

**PISA 2009**  
**INFORMATION NOTE**  
**7 December 2010**

**CONTENTS**

**1. BACKGROUND**

- 1.1. What is PISA?
- 1.2. Release of PISA 2009 results
- 1.3. How is PISA administered?
- 1.4. Who takes PISA?

**2. WHAT WERE THE RESULTS FOR STUDENTS IN IRELAND IN PISA 2009?**

- 2.1. Reading
- 2.2. Mathematics
- 2.3. Science

**3. WHAT FACTORS ARE ASSOCIATED WITH ACHIEVEMENT?**

- 3.1. Reading for enjoyment
- 3.2. Socio-economic status
- 3.3. Having large numbers of books at home
- 3.4. Speaking the language of the test at home
- 3.5. In dual-parent families
- 3.6. Access and use of ICT – a complex picture
- 3.7. School characteristics

**4. DECLINES IN READING AND MATHEMATICS IN PISA 2009**

- 4.1. How great are the declines in reading and mathematics test scores?
- 4.2. What may have caused the declines in the test scores in reading and maths?
- 4.3. Why have test scores declined in reading and maths but not in science?
- 4.4. Do these declines in test scores mean that standards in reading and maths have declined in Ireland?

**APPENDIX A: EVIDENCE REGARDING TRENDS IN LITERACY AND NUMERACY**

**APPENDIX B FURTHER DETAILS REGARDING THE FACTORS THAT MAY HAVE AFFECTED READING AND MATHS SCORES IN IRELAND**

**Overview**

- B.1 Greater numbers of students not speaking the language of the test at home
- B.2 Students with special educational needs and fewer early school leavers
- B.3 Survey fatigue and student disengagement
- B.4 Eight poorly performing schools
- B.5 Distribution of students across second, third, transition or fifth year
- B.6 Changes to the curriculum
- B.7 Weaknesses in how PISA establishes and reports trends in achievement

## 1. BACKGROUND

### 1.1 What is PISA?

- The OECD's Programme for International Student Assessment (PISA) is an international survey of the achievement of 15-year-old students in reading literacy, mathematical literacy and scientific literacy. PISA assessments have taken place in 2000, 2003, 2006 and, most recently, in 2009.

### 1.2 Release of PISA 2009 results

- **The outcomes of the 2009 cycle and the contents of this information note are under strict embargo until Tuesday, 7 December 2010 at 11.00am Paris time (i.e. 10.00am Irish time).**

### 1.3 How is PISA administered?

- PISA is implemented by the OECD which has a contract with a consortium of research bodies that carry out the research on its behalf. The PISA Consortium is led by the Australian Council for Educational Research (ACER). **In 2009, the PISA assessments were administered in 65 education systems, representing over 80% of the world's economy** (34 OECD member countries territories<sup>1</sup> and 31 other partner countries).
- In each cycle (or round) of PISA one of the skills (reading, mathematics or science) is designated as a "major domain". Greater emphasis is placed on the testing of that domain in that cycle. In comparing performance over time, the OECD compares each domain to when it was last a major domain. In the report on PISA 2009, the comparisons are made as follows: **outcomes in reading in 2009 are compared to those in 2000 (i.e. 2000 vs 2009), mathematics on the basis of 2003 vs 2009 and science on the basis of 2006 vs 2009.**
- One the most widely reported aspects of PISA is the average (or "mean") scores achieved by students in a country in reading, mathematics and science. These are ranked in the PISA report to produce tables of countries' performance. The PISA report also categorises country averages as "above the OECD mean (average)," or "at the OECD mean", or "below the OECD mean;" i.e. country averages are compared to the average score for all OECD countries (rather than to the average for all participating countries). The basis on which countries are designated as being above, at or below the OECD mean takes into account error, or uncertainty, arising from sampling and measurement error (i.e. samples rather than populations of students take the assessment and each student attempts only a subset of the test questions).

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<sup>1</sup> This figure includes one accession candidate, Estonia.

## 1.4 Who takes PISA?

- PISA is based on a random sample of 15-year old students in each of the participating countries. In Ireland, 144 schools took part, representing 88.4% of the schools selected. After refusals and absences were taken into account, 3,937 students completed the assessment giving a weighted student response rate of 83.8%. Of the students who participated in Ireland, 59.1% were in Third Year, 24.0% were in Transition Year, 14.4% in Fifth Year and 2.4% in Second Year.

## 2. WHAT WERE THE RESULTS FOR STUDENTS IN IRELAND IN PISA 2009?

### 2.1 Reading

- **Irish students' performance in reading places Ireland among the "average performing" countries in this domain.** Ireland achieved a mean score on the combined reading scale of 495.6, which is not significantly different from the OECD mean of 493.4.<sup>2</sup>
- **Ireland's rank, based on its mean score, is 17th out of 34 OECD countries and 21st out of 65 OECD and partner countries.** Allowing for measurement and sampling error, Ireland's rank ranges from 12th to 22nd among OECD countries and from 15th to 27th among all participating countries.

Selected countries above the OECD average in reading literacy	Selected countries at the OECD average in reading literacy	Selected countries below the OECD average in reading literacy
Finland	<b>Ireland</b>	Austria
Canada	United States	Spain
Australia	Germany	Greece
New Zealand	France	Italy
Netherlands	United Kingdom	Luxembourg
Japan	Hungary	Czech Republic
Poland		Israel

- **Just over 17% of students in Ireland (compared to 18.8% on average across OECD countries) are low-achieving in reading.** These students have a reading proficiency level at or below Level 1a, which is considered to be **below the basic level needed** to participate effectively in society and in future learning. This means that over one in six students in Ireland is estimated to have poor reading skills. Ireland does slightly better on this measure than the UK or Germany, but considerably worse than countries such as Finland and Canada.

<sup>2</sup> When reading was first tested as a major domain in PISA 2000, the mean (average) achievement score for the OECD was set at 500 (and the standard deviation at 100). By 2009, the mean score for reading across the OECD was 493.4. This means that across the OECD, the mean student achievement score was slightly lower in 2009 than it had been in 2000. (The mean score of 500 was set for mathematics in 2003 when mathematics was a major domain and similarly for science in 2006).

- **Ireland has about the same proportion of highly skilled readers**, or students at or above Level 5, as is found on average across OECD countries (7% versus 7.6%, respectively).
- **Ireland has a similar percentage of low achieving students as Northern Ireland, (17.2% versus 17.5%) but a somewhat lower percentage of high-achieving students (7% versus 9.3%).** The mean score for Northern Ireland (499.4) is higher than but not significantly different from the mean score for Ireland.
- **In Ireland, females achieved a mean score (515.4), which is significantly higher than the mean score for males (476.3).** The difference between males and females in Ireland is the same as the difference among OECD countries on average (39 points).
- **Almost a quarter of male students (23.2%) in Ireland achieved an average score which is considered to be below the level of literacy needed to participate effectively in society and future learning** (at or below Level 1a). Only 11.3 % of females in Ireland fell into this group.
- **Ireland’s performance in reading has dropped 31 points since 2000:** this means that Ireland has dropped from among the “above average” performing countries in reading to among the “average performing” countries. Further information about this decline will be found in Section 4 and in the Appendix.

## 2.2 Mathematics

- **The performance of Irish students in Mathematics places Ireland among the “below average” performing countries in this domain.** In mathematics Ireland achieved a mean score 487.1 which is significantly below the OECD average of 495.7, albeit by just 8.6 score points.
- **Ireland’s ranking in mathematics is 26th out of 34 OECD countries and 32nd out of 65 participating countries.** Allowing for measurement and sampling error, Ireland’s rank is between 22nd and 29th among OECD countries and 28th and 35th among all countries.

<b>Selected countries above the OECD average in mathematical literacy</b>	<b>Selected countries at the OECD average in mathematical literacy</b>	<b>Selected countries below the OECD average in mathematical literacy</b>
Finland	Austria	United States
Canada	Norway	<b>Ireland</b>
Australia	Poland	Greece
New Zealand	France	Italy
Netherlands	United Kingdom	Luxembourg
Shanghai-China	Sweden	Spain
Singapore	Czech Republic	Israel

- **Ireland has a slightly smaller proportion of students in the lowest performing category in mathematics than the average of OECD countries.** The proportion of students at/below Level 1 in Ireland (20.8%) is slightly less than on average across OECD countries (22.0%) and is similar to that in the United Kingdom (20.2%) and Poland (20.5%), both of which achieved an overall mean score not significantly different from the OECD average.
- **However, Ireland has significantly fewer students at the higher proficiency levels (at/above Level 5) than the OECD average (6.7% compared to 12.7%) and also in comparison to United Kingdom (9.8%) and Poland (10.4%).**
- **The mean score for Northern Ireland (492.2) is not significantly different to the mean score for Ireland.**
- **Ireland and Northern Ireland have similar proportions of low achieving students in mathematics but there is a greater proportion of higher-performing students in Northern Ireland than in Ireland.** The proportion of low-achieving students in Northern Ireland (21.4%) is similar to the corresponding percentage for Ireland (20.8%) and on average across OECD countries. However, there are proportionally more high achieving students in Northern Ireland (10.3%) than in Ireland (6.7%).
- **In Ireland, males (490.9) outperform females (483.3) on mathematical literacy, but the difference is not significant.**
- **The proportion of low-achieving males (20.6%) and females (21%) are slightly lower than the corresponding OECD averages (20.9% and 23.1%).**
- **Ireland's mean mathematics score has dropped 16 points, from 502.8 in 2003 to 487.1 in 2009.** This means that Ireland has dropped from among the “average performing” countries in Mathematics to among the “below average” performing countries. The majority of this decline (14 of the 16 points) has occurred between 2006 and 2009. Ireland's rank has dropped from 20th to 26th among countries that participated in both cycles. This decline is discussed further in Section 4 and in the Appendix.

### 2.3 Science

- **Ireland remains among the “above average” performing countries in Science.** Ireland's mean score for Science in 2009 is 508.0, which is significantly higher than the OECD average of 500.8
- **The mean score for Ireland is 14th highest of the 34 OECD countries and 20th highest of the 65 participating countries.** Allowing for measurement and sampling error, Ireland's true rank is between 11th and 17th among OECD countries and between 16th and 23rd among all countries.
- **In terms of overall rank, Ireland has climbed two places from 20<sup>th</sup> to 18<sup>th</sup> among the 57 countries that participated in both the 2006 and 2009 cycles of PISA.**

- Students in Northern Ireland achieved a mean score (511.4) that is significantly above the OECD average but is not significantly different to the mean score for Ireland.
- The percentage of students in Ireland scoring at or below Level 1 on science in Ireland (15.2%) is somewhat lower than on average across the OECD (18.0%), while the percentage at or above Level 5 (8.7%) is similar to the OECD average (8.5%).
- **Since 2006, there has been no change in average science achievement in Ireland.** Furthermore, there has been no change in the percentages of students at or below Level 1 or at or above Level 5. In both 2006 and 2009 gender differences in science achievement are small and not statistically significant in Ireland.

<b>Selected countries above the OECD average in scientific literacy</b>	<b>Selected countries at the OECD average in scientific literacy</b>	<b>Selected countries below the OECD average in scientific literacy</b>
Finland	United States	Sweden
Canada	Norway	Austria
Australia	Denmark	Portugal
New Zealand	France	Italy
<b>Ireland</b>	Hungary	Spain
Shanghai-China	Czech Republic	Luxembourg
Singapore		Greece
United Kingdom		Israel

### 3. WHAT FACTORS ARE ASSOCIATED WITH ACHIEVEMENT?

A number of factors are found to be associated with student performance on the PISA tests. Analysing these factors can help us to understand how the achievement of students could be improved. This section focuses on reading achievement, although the relationship with the characteristics considered are similar in the case of both mathematics and science.

#### 3.1 Reading for enjoyment

- **Reading for enjoyment has a positive relationship with reading achievement.**
- **42% of students in Ireland reported that they never engaged in reading for enjoyment** (compared to 37% on average across OECD countries), while almost 16% (15.8%) reported reading for enjoyment for more than one hour a day. The proportion of such students in Japan and Belgium (countries that have significantly higher reading scores than Ireland) is about the same as in Ireland.
- In Northern Ireland, 43.3% of students report that they do not read for enjoyment – about the same as in Ireland.
- The mean **score of students who read for enjoyment for more than one hour per day was 93 points higher than that of students who did not read for enjoyment.**

Males (48%) were more strongly represented in the group of students who did not read for enjoyment than females (33%), and this group was larger in 2009 (41.9%) than in 2000 (33.4%). Other countries also had a significant increase in the percentage of students not reading for enjoyment: in Finland, for example, this increased from 22.4% in 2000 to 33% in 2009.

- If we examine the reading achievement scores of the students that stated that they did not read for enjoyment, we find that students from lower socio-economic backgrounds had an average score of 431.4 while those from higher socio-economic backgrounds had an average score of 498. This means that socio-economic background mediates, at least to some extent, the association between frequency of reading and reading achievement.

### 3.2 Socio-economic status

- **Socio-economic status is strongly related to reading achievement.**
- A measure of socioeconomic status, the PISA index of economic, social and cultural status (ESCS)<sup>3</sup>, was associated with reading performance, as **students in Ireland in the top third of the ESCS distribution had an average reading score that was 76 points higher than students in the bottom third.**
- ESCS accounts for a smaller proportion of the variation (spread) in reading performance among students in Ireland (12.9%) than on average between students across OECD countries (14.1%). However, this difference is not statistically significant.

### 3.3 Having large numbers of books at home

- **Having large numbers of books at home has a positive relationship with reading achievement.**
- On a measure of home educational climate (number of books in the home), students with 0-10 books had a mean score that was 115 points lower than students with over 500 books.
- In Ireland, 6.4% of variation in reading achievement in PISA 2009 is explained by books in the home after accounting for all other factors. This is consistent with earlier research using previous PISA data that confirmed that the relationship between reading achievement and books in the home holds, even when school and home socio-economic status are controlled for.

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<sup>3</sup> ESCS is composed of a set of six inter-related measures of different aspects of student socio-economic background: occupational status of parents, educational level of parents, number of books in the home, family wealth (material possessions), home educational resources, and cultural possessions at home.

- While there was a small increase in student-level ESCS between 2000 and 2009 (i.e. Irish students were somewhat better off) there was no change in home educational resources.

### 3.4 Speaking the language of the test at home

- **Speaking the language of the test at home is positively related to achievement.**
- Both Irish-born ('native') students (91.7%, of all students, mean = 501.9) and non-Irish-born ('migrant') students who spoke English or Irish at home (4.5%, 499.7) had significantly higher mean reading scores than migrant students who spoke other languages at home (3.5%, 442.7).
- Both native students (91.7%, mean = 501.9) and second-generation migrant students (1.4%, 508.2) had higher mean reading scores than first-generation migrants (6.8%, 465.7). The respective OECD averages of these groups are 499, 468 and 449, which indicates that the achievement difference between first-generation and other students is smaller in Ireland than on average across the OECD.

### 3.5 In dual-parent families

- In Ireland, 15.7% students were in single-parent families, which is similar to the OECD average of 16.9%. Students in Ireland from dual-parent families had a mean reading score 25 points higher than students from single-parent families and this difference is somewhat higher than the OECD average of 18 score points.
- The disparity in performance may in part be explained by student socio-economic status; however, students in lone-parent families remain at a significant disadvantage of 13 score points in Ireland when socio-economic status is controlled for when compared to 5 points on average across OECD countries.

### 3.6 Access and use of ICT – a complex picture

- Although students in Ireland had relatively high levels of access to ICT resources at home, and average levels at school compared to students in other OECD countries, **they tended to under-use those resources in both locations, compared to students in other OECD countries.** For example, 92.5% reported that they never posted their work on a school website, while 75.2% reported that they never used email at school.
- Students in Ireland had a mean score on a scale of self-confidence in performing higher-level ICT tasks that was one-tenth of a standard deviation below the OECD average.
- Interestingly, students with high levels of ICT usage at school and students with low levels of ICT usage in school had lower reading scores than students who had average levels if ICT usage in school. **In other words, students who either under-**



**used or used ICT extensively in school did less well in reading than students who had average levels of ICT usage.**

### **3.7 School characteristics**

- School-level variables associated with reading achievement included school average socio-economic status (ESCS, with higher-ESCS schools doing better), and school sector/gender composition (with girls' secondary schools outperforming all other school types).
- The average score difference for reading between students in the top and bottom thirds of the school average ESCS distribution is 72 points.
- Students in all-girls' secondary schools had a mean reading score (531) that ranged between 27 and 65 points higher than students in boys' secondary, mixed secondary, community/comprehensive and vocational schools.
- **However achievement differences across different school types are related to differences in their socioeconomic composition.**

## **4. DECLINES IN READING AND MATHEMATICS**

*This section summarises the issues regarding the declines in students' scores in reading and mathematics that are reported in PISA 2009. The Appendix provides greater detail about each of the factors that may be involved.*

### **4.1 How great are the declines in reading and maths test scores?**

- The PISA 2009 achievement scores in reading and mathematics for students in Ireland show significant declines when compared to scores in previous rounds of PISA.
- The fall in reading (31 score points) is the highest fall experienced by any country, while the fall in mathematics (16 score points) is the second largest fall of any country.
- Irish students' ranking in reading has fallen from 5<sup>th</sup> in the PISA tables in 2000 to 17<sup>th</sup> in 2009 among the 39 countries that participated in both PISA 2000 and 2009.
- The performance of students in reading in Ireland declined uniformly across all ability levels and so cannot be attributed to one particular group, such as very high or very low achievers doing poorly.
- The ranking of Irish students in mathematics fell from 20<sup>th</sup> in 2003 to 26<sup>th</sup> in 2009 among the 40 countries that participated in both PISA 2003 and 2009.
- The decline in mathematics was fairly uniform across the student range of ability, with a slightly more pronounced decline at the upper end of the achievement distribution.

#### 4.2 What may have caused the declines in the test scores in reading and maths?

- The extent of the falls in the reading and maths scores of students in Ireland was unexpected. **Few educational systems have ever experienced *actual* changes in educational standards of the size reported for Ireland by PISA 2009** in such a relatively short period of time.
- In order to better understand the declines in reading and mathematics scores, the Department of Education and Skills commissioned the Educational Research Centre, Drumcondra, Dublin and a team of international experts at Statistics Canada to examine the PISA 2009 results for Ireland in detail.
- **The experts from Statistics Canada and the ERC attribute *some* of the declines to:**
  - Changes in the student population in Ireland, such as greater numbers of students who do not speak English as their first language and more students with special educational needs taking the test
  - The success that schools have had in preventing early school leaving, meaning that more weaker-performing students are now sitting the tests
  - Some evidence of increased student disengagement from the tests evidenced in higher numbers of skipped questions
  - The chance inclusion of a number of very low-performing schools which were not found in previous PISA surveys.
- The experts from the Educational Research Centre have concluded that **changes in the curriculum at primary level that occurred in the years following 1999 cannot explain the decline in performance on PISA reading literacy between 2000 and 2009.**
- **The experts from Statistics Canada and the Educational Research Centre have pointed to factors associated with the design and reporting of PISA that may have contributed to the decline in the scores of Irish students.** Constructing a test that measures achievement accurately across many languages and cultures is a significant challenge; to do this so that reliable estimates of trends across periods of time may be established is an even greater challenge.
- The experts that have advised the Department point out that **many assessment experts have written about weaknesses in PISA and that the OECD has attempted to address some but not all of these weaknesses.** For example, the design of the test was changed between 2000 and 2003 and even small changes to the design can affect measurement properties of test items. Also, the number of reading questions used to establish trends is small, at just 26. Further, the measurement error to establish linkages across cycles may be somewhat underestimated.
- The experts at the Educational Research Centre (ERC) have concluded that **“It is likely that issues about the construction of achievement scores and establishing links (trends) across cycles contributed to the low scores of students in Ireland in reading and mathematics” and that the techniques used by PISA “have overestimated the size of the decline [in achievement].”** These

ERC experts summarise the arguments by saying that PISA is good at identifying whether or not a change in *achievement* has occurred but does less well at establishing the extent of the change. **The OECD does not accept these criticisms but has accepted that “performance changes [in PISA] are associated with a fairly large standard error.”**

#### 4.3 Why have test scores declined in reading and maths but not in science?

- During the decade covered by the PISA tests, science was introduced as a subject in primary schools in 2003-04 and a revised Junior Certificate Science curriculum was introduced at post-primary level. Both curricula were supported by intensive in-service programmes and equipment grants to schools. These changes seem to have counteracted the effect of changes in the student population that may have otherwise lowered performance in science.

#### 4.4 Do these declines in test scores mean that standards in reading and maths have declined in Ireland?

- Both Statistics Canada and the ERC have cautioned the Department of Education and Skills against reading too much into a single set of PISA outcomes. Both have also pointed out that *performance (or achievement) on a test* is not the same as a student's *actual proficiency*. Statistics Canada have noted that student performance in Ireland on the PISA tests has been consistently decreasing over time. They also state that “this may or may not be the result of declining student proficiency, but it is important to consider alternate explanations.”
- **The experts have advised that it is difficult to be certain that there is an underlying real decline in standards over time without further evidence.** The OECD has commented that “performance changes [in PISA] are associated with a fairly large standard error.” Other available evidence shows stable standards over time in literacy and maths in Irish schools (for example, national assessments in reading and mathematics in primary schools, performance of Irish students on international tests such as ICCS and stable outcomes in the State examinations<sup>4</sup>), **so it is not possible to conclude definitively that standards in literacy and numeracy have fallen in Ireland. Certainly, it is highly unlikely that a decline in standards of the extent suggested by PISA has actually occurred.**
- **However, it would be unwise to ignore the possibility that there may have been some decline in actual standards in literacy and numeracy.** The draft national plan to improve literacy and numeracy in schools, *Better Literacy and Numeracy for Children and Young People*, published in November 2010, sets out national targets and a range of significant measures to improve literacy and numeracy in early childhood education and in primary and post-primary schools. These measures include fundamental changes to teacher education, the curriculum in schools and

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<sup>4</sup> ICCS is the International Civic and Citizenship Education (ICCS) Study which ranked second-year students in Ireland 7<sup>th</sup> out of 36 participating countries. Further details of all of the evidence regarding the decline may be found in Appendix A and Appendix B.

radical improvements in the assessment and reporting of student progress at student, school and national level.

## APPENDIX A

### EVIDENCE REGARDING TRENDS IN LITERACY AND NUMERACY IN IRELAND

Evidence other than PISA 2009 suggests that literacy and numeracy standards are stable in Ireland.

- **There is no evidence from national assessments of English reading or mathematics that the performance of primary-level students in Ireland has declined to a significant degree in recent years.** In the case of reading, no significant changes in average performance at fifth class level have been recorded since 1980.
- An analysis of a small but representative number of reference examination scripts for English and Mathematics for Junior Certificate at sample points in the period 1999 to 2009 by the State Examinations Commission has **found no evidence of a significant change in the standard of answering by students.**
- Second-year students in Ireland's post-primary schools obtained **a high literacy-related score in the recently published International Civic and Citizenship Education (ICCS) Study (ranking 7<sup>th</sup> out of 36 participating countries).** Testing of students for this study was completed in post-primary schools in the month prior to that in which testing for PISA 2009 was carried out.
- **Students in Ireland performed well in reading in all previous cycles of PISA (2000, 2003 and 2006).**

## APPENDIX B

### FURTHER DETAILS REGARDING THE FACTORS THAT MAY HAVE AFFECTED READING AND MATHS SCORES IN IRELAND IN PISA 2009

#### Overview

- The PISA 2009 achievement scores in reading and mathematics for students in Ireland show significant declines when compared to scores in previous rounds of PISA.
- The fall in reading (31 score points) is the highest fall experienced by any country, while the fall in mathematics (16 score points) is the second largest fall of any country.

#### *Reading*

- The average reading score of students in Ireland dropped 31 score points between 2000 (when it was at 527) to 496 (495.6) in 2009. It should be noted that this decline includes a non-significant drop of 9 points between 2000 and 2006.
- Irish students' ranking in reading has fallen from 5<sup>th</sup> in the PISA tables in 2000 to 17<sup>th</sup> in 2009 among the 39 countries that participated in both PISA 2000 and 2009.
- The performance of students in reading in Ireland declined uniformly across all ability levels and so cannot be attributed to one particular group, such as very high or very low achievers doing poorly.
- The percentage of Irish students at or above Level 5 (higher performing) in reading declined from 14.2% in 2000 to 7% in 2009, meaning that the percentage of students at this level is not significantly different from the OECD average.
- The percentage of Irish students below level 2 (lower performing) in reading has increased from 11% in 2000 to 17.2% in 2009, meaning that Ireland has gone from being well below the OECD average at this level in 2000 to being not significantly different from it in 2009.
- Other countries that have experienced significant falls in reading between 2000 and 2009 include: Austria (-22 points), Sweden (-19 points), Australia (-14 points), and the Czech Republic (-13 points).

#### *Mathematics*

- The average maths score of students in Ireland dropped 16 score points between 2003 (when it was at 503) to 487 (487.1) in 2009.
- The ranking of Irish students in mathematics fell from 20<sup>th</sup> in 2003 to 26<sup>th</sup> in 2009 among the 40 countries that participated in both PISA 2003 and 2009.
- The decline in mathematics was fairly uniform across the student range of ability, with a slightly more pronounced decline at the upper end of the achievement distribution.

- The percentage of students in Ireland at or above Level 5 (higher performing) decreased from 11.4% in 2003 to 6.7% in 2009 and still remains significantly lower than the corresponding OECD average (12.7% in 2009).
- The percentage of students at or below Level 1 (lower performing) increased from 16.8% in 2003 to 22% in 2009 and is now not significantly different from the OECD average.
- Other countries with significant declines in mathematics between 2003 and 2009 include the Czech Republic (-24 points), Sweden (-15 points), France (-14 points), Belgium (-14 points) and the Netherlands (-12 points). Northern Ireland experienced a decline of 22.5 points.

### **B.1 Greater numbers of students not speaking language of test at home**

- The proportion of students with an immigrant background who participated in PISA testing in Ireland rose from 2.3% in 2000 to 8.3% in 2009. The proportion of students who speak a language other than English/Irish rose from 0.9% in 2000 to 3.5% in 2009.
- **In 2000, migrant students who spoke another language obtained a higher mean score** than those who spoke English/Irish. However, in 2009, migrant students who spoke another language **did significantly less well** than speakers of English/Irish, reflecting changes in the size and composition of migrant groups between the two assessments.
- Overall, it is estimated that **the greater numbers of migrants who do not speak English (or Irish) as a first language has made a small contribution to the overall decline** in students' scores.

### **B.2 Students with special educational needs and fewer early school leavers**

- Other demographic changes between 2000 and 2009 include an increase in the proportion of students with special needs taking the PISA tests (which is not possible to quantify precisely) and a decline in the percentage of early school leavers (from 2.1% to 1.5%). Both of these changes can be expected to have made some contribution to lower average scores in 2009 than in 2000.

### **B.3 Survey fatigue and student disengagement**

- A factor that could have impacted on the way in which schools treated the PISA test administration in 2009 was survey fatigue. Post-primary schools were involved in three international studies in the 2007-08 and 2008-09 school years which is unprecedented. For all three surveys, both a pilot and full-scale study were conducted. Given the limited pool of post-primary schools, some were selected for studies in both school years, and this may have induced survey fatigue, at least among school staff.

- At a more general level, students themselves may not have engaged with the 2009 PISA assessment to the same extent that their counterparts engaged with earlier assessments. However, while there is evidence of greater levels of skipping test items in 2009, it is not clear if this can be attributed to disengagement with the test, or a greater inability to attempt such items. The likelihood is that a combination of both factors affected the outcomes.

#### B.4 Eight very low-performing schools

- In all PISA cycles to date, Ireland fully met the sampling requirements and response rates established by the OECD. However, **the 2009 sample was found to include eight low-performing schools – schools with average reading and mathematics achievement scores that were considerably lower than the lowest school mean scores in 2000.**
- The presence of these schools contributed about a quarter of the decline in reading scores and also affected the maths scores on the tests.
- The presence of these schools in the 2009 sample could be attributed to random sampling fluctuation.
- The identity of the eight schools is not known to the Department of Education and Skills as schools in all countries participate in PISA on the understanding that schools and students may not be identified.

#### B.5 Distribution of students across second, third, transition or fifth year in school

- PISA is administered to 15-year old students. These may be in Second Year, Third Year, Transition Year or Fifth Year in a school. Because of the greater availability of Transition Year in schools in 2009 compared to 2000, the proportion in Transition Year has increased while the proportion in Fifth Year has declined.

	2 <sup>nd</sup> Year	3 <sup>rd</sup> Year	Transition Year	Fifth Year
2000	3.3%	62.0%	16.0%	18.6%
2009	2.4%	59.1%	24.0%	14.4%

- The ERC analysis has attempted to examine whether this significant shift in the school population had any impact on student achievement on the PISA test. Declines in performance were observed across all levels in both reading and mathematics in 2009. However, the smallest declines in both reading (29 points decline in average scores from 2000 to 2009) and mathematics (12.2 points decline in average scores) were observed in third year (the year in which students were focussed on taking their Junior Certificate examination). The largest declines in average reading scores occurred in Transition Year (43.1 points) and Fifth Year (49.7 points) while the largest decline in mathematics occurred in Transition Year (33.4 points).



- It is difficult to interpret these data definitively. For example, the declines in Transition Year in mathematics may be due to the lessened exposure of students to systematic teaching of this subject in Transition Year. (The draft national plan to improve literacy and numeracy in schools: *Better Literacy and Numeracy for Children and Young People* has proposed an increase the time devoted to Mathematics in Transition Year).
- The picture seems more complicated for reading achievement, with significant falls occurring for both Transition Year *and* Fifth Year. In 2000, only 16% of students, mainly from higher socio-economic status were in Transition Year while 19% of students with somewhat lower socio-economic status progressed to Fifth Year. In 2009, the proportion of students in Transition Year had increased to 24%. In contrast, the 14% of students in Fifth Year in 2009 were mainly from low SES backgrounds. This seems to account for the larger decline in performance occurring in Fifth Year than in Transition Year.
- Taken with the evidence that we have concerning student engagement with the test, it could be postulated that when students are in Third Year and are experiencing a tightly focussed, examination-influenced learning environment, they may perform better on formalised pencil and paper tests such as PISA. The fall-off in achievement in the years following the Junior Certificate examination may reflect a greater degree of disengagement with testing and or with curriculum content. This could arise to a greater degree in the group of students who are awaiting their 16<sup>th</sup> birthday when they can legally leave the educational system.

## **B.6 Changes to the curriculum**

- The majority of the 2009 PISA students would have experienced aspects of the revised English Primary School Curriculum published in 1999 and introduced in 2001-2002 and the revised mathematics curriculum introduced in 2002-2003.
- Results of the national assessments of reading and mathematics conducted in 1998/99 and 2004 did not show any change in performance. Students who were in Transition Year of Fifth Year in PISA 2009 (40% of the cohort, and the groups where the largest declines in PISA reading performance were noted) would have been among the cohort sampled for the 2004 national assessments of reading in fifth class in primary school. The ERC has stated that since the performance of these students at primary level did not change significantly from students tested over the preceding two decades, it seems unlikely that changes in curriculum implementation at primary level can explain the decline in performance on the PISA reading test between 2000 and 2009.
- Project Maths has been introduced into 24 pilot schools since September 2008 and was extended to all second-level schools in September 2010. Only 35 of the 3,937 students who participated in PISA 2009 had experienced Project Maths. Hence, since it involved such a small proportion of the PISA 2009 sample, the ERC has concluded that Project maths had no impact on the mathematics performance of Irish students in PISA 2009.

- The ERC has concluded that the introduction of science to the primary school curriculum in 2003-2004 and the implementation of the revised Junior Certificate science curriculum at post-primary level may have mitigated the effects of changes in demography and sampling that might otherwise have lowered performance in science in PISA 2009.

## **B.7 Weaknesses in how PISA establishes and reports trends in achievement**

Analyses of PISA data by the Educational Research Centre and Statistics Canada have identified a number of factors associated with the design and reporting of PISA that may have contributed to the decline in the scores of Irish students.

### *Number of link items*

- When participating in a PISA test, the student completes a large number of “questions” which statisticians call “test items”. Some of the test items are identical in each cycle of PISA but many other items are not the same in each cycle. The identical items that are repeated in each cycle of PISA are called “link items” because they are used to link the cycles of PISA and calculate trends in achievement over time.
- The more link items that are used to calculate trends, the more accurate the reported trend is likely to be. The PISA reading test was the first to be designated as a major domain and uses relatively few link items to report the trends in reading (26 items in the case of PISA 2009). The OECD has implicitly accepted that the number of link items used in the reading test was too small as it used larger numbers of link items for mathematics (32 items) and science (49 items) when these tests came to be developed. The use of a small number of link items, especially in reading, means that comparisons and judgements about trends are based on a narrow evidence base.

### *How linkage over time is calculated*

- PISA reports reading standards comparing 2009 and 2000 outcomes. However, the underpinning mathematics actually compares outcomes in 2009 to those of 2006, then compares those of 2006 to those in 2003 and finally the outcomes of 2003 back to those of 2000. A similar chain (2009 to 2006, 2006 to 2003) is used to establish the trend in mathematics. This is referred to as “chain linking”.
- Some error occurs each time a linkage is made. There is no consensus among international assessment experts as to the estimation of the size of these errors. Statistics Canada argues that because the trend is established using a series of linkages, the error is compounded each time – hence there would be a large link error. The OECD rejects this argument but accepts that “performance changes [in PISA] are associated with a fairly large standard error.” Acknowledging that a larger link error exists in the PISA data would mean that large differences in achievement would be less likely to be statistically significant and would somewhat reduce the reliability of the estimate of change in performance that the OECD reports in PISA.
- One implication of this is that **the 11 score-point drop in reading literacy between 2000 and 2003 (which was not statistically significant) contributes to the 31-point decline observed between 2000 and 2009**. In contrast, a decline of only 2

points between 2003 and 2006 has been carried forward into Ireland's mathematics score in 2009 (i.e., most of the decline occurred between 2006 and 2009). In 2012, when the reading link will be back to 2009 only, earlier declines in achievement (for which there is no obvious explanation) are unlikely to be taken into account.

#### *Changes in the test booklets*

- Changes in the assessment instruments (the test booklets and the items in them) such as changes in the reading test in 2003, when a decline in the performance of Irish students was first recorded, may have played a role. Even minor changes, such as in the location of items in a test, have been found in other studies to affect student scores.

#### *Scaling*

- The procedures used to convert students' raw scores (the number of questions or test items answered correctly) to scale scores may have disadvantaged Irish students, exaggerating the extent of the decline. Statistics Canada has shown that performance of Irish students on 65% of the individual 2009 reading items is better than would be expected on the basis of their PISA scores, and that this difference is more pronounced for new items than for link items.

#### *Summary*

- In summary, **there is evidence that there are weaknesses in the assumptions underlying the methodology used to establish trend data in PISA from one cycle to another.** This means that reporting of trends in PISA may be unstable and, at the very least, points to the need to treat PISA data with caution (without, of course, disregarding the results). **Having said this, PISA is generally regarded of the most rigorous international assessment of its kind.**