Gender differences at age 15:
Evidence from PISA on performance, attitudes and ICT usage

‘Return to gender’: Gender, ICT and education, Oslo, Norway
2 June 2008
PISA

A three-yearly global assessment that...

... examines the performance of 15-year-olds in key subject areas as well as a wider range of educational outcomes

- Including students attitudes to learning, their beliefs about themselves, and their learning strategies

... collects contextual data from students, schools, parents and systems to identify policy levers

... including optional questionnaire on students’ familiarity with ICT (25 OECD countries in 2006)

Coverage in PISA 2006

- 57 countries
- Representative samples of between 3,500 and 50,000 15-year-old students drawn in each country
  - 4692 students in Norway
- Total of 400,000 students.
Gender: Key findings so far in PISA

- Performance differences between males and females
  - **READING**: Females outperform males in all countries; differences are pronounced
  - **MATHEMATICS**: Males outperform females in the majority of countries; differences are moderate
  - **SCIENCE**: No gender differences overall; but in certain areas of the test there are small differences

- Differences in attitudes to learning
  - **MATHEMATICS**: Females much less confident in themselves as mathematics learners and much more anxious about learning mathematics
  - **SCIENCE**: Males report slightly higher academic confidence; In a minority of countries males are more positive on a number of measures
  - **COMPUTERS**: Males report more frequent use of computers and more confidence in the more demanding computing tasks
Science and gender

- Overall in PISA 2006 science
  - no performance differences
  - students were positive about science both in general and as a school subject and not entrenched gender differences

- But in a minority of countries there are gender differences in favour of males...
  - Germany, Iceland, Japan, Korea, Netherlands, United Kingdom

- Further, in some countries females are performing well, but reporting comparatively less positive attitudes to science...
PISA 2006: Gender differences in science performance

Overall science
- Identifying scientific issues
- Explaining phenomena scientifically
- Using scientific evidence

BUT Norway is one of 5 OECD countries where males report significantly higher enjoyment of learning science (also Japan, Netherlands, Korea, United Kingdom).

OECD (2007), PISA 2006 - Science Competencies for Tomorrow’s World, Tables 2.1c, 2.2c, 2.3c, 2.4c, 2.7, 2.8, 2.9, 2.10
Evidence from PISA on gender differences

1. These vary from subject to subject.
2. The extent of these varies from country to country.
4. Suggests that in some cases students may not choose to pursue studies in certain areas, even though they have the ability.
Overview of computer usage (2006)

- **Students most often...**
  - Use computers to communicate
  - Use the Internet to research information
  - Download music

- **Males often...**
  - Play games
  - Download software (including games)

- **In most countries only around 50% or less often...**
  - Write documents

- **Minority of students often...**
  - Use spreadsheets
  - Programme on computers (less so than in 2003)
Student use of computers for the Internet and entertainment (2006)

<table>
<thead>
<tr>
<th>2006</th>
<th>40 countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Play games</td>
<td></td>
</tr>
<tr>
<td>Download software</td>
<td></td>
</tr>
<tr>
<td>Collaborate with group/team over Internet</td>
<td></td>
</tr>
<tr>
<td>Download music</td>
<td></td>
</tr>
<tr>
<td>Browse Internet for information</td>
<td></td>
</tr>
<tr>
<td>Communicate (e.g. e-mail/chat rooms)</td>
<td></td>
</tr>
</tbody>
</table>

This shows you to what extent the pattern of gender differences holds across countries.

This is the gender differences divided by those of females. For example, in 40 out of 40 countries significantly more males than females report frequently playing games.

A value of 2.0 indicates that on average there are twice as many males reporting this than there are females (e.g., 20% / 10%). This is used as an indicator of how entrenched the gender differences are. A value of 1.0 indicates that there are no gender differences on average.

This shows you to what extent the pattern of gender differences holds across countries. For example, in 40 out of 40 countries significantly more males than females report frequently playing games.

However, the picture is more nuanced for frequent browsing for information on the Internet. On average, there are not pronounced gender differences (1.1) and these are in favour of males in 22 countries and in favour of females in 3 countries.

A value of 1.0 indicates that there are no gender differences on average. A value of 2.0 indicates that on average there are twice as many males reporting this than there are females (e.g., 20% / 10%). This is used as an indicator of how entrenched the gender differences are.
Along with playing games, this is where we see the largest gender differences in frequent computer usage (significant in all countries in 2003 and 2006). M/F = at least 1.5 in all OECD countries except Greece.

Largest relative gaps are in Denmark, Germany, Iceland, Finland and Sweden (M/F = 2.5 or more).
Frequently download music (2006)

Significant gender differences in favour of males in PISA 2006 in all countries.
Largest relative gaps are in Japan and Finland.

More females reduced the gap in:
Finland, Denmark, Switzerland, Iceland
Frequently communicate on computers

No gender differences in Japan, Portugal, Germany, Czech Republic, Spain, Belgium and Sweden.
More males in 5 OECD countries (notably Greece and Turkey).
More females in 13 OECD countries.

In Ireland, New Zealand, Denmark, Australia and Iceland there are now significantly more females (change since PISA 2003).
Student use of computers for programs and software (2006)

<table>
<thead>
<tr>
<th>2006 40 countries</th>
<th>Males/Females</th>
<th>M</th>
<th>F</th>
<th>Largest gender differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Writing computer programs</td>
<td>1.6</td>
<td>39</td>
<td></td>
<td>DEN, FIN (at least 3.0); ISL, SWE, LIE, NLD (at least 2.0)</td>
</tr>
<tr>
<td>Using spreadsheets</td>
<td>1.3</td>
<td>34</td>
<td></td>
<td>LIE, ISL (at least 2.0)</td>
</tr>
<tr>
<td>Drawing, painting or using graphics programs</td>
<td>1.2</td>
<td>22</td>
<td>4</td>
<td>POL, NOR (at least 1.5 in favour of males); JPN, KOR (at least 1.5 in favour of females)</td>
</tr>
<tr>
<td>Using educational software</td>
<td>1.2</td>
<td>30</td>
<td>1</td>
<td>SWE, SVN, FIN (at least 2.0)</td>
</tr>
<tr>
<td>Writing documents</td>
<td>0.9</td>
<td>6</td>
<td>19</td>
<td>Note that differences are not pronounced (max is 1.3 in favour of females in JPN)</td>
</tr>
</tbody>
</table>
In general, the usage of computers for programming is much reduced since 2003. Over 40% of males do this frequently in Norway, Greece and Spain. But this is less than 20% of both males and females in 15 OECD countries.

The gender gap in favour of males is significant in all OECD countries and is most pronounced in:
- Denmark and Finland (% males / % females = at least 3.0)
- Iceland, Sweden and the Netherlands (% males / % females = at least 2.0)
In the majority of OECD countries the percentages of either males or females reporting frequent usage of spreadsheets does not pass 30%. There are no significant gender differences in Japan, Ireland, New Zealand and Hungary. In all other OECD countries, significantly more males report frequent usage of spreadsheets.

Gender differences are most pronounced in:
- Iceland ($M/F = 2.1$)
- Finland, Sweden, Denmark, Czech Republic, Switzerland, Norway, Greece, Poland, Korea and the Netherlands ($M/F = \text{at least } 1.5$)
50% or more of males and females in 12/25 OECD with data. No significant gender differences in Iceland, Czech Republic, Slovak Republic, Switzerland, Germany, Turkey and Denmark. In Greece and Poland significantly more males report this. In all other OECD countries significantly more females report this. However gender differences are not very pronounced.
# Student confidence in high-level ICT tasks (2006) [1/2]

<table>
<thead>
<tr>
<th>2006 40 countries</th>
<th>Males/ Females</th>
<th>M</th>
<th>F</th>
<th>Largest gender differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using anti-virus software</td>
<td>1.3</td>
<td>40</td>
<td></td>
<td>SVK, DEN, RUS, ITA, LTU, LAT, SWE (at least 1.5)</td>
</tr>
<tr>
<td>Creating a database</td>
<td>1.2</td>
<td>31</td>
<td>1</td>
<td>DEN, SWE, FIN, NOR, ISL (at least 1.5)</td>
</tr>
<tr>
<td>Creating a multimedia presentation</td>
<td>1.1</td>
<td>22</td>
<td>2</td>
<td>Note that differences are not pronounced (max is 1.3 in favour of males in FIN, LTU, ISL)</td>
</tr>
<tr>
<td>Constructing a web page</td>
<td>1.1</td>
<td>22</td>
<td>2</td>
<td>Note that differences are not pronounced (max is 1.3 in favour of males in LTU, SVN)</td>
</tr>
</tbody>
</table>
## Student confidence in high-level ICT tasks (2006) [2/2]

<table>
<thead>
<tr>
<th>2006</th>
<th>Males/Females</th>
<th>M</th>
<th>F</th>
<th>Largest gender differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 countries</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Editing digital photographs</td>
<td>1.0</td>
<td>25</td>
<td>6</td>
<td>Note that differences are not pronounced (max is 1.3 in favour of males in SVK)</td>
</tr>
<tr>
<td>Using a spreadsheet to plot a graph</td>
<td>1.0</td>
<td>18</td>
<td>3</td>
<td>Note that differences are not pronounced (max is 1.2 in favour of males in ISL)</td>
</tr>
<tr>
<td>Creating a presentation</td>
<td>1.0</td>
<td>14</td>
<td>9</td>
<td>Note that differences are not pronounced (max is 1.2 in favour of males in SVK)</td>
</tr>
<tr>
<td>Using a word processor</td>
<td>1.0</td>
<td>6</td>
<td>19</td>
<td>Note that differences are not pronounced (max is 1.2 in favour of females in JPN)</td>
</tr>
</tbody>
</table>
Evidence from PISA on gender differences in computer usage at age 15

1. These vary from task to task.
2. The extent of these varies from country to country.
3. Often the gender differences in confidence in performing tasks are not as pronounced as those in frequently doing these tasks.
4. Suggests that in some cases students may feel able to perform different ICT tasks, but do not choose to do so?