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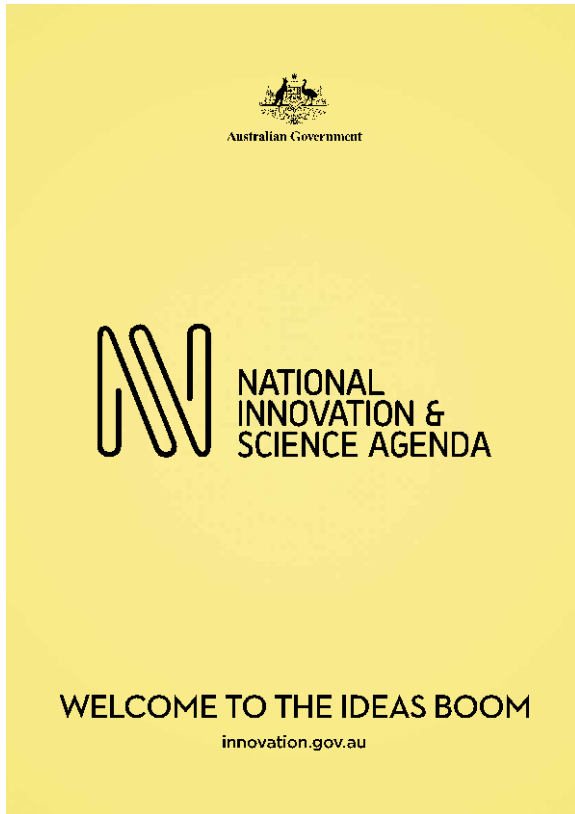
MELBOURNE GRADUATE
SCHOOL OF EDUCATION

Shaping minds, shaping the world

International initiatives attracting girls into under- represented STEM areas

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- The Australian context.
- How do we compare internationally?
- Current influences on girls participation rate in STEM.
- International initiatives.
- What can Australia learn from this?



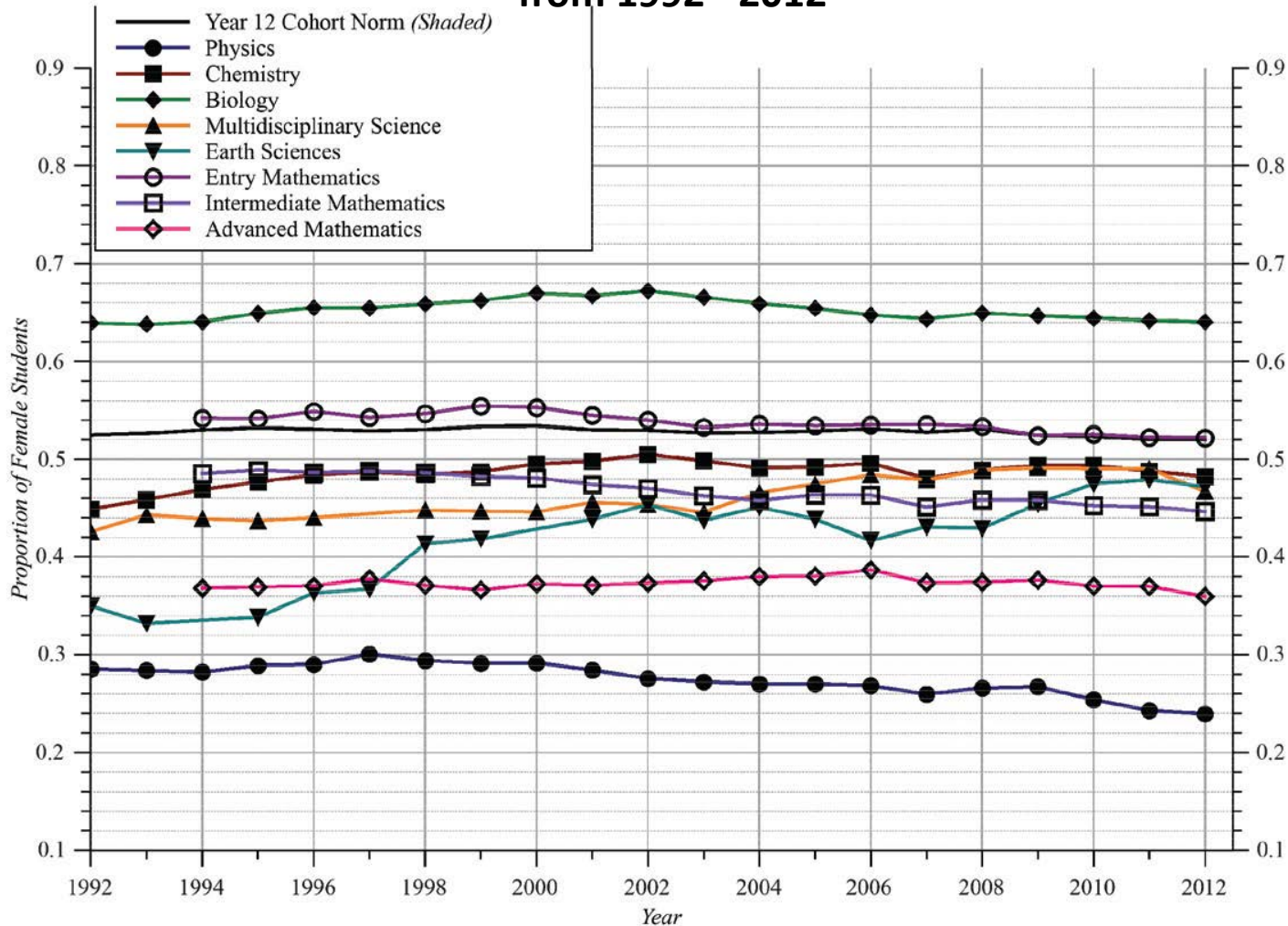
‘Women hold around a quarter of STEM and ICT related jobs and are significantly underrepresented in high level research positions. We need to engage more girls in STEM and computing, and provide pathways to progress their interest across the education system and into careers.’ (National Innovation & Science Agenda 2015, p. 12)

Percentage of qualifications awarded to women in tertiary type A and advanced research programs, by STEM field in 2010 for selected countries. Source: STEM Country Comparisons 2013

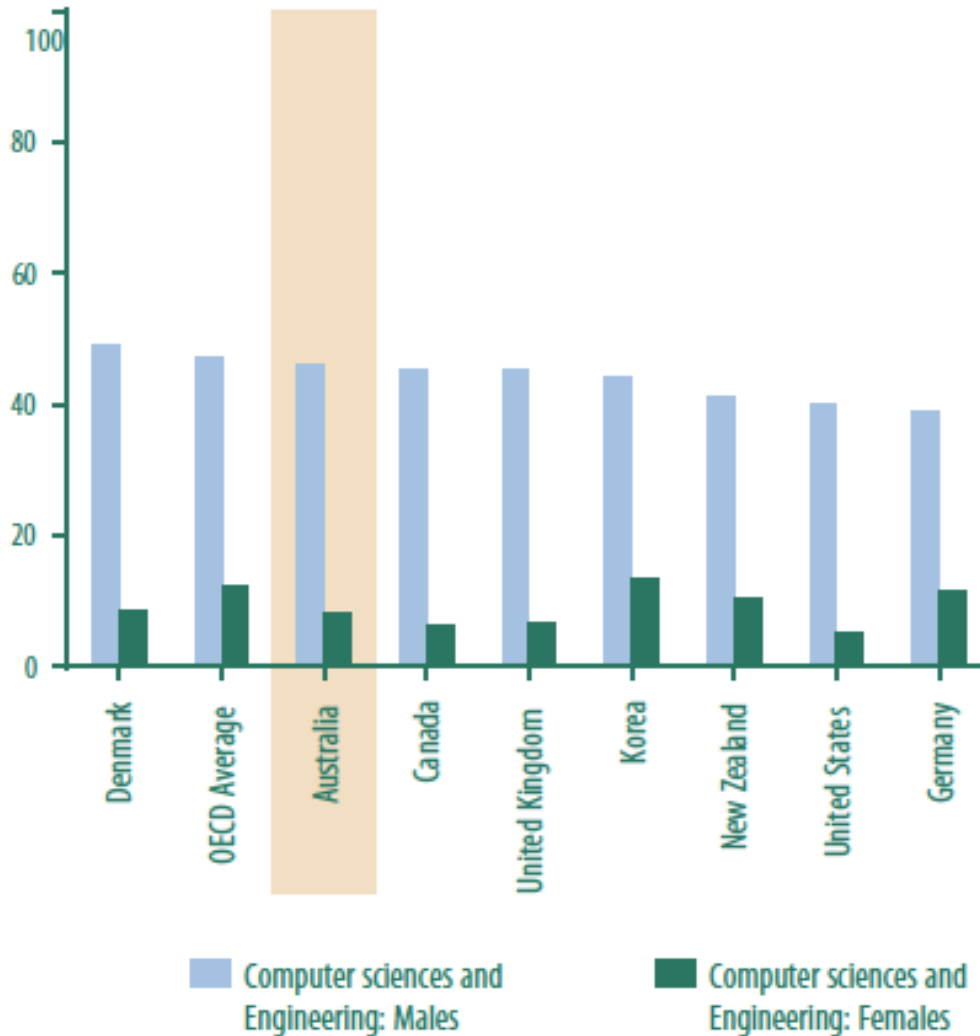
| | Engineering, Manufacturing and Construction | Sciences | Life Sciences | Physical Sciences | Mathematics and Statistics | Computing |
|------------------|---|--------------|---------------|----------------------|-------------------------------|--------------|
| Finland | 21.48 | 46.30 | 76.18 | 50.35 | 47.51 | 28.40 |
| Germany | 21.96 | 44.30 | 67.44 | 42.72 | 61.36 | 15.33 |
| New Zealand | 30.20 | 44.31 | 58.92 | 45.80 | 47.80 | 23.55 |
| EU21 Average | 28.39 | 42.29 | 66.80 | 44.85 | 48.88 | 18.75 |
| OECD Average | 27.19 | 41.61 | 64.23 | 43.81 | 45.89 | 19.73 |
| Canada | 23.50 | 49.01 | 62.64 | 44.80 | 42.45 | 17.91 |
| Korea | 23.32 | 39.22 | 48.37 | 46.89 | 54.80 | 20.86 |
| Denmark | 32.00 | 37.29 | 67.36 | 38.40 | 36.17 | 20.89 |
| Norway | 26.68 | 36.17 | 74.66 | 38.49 | 31.05 | 19.72 |
| United States | 21.67 | 43.50 | 57.94 | 39.38 | 41.61 | 21.08 |
| Australia | 24.31 | 37.31 | 55.15 | 48.05 | 39.89 | 19.57 |
| France | 30.05 | 37.62 | 62.71 | 38.70 | 36.15 | 15.81 |
| United Kingdom | 22.56 | 37.52 | 50.81 | 42.58 | 40.32 | 18.71 |
| Switzerland | 19.53 | 34.40 | 52.89 | 32.29 | 31.83 | 8.20 |
| Netherlands | 19.51 | 22.66 | 62.35 | 24.22 | 31.97 | 10.94 |

Source: OECD 2012a, *Education at a Glance 2012: OECD Indicators*, OECD Publishing, Paris.

Subject sex ratios showing the number of female students per 100 males within each course from 1992 - 2012



- Students self concept (ability beliefs) (Marsh & Martin 2011) and interest are two crucial constructs of a student's motivation to undertake science and mathematics (Eccles 2005).
- Self concept and expectation inextricably linked.
- Expectation is a very good predictor of future pathways (eg Nauta, Epperson & Kahn 1998; Len et al 2005)
- US research found that 14 year olds who expect to undertake careers in science are 3.4 times more likely to end up taking a degree in physics sciences or engineering.



The percentage of participating 15 year-old students **expecting** a science related career by 30 years of age, by field and gender, in PISA 2006. Source: STEM Country Comparisons 2013.

- Self-concept and expectations influenced by a range of influences.
- Much research showing that social interactions with adolescents by parents, peers, teachers and career advisors are highly influential (eg Archer, DeWitt & Wong 2013).
- Gender stereotypes are pervasive in these interactions (eg Adamuti-Trache & Andres 2008; Calabrese, Barton & Tan 2009).



- Finland, Germany, France, New Zealand, Korea, Denmark, Norway and the United States perform better than Australia in female participation in the STEM disciplines on a range of measures (OECD 2012).
- These countries have a range of policies and programs that have specifically targeted gender equality in the STEM disciplines.
- Culture as a factor? Compare to US and UK.



Common elements

- Supported by the relevant ministries and equity policies
- Consist of a number of sites/nodes across the country
- Working with industry and higher education
- Support for teachers through curriculum resources and professional development.

- A number of good small programs and initiatives have been run but with limited success.
- Research showing that many smaller initiatives improve girls' attitudes to science however have little effect on girls' actual subsequent choices (eg Darke, Clewell & Sevo 2002).

What should we focus on?

- Need a concentrated effort that takes on the multitude of influences.
- Social and cultural influences dominate from an early age.
- Gender is produced through discursive and bodily acts. It is performative (Butler 1990). Children experience pressure to perform particular versions of femininity (Renold 2005).
- Argument to be made that significant cultural change within Australia needs to be made to see progress

