

Under-representation in physics

Beth Bramley

Gender Balance Manager

What the data tell us (2018 report)

- **Girls perform just as well as boys in physics at GCSE.** However, in 2016, only 1.9% of girls chose A-level physics, compared to 6.5% of boys. This is 5,669 girls compared to 21,032 boys.
- 68% of all schools with girls send fewer than two girls to A-level physics. **44% of schools send no girls at all.** By comparison, 28% of all schools with boys send fewer than two boys to A-level physics.
- 65% of girls have physics in their top four grades at GCSE. **Of these students, only 8% progress to A-level.** When chemistry and biology were in a girl's top four GCSE subjects, 25% and 32% progressed to the respective A-level.

Three challenges

The strategy identifies three key challenges that present the greatest barriers to unlocking the potential of physics and its impact in society:

1



Diversity and skills: We want to build a thriving, diverse physics community and play our part in solving the science, technology, engineering and maths (STEM) skills shortage by ensuring that people, no matter their background or where they live, have access to world-class physics education and training.

2

Unlocking capability: We want to ensure that the UK and Ireland are able to realise the full societal and economic benefits of the new industrial era.

3

Public dialogue: We want to show the impact of physics on people's lives, enabling informed public debate about funding and policy in areas including healthcare, climate change and cyber security.

We want our physics community to represent the society it serves.

Gender imbalance: IOP research base @ iop.org/genderbalance

It's Different for Girls

The influence of schools

An exploration of data from the National Pupil Database looking at progression to A-level physics in 2011 from different types of school at Key Stage 4



IOP Institute of Physics

Why not physics?

A snapshot of girls' uptake at A-level



IOP Institute of Physics | nationalgrid

An Institute of Physics Report | October 2015

Opening Doors

A guide to good practice in countering gender stereotyping in schools



IOP Institute of Physics

An Institute of Physics Report | December 2013

Closing Doors

Exploring gender and subject choice in schools



IOP Institute of Physics

An Institute of Physics Report | March 2017

Improving Gender Balance

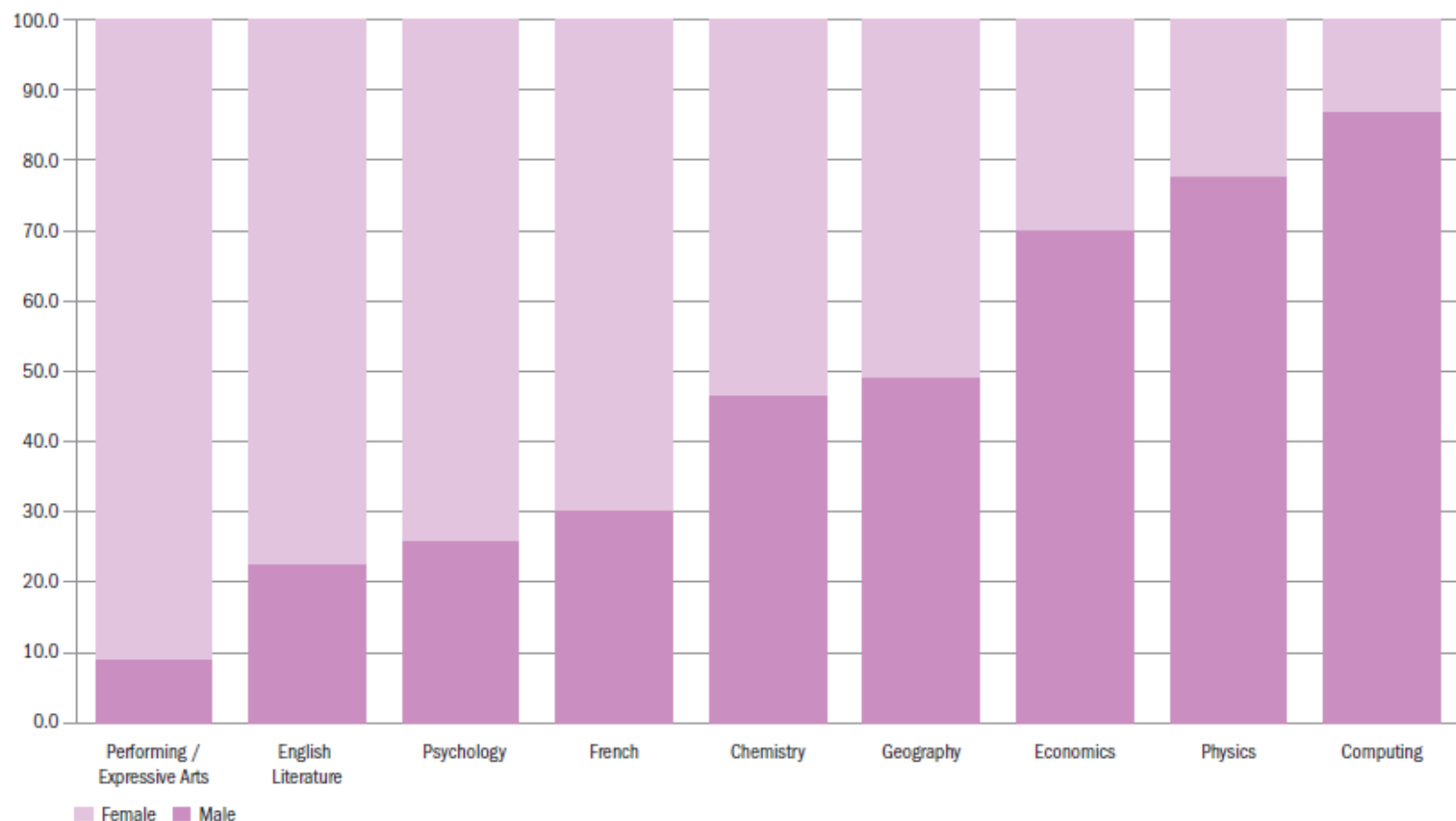
Reflections on the impact of interventions in schools



IOP Institute of Physics

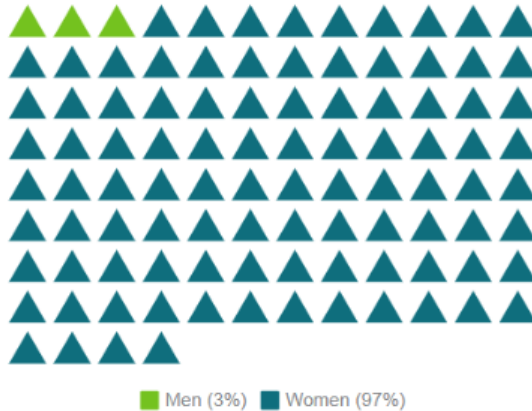
IOP Institute of Physics

Difference between boys' and girls' subject choice at A-Level (UK, 2019)

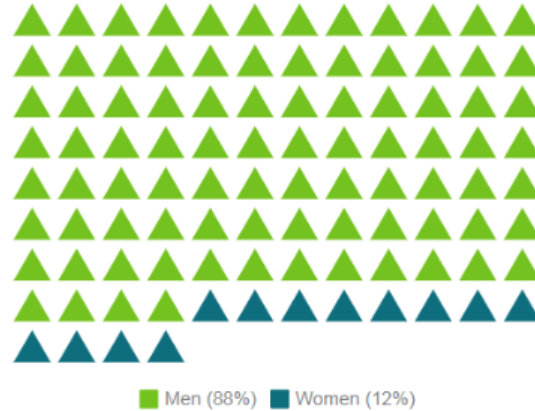


Results of choices

Early Years Educators



Engineering Workforce



Early Years Educator data from MITEY UK and Engineering Workforce Data from the WISE campaign

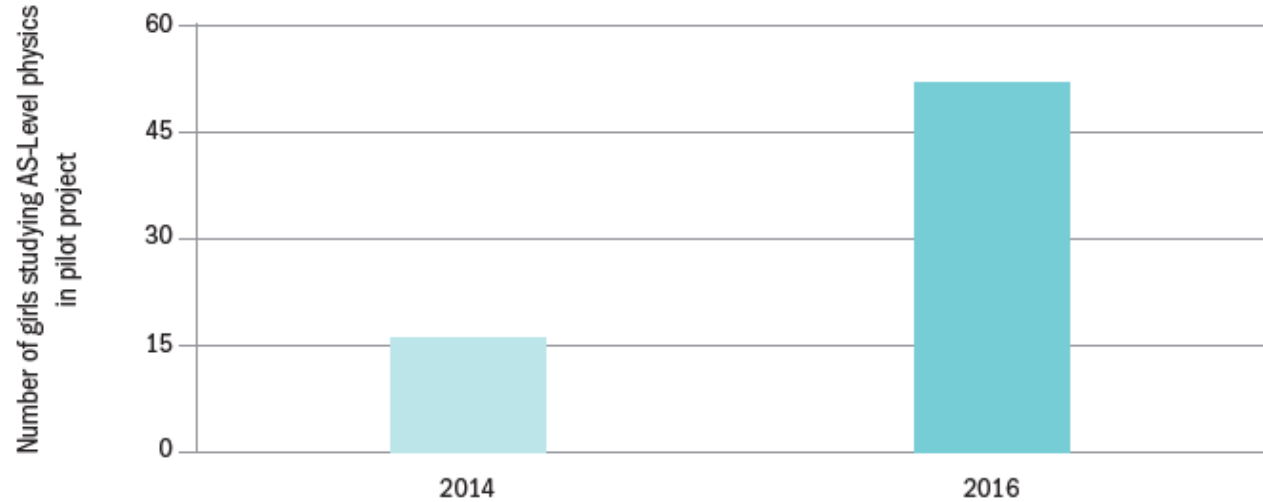
Findings – Aspires



- Students with low Science Capital are unlikely to see science as 'for me'
- Enjoyment of science doesn't translate into science aspirations
- Current careers education is patterned by existing social inequalities
- Girls pursuing the physical sciences post-16 are exceptional
- Young people's career aspirations are relatively unchanged over time

A transformational finding

Pilot project KPI: Increase in A-Level physics uptake among girls



Randomised Control Trial

Improving Gender Balance



Conducting pupil pursuit



Surveying parents



Meeting governors



Looking at school data and publications through a 'gender lens'



Joining any options and parents' evenings



Focusing on physics and science department

Useful for
teaching and
outreach
professionals

10 Inclusive Teaching Tips for Teachers

These tips were developed from our research into gender and behaviour patterns. We recognise that there are variants and these behaviours are not the experience of all individuals. Inclusive teaching is therefore intended to support all students.

1  Use everyday language Low confidence learners can be intimidated by technical jargon. Avoid it and make sure that you only introduce technical language or equations once the context is understood.	6  Allow time for pair or group discussions Give time for students to discuss answers to challenging questions before asking them to share ideas with the class.
2  Avoid asking for volunteers Some groups may be more likely to raise their hands, call out answers and volunteer to take part in activities. Other techniques, such as individual whiteboards or selecting students at random, can broaden the range of students participating.	7  Challenge discriminatory language School should be welcoming to everyone. Always treat sexist language as unacceptable, and tackle the attitudes behind it.
3  Assign roles for practical work Certain students are more likely to dominate the active roles while others may take on more passive roles, like writing. To avoid this, you can assign roles or use single-sex groups for practical and group activities.	8  Monitor your interactions with different genders You might be surprised at the ratio of different genders asking or answering questions in your class. Keep a tally yourself or ask a colleague or student to observe one of your lessons and keep count.
4  Use examples that show how your subject links to their experience This is useful for all students, but research shows that girls in particular tend to appreciate context and seeing the bigger picture.	9  Regularly refer to a range of careers that use skills from your subject Girls are more likely to consider their future career when choosing their options. Emphasise the transferable skills that studying your subject helps to develop.
5  Use gender-neutral contexts whenever possible Try to avoid using examples that focus on stereotypically male or female hobbies or interests.	10  Ensure that your students are exposed to a diverse range of role models in your subject Be wary of giving your students the impression that only some people can do your subject. Emphasise that everyone can do it, irrespective of their background.

Find out more at iop.org/genderbalance

Making a sustained and systemic difference

- Highly consequential reframing from encouraging girls to take physics -> removing barriers to non-stereotypical subject choice for all
- Growing and building consensus around role of societal biases and stereotypes affecting subject choice
- Shift of emphasis from one-off events (role models, careers) to whole-school culture change
- Growing acknowledgement of need to work with all staff in a school; not just physics teachers
- Challenging notions of physics as 'too hard' and an elitist subject
- Starting early!

Thank you

Any questions?

@PhysicsNews

www.iop.org

IOP Institute of Physics