

Research Informed Strategies, International Women's Day and International Day of Women and Girls in Science

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One of my first research informed strategies was a response to a question that had always irked me somewhat,

Why do girls choose to do Physics?

The reason this question was so frustrating was because it highlighted the low numbers of female students that would embark on the course at A Level. I embarked on a journey to uncover the truth behind some of the myths and legends that tell a story of how we perceive the role of women in Science, especially in Physics.

Boys are better than girls in Physics

This is simply not true

Data has varied over the years but there is no distinguishable pattern or trend that can support this claim. An interesting article, published by the New Scientist (2018), placed the spotlight on for Charles Tracy, head of education at the Institute of Physics in the UK. Tracy says, “Girls perform at least as well, if not better.”¹



Figure 1
“Follow your dreams: you won’t regret it.” – Cirilli, M. Head of Medical Applications, CERN

¹ <https://www.newscientist.com/article/mg24032031-900-women-in-physics-why-theres-a-problem-and-how-we-can-solve-it/> - Jamieson, V, 2018

I agree entirely with the importance of diversity in thinking for Physics to continue to play its part in understanding the inner workings of the universe as well as strengthening our ability to create and innovate. Much like Manuela Cirilli, who permitted the sharing of a tweet in 2018 which shown in **Figure 1**², all genders have the ability to contribute something meaningful to the world of Science, therefore they should be given the opportunity to do so. At this point, I stumbled to add my own personal opinion. I found myself in the position whereby data was lacking because I had only taught four female physicists which made up for approximately 8.3% of the cohort that have completed the A Level Physics course. With such a small sample, I could not gather the evidence to challenge this perception first hand.

I reflected on my own personality and persona as a teacher. Did I target the male students who had an aptitude for Mathematics? Am I targeting my own gender, and in some instances neglecting the female students because I don't strike the same rapport with them?



HOW DID THIS EVEN BECOME A THING!!!

People can grow to love Physics, or they can grow apart from it. This is the same story for many subject areas.

So many people in our society buy into the fallacy but it is just not true. An example of this was Alessandro Strumia. He has been allowed to impact the minds of so many young minds before his suspension from CERN, who have now finally severed their ties with this allegedly sexist physicist.³ A potential source for this type of institutionalised gender stereotyping has been made clearer, whilst maintaining that it is not forgivable, by Carole Mundell, Observational Astrophysicist, University of Bath, UK; who is shown in **Figure 2**



Figure 2
Mundell, C. Observational
Astrophysicist, University of Bath

“In countries like the UK, it has been a relatively short time since women were admitted to university, awarded degrees, allowed to continue to work after marriage and to return after starting a family. It takes time and conscious effort to ensure these changes feed through to traditionally male-dominated fields like physics. Now is an exciting time to make that happen.”

² <https://twitter.com/WIPO/status/989513916215713793/photo/1> – World Intellectual Property Organisation, April 2018

³ <https://www.theguardian.com/science/2018/oct/01/physics-was-built-by-men-cern-scientist-alessandro-strumia-remark-sparks-fury> – Giuffrida. A & Busby. M, 2018

When one chooses whether or not to pursue Physics in further of higher education may be founded in their ability, but gender should certainly not be the reason. This is similar to an explanation given by Aniko Rakai, depicted in **Figure 3**⁴, when asked about the place women have in Science.

The Avanti Way furthers this by outlining the intent of the MAT that, “*Students are actively involved in creating their own paths of learning with opportunities for in-depth study of their chosen areas, gaining deeper insight into their interests and abilities.*”⁵

My careful reflection led me to think about how I am inspiring pupils in the classroom and if I settle into unconscious bias when thinking about their next steps in Physics.

Though, it is easy to reflect but more difficult to action.

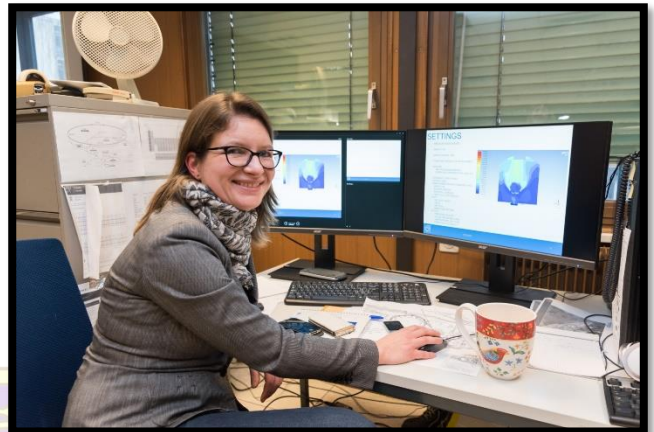


Figure 3
Rakai, A. Hungarian Engineer at CERN

Why do girls choose to do Physics?

And so, I return to this fundamental question to seek the reasons. There has been research of the powers of persuasion one might have as a role model who falls within the same gender as the pupil but for the purposes of this research informed strategy, I did not fully engage with it. The reason was that I wanted Physicists to choose the subject because they loved it, not just because I did, and I just so happen to be the same sex.



Figure 4
Bouhired-Ferrag, D. Algerian-British Engineer at CERN

Looking back at the strategy I implemented, I realised that it resonates deeply with the Avanti Way in treating the pupil simply as a learner without a label, focussing on growth and development of character and spirit, as well as progressing towards academic excellence. I sought to do what Denia Bouhired-Ferrag, shown in **Figure 4**⁶, so eloquently quotes, “Encourage independent spirit.”⁷

⁴ <https://home.cern/sites/home.web.cern.ch/files/image/inline-images/cmenard/aniko-rakai.jpg>

⁵ <https://avanti.org.uk/wp-content/uploads/2020/08/The-Avanti-Way.pdf> - Avanti Way, Page 9

⁶ <https://home.cern/sites/home.web.cern.ch/files/image/inline-images/hjarlett/denia-bouhired.jpg>

⁷ <https://home.cern/news/series/women-science/naturally-im-scientist>

To implement my intent, I focused on the single most powerful I have used so far in my teaching profession. It is something that can be adapted for other subject areas and can be used for all pupils, regardless of which gender they identify with. It also supports one of the eight benchmarks of good practice outlined by the Gatsby.

“All teachers should link curriculum learning with careers. Science, technology, engineering and mathematics (STEM) subject teachers should highlight the relevance of STEM subjects for a wide range of future career paths.”⁸

The resource I used was published by the Institute of Physics and it is available in two formats:

[Version 1](#)⁹

[Version 2](#)¹⁰

I focussed broadly on all ten aspects at different times during the lessons. I had the poster up in my classroom which aided my planning to include these steps and at one point explicitly tracked them. This was because of the link between points nine and ten.

9. Regularly refer to a range of careers that use skills from your subject

10. Ensure that your students are exposed to a diverse range of role models in your subject

It was important to me to find a diverse range of role models in the range of careers that could be done. This is now much easier thanks to events such as **International Women's Day** and **International Day of Women and Girls in Science**.

It is due to these days that I have recently learnt about Swati Mohan, shown in **Figure 5**¹¹, and am now able to celebrate yet another achievement in Physics. She is a great role model and her story is incredibly inspiring in both personal and professional capacities. When Swati played a key role in the Perseverance Mission for NASA, she showed humility by saying, "Everyone built from the strengths of one another, so the capability of the full team was more than the sum of the individual people."¹²

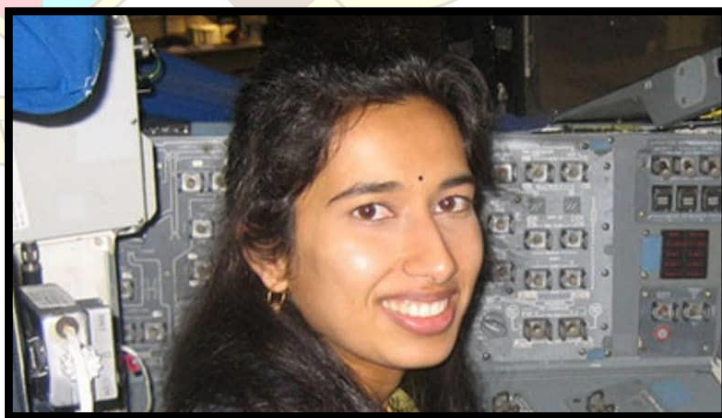


Figure 5

Mohan, S. Indian-American Aerospace Engineer

⁸ <https://www.gatsby.org.uk/uploads/education/reports/pdf/pwc-assessing-benchmarks-of-good-practice-in-school-career-guidance.pdf> - Gatsby Charitable Foundation, 2014, page 3

⁹ <https://www.iop.org/sites/default/files/2019-07/IGB-10-tips-science-specific.pdf>

¹⁰ <https://www.iop.org/sites/default/files/2021-01/IOP-10-inclusive-tips-for-teachers.pdf>

¹¹ (Image: NASA Mars website)

¹² <https://timesofindia.indiatimes.com/india/indian-values-a-big-part-of-me-says-marsvellous-mohan/articleshow/81182175.cms> - The times of India, 2021

Another key point was number five.

5. Use gender-neutral contexts whenever possible

I had to truly focus on this as it was my natural response in my previous teaching experience to create scenarios and questions based on my interests and using myself in my mind's eye when modelling a scientific problem. I realised that I rarely referred to a person in my classroom examples as “she” or “her” because I envisaged myself or other male sci-fi characters in these scenarios. However, I always failed to talk about Princess Leia's role in challenging the ‘damsel in distress’ stereotype; Captain Janeway's leadership through uncharted solar systems; the incredible true story of Katherine Jonson, Dorothy Vaughan and Mary Jackson (Figure 6).¹³



Figure 6

"Hidden Figures" tells the incredible untold story of Katherine Jonson (Taraji P. Henson), Dorothy Vaughan (Octavia Spencer) and Mary Jackson (Janelle Monáe) – brilliant African-American women working at NASA who served as the brains behind the launch into orbit of astronaut John Glenn, a stunning achievement that turned around the space race. The visionary trio crossed all gender and racial line and inspired generations.

The impact of this research informed strategy, inspired by days that promote inclusivity and equality, was largely positive! In this targeted year group we had 27 pupils choose to do Physics, which is a personal best, and of that cohort 12 were female (44%).

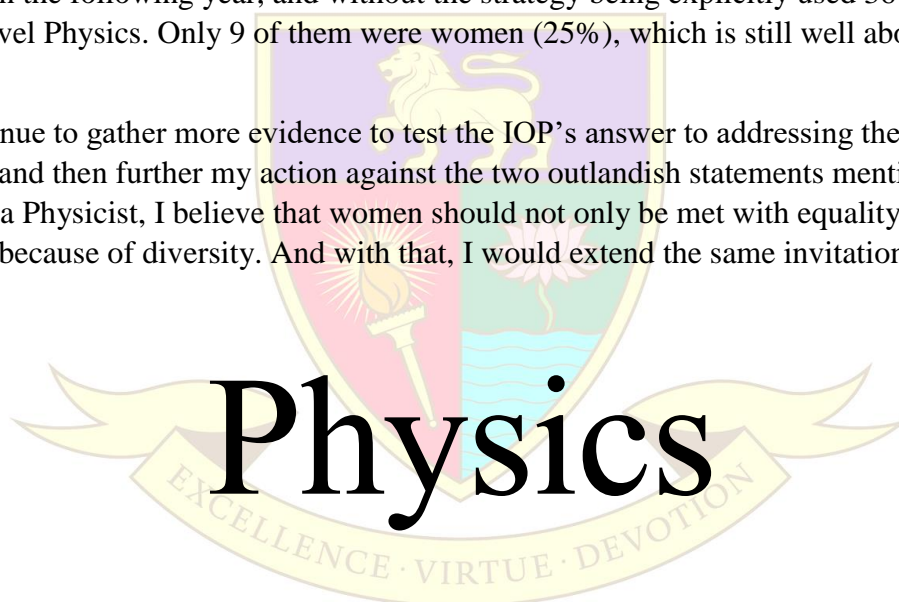
¹³ <https://family.20thcenturystudios.com/movies/hidden-figures>

Why did these girls choose to do Physics?

The greatest thing about this research informed strategy is that none of the female pupils attributed their decision to me. I believe that the in-depth guidance provided by the Institute of Physics¹⁴ made the learning experience through Key Stage 4 Science more accessible and relatable. The movements forward made by Women in Science allowed me to find a vast amount of role models who have shared their stories and passion for the subject. There may be some other contributing factors to this result, such as the success of the Mathematics Department or the overall strength of the Science Department as a whole, but this does allow me to further my understanding in what action can be taken to level the playing field.

I will continue to probe into debunking some of the stereotypical thoughts surrounding the masculinity of Physics. It should also be mentioned that I had very little time with the Triple Scientists in the following year, and without the strategy being explicitly used 36 graduated to do A Level Physics. Only 9 of them were women (25%), which is still well above average but...

I will continue to gather more evidence to test the IOP's answer to addressing the gender imbalance and then further my action against the two outlandish statements mentioned earlier. As a Physicist, I believe that women should not only be met with equality, but welcomed because of diversity. And with that, I would extend the same invitation to all learners.



"You cannot hope to build a better world without improving the individuals. To that end, each of us must work for our own improvement."

"We must have perseverance and above all confidence in ourselves. We must believe that we are gifted for something and that this thing must be attained."

Marie Curie

¹⁴ <https://www.iop.org/school-resources-address-gender-imbalance>