DIGITAL ENGINEERING
TECHNOLOGY & INNOVATION




Catch 22

Improving visibility of women in science and engineering for both recruitment and retention

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Transforming engineering for the future

Inspiring the next generation of engineers

DIGITAL ENGINEERING TECHNOLOGY & INNOVATION

WEST OF ENGLAND Combined Authority

Enabling Capabilities

Establishing digital domain expertise, core re-useable technology and infrastructure to accelerate the shift to digital

Industry Proof of Concepts

Sector agnostic projects to tackle barriers to digital transformation and investigate ROI

Skills

A comprehensive skills and development programme to ensure the current and future workforce is digital-ready

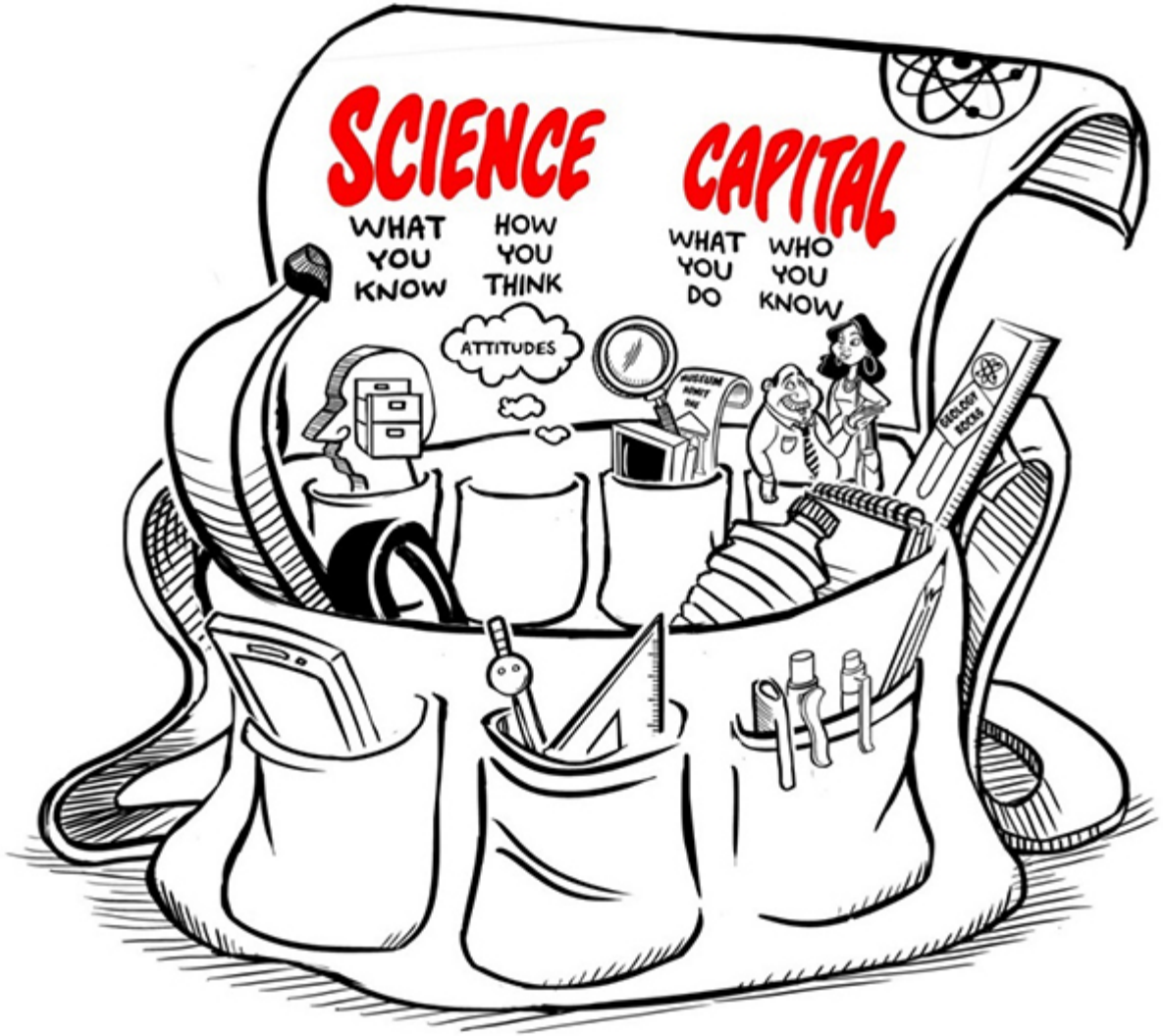
Inclusive engineering – who gets to work in these industries?

Reasons why we should care about who does Science, Technology, Engineering and Mathematics (STEM):

1) Utilitarian (sheer numbers)
2) Equity (making the workplace environment inclusive)
3) Democratic (widening which problems are studied/solved)

Fogg-Rogers, L. (2017) Does being human influence science and technology? *Journal of Science Communication*

How can we widen participation in digital engineering and STEM?



Archer, L., Dawson, E., DeWitt, J., Seakins, A., & Wong, B. (2015). "Science capital": A conceptual, methodological, and empirical argument for extending bourdieusian notions of capital beyond the arts. *Journal of Research in Science Teaching*, *52*(7), 922–948.

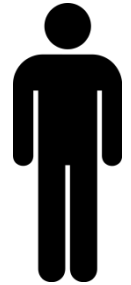
Social Cognitive and Social Identity Theories

"An individual's learning is not only related to their personal capabilities and experience, but also to their observations of others within the context of social interactions, experiences, and outside media influences".

Fogg-Rogers, L., Sardo, A.M., Boushel, C. (2017). Robots vs Animals: establishing a culture of public engagement and female role modelling in engineering higher education. *Science Communication*

Direct learning

Experience of success and emotional arousal = mastery



Indirect learning

Social norms and social persuasion

Vicarious experience = role modelling

Catch 22 – the recruitment and retention paradox

Retention needs focus too

"Results revealed the top three sets of reasons underlying women's decision to leave the jobs and engineering field were related to:

- first, poor and/or inequitable compensation, poor working conditions, inflexible and demanding work environment that made work-family balance difficult
- second, unmet achievement needs that reflected a dissatisfaction with effective utilization of their math and science skills
- third, unmet needs with regard to lack of recognition at work and adequate opportunities for advancement".

Singh, R., Fouad, N. A., Fitzpatrick, M. E., Liu, J. P., Cappaert, K. J., & Figuereido, C. (2013). Stemming the tide: Predicting women engineers' intentions to leave. *Journal of Vocational Behavior*, *83*(3), 281–294.

Women Like Me project – 2018-2021

65 senior women engineers

- **Women benefit from mentoring support from other women, as well as a supportive working environment. Both senior and junior women benefit from women's networks (Fogg-Rogers and Hobbs, 2019).**

65 junior women engineers

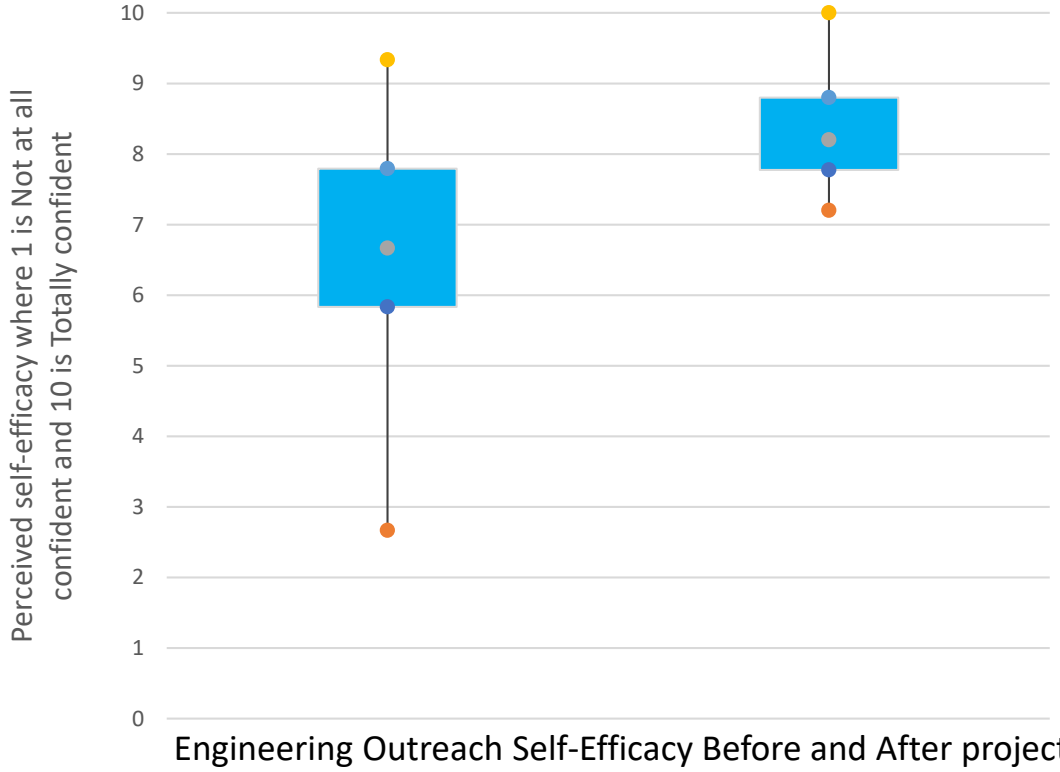
- **Women like to see women acting as role models in their chosen careers in order to feel comfortable with their aspirations (Fogg-Rogers et al, 2017)**
- **Improving public engagement skills is a key aim for engineering professional bodies (EPC, 2014)**

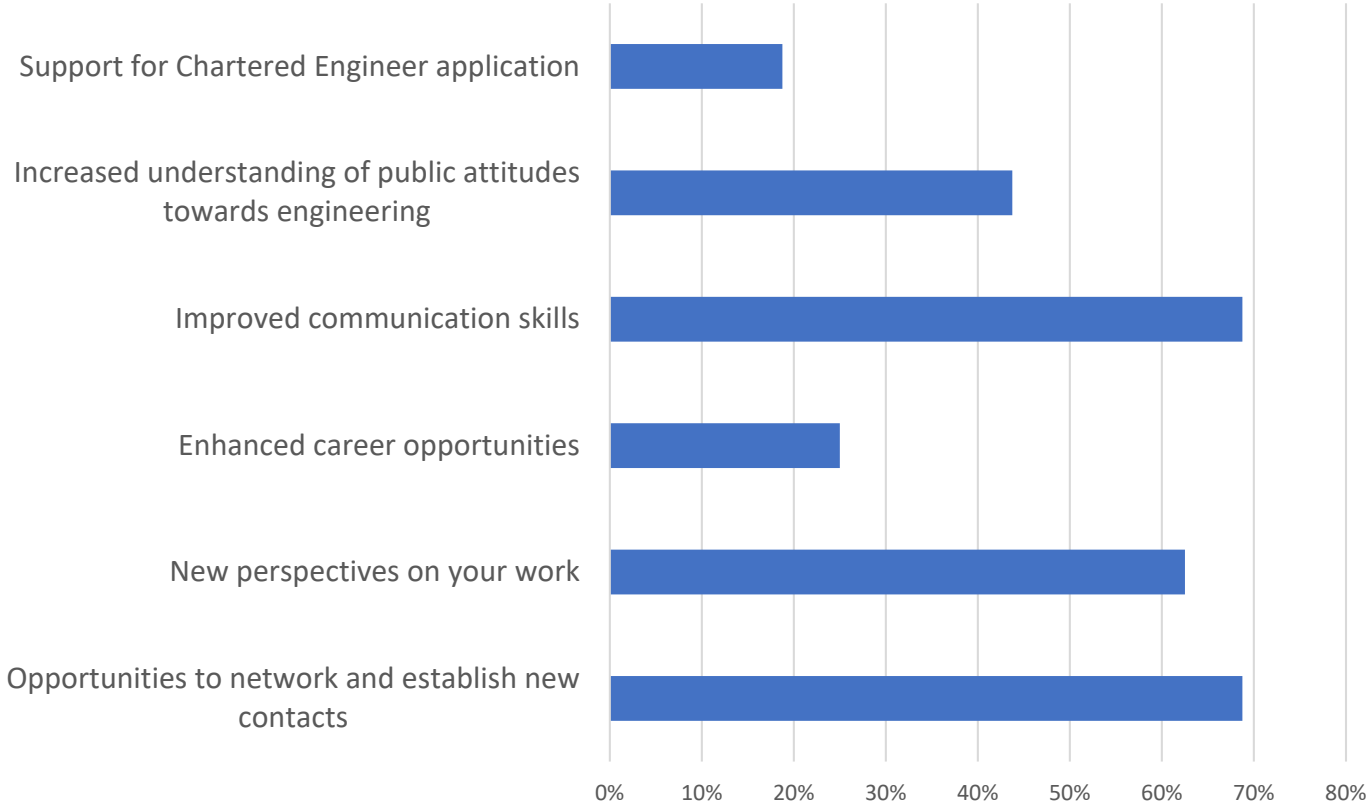
School Children (boys and girls)

- **Children, decide on the appropriateness of science as a career before age 11 (Archer et al, 2013).**
- **Girls like connecting STEM disciplines with relevant real-world problems (High Level Group on Science Education, 2007).**

Fogg-Rogers, L., & Hobbs, L. (2019). Catch 22 - improving visibility of women in science and engineering for both recruitment and retention. *JCOM: Journal of Science Communication*, *18(4)*,

Visibility benefits junior and senior engineers





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Fogg-Rogers, L., & Moss, T. (2019). Validating a scale to measure engineers' perceived self-efficacy for engineering education outreach. *PLoS ONE*, *14(10)*

Engineering our future – communal goals outreach

1) Focus on engineering which helps people, society, or the environment
2) Use storytelling to put people-focused goals into engineering
3) Emphasise that engineering is a creative process

Boucher, K. L., Fuesting, M. A., Diekman, A. B., & Murphy, M. C. (2017). Can I Work with and Help Others in This Field? How Communal Goals Influence Interest and Participation in STEM Fields. *Frontiers in Psychology*.

Hobbs, L., & Fogg-Rogers, L. (2020). Making STEM for everyone: Reaching under-served audiences. *School Science Review*, *101(375)*, 19-23.

Engineering Curiosity
BIG BEAM IN!

A series of online engineering engagement events as part of British Science Week celebrations.

54 primary and secondary schools took part from across the region

Engineers engaged over 3500 pupils with engineering careers in the West of England

Challenging common stereotypes and myths about engineering through our curriculum linked **teaching resources** and the new **Engineering Curiosity card set**

References

Fogg-Rogers, L., Sardo, A.M., Boushel, C. (2017). Robots vs Animals: establishing a culture of public engagement and female role modelling in engineering higher education. *Science Communication*

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Digital Engineering Technology & Innovation (DETI) is a research, innovation and skills initiative that brings together leading companies, technology disruptors and universities to push the boundaries of the digitally enabled engineering of the future, to help UK businesses maintain engineering leadership. DETI is a strategic programme of the West of England Combined Authority (WECA), delivered by the National Composites Centre (NCC) in partnership with the Centre for Modelling & Simulation (CFMS), Digital Catapult, the University of the West of England (UWE), the University of Bristol, and the University of Bath. DETI is funded by £5m from WECA, with co-investment from the High Value Manufacturing Catapult and industry.

For more information visit; www.deti.uk or email deti@nccuk.com

https://curiosityconnections.net/

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