

## Making STEM for everyone

### Resources for supporting people from under-represented groups to engage with Science, Technology, Mathematics and Engineering

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### A resource compilation

This document provides a compilation of resources for supporting people from underrepresented groups to study STEM subjects, enter STEM careers and see that STEM subjects can be 'for them'.

The list is arranged in a series of sections designed to make the wide range of resources in this area easier to navigate:

#### Background

General information on under-represented groups in STEM and what influences participation in STEM

#### **Science capital**

Understanding the term 'science capital' and its application

## Diversity in science, positive role models and case studies

Examples of people from under-represented groups in STEM, and resources to support the concept of 'STEM for all'

#### What could a STEM career look like?

Examples of roles using STEM

#### Engineering in a different light

Engineering might not be what you think it is...

#### Inclusion in the classroom

Inclusive STEM teaching support

#### Breaking the mould

Challenges to stereotypes in popular culture

#### Encouraging people into STEM

Resources to support interests in STEM

## Under-represented groups in STEM

There are many groups of people who are under-represented in STEM. This can be for entry into STEM study and careers, access to informal learning opportunities and for retention and progression once working in STEM related jobs.

For example:

- Only 11% of the UK engineering workforce and 5% of registered engineers and technicians are female<sup>1</sup>
- Only 20% of A level Physics students are girls; this hasn't changed in over 30 years<sup>2</sup>
- Black children and children from low socioeconomic status backgrounds are less likely to have 'science capital' and go on to choose STEM study and careers<sup>3</sup>
- Black and minority ethnic students are less likely to progress to scientific jobs after graduating than white students<sup>4</sup>
- Women are under-represented in senior roles in STEM<sup>4</sup>
- People from low income, minority ethnic communities can perceive science centres as 'not for them'<sup>5</sup>

<sup>1</sup>WES (2017) <u>https://www.wes.org.uk/content/wesstatistics</u>

<sup>2</sup>WISE (2014) <u>http://www.wisecampaign.org.uk/uploads/wise/files/</u>

not\_for\_people\_like\_me.pdf <sup>3</sup>Archer et al. (2014) <u>https://doi.org/10.1002/tea.21122</u>

<sup>4</sup>Royal Society (2014) <u>https://royalsociety.org/topics-policy/diversity-in-science/uk-scientific-workforce-report/</u>

<sup>5</sup>Dawson (2014) <u>https://doi.org/10.1002/sce.21133</u>

Supporting Under-represented Groups

**UWE Science Communication Unit** 

## **Background information**

Not for people like me? The WISE report on under-represented groups in STEM <a href="https://www.wisecampaign.org.uk/uploads/wise/files/not\_for\_people\_like\_me.pdf">https://www.wisecampaign.org.uk/uploads/wise/files/not\_for\_people\_like\_me.pdf</a>

What influences participation in science and mathematics? <u>https://www.sciencecentres.org.uk/resources/academic-research/tisme-publications-including-what-influence-participation-science-and-mathematics-report/</u>

State of the nation report of UK primary science education <u>https://wellcome.ac.uk/sites/default/files/state-of-the-nation-report-of-uk-science-education.pdf</u>

Informal science learning overview <a href="https://wellcome.ac.uk/what-we-do/our-work/increasing-informal-science-learning">https://wellcome.ac.uk/what-we-do/our-work/increasing-informal-science-learning</a>

Review of informal science learning in the UK <u>https://wellcomelibrary.org/item/b21247213#?c=0&m=0&s=0&cv=0</u>

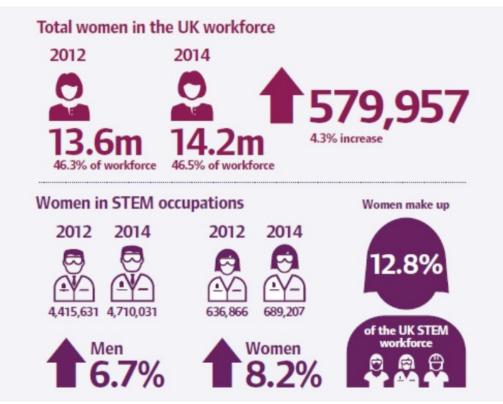
How do the public really feel about science and research? <u>https://blog.wellcome.ac.uk/2016/04/12/how-do-the-public-really-feel-about-science-and-research/</u>

Engineering UK State of Engineering research <a href="https://www.engineeringuk.com/research/">https://www.engineeringuk.com/research/</a>

Public Attitudes to Science surveys https://www.gov.uk/government/collections/public-attitudes-to-science

Public Attitudes to Chemistry

http://www.rsc.org/campaigning-outreach/campaigning/public-attitudes-chemistry/



MacDonald 2014. Not for people like me? WISE Campaign

## **Science capital**

Science capital made clear https://group.sciencemuseum.org.uk/wpcontent/uploads/2017/06/science\_capital\_ made\_clear.pdf

Science capital transforming practice report https://group.sciencemuseum.org.uk/wpcontent/uploads/2017/07/transforming-practiceconference-report.pdf\_

Science capital teaching approach http://www.ucl.ac.uk/ioe/departments-centres/ departments/education-practice-and-society/ science-capital-research/science-capitalteaching-approach-pack\_

Science capital original research https://www.kcl.ac.uk/sspp/departments/ education/research/Research-Centres/ cppr/Research/currentpro/Enterprising-Science/03Research-Outputs.aspx



The Science Capital Holdall (Godec, S., King, H. & Archer, L. (2017) The Science Capital Teaching Approach: engaging students with science, promoting social justice. London: University College London)

# **Diversity in STEM, positive role models and case studies**

Royal Society diversity in science resources <a href="https://royalsociety.org/topics-policy/diversity-in-science/">https://royalsociety.org/topics-policy/diversity-in-science/</a>

WISE People Like Me resources <u>https://www.wisecampaign.org.uk/resources/2016/04/people-like-me-resource-pack</u>

WISE role models <a href="https://www.wisecampaign.org.uk/inspiration/tag/role-models">https://www.wisecampaign.org.uk/inspiration/tag/role-models</a>

Women's Engineering Society role models <u>https://www.wes.org.uk/role-models#</u>

Card Geotechnics Female Face of Civil Engineering publication <a href="http://my.page-flip.co.uk/00000013/00012513/00094393/">http://my.page-flip.co.uk/00000013/00012513/00094393/</a>

Engineer case studies

https://www.raeng.org.uk/education/what-is-engineering/engineer-case-studies

IEEE Women in Engineering apps and e-book <a href="http://wie.ieee.org/ieee-wie-apps-and-ebooks/">http://wie.ieee.org/ieee-wie-apps-and-ebooks/</a>

IEEE Women in Engineering posters

http://wie.ieee.org/ieee-wie-poster-series/

Telegraph Women in Engineering

https://www.telegraph.co.uk/business/women-in-engineering/

Prospects Women in Engineering

https://www.prospects.ac.uk/jobs-and-work-experience/job-sectors/engineering-andmanufacturing/opportunities-for-women-in-engineering\_

Engineer Girl resources and case studies <a href="https://www.engineergirl.org/">https://www.engineergirl.org/</a>

BAE Systems celebrating women in engineering <u>https://www.baesystems.com/en-uk/feature/celebrating-women-in-engineering</u>

Shell Women in Engineering and Technology video <a href="https://youtu.be/ribBP7gAvvg">https://youtu.be/ribBP7gAvvg</a>

Bam Nuttall gender inequality video https://www.youtube.com/watch?v=70pD7eG6T9k

Profiles of women in science https://science-girl-thing.eu/en/profiles-of-women-in-science

Girls in the Physics Classroom report <a href="http://www.iop.org/education/teacher/support/girls\_physics/review/page\_41597.html">http://www.iop.org/education/teacher/support/girls\_physics/review/page\_41597.html</a>)

Girls in Physics videos <a href="http://www.iop.org/education/teacher/support/girls\_physics/videos/page\_41607.html">http://www.iop.org/education/teacher/support/girls\_physics/videos/page\_41607.html</a>

EDF Pretty Curious resources https://www.edfenergy.com/prettycurious



## What could a STEM career look like?

Dream jobs in science https://science-girl-thing.eu/en/jobs

Reasons science needs you https://science-girl-thing.eu/en/6-reasons-science-needs-you

BP employee profiles (including some marked "Women in Technology") https://www.bp.com/en/global/bp-careers/hot-topics/hot-topics-profiles.html

Centrica career profiles https://www.centrica.com/careers/graduates-apprentices/graduate-roles/our-people

BAE Systems featured roles https://www.baesystems.com/en-uk/careers/careers-in-the-uk/featured-roles

Shell careers https://www.shell.co.uk/careers/students-and-graduates.html

Bam Nuttall careers (including diversity information) http://www.bamnuttall.co.uk/pg/careers

Bam Nuttall aspprenticeship information http://www.bamnuttall.co.uk/images/editor/Apprenticeship%20further%20programme%20 information.pdf

Rolls Royce A day in the life of ... profiles <u>http://www.rolls-royce.com/media/insights.aspx</u>

Working for Airbus http://company.airbus.com/careers/Working-for-Airbus.html#chapter-06

Jaguar Land Rover career pathways http://www.jaguarlandrovercareers.com/working-here/#career-pathways

## **Engineering in a different light**

Royal Academy of Engineering – Engineering Is posters https://www.raeng.org.uk/education/ schools/teaching-and-learning-resources/ engineering-is-posters

This is Engineering http://www.thisisengineering.org.uk/

Year of Engineering https://www.yearofengineering.gov.uk/

**Tomorrow's Engineers** http://www.tomorrowsengineers.org.uk/



Find out how: raeng.org.uk/EngineeringIs

## Inclusion in the classroom

Royal Society briefing on unconscious bias <u>https://www.sciencecentres.</u> org.uk/resources/academicresearch/report-unconsciousbias-workplace/

Implicit association (unconscious bias) test <u>https://implicit.harvard.edu/</u> implicit/uk/

Unconscious bias test http://www.the-twist-project.eu/ en/iat/intro/?embed



University of Bath Women in Engineering Teachers' Toolkit http://www.bath.ac.uk/publications/women-in-engineering-teachers-toolkit/

10 steps towards gender equity in science <u>http://www.the-twist-project.eu/media/dyn/TWIST\_Guidelines\_light.pdf</u>

One Size Fits All? Enhancing gender awareness in teaching <a href="http://www.the-twist-project.eu/media/dyn/TWIST-Onze\_size\_fits\_all.pdf">http://www.the-twist-project.eu/media/dyn/TWIST-Onze\_size\_fits\_all.pdf</a>

Gender Balance www.iop.org/genderbalance

Inclusive Science Teaching Tips For Teachers http://www.iop.org/education/teacher/support/girls\_physics/resources-and-guidance-for-teachers/ file\_68643.pdf

Inclusive physics classroom learning checklist <u>http://www.iop.org/education/teacher/support/girls\_physics/resources-and-guidance-for-teachers/file\_68642.pdf</u>

Science: it's a people thing, workshop for KS3-4 female students <u>http://www.iop.org/education/teacher/support/girls\_physics/people-thing/page\_61998.html</u>

Engaging with girls teacher action pack <u>http://www.iop.org/education/teacher/support/girls\_physics/action\_pack/page\_41739.html</u>

Girls in the Physics classroom teacher action guide <u>http://www.iop.org/education/teacher/support/girls\_physics/action/page\_41602.html</u>

Opening doors countering gender stereotypes good practice guide <u>http://www.iop.org/education/teacher/support/girls\_physics/reports-and-research/opening-doors/page\_66438.html</u>

## **Breaking the mould**

A Mighty Girl science and technology books https://www.amightygirl.com/books/general-interest/science-technology

Bitz and Bob (BBC) http://www.bbc.co.uk/mediacentre/proginfo/2018/11/bitz-and-bob <a href="https://www.bbc.co.uk/cbeebies/shows/bitz-and-bob">https://www.bbc.co.uk/cbeebies/shows/bitz-and-bob</a>

Do You Know? (BBC) https://www.bbc.co.uk/cbeebies/shows/do-you-know

Goodnight Stories for Rebel Girls – quotes from rebel women <u>https://www.penguin.co.uk/articles/features/2017/mar/amazing-quotes-from-7-rebel-women/</u>

Science Grrl http://sciencegrrl.co.uk/

Women in Science: 50 fearless pioneers who changed the world <a href="https://www.rachelignotofskydesign.com/women-in-science/">https://www.rachelignotofskydesign.com/women-in-science/</a>

WISE Top 10 science gift suggestions <u>https://www.wisecampaign.org.uk/inspiration/2016/11/top-10-christmas-science-gifts-for-girls</u>

12 inspiring STEM books for girls (and great for boys to read too!) https://www.edutopia.org/article/12-inspiring-stem-books-girls-emelina-minero\_\_\_\_\_

Female STEM role models in film <u>https://www.siliconrepublic.com/people/female-stem-role-models-film</u>

## **Encouraging people into STEM**

Hypatia Project full toolkit (aimed at teenagers, to be used by schools, informal learning organisations, researchers and industry) <u>http://www.expecteverything.eu/file/2017/03/Hypatia\_Toolkit\_EN.pdf</u>

WISE Ten steps for maintaining the female talent pipeline <u>https://www.wisecampaign.org.uk/consultancy/industry-led-ten-steps/10-steps</u>

Year of Engineering schools resources https://www.yearofengineering.gov.uk/school

Women Like Us career advice packs for women https://www.womenlikeus.org.uk/advicepacks/

How to encourage women into science, engineering and construction <a href="https://www.theukrc.org/wise/">https://www.theukrc.org/wise/</a>

Learning to be an engineer <u>https://www.raeng.org.uk/ltbae</u>

CPD for teachers <a href="https://www.yearofengineering.gov.uk/cpd">https://www.yearofengineering.gov.uk/cpd</a>

Lesson ideas <u>https://www.yearofengineering.gov.uk/lesson-ideas</u>

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www.uwe.ac.uk/research/sciencecommunicationunit