

What can be done in 2020 to get more women into STEM?

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UCAS Annual Conference for Teachers and Advisers

3 – 4 February 2020, Brighton, UK



THINK



WHAT IS THE CURRENT SITUATION? - WORKFORCE

WISE 2019 Workforce Statistics - Core stem

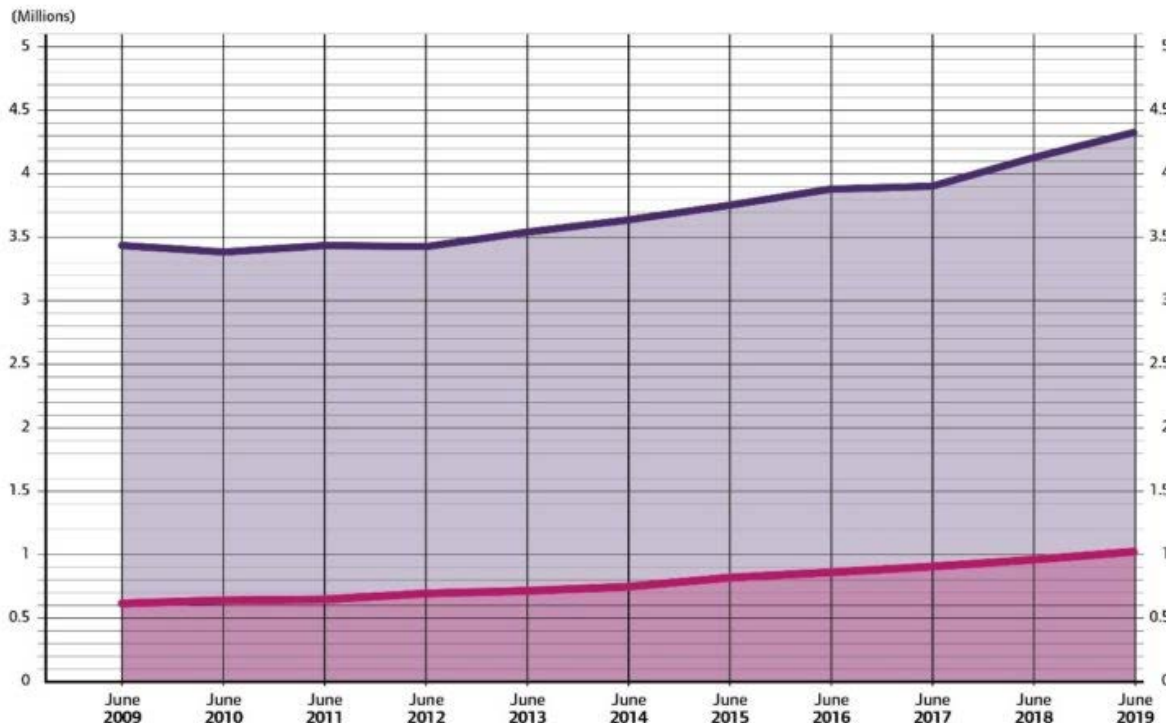
Women in core-STEM occupations in the UK reached 1M for the first time in 2019 – making up 24% of the core stem workforce (17% in 2009).

Men and Women in
Core STEM 2009 – 2019

Key

— Total Women in Core STEM

— Total Men and Women in Core STEM



campaign for
gender balance
in science, technology
& engineering

WISE

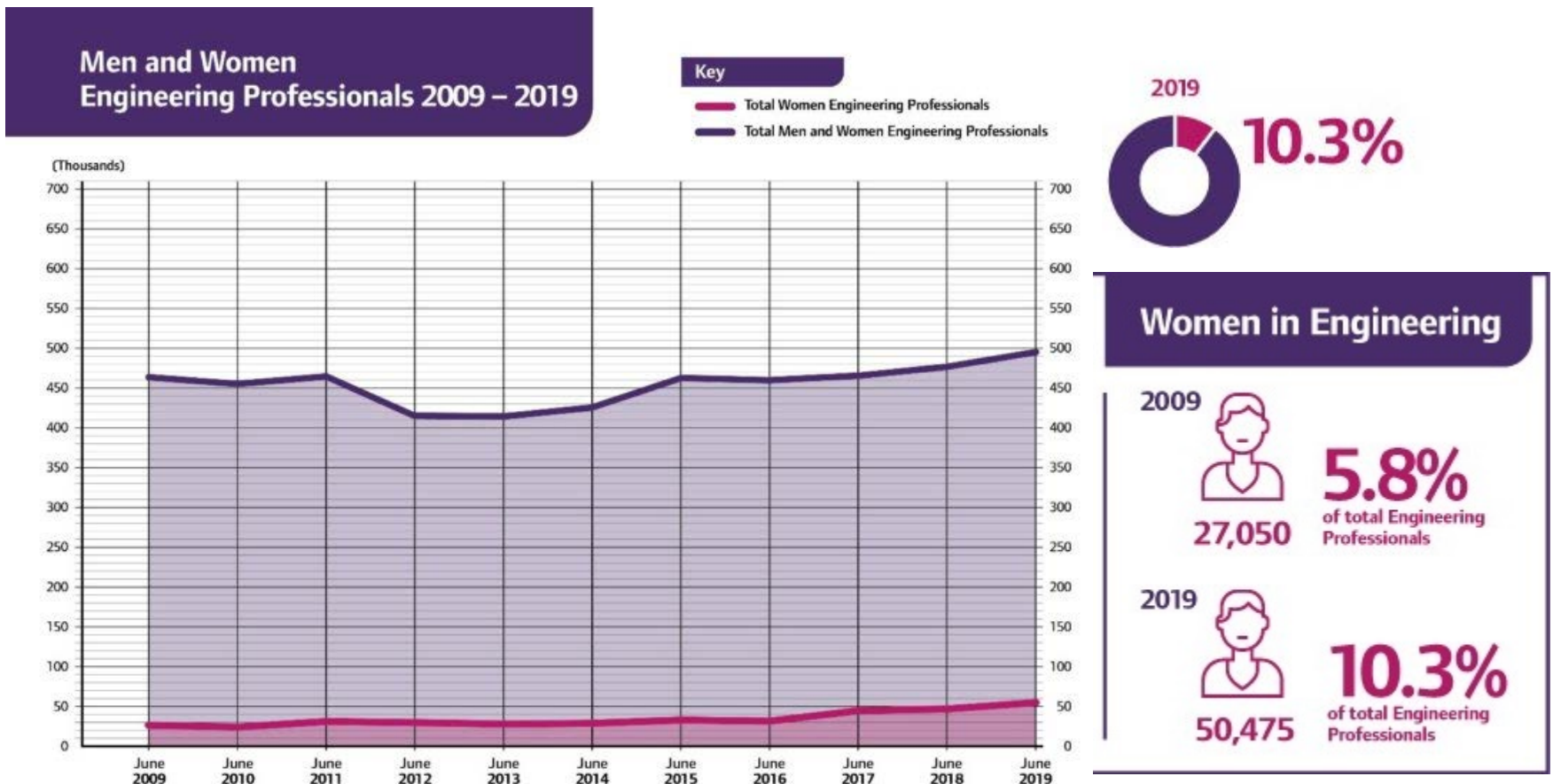
**Women in Science
and Engineering**

WHAT IS THE CURRENT SITUATION? - WORKFORCE

WISE 2019 Workforce Statistics - Engineering

The number of women in engineering roles almost doubled in the last decade, from just over 25,000 to just over 50,000.

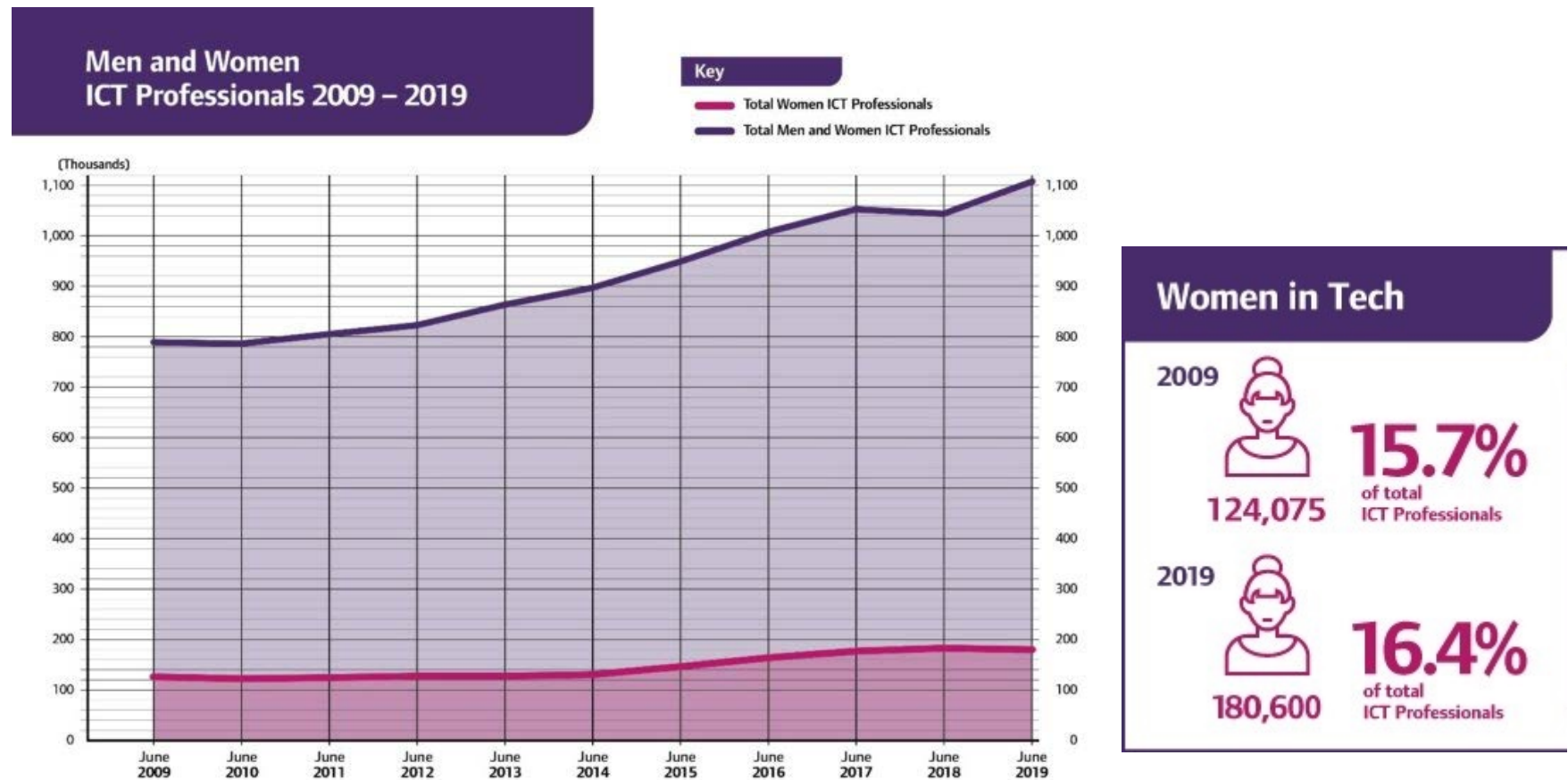
BUT still only 10% of the workforce – although % has also doubled.



WHAT IS THE CURRENT SITUATION? - WORKFORCE

WISE 2019 Workforce Statistics - Tech (ICT)

The number tech roles has increased significantly over last decade
– but % of women in tech roles has stayed constant at 16%



WHAT IS THE CURRENT SITUATION? - WORKFORCE

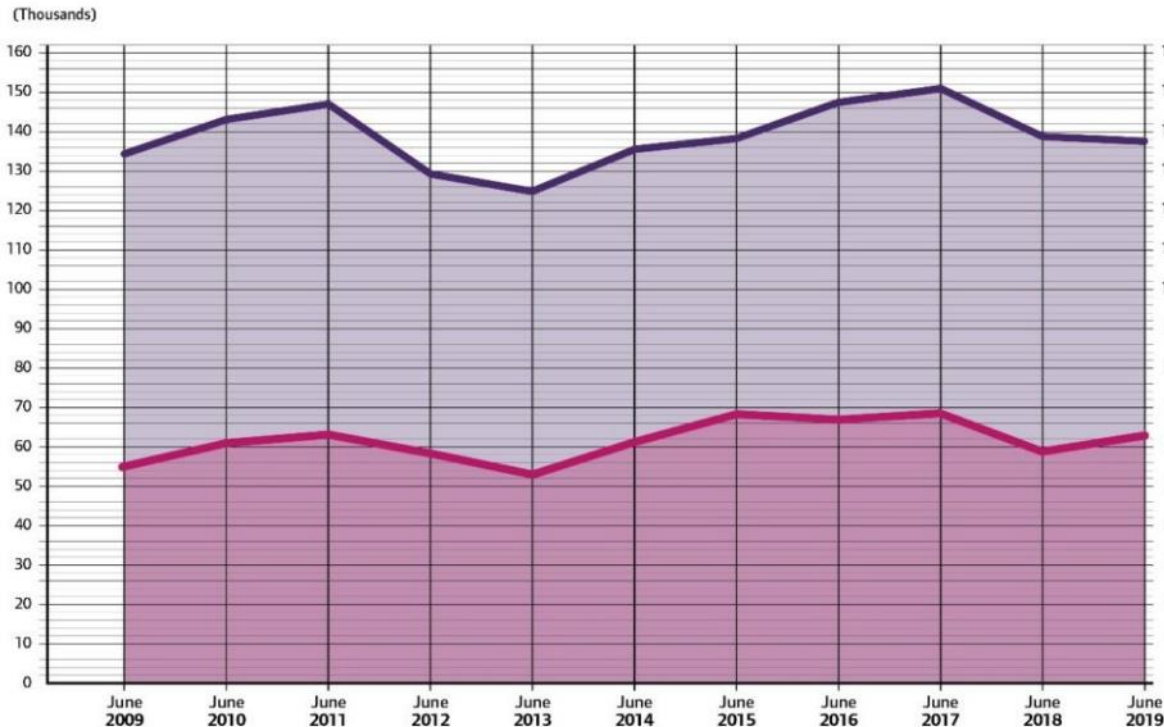
WISE 2019 Workforce Statistics - Science

The proportion of women in science professional roles is 46% - but an increase of only 4% over the last decade.

Men and Women Science Professionals 2009 – 2019

Key

- Total Women Science Professionals
- Total Men and Women Science Professionals



Women in Science

Professional Occupations: 2018 - 2019

2018



58,725

2019



62,675

2018



42.4%

2019

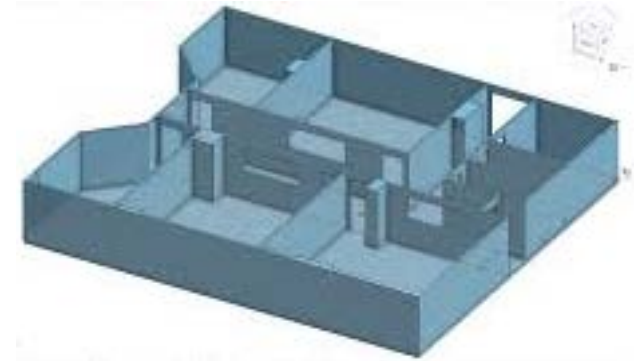
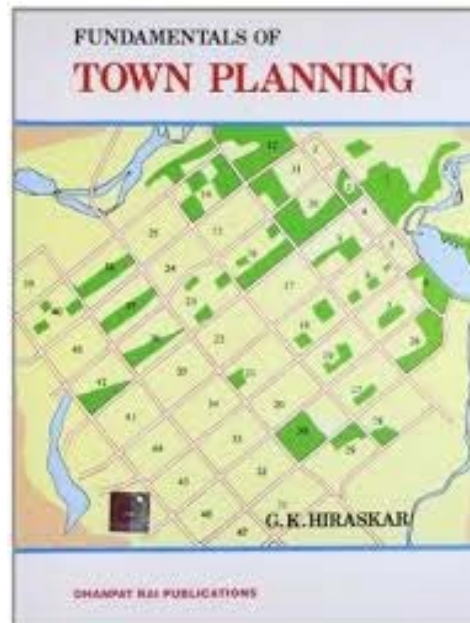


45.7%

Women as a percentage of total Science Professionals

WHY DOES IT MATTER?

People like me



WHY DOES IT MATTER?

UK prosperity and skills deficit

Engineering UK 2018

The state of engineering



<https://www.engineeringuk.com/media/156187/state-of-engineering-report-2018.pdf>

Challenges and recommendations

If modern engineering is to continue to provide its enormous economic and social contributions to the United Kingdom, it is of critical importance that the engineering community work alongside the government and educational sector to address the skills shortage.

Challenges

- Too few STEM teachers
- Limited access to STEM careers activity
- Too few women becoming engineers
- Too little home grown talent
- Too little understanding of apprenticeships

Recommendations

1. Streamline the STEM outreach landscape to make it simpler for schools to connect with employers and other providers to access high quality, engineering focused STEM engagement activity
2. Develop a better understanding of what engineering focused careers interventions work so we can direct our resources to the most effective methods to inspire young people to study STEM and pursue engineering careers
3. Increase the supply and retention of specialist STEM teachers, who have a vital role in shaping the aspirations and career trajectories of young people
4. Actively safeguard and enhance the status of the UK's higher education sector as world class and welcoming to talent from across the world
5. Raise awareness of apprenticeships among young people and their influencers – and ensure the apprenticeships on offer are of high quality
6. Ensure young people have a full understanding of the excitement and variety a career in engineering offers, and the potential contribution they can make as an engineer
7. Improve our understanding of the barriers for women, black and minority ethnic communities and people from disadvantaged backgrounds to pursue pathways into, and careers in, engineering

Engineering UK 2018 was produced with the support of the members and fellows of the following Professional Engineering Institutions:

BIS, The Chartered Institute for IT
British Institute of Non-Destructive Testing (BINDT)
Chartered Institution of Building Services Engineers (CIBSE)
Chartered Institution of Highway & Transportation (CIHT)
Chartered Institute of Plumbing and Heating Engineering (CIPHE)
Chartered Institution of Water and Environmental Management (CIWEM)
Energy Institute (EI)
Institution of Agricultural Engineers (AgrE)
Institution of Civil Engineers (ICE)
Institution of Chemical Engineers (IChemE)
Institute of Cast Metals Engineers (ICME)
Institution of Engineering Designers (IED)
Institution of Engineering and Technology (IET)
Institution of Fire Engineers (IFE)
Institution of Gas Engineers and Managers (IGEM)
Institute of Highway Engineers (IHE)
Institute of Healthcare Engineering and Estate Management (IHEEM)
Institution of Lighting Professionals (ILP)
Institute of Marine Engineering, Science & Technology (IMarEST)
Institution of Mechanical Engineers (IMechE)
Institute of Measurement and Control (InstMC)
Institution of Royal Engineers (InstRE)
Institute of Acoustics (IOA)
Institute of Materials, Minerals and Mining (IMMM)
Institute of Physics (IOP)
Institute of Physics and Engineering in Medicine (IPeM)
Institution of Railway Signal Engineers (IRSE)
Institution of Structural Engineers (IStructE)
Institute of Water Nuclear Institute (NI)
Royal Academy of Engineering (RAEng)
Royal Aeronautical Society (RAeS)
Royal Institution of Naval Architects (RINA)
Society of Environmental Engineers (SEE)
The Society of Operations Engineers
The Welding Institute (TWI)

Engineering is a not-for-profit organisation, which works in partnership with the engineering community to promote the vital role of engineers and engineering across the UK. Engineering UK leads engagement programmes The Big Bang and Engineering Week. Engineering UK produces the annual State of Engineering report and the Engineering Brand Monitor.

www.engineeringuk.com

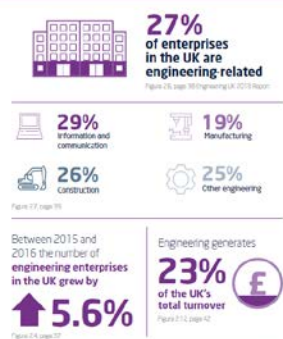
@_EngineeringUK #EngUK18

The state of engineering Key facts 2018

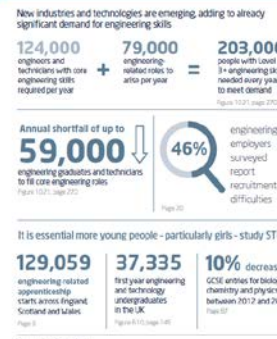


EngineeringUK

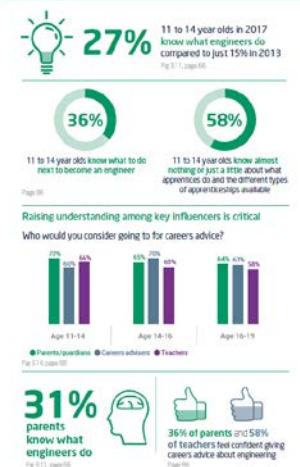
Engineering is of vital importance to UK's economy



Engineering skills are in short supply



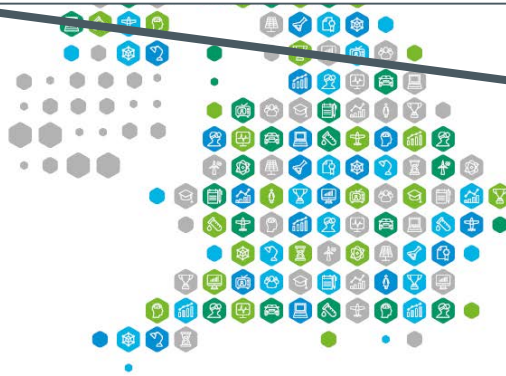
We need to improve awareness of engineering and the different routes into the profession



https://www.engineeringuk.com/media/1641/7505_infographic_leaflet_2018_web.pdf


27%
of enterprises
in the UK are
engineering-related

Figure 2.6, page 38 Engineering UK 2018 Report



pp 284

The state of engineering


Annual shortfall of up to
59,000 
engineering graduates and technicians
to fill core engineering roles

Explore the next generation. EngineeringUK leads engagement programmes: the Big Bang and Tomorrow's Engineers, produces the annual State of Engineering report and the Engineering Brand Monitor.

www.engineeringuk.com @EngineeringUK #EngUK1



We need to improve awareness of engineering and the different routes into the profession



27%
of enterprises
in the UK are
engineering-related

Figure 25, page 10 Engineering UK 2013

29%
Information and
communication

26%
Construction

Between 2015 and 2016 the number of engineering enterprises in the UK grew by **↑ 5.6%**

Engineering employs
5.6 million


19%
Manufacturing

25%
Other engineering

Engineering generates
23% of the UK's total turnover

↑ 5.1%
increase in employment
over the last five years

Every time a new job is created in engineering
1.74 jobs are created elsewhere

New industries and technologies are emerging, adding to already significant demand for engineering skills

124,000 engineers and technicians with core engineering skills
+ 79,000 engineering-related roles to arise per year
= 203,000 people with U.S. engineering-related skills

Annual shortfall of up to
59,000
engineering graduates and technicians
to fill core engineering roles

It is essential more young people - particularly girls - study STEM

129,059 engineering related apprenticeship starts across England, Scotland and Wales
37,335 first year engineering and technology undergraduates in the UK
10% decrease GCSE entries for biology, chemistry and physics between 2012 and 2017

Proportion female:
GCSE Physics entrants
50%

Engineering and technology undergraduates
students
16% 
Figure 6.12 page 145

Engineering apprenticeship starts (England and Wales)
8% 
Figure 6.13 page 116

Demetrius and Thomas' figures presented here are not directly comparable to previous editions, due to the use of a different data source.

 **27%** 11 to 14 year olds in 2017 know what engineers do compared to just 15% in 2013
Fig 31.7, page 60

11 to 14 year olds know what to do next to become an engineer

11 to 14 year olds know almost nothing or just a little about what apprentices do and the different types of apprenticeships available

Raising understanding among key influencers is critical

Who would you consider going to for careers advice?

Age Group	Percentage
Age 18-34	73%
Age 35-54	65%
Age 55-74	64%

31% parents know what engineers do



36% of parents and 58% of teachers feel confident giving careers advice about engineering

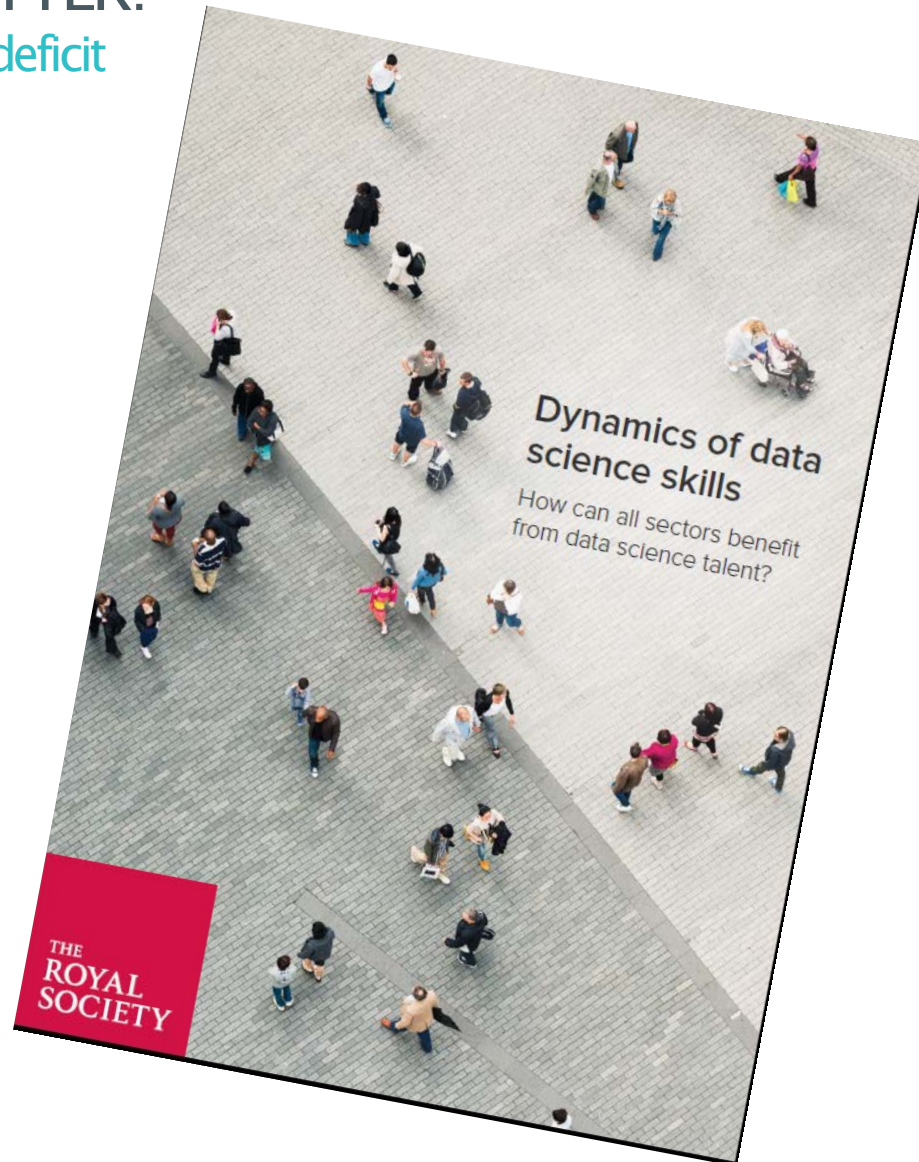
 

Fig 2.11, page 95

https://www.engineeringuk.com/media/1641/7505_infographic_leaflet_2018_web.pdf

WHY DOES IT MATTER?

UK prosperity and skills deficit



WHY DOES IT MATTER?

Salaries

- STEM jobs amongst the best paid
- 17.3% gender pay gap in UK workforce (ONS 2019)
- Why are more females not participating in the higher paid careers?
- Affects life-long financial security and independence
- Encourage female students towards higher paid jobs

Degree Subject ↕	Average Graduate Salary ▼
Dentistry	£34,840
Chemical Engineering	£31,824
Veterinary Medicine	£29,224
Economics	£29,068
General Engineering	£29,068
Mechanical Engineering	£28,236
Aerospace engineering	£27,820
Civil Engineering	£27,716
Electrical & Electronic Engineering	£26,416
Physics & Astronomy	£26,312

WHY DOES IT MATTER?

Salaries

UK STEM graduates 'earn nearly 20% more than their peers'

08 Jul 2016



Save



Recent research has found that science, technology, engineering and maths (STEM) graduates can earn nearly 20% more than their peers, at an average of £26,023.



The Korn Ferry division of the Hay Group analysed salaries of 42,500 entry level jobs from over 770 organisations across the UK. Their results also show that entry level STEM roles within software development or engineering could see an increase of wage by 19% to £30,973 and 17% to £30,370 respectively, making these the highest paid entry-level roles in the country.

The sectors traditionally considered the highest paying for graduates, such as law (£25,893) or finance and accounting (£24,624) are shown to fall below software development and engineering salaries.

Vivienne Dijkstra, global graduate practice leader for Korn Ferry Futurestep, said: "With

Advice by Career Sector

Actuaries

Chartered Accountancy





Insurance


Investment Banking

Management Consultancy

HOW DID WE GET HERE?

Doing the maths ... and it doesn't add up!

-  Exciting and diverse work
-  Valuable to economy
-  In demand, i.e. good employment opportunity
-  Well paid

-  Insufficient people choosing a STEM career

CURRENT SITUATION IN SCHOOLS

GCSE



BIOLOGY GCSE



2019

2018

Change

Students **177,454** 176,325 **↑1.0%**
Girls **88,886** 89,014 **0%**



50%

50%



CHEMISTRY GCSE



2019

2018

Change

Students **170,034** 168,273 **↑1%**
Girls **83,883** 83,983 **0%**



49%

50%



PHYSICS GCSE



2019

2018

Change

Students **168,330** 166,462 **↑1.0%**
Girls **82,546** 82,356 **0%**



49%

49%



DESIGN & TECH GCSE



2019

2018

Change

Students **99,659** 127,232 **↓22%**
Girls **29,741** 41,836 **↓29%**



30%

33%



COMPUTING GCSE



2019

2018

Change

Students **80,027** 74,621 **↑7%**
Girls **17,158** 15,046 **↑14%**



21%

20%

Lower representation of females

Equal representation of females

CURRENT SITUATION IN SCHOOLS

GCSE



GCSE RESULTS 2019

Students gaining A*-C Grades in STEM subjects

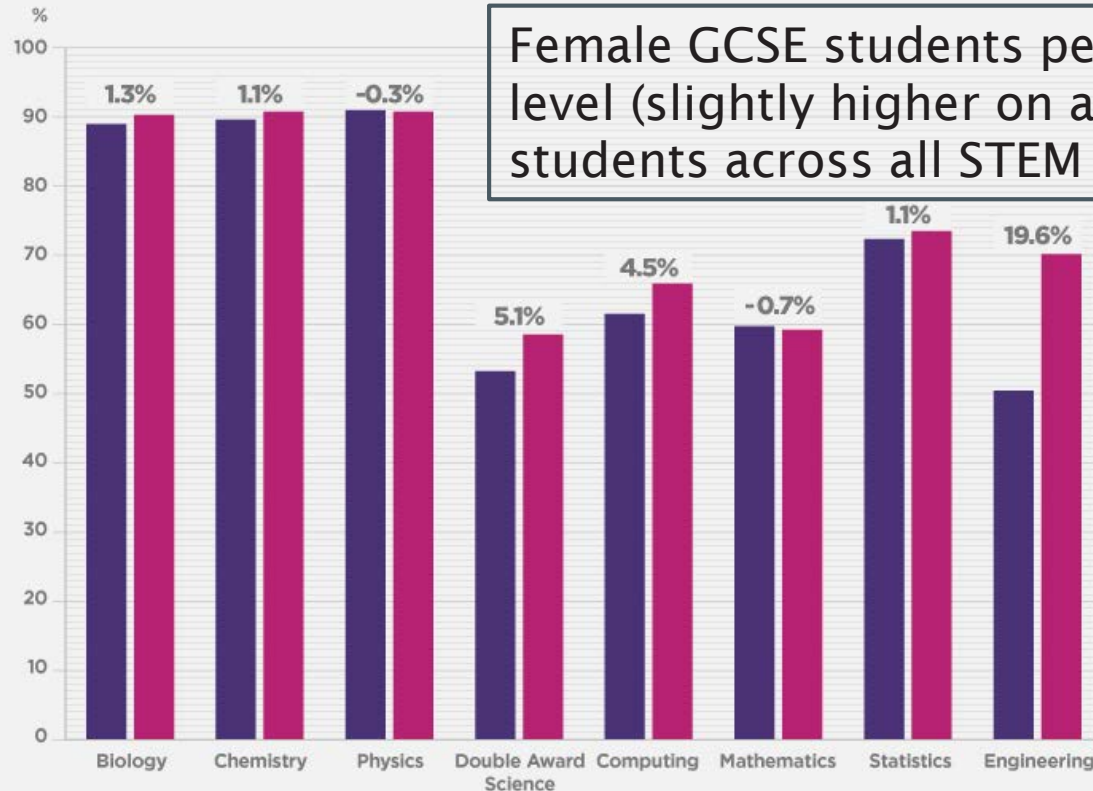


Boys



Girls

Note: Figure at top of each column indicates percentage difference between girls' and boys' performance.



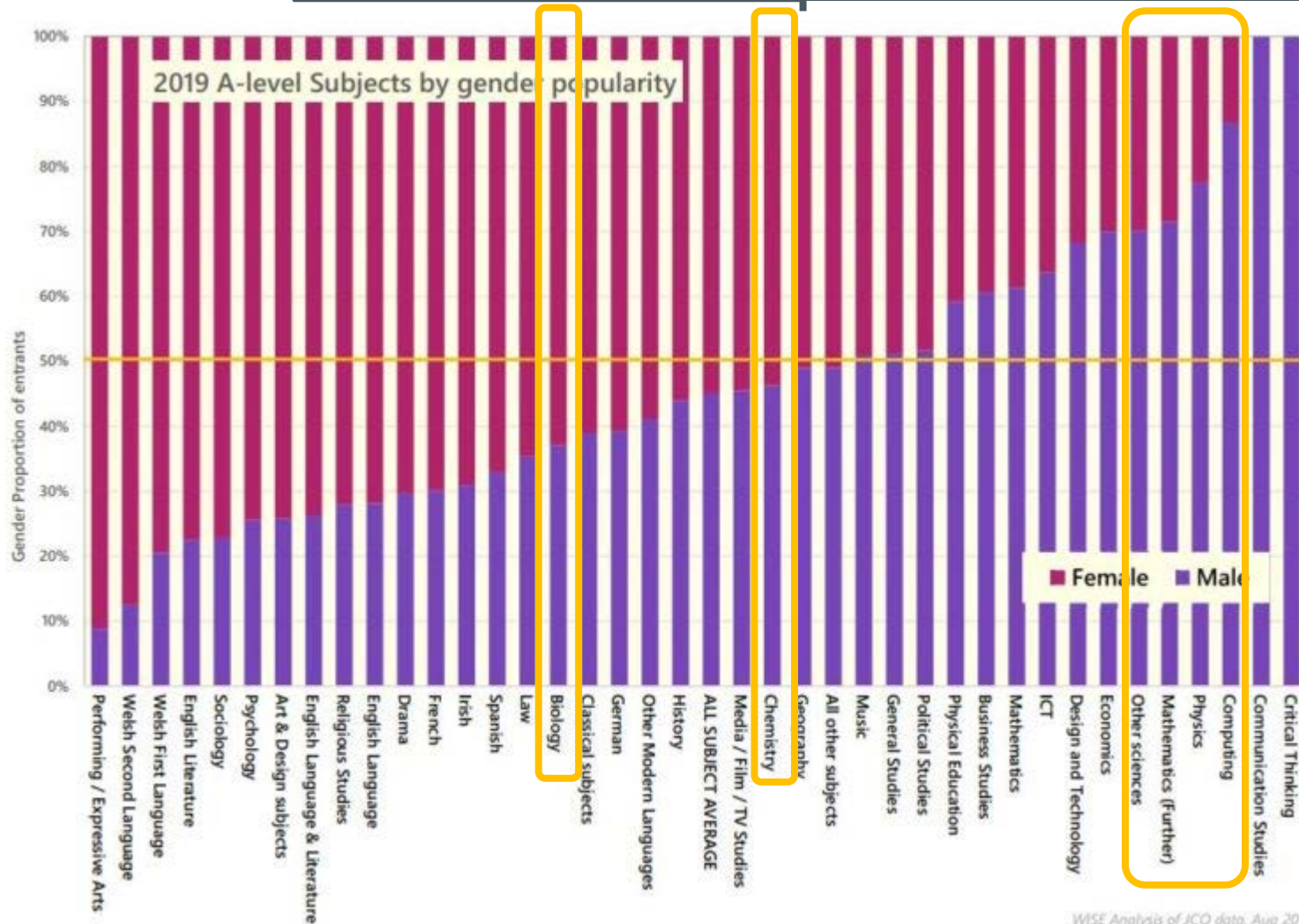
Female GCSE students perform at a similar level (slightly higher on average) to male students across all STEM subjects

CURRENT SITUATION IN SCHOOLS

A Level

> 50% female students

< 50% female students



CURRENT SITUATION IN SCHOOLS

A Level



PHYSICS A-LEVEL



Down from 49% female students at GCSE



COMPUTING A-LEVEL



Down from 21% female students at GCSE



MATHS A-LEVEL



Year on year reduction in # students and % female unchanged.

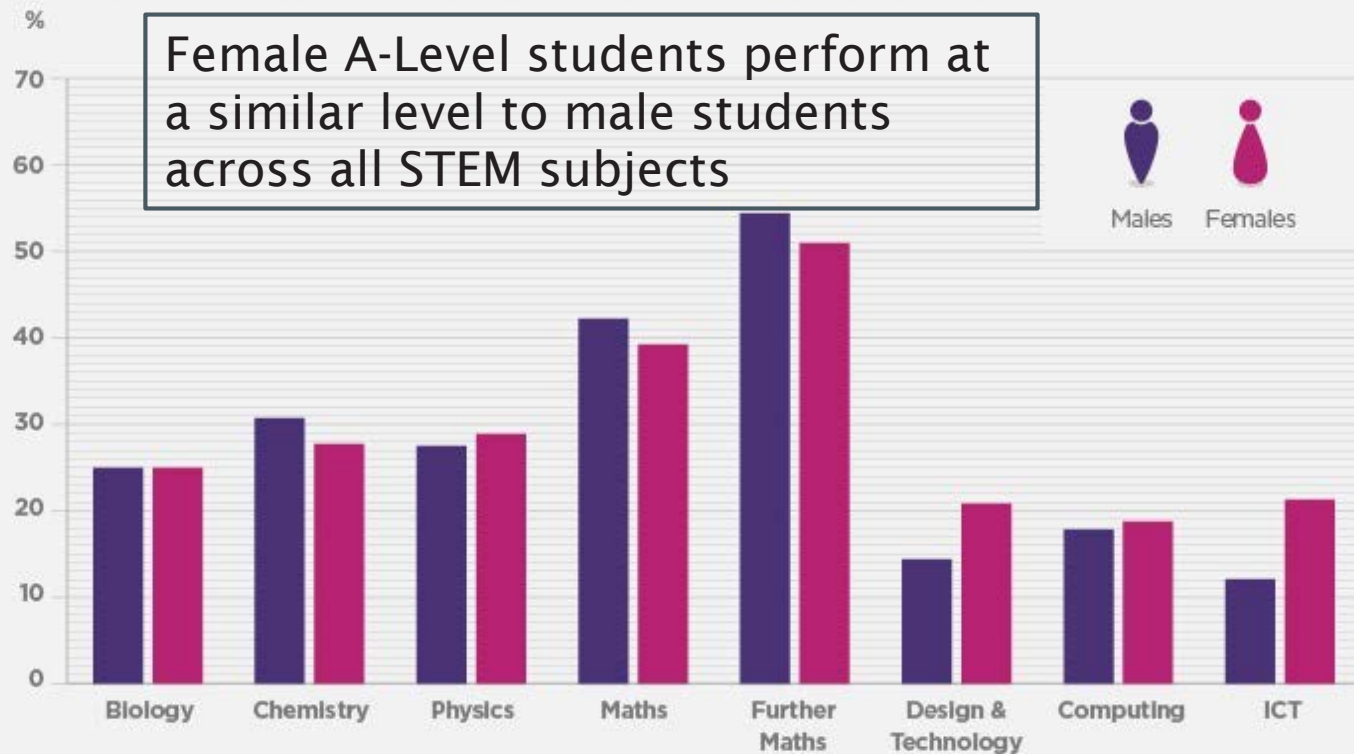
CURRENT SITUATION IN SCHOOLS

A Level



A-LEVEL RESULTS 2019

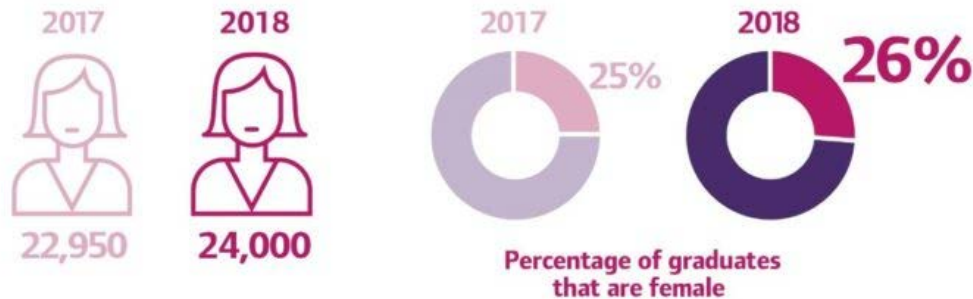
Students gaining A* and A Grades in STEM subjects



CURRENT SITUATION IN UNIVERSITIES

Graduates

Core STEM subjects



Physical Sciences



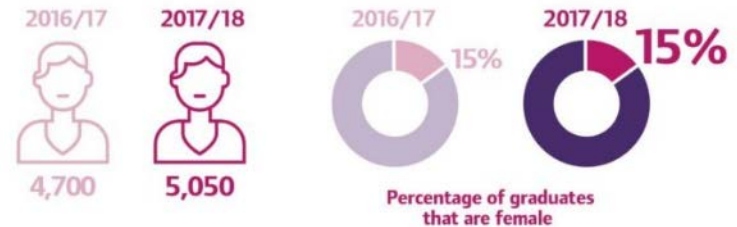
Mathematical Sciences



Computer Science



Engineering & Technology



SUMMARY

Identifying the trends

Starting high is a good place to be ...

- Biology and Chemistry have good % representation of female students at GCSE that follows through to the % representation in the workforce

Drops are not recovered ...

- Physics shows a drop from GCSE to A level that is not recovered at degree level or in the workforce.

Low starting points are not improved later ...

- Design & Tech and Computer Science have low % participation of females at GCSE that follows through to low % participation in the workforce across Tech and Engineering.

Need to engage early and keep engaged

50% of the UK population is female

47% of the UK workforce is female

17% gender pay gap in UK workforce

STEM jobs are critical to UK prosperity and amongst the best paid roles in the workforce

Female students perform at the same level as male counterparts across all STEM subjects at every stage of education.

WHAT IS THE PROBLEM?

Engineering UK Annual Report 2018: State of the sector – Challenges – Recommendations

Key Challenges

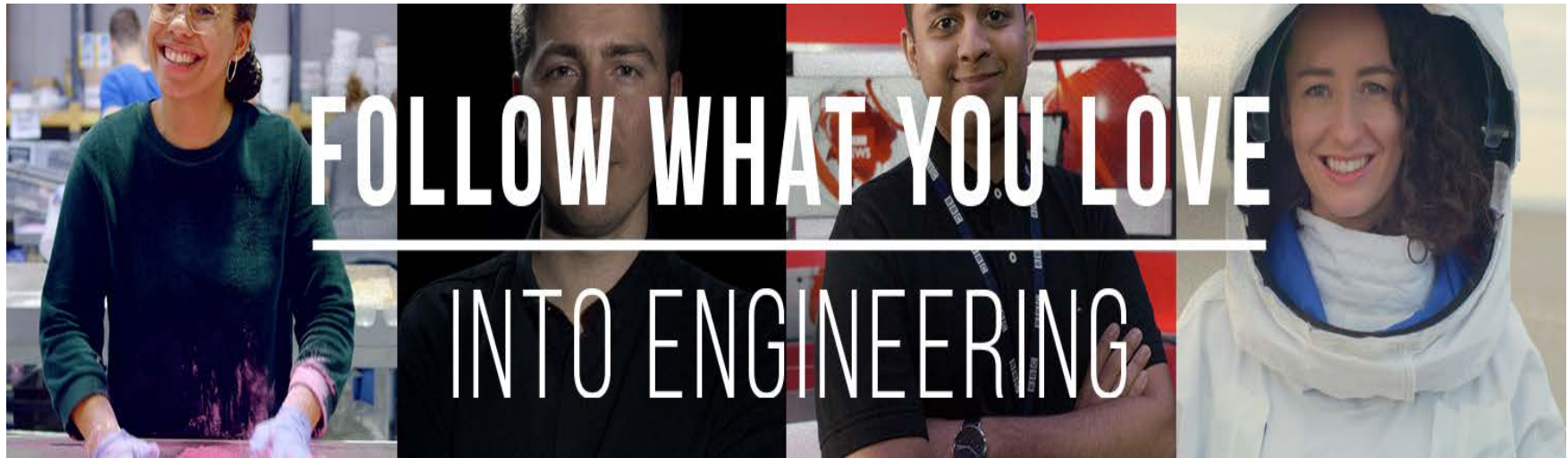
- Too few STEM teachers
- Limited access to STEM careers activity
- Too many initiatives
- Too few women becoming engineers
- Too little home grown talent
- Too little understanding of apprenticeships



“The Royal Academy of Engineering estimates that **more than 600 UK organisations run STEM engagement initiatives directed at schools** and there have been a host of policy efforts to address skills shortages through, for example, reform in technical education. However, coordination between activities and evidence of impact remains limited and **teachers find it difficult to navigate this complex landscape.**”

#THIS IS ENGINEERING

Royal Academy of Engineering

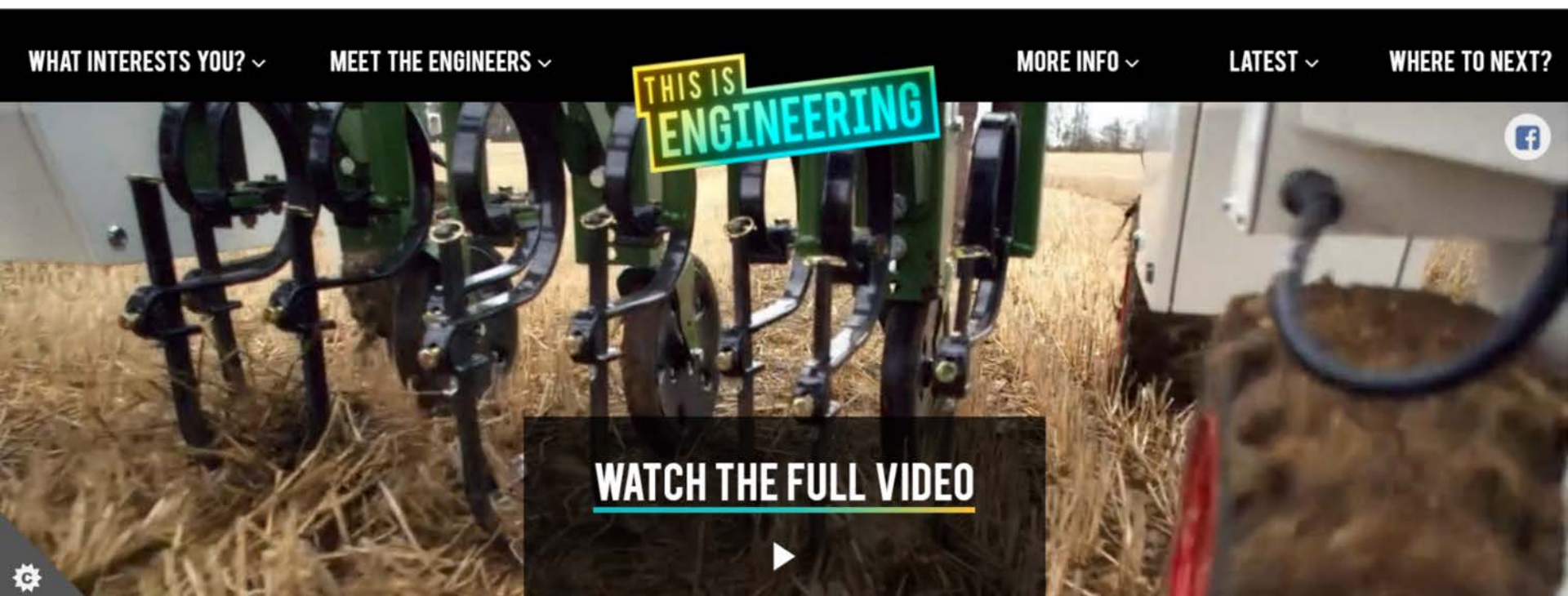


- Campaign, launched in 2018 to **encourage more young people, from all backgrounds, to consider engineering careers.**
- Campaign videos were watched over 28 million times in total; 90% of video views were from 13-17 year olds, 50% of the audience was female
- Consideration of engineering as a career option doubled among GCSE and A level students surveyed who had seen the campaign, and the increase is even more significant among females and BAME students.

WHAT CAN YOU DO?

Use it!

USE THE RESOURCE! SHARE IT! MAKE SURE MORE STUDENTS SEE IT!



<https://www.thisisengineering.org.uk/>



<https://www.youtube.com/thisisengineering>



<https://www.facebook.com/FollowWhatYouLove>



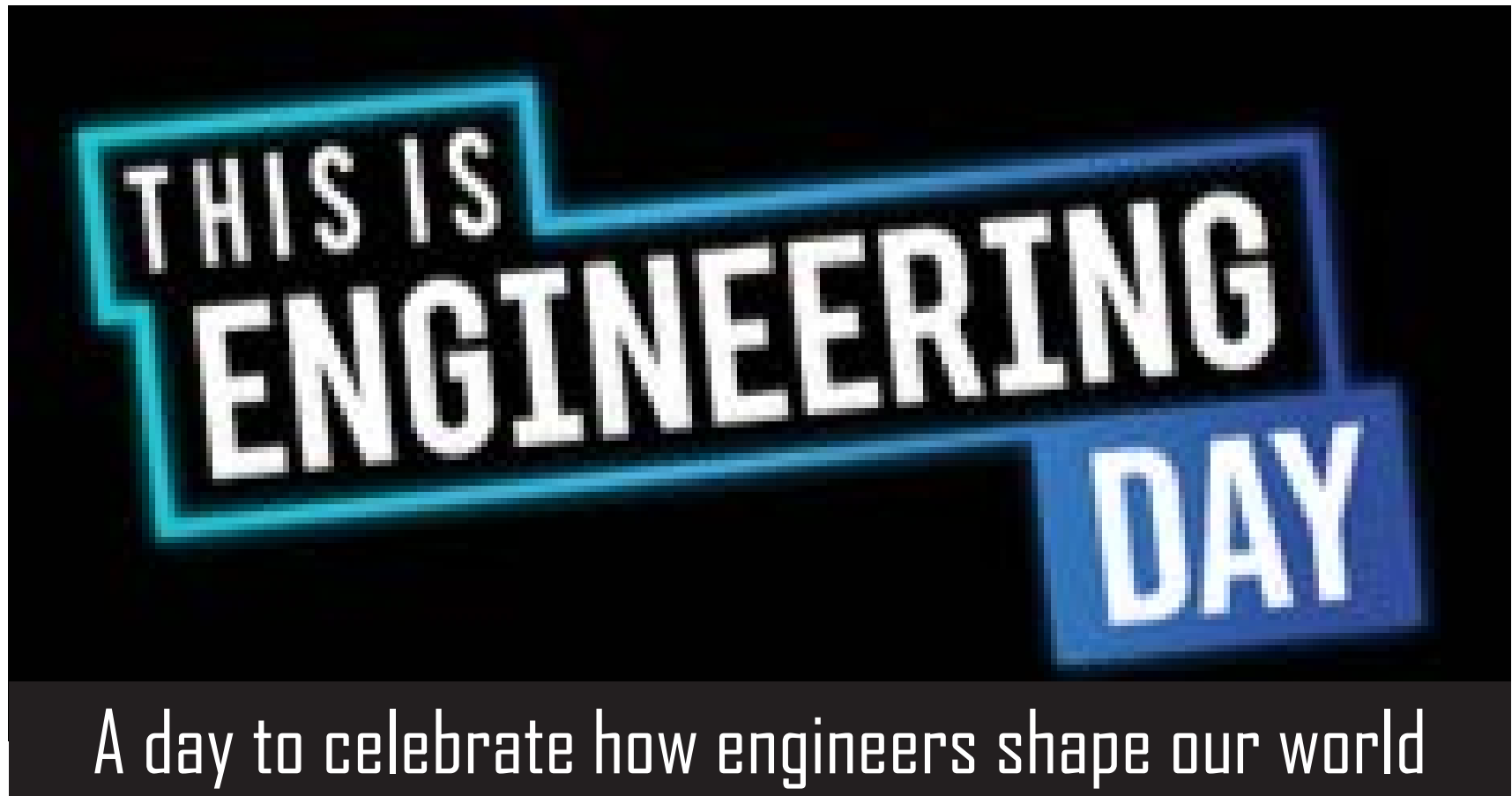
@ThisIsEng

#thisisengineering

THIS IS ENGINEERING DAY

Royal Academy of Engineering

- Inaugural event 6 November 2019 – will happen in 2020 too!
- Nationwide and global events around the day – tap in to engage students



THIS IS ENGINEERING DAY

Royal Academy of Engineering

Pledge – TO CHANGE THE IMAGE OF ENGINEERING AND ENGINEERS

An AI algorithm trained on online image search results for ‘engineer’ generated artificial images of what it learned a typical engineer looked like – the majority of images generated were of a white man wearing a hard hat.



Creation of freely available image library showing the diversity of engineers and engineering

<https://www.flickr.com/photos/thisisengineering/>



“You can’t be what you can’t see”

THIS IS ENGINEERING DAY
Royal Academy of Engineering

THIS IS A FUTURE FOR ENGINEERING



A 10-POINT ACTION PLAN INFORMED BY YOUNG PEOPLE

This is Engineering, led by the Royal Academy of Engineering in collaboration with EngineeringUK, is a campaign to bring engineering to life for young people, and give more people the opportunity to pursue a career that is rewarding, future-shaping, varied, well-paid and in-demand.

ENGINEERING UK

Not-for-profit organisation

[Home](#)[About us](#)[Our programmes](#)[Research](#)[News & Media](#)[Membership](#)[Institutions](#)

Inspiring tomorrow's engineers

We aim to inspire, engage and inform the next generation of engineers via programmes designed to excite young people about the variety and opportunity presented by a career in modern engineering and give them the chance to meet people already working as engineers.

ENGINEERING UK

Not-for-profit organisation

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Skills Partnership

The EngineeringUK Skills Partnership is a network of businesses working together to grow the engineering talent pipeline.

We want to inspire tomorrow's engineers through high quality engagement activities that offer opportunities to experience engineering first hand and to hear from and speak to engineers. We aim to create a positive and sustained transformation in their attitudes and help increase the take-up of subjects that create the pathways into engineering careers.

Our expert team works with a wide range of companies, of all sizes, across the UK to support them in addressing their future engineering talent needs by engaging with young people in the most effective, impactful ways.



Top tips for delivering engineering activities

TOMORROW'S ENGINEERS WEEK

Tomorrow's Engineers

Tomorrow's
Engineers

Tomorrow's Engineers Week

Robotics Challenge

Energy Quest

About Us Students • Volunteers • Real Jobs News Careers resources & activities •

Meet The Future You

Take the quiz and Meet The Future You!

Could you see yourself exploring outer space, protecting the environment, designing apps or developing cures for diseases?



<https://www.tomorrowsengineers.org.uk/>

<https://www.tomorrowsengineers.org.uk/tomorrows-engineers-week-2019/>

WOMEN IN SCIENCE AND ENGINEERING (WISE)

Quiz



WISE

campaign for
gender balance
in science, technology
& engineering

MY SKILLS MY LIFE

SIGN UP

SIGN IN

A campaign by



BRITISH SCIENCE WEEK 6 – 15 MARCH 2020

Resources for schools

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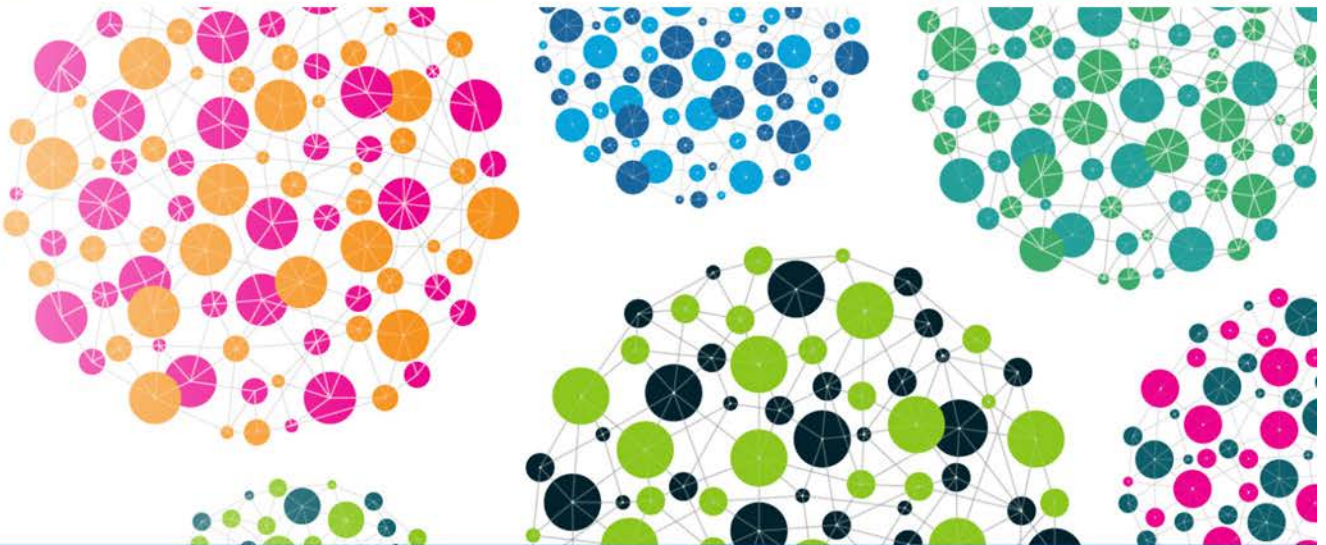
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6-15 March

British Science Week 2020



British Science Week takes place between 6-15 March 2020 - join us for a ten-day celebration of science, technology, engineering and maths



BRITISH
SCIENCE
ASSOCIATION



UK Research
and Innovation

ROYAL INSTITUTION Ri

Public engagement



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Education

Families

Christmas Lectures

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Upcoming Events

View all events

Public



Nano comes to life
13.01.2020

Public



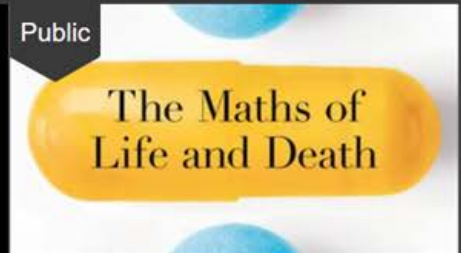
What does it take to be an
inventor?
14.01.2020

Public



Game of Bones
18.01.2020

Public

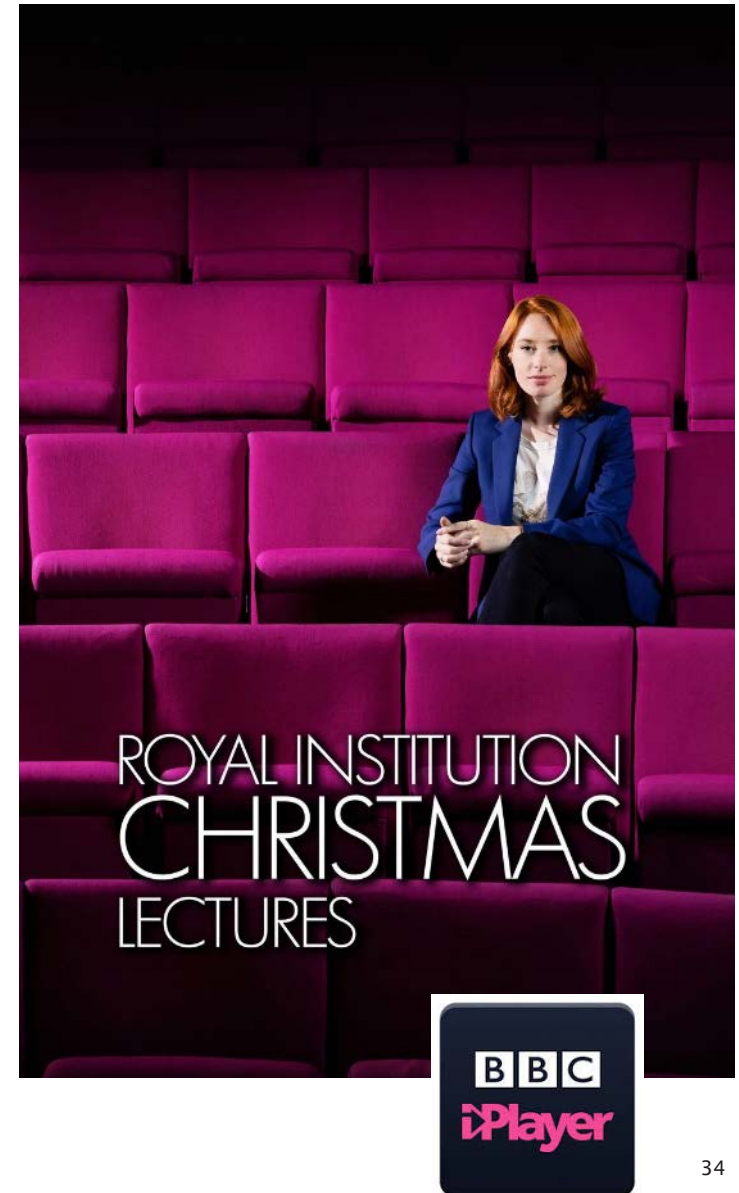


The maths of life and death
21.01.2020

Ri CHRISTMAS LECTURES


Children-centred lectures on science since 1825!

2019 “Secrets and lies: The hidden power of maths” by Hannah Fry




STEM AMBASSADORS

Pairing initiative between schools and STEM professionals to come to your school

 01904 328 300

PRIMARYSECONDARY▼FEHEEMPLOYERS

SIGN INREGISTER🔍 SEARCH

RESOURCESCPDSTEM CLUBS**STEM AMBASSADORS**ENRICHMENTNEWS AND VIEWS

Become a STEM AmbassadorIdeas and inspirationLocal STEM Ambassador HubsTraining and support

STEM Ambassadors

STEM Ambassadors are volunteers from a wide range of science, technology, engineering and mathematics (STEM) related jobs and disciplines across the UK. They offer their time and enthusiasm to help bring STEM subjects to life and demonstrate the value of them in life and careers.

STEM Ambassadors are an important and exciting free of charge resource for teachers and others engaging with young people inside and out of the classroom.

We have made it simple to get involved. Once you have registered, you can find a STEM Ambassador or get involved in an activity from your dashboard.

Access your dashboard

OUTREACH AND WIDENING PARTICIPATION

Schemes and initiatives run by Universities for Schools

Working with schools, colleges, teachers, advisors and community groups, locally and nationally, to support STEM students in their progression into higher education.

- Summer schools and residentials



A2S summer school

This summer school is the first intervention within the Access to Southampton scheme. Participants will take part in lectures, seminars and/or labs organised by academic tutors from their chosen discipline.



Widening Access to Medicine Residential (BM6)

Our Widening Access to Medicine Residential is for students who want to study medicine at university and through a widening programme.



Experience Engineering

Our Experience Engineering...



Marine Headstart

Our Marine Headstart is a residential course for Year 12



Oceanography and Marine Biology

Our Headstart summer school is for those interested in studying Marine Biology or Oceanography



Electronics and Computer Science

If you love maths, technology or science, this course will enable you to apply your skills to computer science and electronic engineering.



Biomedical Electronic Engineering

Our Biomedical Electronic Engineering Taster Course lets you experience the cutting edge interface of electronics and healthcare technologies.



Smallpeice STEM summer schools

Smallpeice is an educational charity running summer schools and residentials with universities. This year the University of Southampton is running Ignition and Momentum courses.

OUTREACH AND WIDENING PARTICIPATION

Schemes and initiatives run by Universities for Schools

- Day workshops and school visits



Dragonfly Day is a hands-on one day workshop for Year 9 female students to inspire and engage them into considering a career or further study in STEM subjects.

STEM Badge Day is for Girl Guides and is a one day hands-on event to inspire and engage girls into considering a career or further study in STEM subjects.



ENGINEER A NEW WORLD: A STUDENT PERSPECTIVE

Megan Martin

Introduction

- Megan Martin
- 4th Year
- MEng Civil Engineering with Industrial Placement Year

Home, Bath



University, Southampton



Why engineering?

- Environmental considerations
- Renewable energy
- Connectivity



My UCAS memories

- What was I looking for?

UNIVERSITY	COURSE
Reputation	Reputation
Distance from home	Accredited degree
Campus University	Career prospects
Green space and Parks	Interesting course
Atmosphere	Practical/lab work
Safe Environment	Engineering facilities

My engineering highlights

- Field trips and site visits

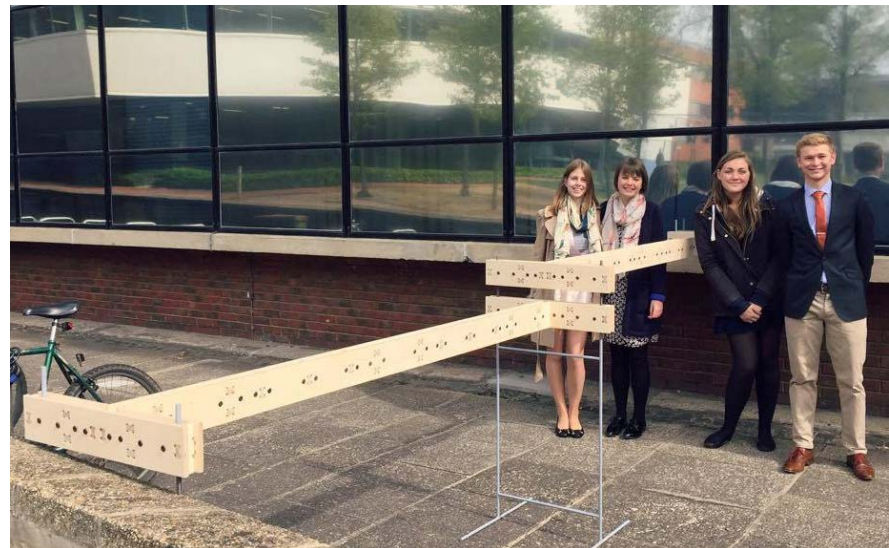


My engineering highlights

- Design projects and design showcases

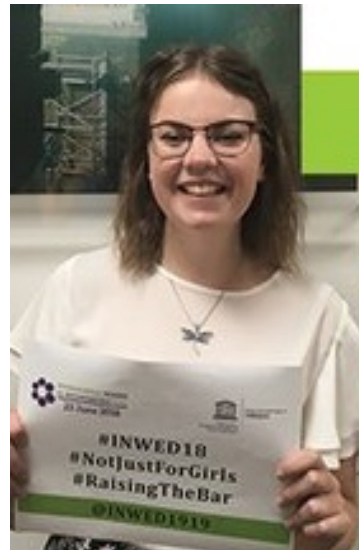


Instagram: Southampton_engineering



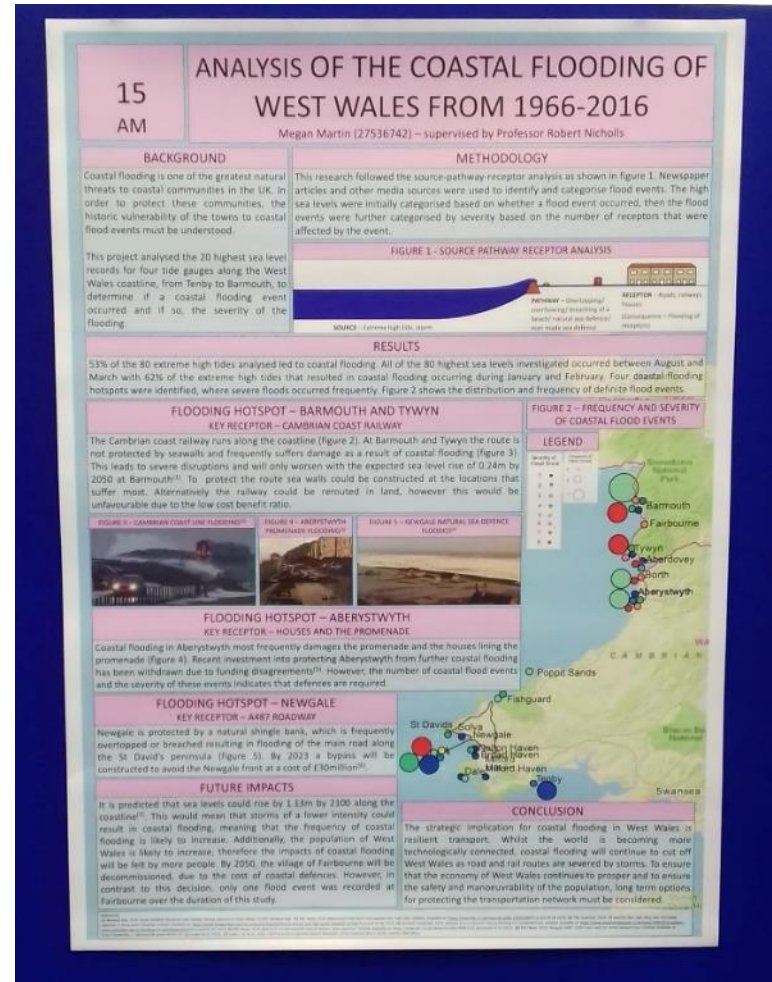
My engineering highlights

- Summer placements and industrial placement year
 - Civil engineering consultancy
 - Structural design and rail sector



My engineering highlights

- Individual and group research projects



My engineering highlights

- Networking opportunities



What next?

- Graduate civil engineer
- Civil engineering consultancy
- Energy sector



ENGINEER A NEW WORLD: A STUDENT PERSPECTIVE

Megan Martin

WHAT CAN BE DONE IN 2020 TO GET MORE WOMEN INTO STEM?

What can you do?

- There is a strong and clear message – supported by a lot of excellent resources – that engineering is diverse and requires a diversity of engineers
- Need to get the message to female students – and to other under or unrepresented groups in STEM
- You - teachers and advisors – are critical in getting this message out to students AND PARENTS

Raising understanding among key influencers is critical

Who would you consider going to for careers advice?

31%
parents
know what
engineers do

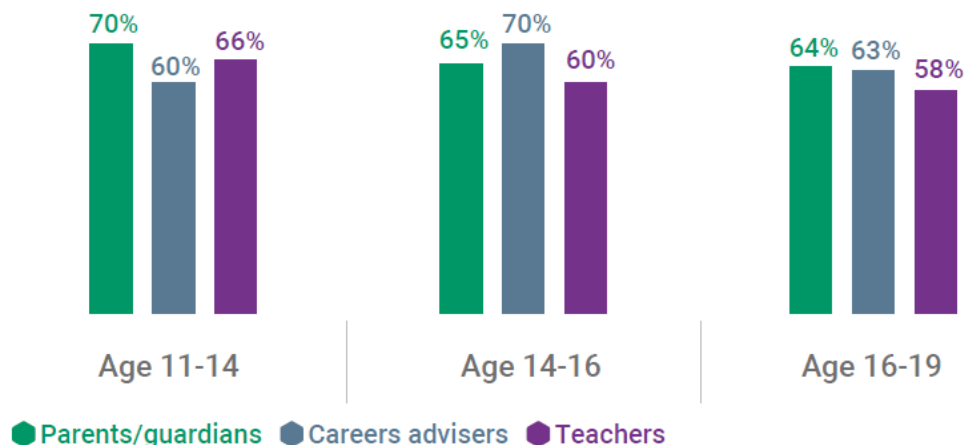


Fig 3.14, page 68

WHAT CAN BE DONE IN 2020 TO GET MORE WOMEN INTO STEM?

What can you do?

- Use the resources highlighted in this presentation for ideas and activities for students and parents
 - all the URLs are on the individual slides (which you will get)
- Get in touch with the organisations highlighted in this presentation if you need advice
- Share the resources with students and parents
- Share the experiences of people like Megan with students and parents
- Start conversations with students and parents

“STEM professionals shape our world – you need to be involved to shape a world you want to live in and leave for future generations”

Questions, comments, discussion points



& I have some postcards you can take away
as a reminder #thisisengineering

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