



University Technical Colleges[®]

Opening up new opportunities for girls



Produced by WISE for the
Royal Academy of Engineering
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Women's Engineering Society and
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Foreword

"I welcome the work University Technical Colleges (UTCs) are undertaking with the Royal Academy of Engineering and WISE. It is essential for UTCs to reach out to and fully engage women in the opportunities available in careers in STEM.

The UK is in the midst of a skills shortage – and the problem is set to increase. It's estimated that 1.28 million new science, technology and engineering professionals are needed by 2020.

This is why UTCs are so essential to both the economy and to young people themselves. They offer 14-18 year olds the opportunity to take a highly-regarded technically-orientated course of study, which provides clear progression routes into further / higher education, an apprenticeship or work.

Importantly though, within this new generation of technicians and engineers, we need to attract more women. The UTC offering is set up to help ensure that as many women as possible have the opportunity to follow a scientific or engineering career – and these sectors will benefit from greater diversity in the workforce.

I am hugely supportive of any steps being taken to help ensure that many, very talented women are given the opportunity to specialise and progress within STEM careers.

The Royal Academy of Engineering and the other organisations who have contributed to this booklet should be commended for producing such an essential resource. I very much hope that each and every UTC will do its best to embrace the advice, helping to ensure we all contribute to attracting the very best people – men and women – into STEM, which is crucial to both the global and the UK economy."



Lord Baker
Chairman, Baker Dearing Educational Trust

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Introduction

"The UK needs many more people with skills in innovation, creativity and enterprise – skills that are fundamental to engineering and key to the UK's competitive edge. University Technical Colleges are superbly positioned to reach out to young people from all backgrounds, male and female, and to bring to life the wonderful opportunities available from a career in engineering.

The Royal Academy of Engineering has commissioned this booklet because girls and young women are currently so poorly represented in engineering and it is imperative that we do more to harness their skills and talent. It is only by doing so that we will sustain and grow the capacity of the UK to compete on the world stage.

The organisations that have come together to create this resource are expert at developing and crafting tools and techniques to enthuse and develop girls' appetite for STEM subjects. The wealth of knowledge contained has been tried and tested over time with a range of different groups. I hope you will apply it to your UTC environment to reap the benefits of improved gender-balance across all your activities – particularly those that seek to engage a more diverse cohort."

Philip Greenish CBE
Chief Executive, Royal Academy of Engineering

Aim of this booklet

To support Principals, Governors and leadership teams of University Technical Colleges (UTCs) to increase the participation of girls in science, technology, engineering and mathematics (STEM).

The booklet outlines the **business case** and the **social case** for recruiting girls in comparable numbers to boys into STEM education and careers. The intention is to provide practical advice and access to resources that will support UTCs to engage and inspire girls and young women to pursue STEM education and careers.

University Technical Colleges – a woman’s place

UTCs present an opportunity to attract more girls to gain the skills and qualifications they need to access a growing range of employment options in science, technology and engineering. They are a new type of school – offering the chance to learn technical subjects through combining academic and practical studies. As such, they provide a real opportunity to challenge stereotypes that limit the participation of girls in science in more traditional schooling.

However, despite offering direct pathways to rewarding and successful careers in STEM, it is still a challenge for some UTCs to attract girls in significant numbers. We all need to challenge pre-conceptions about science and engineering to increase their appeal to girls.

“It is encouraging to see that our efforts to highlight the importance of engineering as a career have had a positive effect and that more women and girls are seeing it as an exciting career”.

Vince Cable, Secretary of State for the Department for Business, Innovation & Skills, February 2014 (commenting on a report from Tomorrow’s Engineers)

UTCs offer an environment that research tells us appeals to girls – setting the learning in context and providing a project-based learning culture.

A recent legal ruling prevents UTCs from ring fencing places for girls and so UTCs must look to strategies and practices that will **encourage and enable** girls to participate in equal numbers to the boys.

“The analytical, problem solving, leadership skills and rigorous academic preparation that students acquire here are exactly what employers are looking for. Most good Higher Education Institutions are looking for them too... and, if they are not, then they will soon catch on!”

Paula Gwinnett, Director of Engineering, JCB Academy

“We have set targets to have girls making up at least 25% of our enrolment by 2020.”

Jim Wade, Principal, JCB Academy



Sophie Wooldridge, Year 12, UTC Reading

I've joined UTC Reading as I want to specialise in computer science. It also means I can get my A-levels in maths and physics. I want to build a career in IT, because I really enjoy it. Being at the UTC will help me decide which area of computer science to specialise in.

The industry partners played a big part in my decision to join the UTC Sixth Form, so it's great that I've been learning a lot of new skills from the business challenges set by them. After my A-levels I want to start an apprenticeship in computer science and work towards a sponsored degree.

The business case for more women in STEM

- The UK economy will require 830,000 professional scientists, engineers and technologists - over 100,000 new professionals each year (to 2020).¹
- The UK engineering and construction sector faces over a 100,000 worker shortfall by 2050, due to skills shortages, an ageing workforce and forecast migration trends.²

Despite women representing 46% of the UK labour force,³ women are under-represented in STEM, making up **just 13%** of those in STEM occupations.⁴

This is an **urgent issue**, the skills shortages are present **now** and **immediate action** is needed to fill the skills gaps. Drawing from only half the talent pool means that capable individuals are overlooked, and insufficient numbers of qualified and competent workers will be available to meet the demand.



Failure to attract women means that industry is losing potential talent and missing out on the benefits of a diverse workforce.

“If schools can promote STEM subjects and offer every pupil the opportunity to develop knowledge of electronics and computer aided design, they will better reflect modern industry.”

Mike Wright, Executive Director,
Jaguar Land Rover

[Britain] “produces 12,000 engineering graduates a year – and there are currently 54,000 vacancies.”

Sir James Dyson, February 2014

Hannah Stanbury,
Apprentice,
Defence Munitions,
Gosport



“As an apprentice within the production areas of the depot I have been trained in the maintenance, processing and repair of sophisticated equipment, as well as having opportunity to study.”

“My granddad came home one day and gave my grandma the leaflet for this apprenticeship to give to her friends for their grandsons. I said, “I want to have a go at that, because it’s everything I want to do, it’s engineering, it’s the MOD,” and I haven’t looked back since really!”

The social case for more women in STEM

Girls are missing out on financially rewarding careers

- Girls are failing to seek out STEM apprenticeships despite there being well paid careers readily available. Girls make up less than 3% of engineering apprenticeships and 2% of construction.⁵
- Median hourly earnings for women working full time in the UK in 2013 were £1.36 less than the average for men working full time. Part of the explanation for this 10% gender pay gap is that occupations where women are in a majority pay less than jobs traditionally done by men.⁶

Girls do well at technical subjects

- Girls achieve better than or equal grades to boys at GCSE in most STEM subjects. Those that choose to study STEM subjects at A level are more likely to achieve A*- C grades than boys.⁷⁻⁸



Failure to include women in this sector is preventing women from accessing **enjoyable, well paid** and **rewarding work** and **achieving their full potential**.

Holly Broadhurst,
Apprentice, JCB Compact
Products



"The opportunities that The JCB Academy offered me made me see that I was able to achieve my goals of becoming an engineer. I am now capable of doing things that I would not have done 3 years ago."

"My engineering career genuinely provides me with a great sense of fulfilment, knowing that what I design and do in my day to day work directly translates to real life."

Shelley Galvin, Geotechnical Engineer, Capita

"If I was to choose my career again, I would choose exactly the same."

Sarah House, Civil Engineer

"I can't think of any job which would be more rewarding."

Female engineer at WISE Building Your Future event

"My role is predominantly IT based and I am studying for a Foundation Degree in IT funded by BT as part of my apprenticeship framework. I would recommend that girls take up the opportunity to contribute to today's world that is built on the foundation of technology."

Memona Mohammad,
BT Apprentice - Ethernet
Planning, BT Technology
Service & Operations



Legal position

UTCs have various legal obligations under UK equality legislation, including not to discriminate against, harass or victimise pupils in connection with ‘protected characteristics’, including gender.

In addition, the general public sector equality duty requires UTCs, in the exercise of their functions, to have due regard to the need to:

1. **Eliminate** discrimination, harassment and victimisation.
2. **Advance** equality of opportunity (including by removing or minimising disadvantages, taking steps to meet different needs and encouraging disproportionately low participation).
3. **Foster** good relations.

UTCs are also required by the specific equality duties to:

- **Publish information to demonstrate compliance with the general equality duty**

For example:

- How many females are enrolled and what are they studying?
- How many progress into STEM education and training, employment, or HE courses?

- **Prepare and publish one or more specific and measurable equality objectives**

For example:

- Have you set a target for female enrolment next year?
- Have you set a target for how many of this year’s girls will continue in engineering next year?

Positive action

Positive action describes proportionate action taken to achieve a prescribed aim in connection with a protected characteristic, including enabling or encouraging individuals to overcome or minimise a disadvantage, meeting the needs of individuals and enabling or encouraging disproportionately low participation. Positive action is lawful and, depending on the circumstances, may include: female focused open days; targeting advertisements and prospectuses; leaflets specifically aimed to encourage girls to apply; altering the provision; and outreach and monitoring.

Positive discrimination

Positive discrimination describes action involving preferential treatment designed to benefit disadvantaged or under-represented groups (for example, in the recruitment/admissions process) and is unlawful unless a statutory exception applies.

Case study

*In 2013, the Schools Adjudicator determined that **one** Academy’s (UTC) admissions criteria which prescribed that 120 students, consisting of 60 males and 60 females, would be admitted, was discriminatory.*

The Academy’s policy was challenged by a parent of an unsuccessful male applicant who argued that as only a small number of females applied (who were therefore effectively guaranteed a place), male applicants were placed at a distinct disadvantage.

Whilst recognising the Academy’s “laudable aim” of encouraging more females into engineering, the adjudicator agreed that the policy placed male applicants at a particular disadvantage and was indirectly discriminatory.

As part of its deliberations, the adjudicator considered whether the policy was objectively justified and whether the ‘positive action’ provisions applied. These can justify proportionate action taken to enable or encourage participation (for example, by females) where an organisation reasonably thinks that participation is disproportionately low. However, the adjudicator concluded that these provisions were not engaged, as the action taken was prohibited by another statutory requirement (namely, school admissions law which requires schools to have one published admission number – in this case the Academy’s criteria provided for 60 male and 60 female students).

The decision acts as a reminder regarding the requirements of admissions and equality laws and the need to ensure that any measures taken to encourage female participation are proportionate and lawful.

“My daughter’s friends think she’s a freak because she likes science.”

Parent of teenager

UTCs are taking legal positive action to meet their targets

“UTC Reading is proud to have initiated a WISE hub to help raise awareness of STEM subjects with primary and secondary schools across Berkshire, and to encourage females to build a career in the relevant industries. We also have some brilliant female role models through our industry partners, who regularly work with our students through employer challenges and attend our taster events to speak to potential students about their career.”

Joanne Harper, Principal of UTC Reading

JCB Academy has a recruiting policy that seeks qualified teachers from an industry background and actively encourages BME and female applications.

Sheffield UTC runs STEM clubs for students who show an interest in STEM to keep them engaged and reassure them – the clubs are mixed but particularly appeal to girls.

“It’s hard to consider what career you want... if you don’t have strong role models to inspire you.”

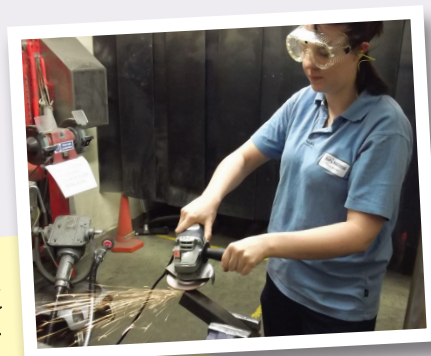
Schoolgirl, Girl Guiding UK

Why don’t girls apply?

Recruiting girls into schools which focus on traditionally male subjects at 14 (when 14 is not a normal transition point in education) is always going to be difficult. Girls and their parents are unlikely to receive careers advice on UTCs to support choices at 14, which means that a pro-active outreach and marketing strategy is critical to UTC’s success. Recent research indicates that parents are the main influencers on a girl’s career choice.⁹

There is a strong perception that certain careers, particularly those in the physical sciences, are masculine.¹⁰ Stereotypes limit girls’ choices – and those who are willing to step out of the ‘normal’ need reassurance that they are doing the right thing. Their parents also need reassurance.

Parents who view UTCs as a route to a narrow range of employment opportunities, in what they perceive as masculine careers, are unlikely to encourage their daughters to apply. It is important to explain about options to progress along different routes post 16 and post 18. The message to get across is that UTCs open up opportunities rather than closing them down.



Sara-Jayne Barker,
Nestlé Apprentice

Sara-Jayne, left school at 16 and completed an AS level in engineering in her first year as a modern craft apprentice with Nestlé. In her 2nd year training she joined York Factory Maintenance and carries out planned inspections and scheduled maintenance in all of the departments on site, supporting the

factory to improve safety and efficiency, eliminating hazards and creating a better working environment for all.

She loves engineering because, ‘so many seemingly small or simple components can come together to perform such complex and magnificent tasks’.

Checklist for change -

What can UTCs do to increase the recruitment of girls?

Prepare the ground

- Our Principal and senior leaders are committed to the principle of equal participation in our UTC.
- We have shared the business case with all staff, governors and sponsors.
- Our policies and practices reflect our commitment to equal participation.
- We have diversity objectives and measures in the strategic plan.
- We have champions to drive our diversity objectives forward.
- We have identified the resources we need, eg. expertise, role models and examples of good practice.
- We have identified and addressed training needs.

Understand the data

- We collect data on participation by gender and ethnicity (from initial enquiry, through to progression) for all students.
- We collect data on gender and ethnicity for all staff, broken down by grade and subject area.
- The UTC Board regularly reviews this data.
- We compare our data with local demographics and benchmark with other UTCs.
- We set and publicise targets for female student and staff participation in STEM.

Provide unbiased information that appeals to girls

- Our website, recruitment and marketing materials show girls and students from different ethnic backgrounds doing STEM activities.
Resource: UTC Sheffield website www.utcsheffield.org.uk
- We offer female only taster courses and open days where girls and their parents can meet female role models.
Identify role models to appeal to students from all different backgrounds and communities. Use your past and current students, University partners and sponsors.
- We provide information that encourages girls to embrace the full range of STEM careers.
Make links with issues which girls often care about such

as the environment, animals, health and living conditions around the world. Show how science and technology relate to everyday life.

Resource: www.wisecampaign.org.uk/women/mind-maps

- We advertise in locations/online platforms used by girls.
Consider young women's groups, Girl Guides, drama groups, girls' magazines, netball clubs.
- We are actively involved in local and national careers events that promote STEM to girls.
- We work with local schools, colleges, universities and employers to promote a positive message about girls in STEM.
Schools may not welcome links with UTCs - consider opening a STEM Centre and build good links with primary schools within your catchment area.
Resource: www.stemcentre.nhc.ac.uk
- We use national initiatives as a hook to promote diversity in the UTC.
eg. National Women in Engineering Day, National Apprenticeship week, International Women's Day, WISE Awards.
- Our student ambassadors and staff who attend careers events, give talks in schools or the community are trained in how to engage girls with STEM.
- We regularly review our marketing material to ensure that words and images get the message across that we welcome and support girls in STEM.
Ask girls and parents what they think and act on the feedback.

Engage with parents, families and careers advisors

- Parents, families and careers advisors are involved in our events and activities which show the benefits and opportunities for girls who choose a STEM career.
- We market the very wide range of career and further/higher education destinations available to students who attend a UTC.
- We emphasise the pastoral care, extra-curricular and social activities available to girls at our UTC.
Parents and girls may be concerned that girls could be isolated and lonely if they are in a minority.
- We talk to careers advisors to ensure they promote a positive message about girls and STEM.

- We collect and act on feedback from parents and girls from different backgrounds to inform future events and policy at the UTC.
- We provide opportunities for local STEM employers to talk to parents and girls about career opportunities in their business.

Provide access to female role models

- We have an active group of local female role models.
Ask local employers, STEMNET, WES, WISE, WiSET, Science Grrl.
Resource: www.stemnet.org.uk/ambassadors
- We involve female role models in all open days and events, both mixed and female only.
- We train and support our role models to deliver a positive message to girls.
Resource: see Positive Connections leaflet and 101 jobs from science and maths poster on WISE website.
- We select role models from diverse backgrounds to appeal to different audiences.
- We encourage our female students to become ambassadors and role models.
- We encourage local employers to provide female role models as speakers and support for projects.
Take care not to rely too heavily on one or two female role models - the time commitment may become difficult for them.

Develop an inclusive learning environment

- We encourage all students to treat each other with respect and to mix across gender, race and other boundaries.
- Our physical environment is welcoming to girls.
Consider access, areas where boys may congregate, rest areas, think about images and displays – do they reflect positive images of women and women’s interests? Ask the girls if you are unsure.
- **All** contact with the UTC is welcoming and supportive, from arrival on site to moving around the building.
Will the student be the lone female in a group of boys, will they feel intimidated on arrival? Provide a female ambassador who can offer a welcome and be a guide.
- **All** our students and staff participate in equality and diversity training and awareness-raising activities.

- We have named staff to support and mentor female students.
- Posters explaining our values are visible throughout the school building.
- We collect and act upon student feedback.
- We identify projects that will particularly interest girls.
Girls are often inspired by projects which make a difference to society.
- We actively encourage girls to participate and ask or answer questions as much as boys in all lessons and activities.
- Our teachers take care to use female examples and say she/her when talking about scientists.
- We train staff in techniques that work for girls.
Consider your practical activities: can everyone participate regardless of physical strength? Do you take account of variations in confidence and familiarity? Girls may be less likely to have used hand tools, changed tyres or carried out domestic electrical tasks than boys, and may be less confident in doing this type of activity.

Support girls to make a career in STEM

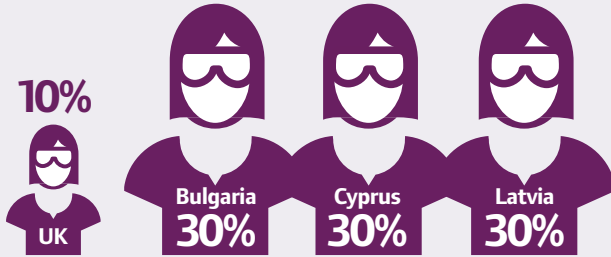
- We provide networking opportunities for girls to meet other females.
These could be internal for your female students, or involve women from local colleges, universities and companies.
- We offer mentors to our students.
Peer mentors, internal or external can help girls who may be isolated.
- We develop work experience opportunities with local companies which support and welcome women in technical roles.
- We provide up to date, relevant guidance on progression routes into varied careers and roles.
Take care not to reinforce stereotypical routes for girls.
- We monitor destinations for girls and boys and promote positive examples to our current students.

We reward and celebrate success

UTC Governors please refer to the flyer available online to make sure your UTC is on track.

The facts, at a glance

The UK has the lowest percentage of female engineering professionals in Europe,



at less than 10%, while Bulgaria, Cyprus and Latvia lead the way with 30%.

Women make up just



Girls are achieving better or equal grades than boys at GCSE in most STEM subjects, and those that choose STEM subjects at A level achieve higher A*- C grades compared to boys.

The average earnings for women working full time in the UK are

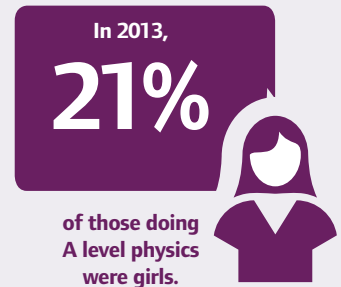
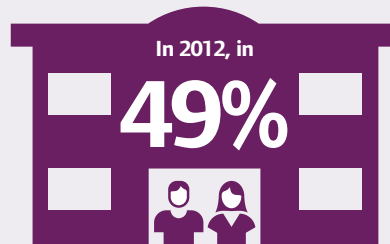


less than men.

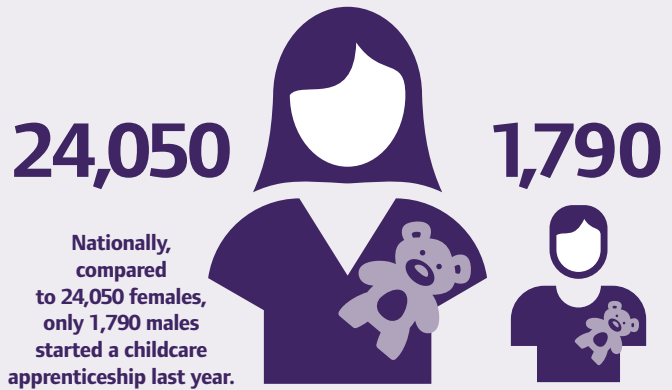
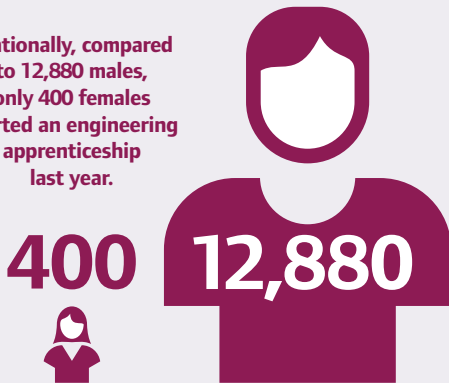
The UK requires

100,000

more professional scientists, engineers and technologists each year – the forecast for 2012-2020.



Nationally, compared to 12,880 males, only 400 females started an engineering apprenticeship last year.



HAIRDRESSING

5 people competing for every **1 job**
(94,000 people trained for 18,000 jobs)



CONSTRUCTION

2 jobs available for every **1 person** trained
(123,000 people trained for 275,000 jobs)



Of 300 professional women engineers questioned:

- 64%** said potential recruiters should provide more work placements
- 70%** said engineering would benefit from improved careers advice
- 91%** said they had an inspirational teacher
- 98%** said their job was rewarding

Sources: Atkins; Institute of Physics; Local Government Association; Office for National Statistics; Royal Academy of Engineering; WISE.

Conclusion

By attracting more girls into STEM, UTCs will:

- **help girls to realise their potential**
- **improve women's potential pay and prospects**
- **develop a bigger and more diverse talent pool for local employers**
- **contribute to economic growth**

WISE supports schools, colleges, universities, employers, industry bodies and campaigners to get more girls and women into STEM, to keep them in and help them to progress. Connect with WISE and others to make a positive difference – www.wisecampaign.org.uk

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Please refer to the Royal Academy of Engineering website for more case studies, the latest research, evidence and advice:

www.raeng.org.uk/about/diversity/default.htm and

www.raeng.org.uk/about/diversity/resources/default.htm

Or via email: diversity@raeng.org.uk

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in science, engineering and technology
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