

OCTOBER 2016

**ENGINEERING
AND EDUCATION**

ADAM RAWCLIFFE

MOTION:

**“ANYONE CAN
BECOME AN
ENGINEER”**

**DEBATING MATTERS
TOPIC
GUIDES**

www.debatingmatters.com

FUTURE OF ENGINEERING DEBATES BY:

Institute of Ideas

**Institution of
MECHANICAL
ENGINEERS**

CONTENTS

Introduction

Key terms

The Engineering & Education debate in context

Essential reading

Backgrounders

Organisations

In the news

KEY TERMS

[Engineering](#)

[Innate](#)

[STEM](#)

INTRODUCTION

1 of 6

NOTES

1
1
2
4
5
6
6

The UK is suffering an engineering skills shortfall, prompting many in the industry to ask the question: can anyone become a scientist or engineer? [Ref: [Bloomberg](#)]. The Warwick Institute for Employment Research suggests that for a prosperous UK economy, an additional 1.82 million people will be needed in engineering jobs between 2012 and 2022 [Ref: [Institution of Mechanical Engineers](#)]. Engineering UK suggests that over the same timeframe there will be a shortfall of some 550,000 engineers and skilled technicians [Ref: [Institution of Mechanical Engineers](#)]. In a world which is ever more reliant on technology, there is “a danger that the UK as a whole, could miss out on the opportunities within advanced manufacturing and engineering due to ignorance and a lack of skills” [Ref: [Telegraph](#)]. If you dig deeper the trend only becomes more concerning. A tiny 7% of UK engineers are female, the lowest proportion in Europe, despite girls on the whole outperforming boys in science GCSEs [Ref: [New Scientist](#)]. In Singapore, where applied science is arguably more valued, 40% of graduates are engineers - skills incredibly attractive to foreign investors [Ref: [Telegraph](#)]. Within this context, Christine Cunningham, an education researcher and vice president at the Museum of Science in Boston, believes young children do not know what engineers are. When prompted to draw a picture of an engineer, students frequently depict train drivers or construction workers assembling buildings, bridges or roads [Ref: [Discover Magazine](#)]. With all of this in mind, are certain individuals inclined towards a STEM career, with an innate engineering disposition so strong, that it does not need developing in the way we assume other skills do? Or are lots of young people missing out on a technology or engineering career because they don’t know what engineering is or what engineers do? Would better education prove that anyone can be an engineer, or are certain people born for a career in engineering?

Can anyone become an engineer?

Whilst many of us believe we can do anything we set our mind to, some in the science education community question whether we all have the capacity to become scientists or engineers.

Greg Blonder argues that by the time we reach 11 years old, “the scientists, engineers, poets, basketball players, and beauty queens” have all sorted themselves out, “some by natural inclination, and some by peer pressure” [Ref: [Bloomberg](#)].

Whilst all children may be naturally inquisitive, some suggest that engineers think in a more analytical, methodical and detail-orientated way than the average person, perhaps making it a job for a specialised minority of people [Ref: [Planet Analog](#)]. Yet others argue that all children from an early age play in a way which lets them work out cause and effect, displaying the early signs of scientifically inquisitive minds [Ref: [Scientific American](#)].

Another aspect of the debate is the distinction between males and females, with some arguing that there is evidence that men and women’s brains are ‘wired differently’ – potentially leading one gender to prefer certain types of activity to others [Ref: [BBC News](#)]. Cambridge Professor, Simon Baron Cohen, suggests “that both sexes have equal scientific ability but females have a stronger interest in people”, leading more women into fields such as medicine and men into subjects such as maths and physics [Ref: [Telegraph](#)]. However, opponents are wary of these conclusions, and instead claim that societal pressures are what really influence such decisions, rather than innate female or male traits. Dame Mary Archer offers the explanation that women may not choose careers in science and engineering because such disciplines are associated with masculinity, and “there’s a sense that ‘I can’t be as womanly as a scientist as I could be as a beautician or a journalist’” [Ref: [Telegraph](#)].

How do we solve the engineering shortfall?

Those who believe there is a naturally inclined pool of would-be engineers, argue that the education system is not doing enough to nurture those who are interested in STEM subjects. From this perspective, there are those who claim that educators must “hunt and gather” the few natural technologists, rather than try to “sow and reap” a new crop from seed [Ref: [Bloomberg](#)]. While beneficial for all of us to be scientifically literate, not everyone needs to know how to solve redox equations or memorise the nomenclature of chemistry, biology and physics [Ref: [Bloomberg](#)]. But more broadly, there is the sense that the current education system in the UK is failing would-be engineers. The fact that children in the UK have to make specialist subject choices, often choosing between arts and sciences, as young as 14 years old means that many give up on STEM subjects too early [Ref: [Cooling Post](#)]. A broader curriculum up until the age of 18, with engineering as a subject, might lead more people to consider STEM related careers some argue [Ref: [Institution of Mechanical Engineers](#)]. Subjects such as Design and Technology could be greater utilised to teach the problem-solving, socially beneficial nature of engineering, in the hope that if the industry is portrayed in a better light, we may increase the pool from which future engineers are drawn [Ref: [Telegraph](#)]. Despite these suggestions, critics disagree, arguing instead that attracting the best and brightest from overseas, and removing barriers that prevent scientifically-inclined minds from fulfilling their potential, because of things such as poverty and discrimination, would do far more than broader scientific education for all [Ref: [Bloomberg](#)]. In the same vein, some think that academic snobbery is what actually pushes students away from technical

THE ENGINEERING AND EDUCATION DEBATE IN CONTEXT CONTINUED...

3 of 6

NOTES

occupations, and assert that careers counsellors should do more to promote vocational qualifications and apprenticeships, thus allowing young people reach the top of the industry. Without such measures, engineering's 300 year history at the heart of the UK economy will be in jeopardy [Ref: [Telegraph](#)].

greatest problems like climate change with technology - how do we make sure that we have the engineers necessary to make these systems function? Are scientists and engineers unique groups of people born to follow certain vocational interests? Or, are we not doing enough to give all young people the opportunities to pursue engineering careers?

The role of engineers in society

Evidence suggests that a high proportion of engineers come from an engineering family background – thus learning about the discipline through family or friends [Ref: [Institution of Mechanical Engineers](#)]. Proponents of broader STEM education argue that we need a new understanding of what it means to be an engineer: “We need to raise the profile of an engineer to that of a doctor or solicitor,” Tracy Radford argues. “It’s vital to spread the word and ensure young people understand that engineering is a highly rewarding career, offering many paths and exciting experiences both at home and abroad” [Ref: [Telegraph](#)]. Engineering should be promoted as a people-focused and socially beneficial discipline referenced in the curriculum from primary school to university level [Ref: [Institution of Mechanical Engineers](#)]. However, for others, while technological literacy will be of utmost importance in the future, it is not necessary for everyone to be able to ‘think like a researcher’ [Ref: [Galileo’s Pendulum](#)]. Courses separated into the general and the professional would give us all a common language and appreciation for the vast promise, and limits, of technology, while increasing the base of home-grown scientists and engineers by directing our efforts where they will have most impact [Ref: [Bloomberg](#)]. In a future world where we all travel in driverless cars, receive healthcare from robots, and can tackle the world’s

ESSENTIAL READING

4 of 6

NOTES

FOR

[An engineer's mind: were we born this way?](#)

Jason Bowden *Planet Analog* 28 January 2013

[More than child's play: ability to think scientifically declines as kids grow up](#)

Sharon Begley *Scientific American* 1 October 2011

[Studying engineering before they can spell it](#)

Winnie Hu *New York Times* 13 June 2010

[Scientists are born, not made](#)

Greg Blonder *Bloomberg* 19 September 2006

AGAINST

[Engineering should be taught in schools](#)

Cooling Post 13 April 2016

[Is there any science behind the lack of women in science?](#)

Jennifer Rigby *Telegraph* 16 February 2015

[Teach engineering not cookery, Sir James Dyson says](#)

Telegraph 11 February 2013

[Children are not 'natural' scientists](#)

Matthew Francis *Galileo's Pendulum* 15 November 2012

BACKGROUNDERS

5 of 6

NOTES

[We need to redress the balance and build a proper skills pipeline](#)

Helena Pozniak *Telegraph* 6 April 2016

[Big Ideas: The Future of engineering in schools](#)

Institution of Mechanical Engineers April 2016

[Is there REALLY a skills shortage in the engineering industry, or are employers just not paying up?](#)

Georgina Bloomfield *E&T* 21 July 2015

[Mind the gap](#)

Economist 11 April 2015

[Five Tribes: Personalising engineering education](#)

Institution of Mechanical Engineers December 2014

[Teenage girls rule themselves out of engineering careers](#)

Jessica Hamzelou *New Scientist* 29 November 2014

[UK's engineering shortage must, and can be fixed](#)

Eric Bonino *Telegraph* 2 November 2014

[Girls should be introduced to engineering at a young age](#)

Chris Moss *Telegraph* 24 October 2014

[A survey of engineering education throughout the world](#)

Chris Titley *E&T* 15 September 2014

[Teaching kids to think like engineers](#)

Breanna Draxler *Discover Magazine* 5 November 2013

[The global race for STEM skills](#)

The Observatory on Borderless Higher Education January 2013

IN THE NEWS

[Engineering needs to shout about its benefits as a career](#)

Yorkshire Post 24 May 2016

[Girls are beating boys in tech and engineering at school](#)

Glamour Magazine 20 May 2016

[Dyson opens cutting-edge research centre for young engineers in Cambridge](#)

Telegraph 8 May 2016

[Teach engineering to primary pupils, new report says](#)

Times Education Supplement 12 April 2016

[Strong engineering industry hindered by skills shortage](#)

Institution of Mechanical Engineers 1 February 2016

[A chance for the UK to stem its skills shortage](#)

Financial Times 26 November 2015

[UK needs over one million new engineers and technicians, says](#)

[Royal Academy of Engineering](#)

Independent 22 June 2015

[15 signs you were born to be an engineer](#)

Buzzfeed 25 September 2014

[Men and women's brains are 'wired differently'](#)

BBC News 3 December 2013

[Report reveals scale of UK's engineering skills shortage](#)

Engineer 1 October 2012

6 of 6

NOTES

ORGANISATIONS

[Institution of Mechanical Engineers](#)

[The Institution of Engineering and Technology](#)

ADVICE FOR DEBATING MATTERS



FOR STUDENTS

READ EVERYTHING

In the Topic Guide and in the news - not just your side of the argument either.

STATISTICS ARE GOOD BUT.....

Your opponents will have their own too. They'll support your points but they aren't a substitute for them.

BE BOLD

Get straight to the point but don't rush into things: make sure you aren't falling back on earlier assertions because interpreting a debate too narrowly might show a lack of understanding or confidence.

DON'T BACK DOWN

Try to take your case to its logical conclusion before trying to seem 'balanced' - your ability to challenge fundamental principles will be rewarded - even if you personally disagree with your arguments.

DON'T PANIC

Never assume you've lost because every question is an opportunity to explain what you know. Don't try to answer every question but don't avoid the tough ones either.

FOR TEACHERS

Hoping to start a debating club? Looking for ways to give your debaters more experience? Debating Matters have a wide range of resources to help develop a culture of debate in your school and many more Topic Guides like this one to bring out the best in your students. For these and details of how to enter a team for the Debating Matters Competition visit our website, www.debatingmatters.com

FOR JUDGES

Judges are asked to consider whether students have been brave enough to address the difficult questions asked of them. Clever semantics might demonstrate an acrobatic mind but are also likely to hinder a serious discussion by changing the terms and parameters of the debate itself.

Whilst a team might demonstrate considerable knowledge and familiarity with the topic, evading difficult issues and failing to address the main substance of the debate misses the point of the competition. Judges are therefore encouraged to consider how far students have gone in defending their side of the motion, to what extent students have taken up the more challenging parts of the debate and how far the teams were able to respond to and challenge their opponents.

As one judge remarked *'These are not debates won simply by the rather technical rules of schools competitive debating. The challenge is to dig in to the real issues.'* This assessment seems to grasp the point and is worth bearing in mind when sitting on a judging panel.



**“A COMPLEX
WORLD REQUIRES
THE CAPACITY
TO MARSHALL
CHALLENGING IDEAS
AND ARGUMENTS”**

**LORD BOATENG, FORMER BRITISH HIGH
COMMISSIONER TO SOUTH AFRICA**