



Science: it's a people thing

A discussion workshop for girls

Overview

This workshop will inspire girls who are interested in exploring more about jobs in science, technology, engineering and mathematics – particularly in areas where they are under-represented. The session brings the subjects to life by making connections with issues that girls care about and demonstrating that choosing science (particularly physics) and mathematics keeps their options open for entry into a range of interesting jobs and careers.

The pack is for teachers as well as ambassadors and role models going into schools. It could also be used by teachers as part of a lesson plan, or by volunteers in a workplace as an outreach activity.

Age range

13–16 year olds

"The fact that science links to real life really appeals to me"
Girl, aged 13, Big Bang Fair, March 2013

Relevant subject areas

Design and technology, engineering and manufacturing, mathematics, the sciences

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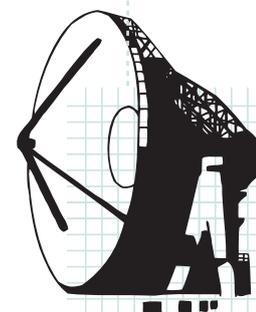
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In addition, there is an editable PowerPoint presentation and the *comments for discussion* in a form to be duplicated and cut up for round-table discussions.





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Notes for facilitators

Background

Intel has teamed up with The Institute of Physics and WISE to create a discussion workshop on the topical theme of women and girls in Science, Technology, Engineering and Maths (STEM). Biology is by far the most popular science with girls, followed by chemistry. The workshop has been designed to inspire girls about the STEM subjects where they are under-represented, such as physics and computer science, by showing them how these subjects connect with issues girls care about and their importance as a gateway into a wide range of interesting jobs and careers.

The workshop was piloted with girls at the Big Bang Science Fair in London in March 2013. Not your usual workshop; the girls did most of the talking! They discussed myths and facts about girls and women in science, technology and engineering and came up with their own ideas on how to make a lasting difference.

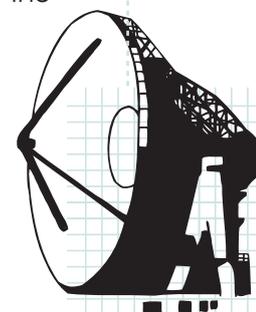
Age group

We believe this session is suitable for girls aged 13-16 but could be easily adapted for use with a younger age group, aged 11-12.

Gender

We developed the session to create a space for girls to have a voice in the debate about STEM, because girls are under-represented in certain STEM subjects, particularly post 16, which means those that do continue with the subjects find themselves in a minority. Girls who came to the sessions at the Big Bang Fair told us they appreciated the opportunity to discuss these issues with other girls. This was especially important for those who came from co-educational schools. We appreciate that gender stereotypes about subject choices affect boys too and that there would be value in giving young people of both sexes an opportunity to discuss these issues. The materials could be adapted for a mixed group, but if this is done, we would recommend having girl-only and boy-only discussion groups, who could compare notes in a plenary session at the end. In a mixed group, there is a risk that girls hold back from saying what they really think and/or that boys dominate the discussion resulting in a girls versus boys conflict, which is not the intention of the workshop.

"It was fun and interesting, as it showed how science can really change everything"
Big Bang girl participant, aged 13





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Aims

The primary aim in running one of these workshops is to inspire girls to pursue a wider range of STEM subjects by meeting role models doing a variety of exciting jobs that use STEM qualifications. A second aim is to give them space to discuss issues that they are likely to face in STEM – from the classroom to the boardroom and to come up with their own ideas. There isn't always a right or wrong answer, but the questions are intended to explore assumptions and raise awareness of different points of view.

The resources are intended to provide stimulus material for teachers, careers advisors and those delivering science outreach and engagement activities to use, and to make STEM subjects more interesting and relevant to girls.

Facts

Some of these facts may be useful for justifying why a school would like to put on a workshop for girls:

- 49% of state-funded schools that offer education for both girls and boys **didn't send any** girls on to do A-level physics in 2011.¹
- Average weekly earnings for women working full time in the UK in 2012 were **£97 less** than the average for men working full time. Part of the explanation for this gender pay gap is that occupations where women are in a majority pay less than jobs traditionally done by men.²
- The UK has the lowest number of female engineers in Europe – at only 9%.³
- Job growth for STEM graduates is likely to be 1.7 times higher than in other areas in the next 10 years.⁴

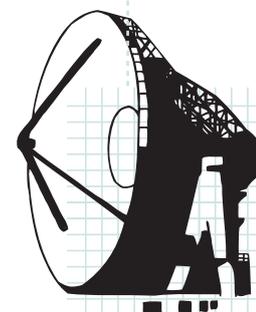
We want girls to be aware of these statistics, discuss how they've come about and what can be done to change things – including actions they can take themselves.

¹ *It's Different for Girls*, The influence of schools report, The Institute of Physics, October 2012, www.iop.org/education/teacher/support/girls_physics/file_58196.pdf

² WISE analysis of Office for National Statistics data, November 2012 www.ons.gov.uk

³ *An investigation into why the UK has the lowest proportion of female engineers in the EU*, Engineering UK, April 2011, www.engineeringuk.com/_resources/documents/Int_Gender_summary_EngineeringUK_04_11_.pdf

⁴ *Ten IT enabled business trends for the decade ahead*, McKinsey and Co, June 2013





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Running your workshop

Format

We've included two suggested formats for the session:

- Option 1 – a one hour session e.g. a PSHE lesson or an extra-curricular session.
- Option 2 – a longer half-day session, which could include:
 - a hands-on activity which you ask the role models to organise and facilitate;
 - laptops available for students to look up information on line about different jobs and careers;
 - opportunities for girls to meet more than one role model.

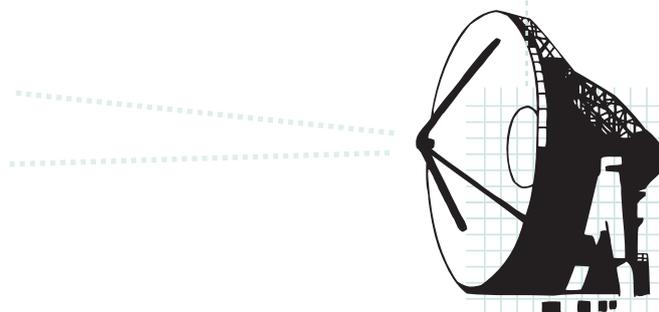
In each case, we suggest a cabaret-style layout so that girls are in groups of 5-6 with a role model in each group. This makes it easier for everyone to participate than in a lecture-based format.

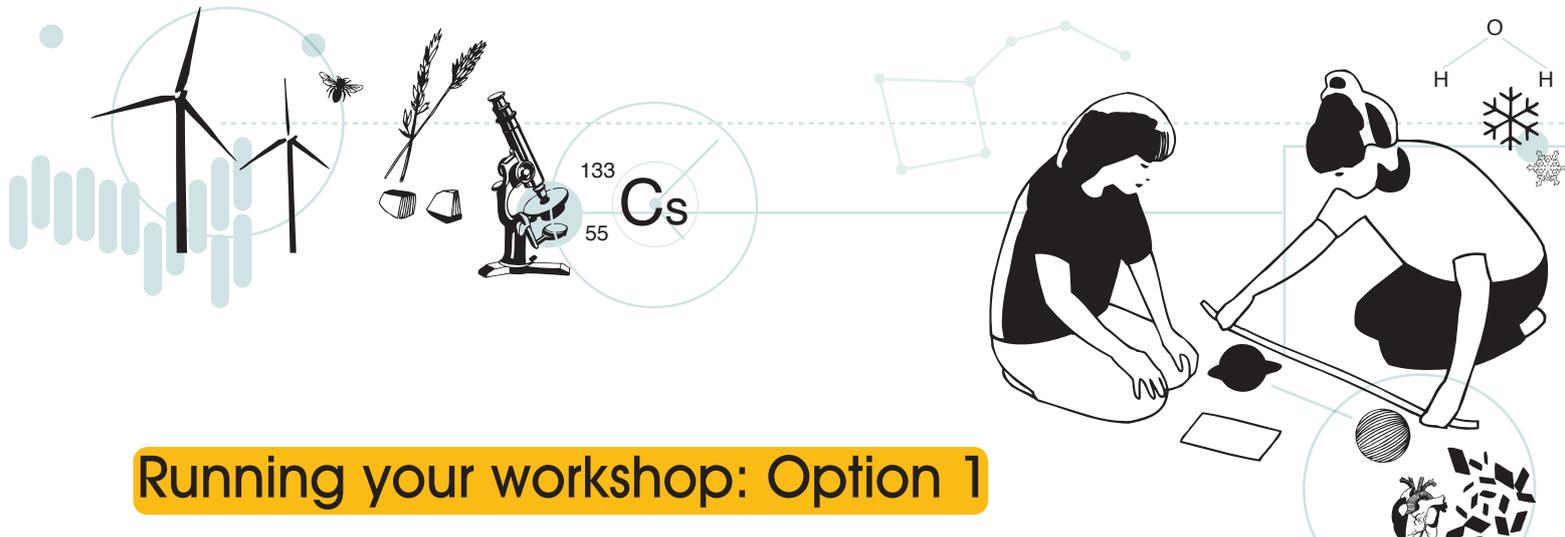
Preparation:

- finding local role models to facilitate each group (see Role model guidelines on a separate sheet);
- it is ideal to hold a meeting or call with these role models to prepare them for the purpose of the session and the format that you're running;
- ask each role model to bring an object or photo relating to their work;
- order call-to-action z-cards for students from education@iop.org.

Presentation Material

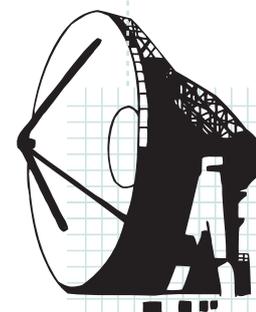
A PowerPoint presentation has been included with this pack for reference as you go through the lesson plan. You can use and adapt this to suit your lesson or day.

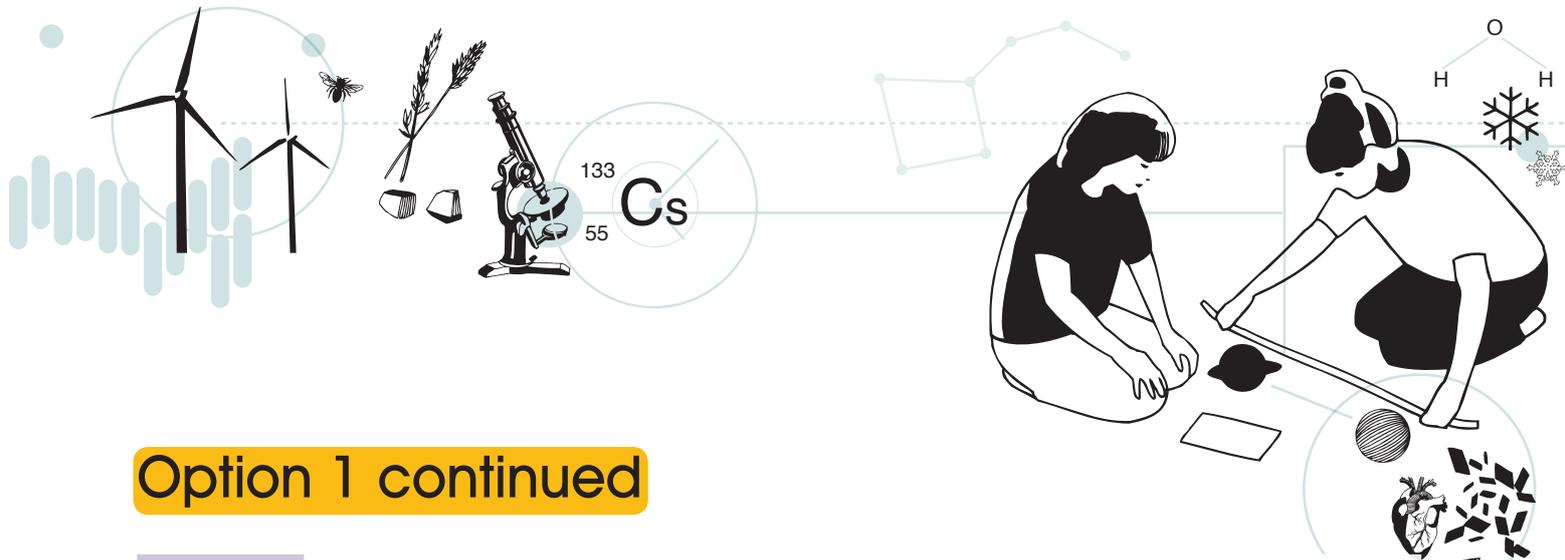




Running your workshop: Option 1

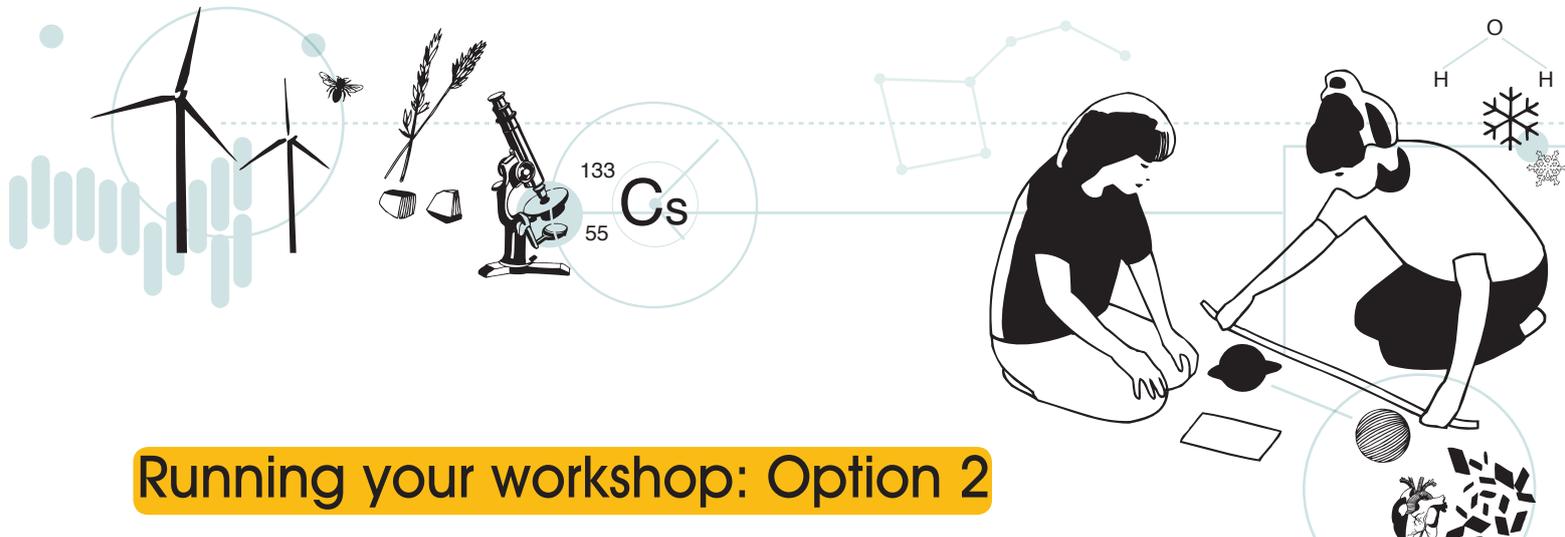
Time	Title	Description
	Pre-workshop preparation	<p>Ask girls to research the types of careers available to people who have STEM qualifications. They could be asked to find 3–5 different careers and some information about what each one involves. WISE has a poster listing 101 jobs from science and maths, linked to a lesson plan and list of websites giving further information about each job.</p> <p>http://www.wisecampaign.org.uk/education/schools</p> <p>You can find out about careers from physics on the Institute of Physics website: http://www.physics.org/careers</p> <p>The European Commission has a site aimed at girls, with case studies of female role models working in science: http://science-girl-thing.eu/en</p> <p>Ask girls to think of some questions that they would like to ask the role models when they meet them – these can include questions about work/life balance, typical salary, travel opportunities, etc. and complete the quiz</p>
5 mins	Introduction	<p>Explain the aim and objectives of the session and run through the programme. Suggest that they use the sticky notes on their tables to note down ideas as the workshop progresses.</p>
10 mins	Male and female stereotypes	<p>Show examples of advertising and packaging aimed at boys and girls, e.g. toys, clothes or beauty products.</p> <p>Ask the girls how they feel about these and does it matter that they are largely stereotyped?</p> <p>Show the short film, 'Science – It's a Girl thing video', from the EC to start the debate around how to approach getting girls into STEM</p> <p>http://youtu.be/g032MPsJfA</p> <p>NB: we found it's much better not to offer any of our own opinions here but see what the girls think and following their discussion you can tell them that the European Commission withdrew this film because of complaints.</p>





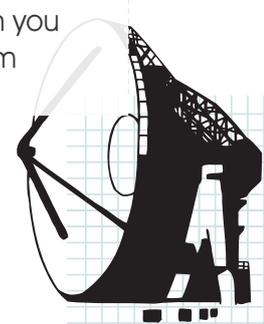
Option 1 continued

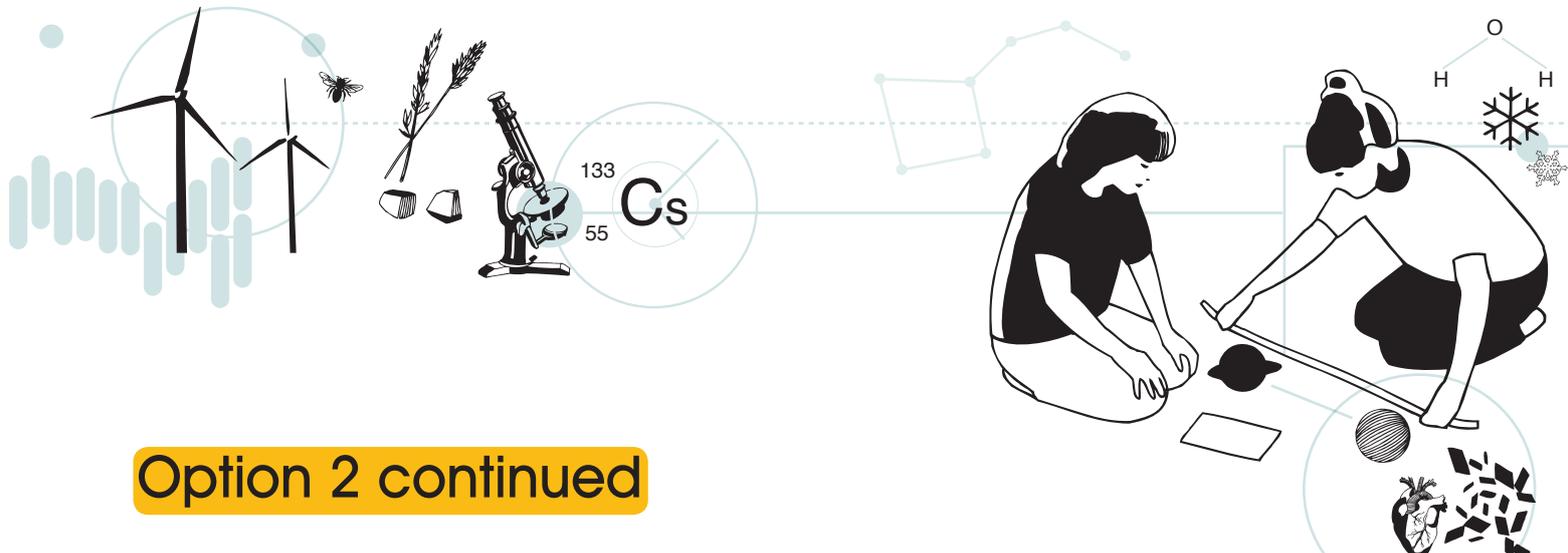
5 mins	Quiz	<p>Role model goes through the quiz with their group (give each role model a set of answers)</p> <p>Each table to choose one fact which surprised them and share with rest of the group</p> <ul style="list-style-type: none"> Discuss whether the EC film works as a way of persuading girls to choose science. If not, what other actions could be taken? Ask girls to write their ideas on sticky notes, which can be stuck on a flipchart or use a computer and projector to display on a screen at the end.
10 mins	Myths and reality	<p>Each table has a selection of provocative comments that are commonly made about girls/women in STEM. The purpose of this session is to give the girls a chance to discuss why people say such things, have a better understanding of the facts and gain confidence in challenging similar comments that they are likely to hear from friends, family or other adults. The role model can challenge the myths around the comments, based on their own experience.</p> <p>Groups discussion</p> <ul style="list-style-type: none"> Why do they think people say these things? Has anyone said similar things to them and, if so, how did they respond? What could they say now if they heard someone make a comment like this? <p>(Practise in pairs and share with rest of group)</p>
10 mins	Hear from role models	<p>Role model spends a few minutes talking about what they do – using the visual prompts. Invite the girls to ask them questions.</p>
10 mins	Learn more about careers in STEM	<ul style="list-style-type: none"> Groups discuss their pre-work into the types of careers available to them What qualifications might they need for these careers? What are the advantages and disadvantages? One individual stands up from each group to share something new that they have learnt about a job or career that you can do if you have a science or technology qualification
5 mins	Planning for the future	<p>Spend a few minutes completing the personal action plan and feedback form.</p> <p>Display the sticky notes so that all the participants can read them.</p>
Total time: 55mins		



Running your workshop: Option 2

Time	Title	Description
	Pre-workshop preparation	<p>Ask girls to research the types of careers available to people who have STEM qualifications. They could be asked to find 3–5 different careers and some information about what each one involves. WISE has a poster listing 101 jobs from science and maths, linked to a lesson plan and list of websites giving further information about each job.</p> <p>http://www.wisecampaign.org.uk/education/schools</p> <p>You can find out about careers from physics on the Institute of Physics website: http://www.physics.org/careers</p> <p>The European Commission has a site aimed at girls, with case studies of female role models working in science: http://science-girl-thing.eu/en</p> <p>Ask girls to think of some questions that they would like to ask the role models when they meet them – these can include questions about work/life balance, typical salary, travel opportunities, etc.</p>
10 mins	Quiz	On arrival invite girls to start filling in their answers to the quiz
10 mins	Introduction	<p>Introduction to:</p> <ul style="list-style-type: none"> the purpose of the session who everyone is – role models to stand up and introduce themselves run through the programme <p>Introduce the role models</p>
20 mins	Male and female stereotypes	<p>Show examples of advertising and packaging aimed at boys and girls, e.g. toys, clothes or beauty products.</p> <p>Ask the girls how they feel about these and does it matter that they are largely stereotyped?</p> <p>Show the short film, 'Science – It's a Girl thing video', from the EC to start the debate around how to approach getting girls into STEM http://youtu.be/g032MPsJfA</p> <p>Do the girls think this is good approach? What are the positive and negatives? Role models to help discuss</p> <p>NB: we found it's much better not to offer any of your own opinions here, but see what the girls think and following their discussion you can tell them that the European Commission withdrew this film because of complaints.</p>





Option 2 continued

20 mins	Myths and reality	<p>Each table has a selection of provocative comments that are commonly made about girls/women in STEM. The purpose of this session is to give the girls a chance to discuss why people say such things, have a better understanding of the facts and gain confidence in challenging similar comments that they might hear from friends, family or other adults. The role model can challenge the myths on the comments, based on their own experience.</p> <ul style="list-style-type: none"> • Why do they think people say these things? • Has anyone said similar things to them and if so, how did they respond? • What could they say now if they heard someone make a comment like this? <p>(Practise in pairs and share with rest of group)</p>
50 mins	Speed networking	<p>The role models, who have up until now, facilitated one group, should rotate around the groups, spending around 10 minutes at a time with each group, giving the girls a chance to interview them. They can use the object or photo they have brought with them to start the conversation.</p> <p>Suggested questions for the group can include:</p> <ul style="list-style-type: none"> • Tell us more about your job? • How did they get there? • What inspires them? • How do you balance your work life with your home life? <p>There is time allowed here for 4 rotations – with some additional time for moving between groups</p>
15 mins	Learn more about careers in STEM	<p>Groups discuss their pre-work into the types of careers available to them</p> <ul style="list-style-type: none"> • What qualifications might they need for these careers? • What are the advantages and disadvantages? <p>One individual stands up from each group to share, with the whole workshop, something new that they have learnt about a job or career that you can do if you have a science or technology qualification.</p>
10 mins	Sharing ideas	<p>Ask girls to think of ideas they might have about what can be done to get more girls into STEM jobs. Write them on the sticky notes and post them on a convenient space somewhere. Some of these can be shared with the whole workshop.</p>
10 mins	Planning for the future	<p>Students return to their groups. They could devise a plan for their school to promote STEM subjects and awareness of gender stereotyping to other girls within the school and/or spend a few minutes completing a personal action plan and feedback form</p>

Total time: 2 hours 25 mins



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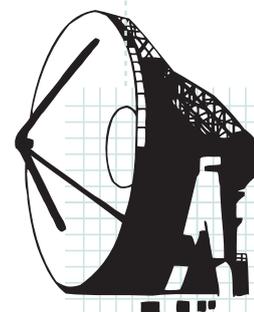
A discussion workshop for girls



Planning checklist

Whether you are running this workshop in the one hour version or the 2¹/₂ hour version, you will need to remember some/all of the following items:

- Arrange a time, date and location for the workshop.
- Confirm who will lead the workshop.
- Liaise with school or schools regarding the age and number of students to be involved – we recommend between 30 and 60 students, aged between 13-15 years.
- Book a space for the workshop and ask for digital projector and screen to be provided. In a large space you may need a microphone as well. There will need to be tables and chairs for students and role models to sit around in groups of between 6 and 10 (max).
- Recruit role-models from a variety of STEM backgrounds. We recommend one per group of 6 students, with at least one additional role-model as a back-up for last-minute drop-outs.
- Ensure that you have briefed the role-models either individually or in groups prior to the workshop – see the role-model guideline sheet for more details. Send them the facilitator notes and the role model briefing sheet to help them see the intentions of the whole workshop. Make sure they know how to reach the venue.
- Arrange for lunches/refreshments if necessary.
- Copy the **comments** about girls doing STEM subjects and cut up (need one set per table).
- Copy the **quiz sheets** – one per student and an **answer sheet** for each role model.
- Copy the **feedback forms** – one for each student.
- Provide **post-it notes** and **pens/pencils** for students to use on each table, as well as **sticky labels** for them to write their names on.
- Ensure you have a **call-to-action z-card** for each student to be distributed at the end of the workshop. These can be ordered in advance from education@iop.org
- Ensure that teachers who are involved are also fully briefed about the purpose of the workshop, so that they can build on the work in their lessons and subsequent interactions with pupils.
- Edit/add to the **PowerPoint**, according to your individual needs.





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Role Model Guidelines

Notes for facilitators

When you're thinking about what role models to invite to your session, you may want to think about some of the advice below about how, why, when and how.

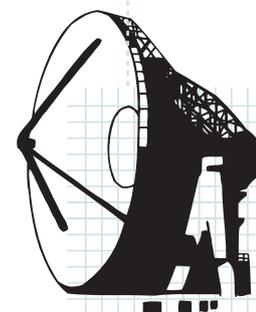
What are the benefits of using role models?

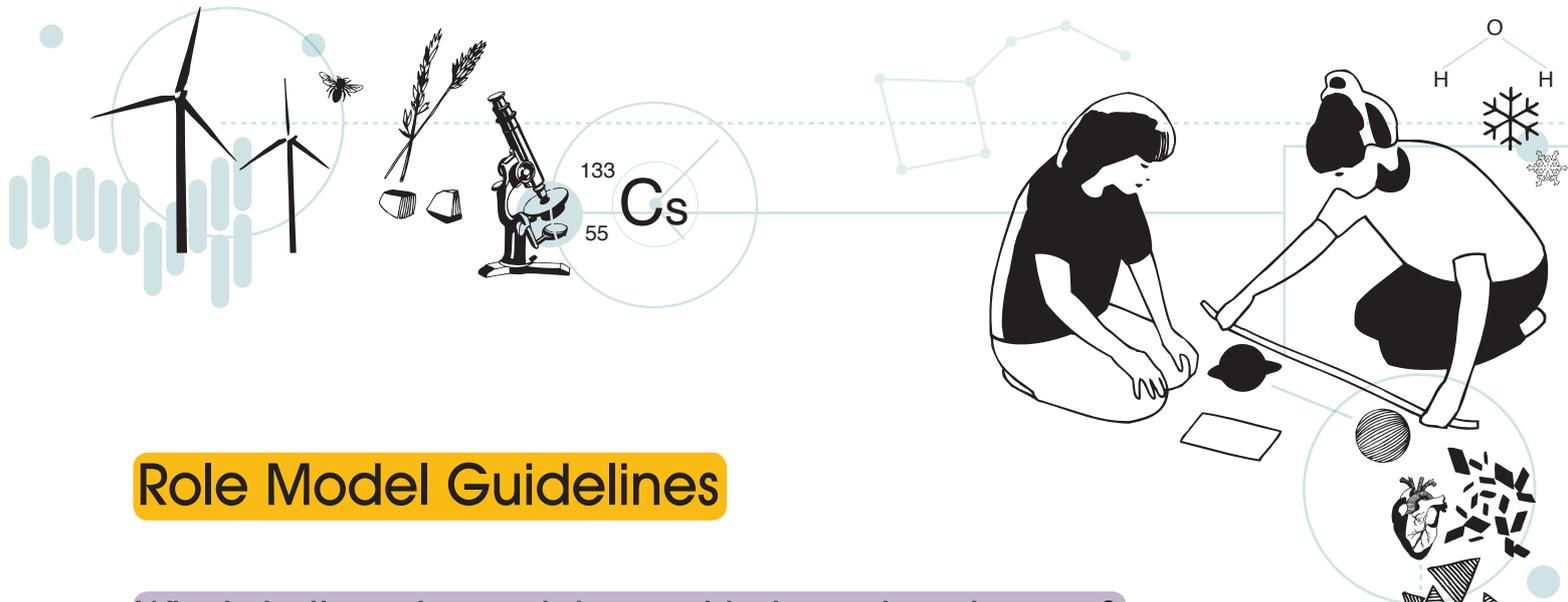
- Many girls do not know any female scientists or engineers.
- Staff and parents may have limited knowledge about the range of jobs and careers available to girls with science and technology qualifications.
- Research has shown that girls perceive physics in particular to be a 'male' subject and have an image of scientists as 'old men with white beards and glasses'.
- Positive female role models are therefore a powerful tool for challenging these stereotypes.

How should positive female role models be identified and selected?

Look for young women, from similar backgrounds to the girls, doing as wide a variety of jobs as possible to appeal to girls with different interests. Your ideal role model will:

- Present a modern image of women working in science, technology or engineering.
- Be a great communicator, able to explain their job without using jargon.
- Have a passion for their work.
- Show how they use creativity and people skills in their work, as well as technical knowledge and skills.
- Be able to inspire the girls by explaining how their job makes a difference to people's lives.
- Be willing to share personal information about their life story and answer questions about their lives outside the workplace.
- Provide practical advice and guidance for girls interested in pursuing studies of, or training in, physics, engineering, technology or computer science.





Role Model Guidelines

What do the role models need to know in advance?

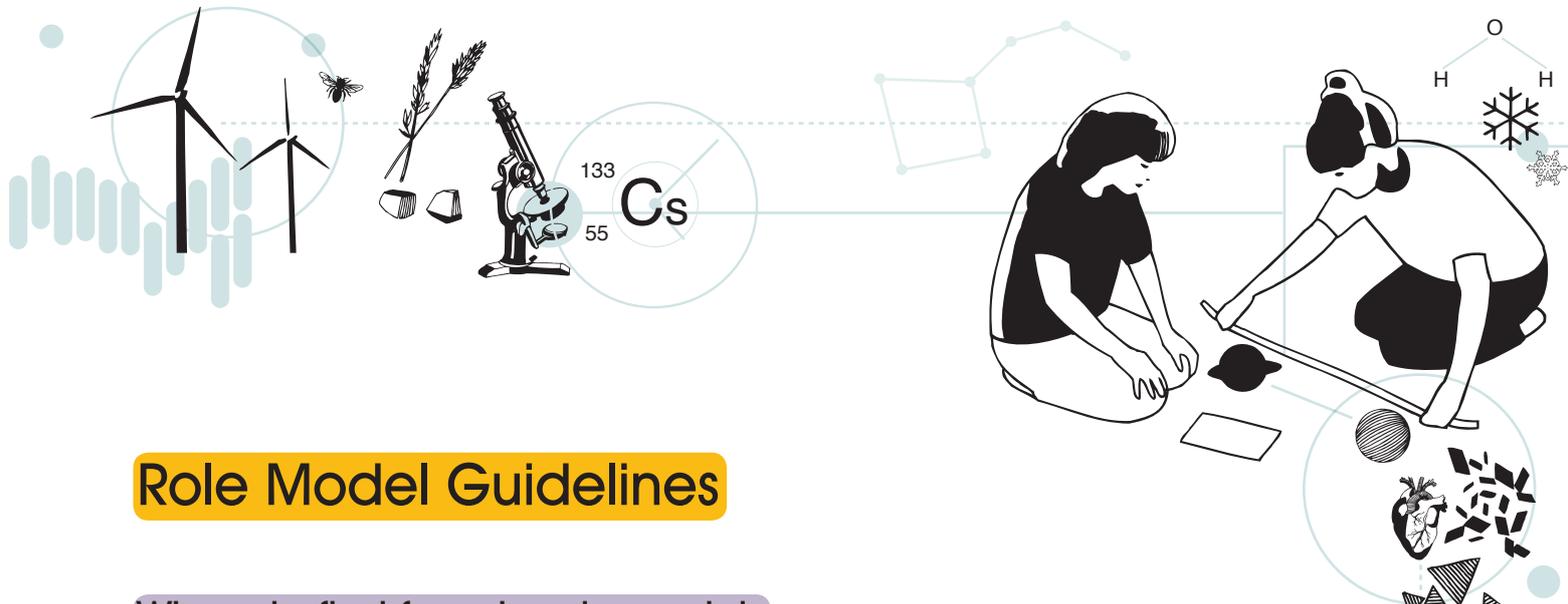
- Positive role models coming into school to participate in STEM related activities will find it useful to know what students have covered in the curriculum and, where appropriate, to link their input to this. For example, 'to be a sound engineer you need to have an understanding of wave properties and acoustics'. (Only Year 12–13 may know what is meant by acoustics.)
- Positive role models need to be provided with an opportunity to 'tune into' girls in the audience. This can be done by getting the girls to interview the role models so that their immediate concerns and interests are addressed.
- Positive role models can be encouraged to bring their job alive for example, by describing a typical day or week.
- Ask the role model to show photographs, materials or equipment from their work environment. For example, a civil engineer might show a building that they designed, or a medical engineer might bring in stainless-steel hip joint and ask girls to guess what it is.
- Encourage the role models to answer questions positively. For example, in response to the question, "Is studying physics at university difficult?", instead of saying "yes" or "no", role models could say things such as, "if you enjoy solving problems, it's a good subject to study" or "you do a lot more practical and lab work than in a lot of other subjects".
- Be honest and open about being in a predominantly male environment, for example, "I sat at the front of the class so that I didn't see the faces of the boys when I answered questions" or "I worked with the only other girl in the class and gave each other moral support".

Questions that role models should be prepared to answer:

- What sorts of activity do they do in a typical day/week?
- What qualifications did they need to get their job?
- What is a typical salary for someone starting in the job and later on?
- What is the gender balance at their work?
- What career progression opportunities are there?
- Does the job have particular perks, such as travel?
- If they have children, what work/life balance arrangements have they and their employers put into place?

Role models enjoy the opportunity to talk to girls

"I would like to thank you for giving me a fantastic opportunity! I really enjoyed myself spreading awareness about a woman's role in the engineering world. The entire programme was well structured and got all of the girls quite involved. It felt really nice to be on the other side of the table and I wish I had someone to tell me as well, when I was their age." **Aritri Dhar, Associate Project Automation Specialist at Fluor Ltd, who was role model at one of the Big Bang Fair workshops for girls, March 2013.**



Role Model Guidelines

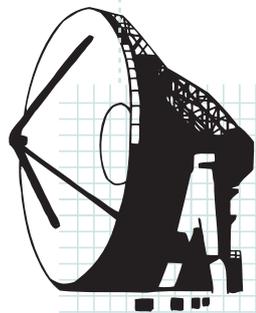
Where to find female role models

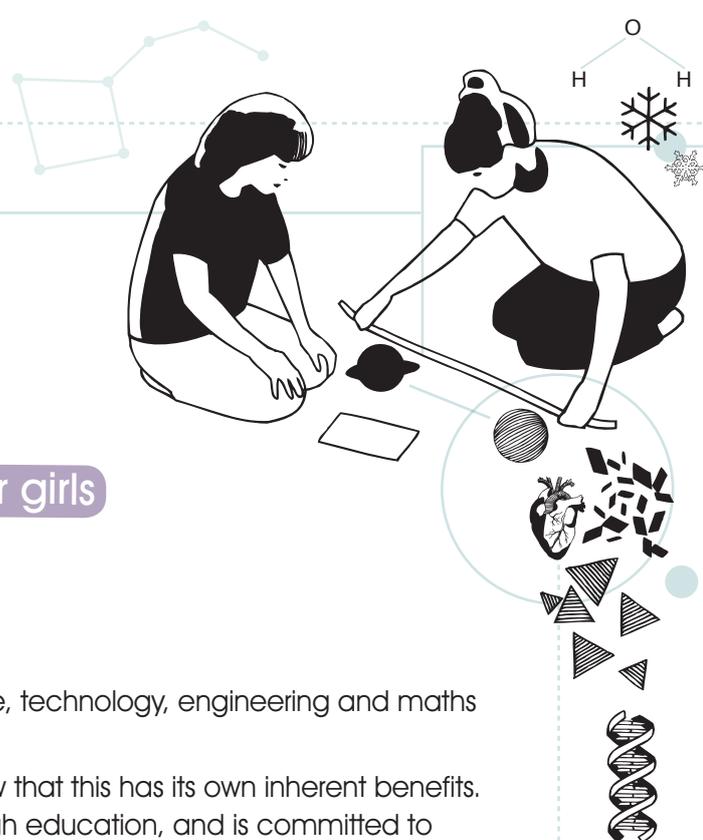
- STEMNET has a network of male and female ambassadors working in STEM who volunteer to work with state schools to inspire young people: www.stemnet.org.uk/content/ambassadors
- WISE has a searchable online database of female role models who have signed up to inspire the next generation of girls to follow in their footsteps: www.wisecampaign.org.uk/women/getset-women
- ScienceGrrl is a network of (mainly) female scientists who are passionate about passing on their love of science, engineering, technology and mathematics to the next generation: www.sciencegrrl.co.uk
- The Education and Employers Taskforce also provides volunteer speakers for schools, to support careers advice activities: www.inspiringthefuture.org
- Ask the school if they have contact with suitable alumni, or approach other local schools to put on a joint event in partnership with science, technology or engineering companies based in the area. See the logos listed at the bottom of the home page on the WISE website: www.wisecampaign.org.uk. All of these companies are members of WISE because they want to get more women working in STEM and may be able to supply role models.

How else can role models be used to inspire girls?

Female role models can be used both in the school and outside in the following ways:

- To contribute to individual lessons, by showing how physics and technology contributes to everyday life.
- To speak at careers fairs or sessions for parents to explain what their job involves and what qualifications are required.
- To participate in mock interview panels.
- As mentors for girls who do not have a scientist or engineer in the family.
- To participate in simulation/enterprise activities.
- To host industrial visits, work placements and shadowing opportunities for teachers and/or students.
- To participate in projects, for example, to be interviewed by students.
- To contribute to STEM club activities and competitions and projects.
- To have a continuing relationship with the school, perhaps by becoming a school governor.





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Further information

You can find more resources to inspire girls about science, technology, engineering and maths from the following organisations:

Intel continues to invest in diversity initiatives, as they know that this has its own inherent benefits. Intel is also helping to transform the lives of millions through education, and is committed to delivering education initiatives that ensure underserved and underrepresented communities and students have access to technology and are inspired to pursue careers in science, technology, engineering and mathematics (STEM). Learn more about their Girls and Women initiatives at: www.intel.com/shewill

WISE is a national campaign promoting female talent in science, engineering and technology, from classroom to boardroom: www.wisecampaign.org.uk

The Institute of Physics provides research, advice and support for teaching physics in schools, particularly on how to make physics more engaging for girls: www.iop.org/girlsinphysics

The British Science Association runs CREST awards for schools and National Science and Engineering Week: www.britishsociety.org

STEMNET works with state schools across the UK to promote STEM activities via a network of volunteer ambassadors: www.stemnet.org.uk

Tomorrow's Engineers has a resource pack for schools and online videos of role models working in engineering: www.tomorrowsengineers.org.uk

If you have any comments or queries, please contact the Institute of Physics via education@iop.org.

