

## STEM Subject Choice and Careers: Table for Good Practice

To consider	What works	Case study examples
<p><b>Images</b></p> <p><b>People</b></p> <ul style="list-style-type: none"> <li>• Monitor no of female: male images, are there equal numbers?</li> <li>• Monitor number of images that indicate a BME background</li> <li>• Avoid images where males are active and females passively look on.</li> <li>• Consider age- does it denote seniority that challenges or promotes stereotypes?</li> <li>• Monitor the number of people with visible disabilities</li> </ul>	<ul style="list-style-type: none"> <li>• Use images of girls/women.</li> <li>• Use images of BME students/role models</li> <li>• Images of girls/BME students doing hands –on activities, looking engaged.</li> <li>• Use images of female/BME role models which overtly demonstrate their occupation</li> <li>• Use images of objects that broaden the understanding of the subject</li> <li>• Use images that have cultural relevance.</li> </ul>	<p><b>The UKRC Parents leaflet</b> The front cover features the targeted students, girls engaged in a hands-on activity and an older, but still young, woman as an aspirational figure.</p> <p><b>The Young Engineers Posters</b> To address the issue of general lack of awareness of the different applications of engineering, the posters illustrate 4 themes; the environment, sports, medicine, and entertainment, each demonstrating how engineering impacts on our lives.</p> <p>The theme of medicine was specifically chosen to attract the interest of girls from cultural backgrounds where they may be expected to go into this area</p> <p>Regarding at the environmental poster , the image of a disaster was carefully chosen: it is of a recent event in this country so it has relevance to our students and is not perpetrating stereotypes of other countries</p>

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<p><b>Object</b></p> <ul style="list-style-type: none"> <li>• Does it engage the audience you are aiming at?</li> <li>• Is it relevant?</li> <li>• Does it broaden understanding of the subject, or confirm existing stereotypes?</li> </ul>	<ul style="list-style-type: none"> <li>• Even stereotypical images can introduce diversity, i.e. Waterloo Bridge was built by women.</li> </ul>	<p><b>Royal Society of Chemistry: 'Discover Chemistry' project</b></p> <p>Not all Chemist wear white coats posters effective challenges the prevailing stereotypes.</p>
<p><b>Design</b></p> <ul style="list-style-type: none"> <li>• Font/overall appearance-does your publication look friendly?</li> <li>• Overall appearance - does it confirm or challenge stereotypes of the subject?</li> <li>• Students will understand that a publication that is predominately pink is aimed at girls, predominately blue/grey is aimed at boys</li> </ul>	<ul style="list-style-type: none"> <li>• Use more gender-neutral colours such a orange/bright green/purple</li> <li>• To ensure girls feel welcome in an activity they may already feel is aimed at boys, overtly use colours that are girl-identified</li> <li>• Use bright colours, variation of font</li> <li>• Include case studies that feature non-traditional role-models</li> <li>• If you find a predominance of male-identified colours that you cannot change, i.e. company logo, sky, sea.</li> </ul> <p>Provide balance by ensuring you have female-identified colours where you can, i.e. borders, in-fill</p>	<p><b>The Brightside Trust-e-mentoring</b></p> <p>They changed the web design and content to appeal to young people who would not necessarily dive into an engineering text book, therefore they have made the website more young and friendly by:</p> <ul style="list-style-type: none"> <li>• lots of pictures</li> <li>• short and snappy text</li> <li>• lots of different tasters.</li> <li>• use of informal logos</li> <li>• rounded text</li> <li>• brighter colours</li> <li>• cartoon avatars, which appeal to girls and boys</li> <li>• on the home page the pictures keep changing</li> </ul>

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<ul style="list-style-type: none"><li>• How computer literate are your audience? Not all students have access to IT, not all adults are proficient</li><li>• Are the colours or font appropriate for those with visual impairment</li><li>• Are the colours or font appropriate for those with dyslexia?</li><li>• Go through your publication, note what colours are used and count how often.</li></ul>		<p>Also, when working with the students it became apparent that, contrary to expectations, not all the students were IT literate, particularly those from less advantaged backgrounds who did not have access to a computer at home.</p> <p>To cater for this Brightside ensures <b>the website is also quite clean</b> (web-speak for simple)</p> <p><b>The London South Bank University: The Engineering Islam Flyer</b></p> <p>Devised to specifically target the most under represented group in engineering: girls from a Pakistani and Bangladeshi community.</p> <p>The front image is a very visually pleasing example of Islamic engineering and the design colours chosen so girls will understand, it is aimed at them.</p> <p>The back cover is beautiful, emphasising the artistic side of engineering, and culturally appropriate</p>
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<h3>Events</h3> <ul style="list-style-type: none"> <li>• Do you have equal numbers of girls and boys?</li> <li>• Do the students reflect the diversity of the institution?</li> <li>• Are speakers diverse? Do they challenge or confirm stereotypes of the subject?</li> <li>• Are the girls getting an equal opportunity for hands-on activity</li> <li>• Are the facilitators aware of equality and diversity issues?</li> </ul>	<ul style="list-style-type: none"> <li>• Ask schools to send equal numbers of girls and boys.</li> <li>• Ask the school to ensure the participants reflect the ethnic make up of the school.</li> <li>• Monitor and evaluate the above. Take action as necessary to ensure equality of participation</li> <li>• Provide speakers that challenge stereotypes of who succeeds in your subject.</li> <li>• Instigate girl-only groups at mixed events, particularly if you anticipate girls being in a minority.</li> <li>• Girl-only events</li> <li>• Provide a pre-event equality and diversity training for all facilitators.</li> </ul>	<h3>The London Engineering Project</h3> <p>‘For example, one teacher said, but I allocate my 20 residential places on a first come first served basis. We suggested he instead put up 2 sheets, first come, first served 10 places for girls, first come first served 10 places for boys.’</p> <p>This school used to send 17 boys and 3 girls. It now sends 10 girls, 10 boys.</p> <h3>Stimulating Physics Project</h3> <p>Instigated single –sex physics lessons for year 9, with positive feedback from both girls and boys</p> <h3>The Young Engineers.</h3> <p>Monitoring indicated that participation of girls in the secondary school clubs had fallen to 36%.</p> <p>The fieldworkers reviewed all their approaches, sent female role models and ambassadors to give presentations to the schools, visited the clubs and arranged a gender awareness training for all teachers running the clubs.</p>
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<ul style="list-style-type: none"> <li>Are you actively targeting students who are statistically less likely to progress in the subject?</li> </ul>	<ul style="list-style-type: none"> <li>If necessary, implement structure which ensures all participants equally access activities</li> </ul>	<p><b>Royal Society of Chemistry 'The Next Generation' project</b> Specifically targeting schools with a low record of students continuing into Higher Education.</p> <p>The RSC addressed the local challenges and ensured the events were free, provided transport and a regional co-ordinator to take the organisational responsibilities from the school</p>
<p><b>Content of activities</b></p> <ul style="list-style-type: none"> <li>Is there a context to the activity which provides a social application for the subject?</li> </ul> <p>It is important for girls to understand why they are doing something and how it contributes to society.</p> <ul style="list-style-type: none"> <li>Ensure the scenario has a positive message</li> <li>Is the activity traditionally appealing to both genders and students from different ethnic backgrounds?</li> <li>Or traditionally boys? (e.g. cars, rockets, weapons, trains etc...) If so, what have you done to ensure it equally appeals to girls.</li> </ul>	<ul style="list-style-type: none"> <li>Show the social context</li> <li>Introduce a cultural focus i.e.</li> <li>Provide local references.</li> <li>Set a scenario that displays your subject in a positive light</li> </ul>	<p>Instead of 'add a light to an existing bell circuit' present them with the challenge 'how would you adapt the bell circuit in a deaf person's home to alert them that someone was at the door?'</p> <p>Produce an alarm that reminds the students of a specific date or time in the religious calendar</p> <p><b>Royal Society of Chemistry 'Discover Chemistry' project</b> Set of posters illustrating the ethical dilemma's of the subject by posing questions such as 'additive or ingredient?'</p> <p><b>London South Bank University</b> Ran a girls' only engineering weeks summer school, focusing on robotics, included discussion on Oscar Prerorius, the Olympic Sprinter with the artificial legs.</p>

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<ul style="list-style-type: none"><li>• Could you change adapt the activity to ensure the interest of girls?</li><li>• What have you done to ensure interest from students from different cultural backgrounds?</li><li>• Or do you need to devise/find a new activity?</li><li>• Can you Incorporate design/decoration into activity</li><li>• Can the students relate to the activity?</li></ul>	<ul style="list-style-type: none"><li>• Introducing ethically dimension to the subject</li><li>• Introducing environmental application of the subject.</li></ul>	<p><b>Project NavyWise</b> 16 Year 10 girls, aged 14 to 15 years, from a number of Hampshire schools undertaking a weeks residential work experience with the Royal Navy ,onboard HMS BRISTOL.</p> <p>All activities were designed and assessed for gender inclusiveness and are hands –on: removing and replacing a propeller, 1 day survival course in the New Forest, releasing and repacking a parachute. Team building activities included to promote the establishing of friendships</p> <p>A competition to redesign an airport lounge may not be appropriate for inner-city children who have not had the opportunity of travelling abroad.</p> <p>One response could be to organise a trip to a local airport, or, simply do something else.</p>
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### Role-models and Ambassadors

- Do they challenge or confirm stereotypes of the subject?
- In terms of age, can your audience relate to them?
- In terms of background; class, gender, ethnicity, disability, family situation, can your audience relate to them?
- Are they aware of equality and diversity issues?
- Are they an engaging speaker?

**"I have tried, but all the role models available are white, middleclass, middle-aged men"**

- A good, inspirational speaker is an asset regardless of their background.
- Can atypical role models be introduced in any other way?
- Can your role models refer to colleagues who reflect greater diversity?

- Provide briefs. Ensure role-models understand your aims.
- Do not use role-models who you feel may engender a negative response.
- Provide equality and awareness training.
- Review any materials they may want to use,, i.e. power-points. If they do not meet your aims, ask them to change or decline to use then
- Use posters that feature atypical role models
- Ensure all materials use i.e. power points, handouts prominently feature atypical role models

### The London Engineering Project:

Recruited from the London South Bank University Faculty to Engineering, Science and the Build Environment, the student ambassadors reflect the diverse ethnic background of the students from the targeted schools, and often being only a few years older, are easier to identify with.

To ensure a high standard and time commitment, the methods employed were:

- Strict recruitment and selection process
- Very good hourly rate
- Provision of tailored Gender Equality Training

### Stimulating Physics Project

Role models are encouraged to bring in photos or materials from their working environment

### The Young Engineers.

To encourage the Young Engineers clubs to participate in the Green Power Challenge, the LEP fieldworkers took the clubs to the final race day.

To counteract the fact that the LEP students would be in the minority, as the vast majority of the other students attending being white boys, the LEP ensured the ambassadors included female BME students with a good background in mechanics. The fieldworkers also arranged for the students to talk to a winning all girls team

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<ul style="list-style-type: none"> <li>• Can your role models reference high achieving, atypical members of their profession?</li> </ul>	<ul style="list-style-type: none"> <li>• Remind; role models of inspirational, high achieving atypical members of their profession, i.e. Zahar Hadid, Architect,  Tanya Budd (winner of Young Engineers for Britain 2005),  Dr Maggie Aderin, physicist,</li> </ul>	<p><b>Project NavyWise</b></p> <p>An informal evening event has been arranged to which the role models, all carefully chosen RN personnel, have been invited. The girls are provided with a list of questions to prompt conversation.</p>
<p><b>Questions on publications</b></p> <ul style="list-style-type: none"> <li>• Considering your target audience, what is the likely response to the question?</li> <li>• Is the question likely to illicit a positive response?</li> <li>• Are some groups, for example girls, inner-city students likely to give a different response to those from a background more typically likely to chose a STEM career i.e. middle-class white boys?</li> </ul>	<ul style="list-style-type: none"> <li>• Having open ended question such as ‘consider the challenges’</li> <li>• avoiding using words such as ‘engineering’ which may have negative connotations</li> <li>• questions that introduce different aspects of the subject that the audience may be unfamiliar with</li> <li>• questions that challenge the stereotypes of the subject</li> </ul>	<p><b>The Young Engineers:</b></p> <p>Experience has shown that non-traditional students may have very little knowledge of what an engineer actually does, and any idea they do have is very limited and stereotypical.</p> <p>Therefore when asked if they could see themselves as an engineer, they may understand, ‘<b>can I see themselves as a large white man covered in oil?</b>’ the response being an emphatic <b>no</b>.</p> <p>While those questions may be suitable for the students who have traditionally joined the Young Engineers clubs, it is entirely possible for a atypical student to reply no to all five questions.</p> <p>The strap line ‘Consider the possibilities’ neatly introduces the creative aspect of engineering, with the various questions designed to further illustrate the social and practical uses of engineering.</p>

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<h3>Publications</h3> <ul style="list-style-type: none"><li>• If you are targeting a specific audience, is the information cultural appropriate?</li><li>• Does the information challenge unhelpful stereotypes</li></ul>	<ul style="list-style-type: none"><li>• Benefit from the diversity within your workplace.</li><li>• Get feedback from those in the target group. Make changes as required.</li><li>• Be bold with the information supplied</li><li>• Be brief</li></ul>	<p><b>The London South Bank University -the Engineering Islam Event</b> 'Shireen' specifically put her full name on the front , with a contact details, to reassure any members of the community who may be unsure if their cultural need will be met.</p> <p>The information includes several cultural references ; Ramadan, Iftar and it is stated that a prayer room will be available and that families are invited</p> <p><b>The UKRC Parents leaflet</b> Designed to encourage parents and carers to support their daughters if they show an interest in engineering, the following information is included:</p> <p>Salaries: Both students and parents have been astonished to see the salary comparisons, and to those that replied that after reading the leaflet they now viewed engineering more positively as a career, every single one singled out salary as a reason why.</p> <p>The quotes were chosen that challenged the misconceptions of engineering and illustrate the unrecognised benefits.</p> <p>As the leaflet is aimed at families from a diverse background ,quotes were used from those whose names might indicate they are from a BME background</p>
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<ul style="list-style-type: none"><li>• Quotes-consider the names of those quoted, have you gender equality, do the names indicate diversity of background</li></ul>		<p>Bearing in mind that not everyone has access to , or is comfortable with, the internet a telephone number and a female contact name is provided</p> <p>To avoid overwhelming those with limited English, a limited amount of further information provided.</p> <p><b>Royal Aeronautical Society (RAS) Website:</b></p> <p>Focus groups were set up-comprising of teachers, career professionals, members and non-members of the Royal Aeronautical Society to evaluate the proposed changes.</p> <p>On example of the RAS responding to the feedback was in regard to the name: the draft name for the site was 'Remove before flight' (referring to the tags that have to be removed pre-flight), however, feed-back from focus groups revealed that no-one understood the reference. A new name has been selected</p>
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A Department for Children, Schools and Families initiative to promote subject choice and careers in Science, Technology, Engineering and Maths (STEM) delivered by the Centre for Science Education at Sheffield Hallam University and VT Enterprise.

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### Appendix

#### **The London Engineering Project**

The aim of the LEP is to promote engineering as an occupation to students who would not ordinarily consider engineering  
The LEP focused on working with students from BME backgrounds, students who did not have a family history of Higher Education and girls.  
As the least represented in engineering, girls from a Pakistani/Bangladeshi background had a specific focus.

The LEP consists of partners from the STEM sector, delivering activities such as residentials, primary and secondary school days, H.E events, e-mentoring and setting up after school science and engineering clubs.

#### **Stimulating Physics Project**

'The aim of the Stimulating Physics Project is to help schools to encourage and support more young people to progress into A level Physics and beyond, as part of this, a range of specific activities have been embedded in teaching and learning to reduce the under-representation of girls in Physics.'

**WISE:** The Women into Science, Engineering and Construction (WISE) campaign is aimed at encouraging girls to take a greater interest in Science and Technology leading to GCSEs or the 14 – 19 Diploma in Engineering as one of their Key Stage 4 subject options

**Project NAVYWISE:** Sixteen girls from year 10, aged 14 to 15 years, from a number of Hampshire schools are undertaking a week's residential work experience with the Royal navy, onboard HMS BRISTOL

The aim of the visit is to provide an opportunity for the 16 girls to gain some practical experience of engineering and to meet female engineering role models from the Royal Navy.

#### **Royal Aeronautical Society Website**

Aim of website to be a one stop shop for careers in Aeronautics

Target users: direct users age 5-30 +, careers professionals, educationalists

The issue: girls are underrepresented in the aeronautical sector and the website was improved with the aim of changing the public perception of this career.

#### **The UKRC Parents leaflet**

Aim- the parents leaflet is designed to encourage parents and carers to support their daughters if they show an interest in engineering.

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For those parents who want to more proactive, a section is included of simple actions that can be taken to promote an interest in engineering

The **targeted audience** of this leaflet is the parents and carers of girls with a specific remit for parents and carers of Pakistani and Bangladeshi girls as this is the least represented group in engineering. Therefore, it was kept in mind that those reading it may have English as a second language.

### **The Young Engineers**

The Young Engineers run after school clubs.

The aim of revised version of the poster was to attract more non-typical students, i.e. girls, BME students, students who did not have a history of Higher Education in their background to the clubs.

The set of 4 which can be found at [www.youngeng.org](http://www.youngeng.org)

The Equality and Human Rights Commission has requested copies of the revised posters as an exemplar of good practice

### **The Brightside Trust-e-mentoring**

Linking students who have an interest in Science and Engineering with a professional or undergraduate with experience in the area, they communicate on the web-blog which is linked to an on-line library

The aim is increase the number of girls entering Engineering and Physics respectively at HE and FE

### **The London South Bank University: The Engineering Islam Flyer**

The aim to recognising that girls from the Pakistani and Bangladeshi background are least likely represented, London South Bank University devised this event with the aim to attract the Muslim community.

The event celebrated Eid, the end of Ramadan. It was held at the prestigious Royal Academy of Engineering and featured a range of activities. Halal food was served and a prayer room provided.

### **The Royal Society of Chemistry**

The Royal Society of Chemistry (RSC) is working with Pfizer on Discover Chemistry, an educational project which will centre on the skills needed from graduates to ensure the chemical industry continues to thrive in the UK. The initiative comes with Pfizer's major investment of up to £1 million over 3 years. The activities and programmes seek to help excite and inspire students at all levels about the subject, to encourage students to continue to study the subject and to demonstrate multiple career paths and options open to chemists. There is a particular emphasis on addressing a likely future skills gap and the programme has identified opportunities to intervene at each stage of the education/training continuum.