



**A REPORT  
ON  
CREATING INCLUSIVE ENGINEERING COURSES**

**MONDAY, 29<sup>TH</sup> MARCH 2010**

**ABBAY CONFERENCE CENTRE  
LONDON SOUTH BANK UNIVERSITY**

## **Purpose of the event**

This one day seminar was aimed at engineering lecturers and programme managers who would like to explore how they could make their courses and engineering departments more inclusive across under represented groups including women, black and minority ethnic groups and students from lower socio-economic groups.

The seminar explored current effective practice by leaders in this field and the experiences from the London Engineering Project. Colleagues from the sector were invited to come along to share their experiences and learn from each other.

This seminar was organised by the Royal Academy of Engineering and the London Engineering Project in partnership with London South Bank University and the Higher Education Academy Engineering Subject Centre. It is one of the seminars from the successful '*Getting girls into engineering...a practical guide*' series and was part of the Royal Academy of Engineering's activity in the National HE STEM Programme ([www.stemprogramme.com](http://www.stemprogramme.com) )

Delegates were invited to:

- share their own effective practice with others in the field
- make some new contacts with people you can work with in the future
- discuss how to take effective practice forward in the sector
- learn to recognise when practice is effective
- take away practical guidance and advice
- discuss some of the more challenging aspects of your work and shared ideas
- find out more about the National HE STEM Programme
- enjoy a nice lunch!

## **Programme of the Day**

10.00	<i>Coffee &amp; Registration</i>
10.30	Welcome & Introductions
10:40	The LEP and beyond Heather Hawthorne, Royal Academy of Engineering
10.50	<b>The positive student experience of an engineering ambassador</b> Gemma Proudley, LEP Ambassador, LSBU
11.05	<b>The National STEM Programme – outline and opportunities</b> Heather Hawthorne, Royal Academy of Engineering
11.15	<i>Coffee break</i>
11.30	<b>Engineering for Society, the lessons learnt in developing a new inclusive degree programme</b> Dr Andy Buckley, University of Sussex
12.00	<b>An inclusive approach to innovation in the curriculum</b> Dr Liz Read, Coventry University
12.30	<i>Lunch</i>
13.30	<a href="#"><u>Workshop Parallel Sessions A</u></a> (see choices below)
14.10	<a href="#"><u>Workshop Parallel Sessions B</u></a> (see choices below)
14.50	Feedback from workshops
15.15	Closing remarks
15.30	Drinks Reception
16.30	Close of event

## Choice of Workshops

<b>Workshop</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>Title</b>	<i><b>Creative approaches to engineering outreach</b></i>	<i><b>Developing approaches to attract different audiences</b></i>	<i><b>Creative approaches to teaching and learning in engineering</b></i>
<b>Facilitator</b>	<i><b>Heather Hawthorne</b></i>	<i><b>Liz Read</b></i>	<i><b>Hal Igarashi</b></i>
<b>Description</b>	How can we use student ambassadors to increase impact? What activities will appeal to a wider audience?	What degrees successfully attract girls and why? Where and how should these degrees be marketed? What would be the distinguishing features of attractive courses?	Examples and case studies of effective teaching and learning styles. How can we engage and retain students on engineering degrees?

## **List of Attendees**

<b>No.</b>	<b>Name</b>	<b>Department/Institution</b>
1	Saher Ahmed	Institute of Physics
2	Carol Arlett	Engineering Subject Centre
3	Peter Barrington	Faculty of Engineering, Kingston University
4	Dragana Barjamovic	School of Informatics, University of Westminster
5	Rob Best	Engineering, Science and the Built Environment, London South Bank University
6	Tom Branald	School of Civil Engineering and Geosciences, Newcastle University
7	Andrew Buckley	Department of Engineering and Design, University of Sussex
8	Laura Chastney	LEP Fieldworker, LSBU
9	Benjamin Drew	Dept of Design and Engineering, University of the West of England
10	Mark Ellis	Student Recruitment Admissions, London South Bank University
11	Russell Hall	National HE STEM Programme Manager, University of Birmingham
12	Heather Hawthorne	The Royal Academy of Engineering
13	Hal Igarashi	The Royal Academy of Engineering
14	Steffi Krause	School of Engineering and Materials, Queen Mary, University of London
15	Lara Lewington	Engineering & Design, Sussex University
16	Aziza Mahomed	Mechanical Engineering, University of Birmingham
17	William Manners	Department of Engineering, University of Leicester
18	Daniell Pariag	LEP Fieldworker, LSBU
19	Tony Price	School of Engineering, University of Warwick
20	Cliff Pritchard	Department of Electronic and Computer Engineering, University of Portsmouth
21	Gemma Proudley	The Royal Academy of Engineering
22	Elizabeth Miles	Faculty of Engineering and Computing, Coventry University
23	Alice Salmon	Aimhigher Events Officer and Ambassador Coordinator, London South Bank University
24	Makhan Singh	School of Mathematics, University of Birmingham
25	Sapna Somani	The Royal Academy of Engineering

## **Attendance and Feedback on Workshops**

### **Workshop 1 – Creative approaches to engineering outreach**

*(Facilitator: Heather Hawthorne)*

#### **Session – A**

<b>No.</b>	<b>Name</b>	<b>Organisation</b>
1	Alice Salmon	WP/LSBU
2	Sapna Somani	RAEng
3	Lara Lewington	University of Sussex
4	Makhan Singh	IMA
5	Gemma Proudley	LSBU

#### **Session – B**

<b>No.</b>	<b>Name</b>	<b>Organisation</b>
1	Benjamin Drew	University of the West of England
2	Steffi Krause	QMUL
3	Saher Ahmed	IOP
4	Gemma Proudley	LSBU

#### **Feedback from the session**

- 1 Setting up ambassador scheme in various HEIs was found to be useful. Different ways to set up such scheme were discussed:
  - A separate unit on a degree course could be set up that focus on ambassador work. Students will get credit for this unit in later semester / year.
  - HEIs can partner with STEM Ambassadors National Scheme managed by STEMNET - <http://www.stemnet.org.uk/ambassadors.cfm>
  - LSBU select their ambassadors via an open application routes. Applicants get short listed and are then invited to attend an assessment centre as well as one-to-one interviews with a short presentation session at the end. At the end, applicant also has an opportunity for a Question and Answer session.
  - Other Universities advertise the position of such ambassadors role as a volunteering role, follow their procedure of recruitment and tell the applicants at the last stage that the position is actually a paid position. With this method, they can ensure the quality and get more enthusiastic students to work.
  - Open up applications again in the Summer term to catch 1<sup>st</sup> and 2<sup>nd</sup> years students who didn't apply in their first term. Gives you the opportunity to recruit more quality applications that may have been missed out in the first recruitment round.
- 2 The groups discussed ideas for possible future outreach activities with school students which may encourage their interest in engineering:
  - Engineering food, like Chocolate manufacture as it links to everyday life
  - Regional problems like water supply in rural areas

- Animatronics
- Inviting guest speakers as they are great role models and help to contextualise engineering and relate it to the real world
- Medical engineering; especially targeted at girls. Including materials engineering looking at wound dressings, dental materials.
- Energy / Solar such as the Solar Car Challenge ran at LSBU
- Ashfield Music Festival (IOP) – [www.iop.org.uk](http://www.iop.org.uk)
- Don't just do "hands on" activities you can also run activities that ask the students to create a poster /presentation or use role play for example.

## **Workshop 2 – Developing approaches to attract different audience**

(Facilitator: Liz Read)

### **Session – A**

<b>No.</b>	<b>Name</b>	<b>Organisation</b>
1	Saher Ahmed	Institute of Physics
2	Dragana Barjamovic	University of Westminster
3	Cliff Pritchard	University of Portsmouth
4	Laura Chastney	London South Bank University
5	Mark Ellis	London South Bank University
6	Russell Hall	University of Birmingham
7	Aziza Mahomed	University of Birmingham
8	Daniell Pariag	London South Bank University

### **Session – B**

<b>No.</b>	<b>Name</b>	<b>Organisation</b>
1	Carol Arlet	Engineering Subject Centre
2	Peter Barrington	Kingston University
3	Tom Branaid	Newcastle University
4	Lara Lewington	University of Sussex
5	William Manners	University of Leicester
6	Tony Price	University of Warwick
7	Alice Salmon	WP/LSBU

### **Feedback from the session**

1 Topics discussed in both sessions includes:

- Initial discussions looked at what degrees are women studying and these included; Medicine, Bio Sciences, Psychology, Law/Languages, Pharmacy, etc.
- This resulted in a discussion about do women choose a degree where they know what they are going to be?
- Why were there so many women (20%) in physics, why did these women not choose to do engineering? The suggestions included the fact that physics covered such subjects as Astronomy / Medical Physics, etc.
- A discussion was had around the theory that women like the idea of a 'Solo Career' at the start where as with engineering one needs to go into "a large organisation".
- The point was made about how on Open days and with outreach it was important to have female member of staff present to represent women and show that it was not all male dominated.
- It was also felt that Engineering is not portrayed as a caring profession. This may in some way put women off Engineering. We need to portray it as an industry that helps people and gives services rather than technology showing products that help

and care. We must portray it as a stream of education that helps by looking more towards social aspect with our projects.

- It was felt that there was a public misperception of engineering about what it is due to media. The debate then moved to – Do we need to change the marketing of engineering as a subject to change this misperception?
- It was also voiced that careers advisors, teachers and parents were unaware of what engineers actually did in their daily lives.
- We need more female science/D&T teachers.

**2** Possible future activities with students in order to encourage and retain their interest in engineering:

- Information available to careers/teachers is not sufficient. We discussed about what actually needed a change – Were the degrees themselves or the way they were marketed?
- We need to do an international comparison with other similar approaches like the USA (MIT) where they take engineers into society doing projects. We must learn about the reactions of their female students to this kind of approach?
- Do we think women would be more interested in “consultancy” career path?
- Rethink what is in the degree (module names), like re-packaging the same degree with different and more female-friendly names.
- Improve standing of the profession through the media, etc.

## **Workshop 3 – Creative approaches to teaching and learning in engineering**

(Facilitator: Hal Igarashi)

### **Session – A**

<b>No.</b>	<b>Name</b>	<b>Organisation</b>
1	Carol Arlet	Engineering Subject Centre
2	Tom Branaid	Newcastle University
3	Benjamin Drew	UWE
4	William Manners	University of Leicester
5	Tony Price	University of Warwick
6	Peter Barrington	Kingston University
7	Steffi Krause	Queen Mary, University of London

### **Session – B**

<b>No.</b>	<b>Name</b>	<b>Organisation</b>
1	Dragana Barjamovic	University of Westminster
2	Aziza Mahomed	University of Birmingham
3	Sapna Somani	The Royal Academy of Engineering
4	Russell Hall	University of Birmingham
5	Cliff Pritchard	University of Portsmouth
6	Makhan Singh	University of Birmingham

### **Feedback from the session**

- 1 Topics discussed in both sessions includes:
  - Deliver content in the context of real applications so that students understand the applications of the theory. This can be addressed in terms of 'examining the problem to be solved'. Delegates favoured the importance of teaching knowledge of the application first then examining the detail of the theory.
  - Using case studies to illustrate engineering solutions. The analysis of Catastrophic Failure and solution redesign engages student interests in building portfolios and media monitoring (Building knowledge of engineering applications and transferable skills).
  - Group Project work – Suggested that design teams using Belbin test results was useful to expedite awareness of personal skills and team roles. It was generally thought that naturally evolved groups would eventually be similar in structure. Enables active engagement of students in the learning process and peer support.
  - Peer assessment is used quite extensively, though delegates expressed caution in its use. The issues identified were having mechanisms to ensure fairness such as using group and individual marking. And issues of the individuals perspectives with respect to their roles in the group.
  - Providing positive and timely feedback on coursework was stated to be an

important factor in student motivation.

- It was reiterated from a presentation made to the group that there were environmental constraints on delivery which affected the capability to undertake innovative delivery.
- On issues of engagement delegates referred specifically outreach schemes using effective lab work and good engineering examples.
- Specifically on retention, there was some discussion on identifying where students drop out. All agreed this occurred in Year 1 and for reasons not fully understood. It was agreed that some of the reasons were not related to the design of curricula and a comparative research with other subjects be undertaken. Some drop out is due to student expectation conflict related to learning styles, what university study actually involves and not knowing what engineering actually is.
- It was agreed that appropriate work experience programmes were important in increasing motivation and improving grades. Industrial experience also enabled students to make better career judgements.
- Some universities use 'long thin' modular curricula in Year 1. One university having used this approach for 7 years considered it to be effective in improving retention. It provided time and opportunities for students to develop learning and studying skills in university. It was noted that it is difficult to implement where progression is dependent on prerequisites.

## **Evaluation done by HEA Engineering Subject Centre**

	<b><i>Excellent</i></b>	<b><i>Good</i></b>	<b><i>Satisfactory</i></b>	<b><i>Poor</i></b>
1. Overall rating of the event	9	2	<input type="checkbox"/>	<input type="checkbox"/>
2. Pre-event organisation	6	3	1	1
3. Organisation on the day	9	1	1	<input type="checkbox"/>
4. Meals/refreshments	4	5	2	<input type="checkbox"/>
5. Meeting rooms/facilities	5	6	<input type="checkbox"/>	<input type="checkbox"/>

---

6. What did you hope to achieve by attending this event?

- Network, find out what other people's views are on being inclusive/promoting inclusivity, etc.
- Networking.
- More awareness about HEI system.
- To learn more about the engineering work, past, present and future.
- Network, learn about other institutions initiatives.
- Sharing best practice.
- Discussion of effective practice.
- Find out what other universities are doing to keep their students. How programmes are designed to attract more females into profession.
- Learn about others experiences/perception of student engagement and what works/ doesn't work.
- New ideas for attracting and retaining female students.

7. What was the most useful or meaningful thing you learnt?

- Ideas of research projects in Engineering Education.
- Group Discussion
- All
- Personal Experiences of being a STEM ambassador.
- Hearing what other HEIs are doing in Outreach and in Female Recruitment.
- Funding opportunities
- Pilot projects other universities are doing in order to help students (maths pack sent to students when they enrol)
- What works in outreach events – 'doing' activities are good but there are other techniques. Others perception of teaching to engage and retain students.
- Continued work on widening participation.

8. What was the most unclear point?

- Fundamental reasons for poor inclusion – existing literature.

9. What might you do differently in the future as a result of attending this event?

- Approach undergraduate office and collect info on Year 1 retention/female students etc.
- 2 workshops instead of 3.
- Hound the eng. School marketing people re: more inclusive material/photos.
- A background lecture surveying work already done in this field.
- Find out what is done at my university in terms of student ambassador scheme.
- Get involved in HE STEM programme. Try to use some techniques in outreach events.
- Adjustment of some marketing materials.

10. Please suggest one thing which could improve future events

- Smaller lecture room.
- Please make available some water to drink with tea/coffee.
- More delegates would afford deeper/more varied discussions.

### **Mini-Report (Optional)**

It has been a very productive and useful seminar. Learning from other peoples/delegates experience presented in the first part of the day will be extremely useful in future. Research/module/programme restructuring. The workshops in the afternoon were a great idea. Many peoples/delegates experience were shared and it was very fruitful.

### **Looking Ahead**

11. The key issues I would like addressed by **the Engineering Subject Centre** in the future are:

- Encouraging interdepartmental collaboration
- A good survey article on research in this area.
- How can we change the perception of engineering in this country?