Encouraging young people into university education in science and engineering - a Southampton perspective

Outreach activities in SES, University of Southampton

Mingyi Tan, School of Engineering Sciences, Ship Science, University of Southampton. The 4th PUL meeting, Yokohama, Japan, May 2009.
Reaching out ...

SES has been proudly involved in a breadth of outreach events

Academics, Postgraduate & Undergraduate students work together to inspire and encourage the next generation of Engineers through a variety of activities

– some of the activities are discussed here
Outline of this talk

- About School of Engineering Sciences
- Outreach & Motivations
- (SES) Events & Activities
  - Some Examples
  - Our Experiences
The UoS structure

Vice Chancellor

Secretary & Registrar

3 Deans

Faculty of Law, Arts and Social Sciences

Faculty of Engg, Science, and Mathematics

Faculty of Medicine, Health and Life Sciences

3 Deputy Vice-Chancellors

Professional Services

Schools

Schools (SES, ...)

Schools

Portfolios:
- Research
- Learning and Teaching
- Strategic Planning
SES structure

RESEARCH GROUPS

Aerodynamics & Flight Mechanics
Astronautics
Computational Engineering & Design
Energy Technology
Electromechanical Engineering
Fluid-Structure Interactions
Bioengineering Science
Materials and Surface Engineering

TEACHING COURSES

Aero / Astro
Mechanical Engineering
Ship Science
Materials / Gen Eng
About Ship Science

Undergraduates, 30-50 per year intake
Postgraduates
  MSc students, 20-25 per annum
  PhD students, 40+
Staff and researchers, ~30
Wolfson Unit for Marine Technology, 10

Often called Naval Architecture
Branch of engineering
Design, construction, repair of:
Merchant ships, military vessels, Drilling Platforms and semi-submersibles, leisure and small craft, SWATH ships, catamarans, yachts, trimarans, hydrofoils, hovercraft, autonomous underwater vehicles ....
What is outreach?

“A systematic attempt to provide services beyond conventional limits”*

Key elements:

- Surpass conventional limits
- Reaching out, to be pro-active
- Follow an organised plan
- But there may be no secure outcome

Motivations

- Encourage, inspire & engage young people in science & engineering
- Provide meaningful learning experiences for young people
- Enable communication between communities / groups /abilities
- Support social & economical agendas & align with University vision

STEM (Science Technology Engineering & Maths) aims to:
- Provide employers with the skills in their workforce;
- Help to maintain the UK’s global competitiveness;
- Make the UK a world-leader in science-based research and development.

Equality and Diversity Legislation aims to
- Ensure that individuals can have equal access to employment and educational opportunities and different services.

Every Child Matters aims to be
- healthy; safe; enjoying, achieving and making positive contributions.

Shape the Future aims to result in improved perceptions of engineering, science and technology amongst young people and hence participation.
## The young people

### Education System in England

<table>
<thead>
<tr>
<th>School</th>
<th>Primary School</th>
<th>Secondary School</th>
<th>College</th>
<th>Uni.</th>
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</thead>
<tbody>
<tr>
<td>Age group</td>
<td>5-6</td>
<td>6-7</td>
<td>7-8</td>
<td>8-9</td>
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<tr>
<td>Year</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>Level</td>
<td>KS1</td>
<td>Key Stage 2</td>
<td>Key Stage 3</td>
<td>KS4</td>
</tr>
<tr>
<td>Tests</td>
<td>SATS</td>
<td>SATS</td>
<td>SATS</td>
<td>GCSE</td>
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- The main subjects are compulsory in KS1-KS3
- There are no compulsory subjects in Yrs 12&13
### Outreach activities

#### School of Engineering Sciences

<table>
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<td>Age group</td>
<td>5-6 7-8 9-10 11-12</td>
<td>11-12 12-13 13-14 14-15 15-16</td>
<td>16-17 17-18 18+</td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>1 2 3 4 5 6</td>
<td>7 8 9 10 11</td>
<td>12 13</td>
<td></td>
</tr>
<tr>
<td>Level</td>
<td>KS1 Key Stage 2</td>
<td>Key Stage 3 KS4</td>
<td>FE HE</td>
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#### Courses

- **The BLOODHOUND Education Programme**, National Science & Engineering Week activities for primary school pupils (KS1&2)
- **A Smallpeice Trust course**, Sustainable Energy Scheme, Dragonfly day and First Edition day for Yr 9-10
- 3 Headstart courses & 2 Smallpeice Trust courses for Yr 11-12

**Plus: talks, workshops, tours, etc**
SES outreach support

Head of School, Academics & Technicians

External Bodies & Industry

PhD / PG Students

Schools & Colleges

Central UK Recruitment & Outreach Team

Naomi McGrew Outreach Coordinator

Naomi McGrew Outreach Coordinator

Dr Julian Wharton

Dr Mingyi Tan

Dr Steven Boyd

Dr Maitham Al-Mosawi

Dr Graham Roberts

Dr Kenji Takeda

Dr Rosie Boltryk

Joy Moloney

Phil Herring & Neil Stocker

Student facilitators
Smallpeice Trust engineering courses at SES

The Smallpeice Trust is an independent charity providing exciting programmes to promote engineering careers to young people.

**Marine Technology**
- For Yr9 students–13/14 yrs
- With the support of The Royal Navy and sponsored by the Lloyd's Register Educational Trust.
- A series of ‘design and build’ projects exploring exciting areas like naval architecture, ship design, off-shore construction and the technology of military vessels.

**Biomedical Engineering**
- For Yr11 students–15/16 yrs
- Sponsored by the Institute of Physics and Engineering in Medicine, opens the door to a career that will improve lives.
- Explore the design of medical devices, the role of engineering in rehabilitation, research and patient safety and an understanding of modern healthcare.

**Supercomputing**
- For Yr12 students–16/17 yrs
- Learning about roles of computers in engineering and build a supercomputer from scratch.
- Participants will design their own futuristic airliner and have the opportunity to pilot their own craft in a state-of-the-art flight simulator.

These are 4 day residential courses with /100/24/20/ students (July)
Headstart courses at SES

The Engineering Development Trust (EDT) is a registered charity, focused on helping talented young people achieve their full potential, in particular, through careers in engineering, science and technology. These courses are monitored and endorsed by The Royal Academy of Engineering.

<table>
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<tr>
<th>The Design Triathlon</th>
<th>Marine Engineering &amp; Ship Science</th>
<th>Sustainable Energy Technologies</th>
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<tbody>
<tr>
<td>• For Yr12 students—16/17 yrs</td>
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<tr>
<td>• Fly a plane, race an Greenpower electric car and design a power-boat.</td>
<td>• Design, build and test a marine turbine for harnessing environmentally safe energy.</td>
<td>• Design and experiment with devices for the generation of sustainable energy.</td>
</tr>
<tr>
<td>• Experience what Aeronautics &amp; Astronautics, Mechanical Engineering and Ship Science are all about with hands-on projects</td>
<td>• Learn the basic principles of designing ships, yachts and marine structures in order to understand how the world's oceans can be utilized.</td>
<td>• Discover technology solutions, its distribution &amp; the implications to society through environmental climate change.</td>
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These are 5 day residential courses with /44/30/30/ students (July)
SES’ involvement in the University of Southampton Sustainable Energy Scheme

UK Student Recruitment and Outreach

The team deliver the University's educational liaison activities, engaging with potential students locally, regionally and nationally.

• This program offers year 10 students a unique chance to find out more about what engineering has to offer, both as a study option and a career.

• Work alongside University students and academic staff at the University of Southampton to explore different kinds engineering during in-school and on-campus activities.

• Receive face-to-face and e-mentoring support from current University engineering students.

• Investigate how sustainable engineering can benefit their school, local community and beyond.

• Compete for a place at the Greenpower Challenge, an opportunity to design, build and race a Goblin electric car.

This is a year long program for local secondary school students
SES’ involvement in the University of Southampton Sustainable Energy Scheme
SES’ involvement in The BLOODHOUND Education Programme

BLOODHOUND is a national project launched in October 2008 – Aim is to design, build, race a car which goes 1,000MPH

• Education runs parallel with this aim – engaging and inspiring all young people into science and technology.

• The BLOODHOUND Education Programme is available to all pupils from primary and secondary schools, and to students in further and higher education. Alongside the education programme will be a series of activities outside the school environment, which will engage more broadly with society.

• SES has been running workshops for primary schools using BLOODHOUND as base for investigating topics in the National Curriculum at Key Stages 1 & 2.
BLOODHOUND is a national project launched in October 2008. The aim is to design, build, and race a car which goes 1,000 MPH. Friday 24th April 2009, Naomi McGrew, Outreach Coordinator
## Widening participation to HE

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<th>Dragonfly day</th>
<th>First Edition day</th>
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<td>• This was introduced by Headstart to encourage more young women to think about science, engineering and technology careers.</td>
<td>• First Edition Day is aimed at year 9 school students who are likely to be the “first in their family” to go onto study at University.</td>
</tr>
<tr>
<td>• This event is for year 9 girls from local schools to take part in building and racing Greenpower Cars. The girls are mentored by a female volunteer from the Design Triathlon.</td>
<td>• This is an one day event working with students from Hampshire Schools to build, test and fly gliders and also experience life at University of Southampton.</td>
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Local schools are invited to participate in these events
Wonders of science

TO the untrained eye this monstrous-looking skull looks like it could have come straight out of the dinosaur age.

But it actually belonged to a hippopotamus as visitors to the University of Southampton's annual science and engineering day found out.

The event was part of the National Science and Engineering Week and boasted different zones including space, technology, life, transport, construction, light, and chemistry.

Visitors could watch the launch of a rocket-powered model of the Bloodhound super sonic car, but, unfortunately for the university's photographer, it crashed into his foot and broke his toe after he stood in its path.

"There was also an Airbus A350 super jet flight simulator, light and laser experiments, the chance to explore real body organs and Tom H

http://www.dailyecho.co.uk/education/4185608.Wonders_of_science/
Workshops / Tours / Talks...
• The aim of the Smallpeice Trust programme is to promote engineering careers to young people.

• The course is a residential 4 day event for year 9 students (13/14 years old) with various activities.

• Fundamentals: Experiments on floatation & this provides some context to the mathematical and physical principles that are taught at school.

• Design and Build: The design & build project allows the students to use their knowledge to aid in the design of a marine vehicle to a design brief.

• Testing and Race: The students must prove their design through testing activities specific to their design brief and to race again other group designs.

Bulk carrier
High speed craft
Air driven vehicle
Manoeuvring design
Marine Headstart
Our experiences

Positive and very encouraging
Support from the University, local school, national organisations, industrial are quite forthcoming. The students are well behaved and seemed to enjoy the activities.

- “I really enjoyed the course and it has helped me validate my plans to go into engineering” (Headstart student, 2008)
- “Excellent use of teamwork. An excellent rapport between Uni students and pupils. Please let us know of any future events.” (Teacher, 2008)
- “Engineering session was excellent – not something I really knew anything about!” (Careers Advisor, 2008)

We believe that it can make a difference
The feedback we have from these events indicates that these outreach activities can be quite effective.
Any Questions

Please ?