
Engineering
Explained
www.engineeringexplained.co.uk

science made simple

Many areas of engineering are suffering a decline in applicants and this is leading to concern about the future supply of top quality UK engineers for the future. In addition, there is a general frustration amongst engineers about the misunderstanding of what engineering is about, and what engineers do in their jobs. The most common public response to the question 'what is an engineer?' would be a 'car mechanic', or 'someone who builds buildings'*. This is very misrepresentative of almost all professional engineers.

Engineers are absolutely vital for improving our quality of life in many ways by turning new scientific ideas into real applications. They are relied upon in many medical fields to develop equipment that can save lives, and are responsible for new technologies that will help to save our planet.

There are already a number of excellent engineering education initiatives across the country, including Young Engineers, the Engineering Education Scheme and The F1 project amongst others. These generally focus on the hands-on workshop element of engineering, giving students first-hand experience of the engineering process. In addition, the pioneering 'Faraday Lecture' used to tour large theatre venues across the UK showing large numbers of students and families how engineering relates to a variety of aspects of life. For some schools however the cost of a coach to the venue, or the need for a keen teacher to coordinate clubs and competitions make these existing initiatives difficult.

Although it is generally accepted that science communication encompasses engineering, technology, mathematics and all other scientific based disciplines, there seems to be a lack of specialists in engineering communication. Many engineers claim that the main problem with 'selling' engineering to school students is the problem that students, and their parents don't really understand what engineering is, and how it is different to science. *Engineering Explained* aims not just to focus on explaining the latest in engineering and showing how it relates to school level study, but to clearly explain the processes of engineering and the wide range of engineering jobs that are available.

*Public Attitude to and Perceptions of Engineering and Engineers 2007

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Summary

The 2008/09 season has been a great year for Engineering Explained. Having met our targets for the year we overshot our planned target for the 2-year project by over 10%. Everywhere we went, the shows were widely received with open arms and open minds. We feel that audiences are embracing engineering as a subject, and want to find out more about what engineering has to offer. Engineering Explained has found itself in the limelight this year in numerous publications and on websites, principally, at the Royal Academy of Engineering Awards where Engineering Explained was awarded the medal for the Public Promotion of Engineering. The shows we have been rolling out this year have gone down exceedingly well, with the addition of an exciting fourth show (linked to the Bloodhound project) to our engineering show repertoire. These shows have been delivered in cities and towns all around the UK and, indeed, the world! From Manchester to Newtown, Newcastle to Cheddar. Even Libya in North Africa got a taste of "A Rough Guide to Engineering". Finally, the evaluation we have received from the audiences that have seen our shows couldn't be better. The comments and thoughts of many of the people, who have seen our shows over the last year, have been collected and compiled by an independent evaluator and the report is attached to this document.

Audience

Engineering Explained has seen a record number in its audiences this year. In the last annual report, we quoted that "Engineering Explained has reached over 7500 students in the last year (year one). With more of the team presenting the engineering shows, we're confident that we can increase this number substantially in the second year". In fact, we have doubled that figure, reaching a massive 15,000 individuals in the last year alone! That takes the total for the project over 2 years to a substantial 22,500 persons. This is over our original target by 2,500 people, and just goes to show how much Engineering Explained has grown and been taken up since it began. The shows have been to numerous locations around England and Wales, including Manchester Trafford Centre and Rutherford-Appleton Labs, but have yet to be shown in Ireland or Scotland (we hope to remedy this in the coming year). Engineering Explained has also toured Libya in Africa, and Hong Kong gaining a remarkable response from everyone involved. This means Engineering Explained shows have already featured in three continents of the world!

Royal Academy of Engineering
Public Promotion of Engineering Medal

This year, Engineering Explained was given a prestigious medal by the Royal Academy of Engineering in recognition for our work in promoting engineering to the wider public. It was presented to Huw James from Science Made Simple at the Academy Awards Dinner at Drapers' Hall in London, which was also attended by HRH The Duke of Edinburgh. Previous winners include Johnny Ball, author and TV presenter Adam Hart-Davies and TV presenter Kate Bellingham, but this is the first time an organisation has won. Celebrity scientist Lord Robert Winston presented the Public Promotion of Engineering Medal for the *Engineering Explained* initiative. Adam Hart-Davies supported Science Made Simple's application with this statement: "Their consistent, enthusiastic and imaginative promotion at all levels in schools must have made at least as great a contribution to young people as all the BBC broadcasts on engineering. They may be small, they may be young, but my goodness they are making a difference."

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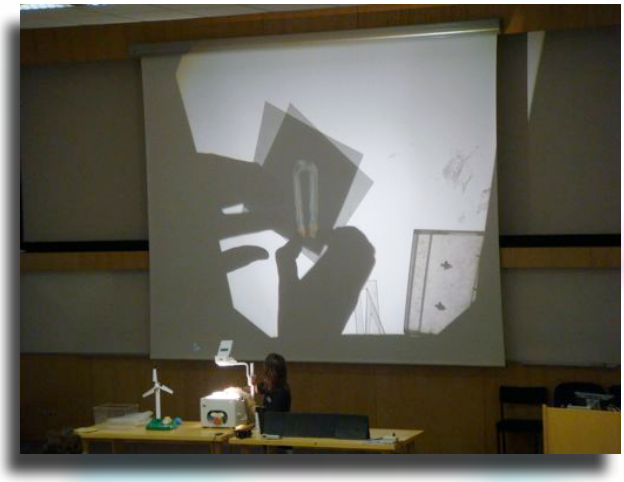
Shows

Who Wants to be a Superhero?

This show lets you meet six real-life young scientists and engineers, each one has made a sixty-second video about their job and what they enjoy most about it. These are interspersed with discussion from a live presenter and interactive demonstrations involving volunteers from the audience.

Over the last year Who Wants to be a Superhero? has been presented 30 times. It has been re-vamped with all new video clips of role models with better sound and image quality.

Generally the show was successful and well received by children and adults. Children in the target age group learnt facts about engineering, with flight, civil engineering, lasers and renewable energy. The demonstrations were regarded by adults and children as the most successful elements.



This show, along with "A Rough Guide to Engineering" was the title show of 2008's Tees Valley Engineering Partnership Christmas Lectures, a 3 day event where students travel from miles around to learn about engineering and what it means to them. This show was also toured to Hong Kong for Hong Kong's Science Museum Festival.

I learnt about the different types of engineering. Being an aeroplane engineer would be cool. I know that engineers solve problems and do good things, but they have to be very clever [boy aged 9]

From Cradle to Grave

This exciting presentation, with lots of demonstrations and audience interaction, reveals how engineering improves our quality of life from before we're born till the end of our lives and challenges the misconception that engineering is only about machines.

Cradle to Grave has been performed 39 times this year. On 18th of September 2008 Cradle to Grave was performed to both school and public audiences in the amazing environment of the science park at Rutherford Appleton Labs (pic inset).

Cradle to Grave was very successful. There is evidence that it was greatly enjoyed by KS3 and KS4 pupils and their teachers. Pupils of all ages also learnt a significant amount from the show. 73.2% of pupils said it had increased their awareness of engineering and 57.9 % said they were now more
interested in engineering.

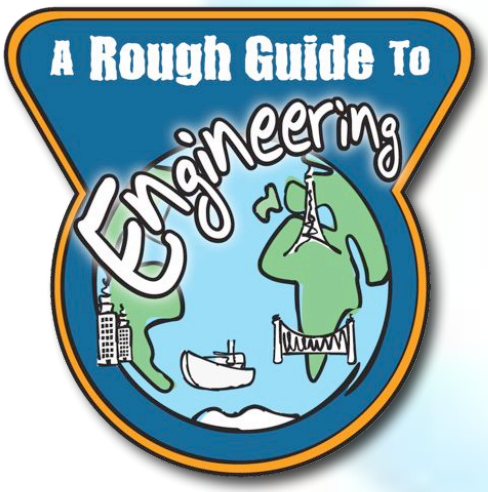
According to the audience the factors that influenced the show's effectiveness were:

- The interactive nature of the show.
- The show incorporates activities that are not normally done in science lessons.
- The show refers to real life applications of engineering that pupils can identify with.
- The presenters' enthusiasm and humour.

I enjoyed the presenter, he spoke it really clear and made it as fun as possible [school pupil]

A Rough Guide to Engineering

"A Rough Guide to Engineering" lets people discover how engineers design cars that go hundreds of miles an hours, build structures that can survive earthquakes, and cook food by using only mirrors! It can really show you how Engineering has changed our lives.



A Rough Guide to Engineering has been presented 26 times this year, in such venues as the Manchester Trafford Centre, the Museum of Science and Industry, and many more. Also, between 14th – 17th February 2009, *science made simple* presenters Huw James and Helen Lloyd visited the British Council in Libya to take the project 'Engineering Explained' into schools there. During the week, they visited 4 schools and performed to nearly 500 people.

The show was well received by family groups, KS3 pupils and their teachers. There is evidence that it had encouraged all of them to think about a wide range of engineering applications, including some that they had not previously considered. It had also deepened their understanding about engineering

The factors that most influenced the show's effectiveness were the noise and visual impact of the demonstrations and the approach and style of the presenter.

I thought engineering was just like men in greasy suits, now I know its loads more [school pupil]

The Engineer Training Programme

Training Engineers for Public Engagement

A smaller, but equally important, aspect of Engineering Explained was to develop and test out some specialised training to help Engineers be better communicators. Though progress on this aspect has been slower to move forward than we would have liked, we have made some significant steps forward and had the opportunity to evaluate our impact as we progress. Our first training course was held at Cardiff University in conjunction with the EPSRC funded project 'Engineering for Life'. We ran a one-day course, which was attended, by 8 academic engineers and our evaluator, Sarah Jenkins. The course was delivered by the Director of science made simple (Wendy Sadler) and the Director of a partner organisation; Graphic Science (Ben Johnson) who between them have over 25 years experience as professionals in the field.

Using a blend of delivery styles - from didactic delivery on the background and issues surrounding public engagement to interactive sessions led by the engineers themselves - the training day contained modules on the following areas of public engagement and Engineering communication.

*What is engineering? - An interactive discussion about the issues of public perception of engineering and engineers
*What is public engagement? - Some background on the whole Public Understanding/Engagement field citing recent studies on public attitudes to science and engineering
*Who are the public? - A look at the ways you can categorise different publics and some ideas on what they want and how to reach them
*Cut the jargon - A practical exercise for the engineers to learn how to simplify their technical language without losing the accuracy of their message
*Hook them in - A practical exercise encouraging the engineers to think like a newspaper editor and find the hook of their research that might interest the public
*Magic Roundabout - A practical exercise in talking to a passing audience in a shopping centre or festival environment using the skills learnt throughout the day
*But did it work...? - Some tips on how to evaluate the effectiveness of your activity or event

The evaluation of the training was generally positive but included some suggestions from delegates on how the courses could be improved in future which we took on board. Following this test run we were then successful in tendering for the contract to run communication-training workshops for the Royal Academy of Engineering Engineering Leadership Awards scheme (ELA). As part of this contract we undertook some front-end evaluation with a small focus group of ELA students (undergraduate students who have been selected to be on a fast track to Engineering Leadership positions of the future). The focus group enabled us to test the water on what the students felt were the most relevant skills for them. We did this by choosing a range of topics (some from our existing training course and others that did not yet exist) and asking them to rank them in order of importance. Using these results, and in conjunction with the Royal Academy, we were able to develop a bespoke course perfectly suited to their needs. Subject to positive evaluation from the students on the course we are hopeful that we will offer these courses every year to each new batch of ELA students across the UK therefore reaching around 60 of the top engineering students each year.

On the strength of this development we were also successful in a tender to deliver training as part of one of the new EPSRC Doctoral Centres of Excellence at Bath University over a period of eight years for post-doctoral students. This is partly due to the success of our evaluation and training work undertaken under the support of sponsors for Engineering Explained and will therefore give a tangible legacy for many years to come.

Over the next two years we intend to offer an increasing number of training courses for engineers, and will continue to evaluate and improve them based on feedback from those who attend. It is hoped that this will build capacity within the engineering community for a cohort of experienced communicators who will themselves go out to become advocates of their subject to a variety of audiences.

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Mad Lab Cymru

Mad Lab is a unique, hands-on electronics workshop for children and adults. In the workshop participants solder electronic components onto specially designed boards. There are currently over thirty MadLab kits which people can make - the simplest being Flashing Lights, the most complicated a programmable robot, which is able to find its way around a maze. The excitement of MadLab is learning how to use a soldering iron, and actually being able to make and take home a working electronic circuit.

We launched Mad Lab Cymru in October and it was a huge success. It brought families from far and wide for the opening week in October half term at Swansea Waterfront Museum. We have found, however, that schools haven't been taking this activity up as much as the shows. This is most likely due to the higher price per head. Organisations such as the museum though, really do like it and we hope to continue rolling this out across the south and to a range of family events.

Bloodhound Supersonic Car

This year, thanks to the quality and reputation of our shows, we were approached by the Bloodhound Education Team to write an interactive engineering show for students around England to show the enormous challenge that stands before the Bloodhound Engineering Team.

BLOODHOUND SSC (supersonic car) has been designed to run at speeds up to 1050mph. It is currently entering the build phase of the programme and the first attempt is scheduled for summer 2010 - with a target of 800mph. The car will then be reviewed and modified before aiming for 1000mph in 2011.

Richard Noble, the driving force behind British World Land Speed racing for over 25 years, says: "This is an iconic engineering and education adventure for the 21st century that is pushing technology to its limit. We aim to inspire the next generation of engineers and scientists by designing and building our incredible car capable of 1000 mph!".

In the show students can find out how jet engines work, and the sheer scale of the forces acting on the car as it drives through the sound barrier straight into the record books. It highlights the differences between normal commercial cars and these high speed counterparts. Also, it shows how engineers will overcome all the problems they face using logical thinking and how the children of today could be the engineering record breakers of tomorrow.

The show was launched at Cheltenham Science Festival on Wednesday 3rd of June. It was also presented at the Rockingham Festival on June 30th, July 1st and July 2nd. We are currently delivering a nationwide tour performing the show in schools and festivals around England.

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News

Engineering Explained has been in the News more than once this year. Recognised in many places and by many organisations for the work it does promoting Engineering for the general public.

ENGINEERING EXPLAINED TOUR

The *Engineering Explained* programme is continuing its nationwide tour of engineering shows in 2009, taking in schools and other venues across the UK. *Engineering Explained* is part of the Science Made Simple initiative, which seeks to 'inspire the next generation of scientists and engineers by sharing a passion for science'. It was launched in 2008 and has organised hundreds of shows and workshops in schools up and down the country, under titles like 'Who Wants to be a Superhero?' and 'A Rough Guide to Engineering'.

At its launch event last year, TV presenter and scientist Dr Adam Hart-Davis presided over a show that featured, among other things, transmitting music via a beam of light; using mirrors to cook food; and locating cancerous cells using proteins extracted from jellyfish.

Continuing their tours throughout 2009, the *Engineering Explained* team, headed by WISE award-winner Wendy Sadler, will be travelling almost non-stop to take their highly visual shows to new audiences.

The tour has three shows currently running. 'A Rough Guide to Engineering' is aimed at secondary school pupils and attempts to show them what engineering really means through the use of multimedia and interactive voting; 'From Cradle to Grave' looks at how engineering underpins society, with practical examples of how it improves our quality of life; and 'Who Wants to be a Superhero?' examines careers in science and engineering, with video diaries from practising engineers and scientists.

Engineering Explained was spun-out of Science Made Simple, which is itself a spin-out of Cardiff University's School of Physics and Astronomy. Supported by the ERA Foundation, EPSRC and the IET, *Engineering Explained* is a project that operates all over the world, with the goal of demonstrating to young people that engineering is exciting, fun and, most of all, a vital element of society.

Scheduled shows take place every month across the UK and individual shows can be booked in advance. However, some dates are already sold out for *Engineering Explained*'s 2009 tour, so interested parties are advised to book as soon as they can.

The Key Stage 2 'Superheroes' bridge at the launch of *Engineering Explained* in 2008

News Centre

News from Cardiff University

Public Promotion of Engineering Medal

10 June 2009

An innovative University spin-out which uses live shows to help inspire young people about engineering has been awarded a medal by the Royal Academy of Engineering.

Cardiff-based science made simple was presented with the Public Promotion of Engineering Medal by Lord Robert Winston, an Honorary Fellow of the Academy, for their Engineering Explained initiative. The presentation took place at the Academy Awards Dinner at London's Imperial War Museum, attended by HRH The Duke of Edinburgh.

Huw James receiving the Public Promotion of Engineering Medal from Lord Robert Winston. Picture credit: Steve Forward

Science and engineering communicator Huw James who collected the medal said: "Our interactive performances have been well-received by a wide variety of audiences and always get people talking and asking questions. They help to get the message out there that engineering is not something done by a stereotyped group of people, but is part of everything we do and offers a wide variety of rewarding job opportunities."

science made simple was set up in 2002 by Wendy Sadler, School of Physics and Astronomy. The company developed the Engineering Explained shows in response to a decline in the number of students taking up engineering and the need for better understanding about the role of engineers in society.

Dr Lesley Paterson, Head of Public Engagement at the Academy, said: "Wendy and her team have done promotion of engineering proud and I am delighted that 'Engineering Explained' has been awarded this year's Public Promotion Medal. By acknowledging that engineering is a complementary but distinct discipline, Wendy and her team have developed and delivered an engaging set of interactive shows and activities to feed the minds of young people that uncover the engineering in our everyday world."

Engineering Explained shows have been performed to more than 17,500 people at schools and events throughout Britain and overseas. The 'Rough Guide to Engineering' show has recently toured Libya by special invitation of the British Council and the initiative's latest production, 'The Bloodhound Supersonic Car Show', launched at the Cheltenham Science Festival last week.

science made simple goes supersonic

© Bloodhound Education Team

The Bloodhound Supersonic Car (SSC) is the topic of a new interactive engineering show from *science made simple*, the award-winning University spin-out. The Bloodhound SSC Show launched at the Cheltenham Science Festival and is now set to tour numerous venues around the country to show students the enormous challenge standing before the Bloodhound Engineering team.

The supersonic car has been designed to run at speeds up to 1050 miles per hour and is currently entering the build phase of its programme. In the show, students can find out how jet engines work, the sheer scale of the forces acting on the car as it passes the sound barrier, and how engineers can overcome the problems they face by thinking logically.

The show is the latest in a series of interactive shows run by the Engineering Explained initiative, developed by *science made simple* in response to a decline in the number of students taking up engineering.

Engineering Explained shows have been performed to more than 17,500 people at schools and events throughout Britain and overseas.

The huge success of this initiative was recognised recently with the presentation of the Public Promotion of Engineering Medal from the Royal Academy of Engineering.

Huw James, Engineering Explained, receiving the Public Promotion of Engineering Medal from Lord Robert Winston. © Steve Forward

Engineering Explained Annual Report

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Website

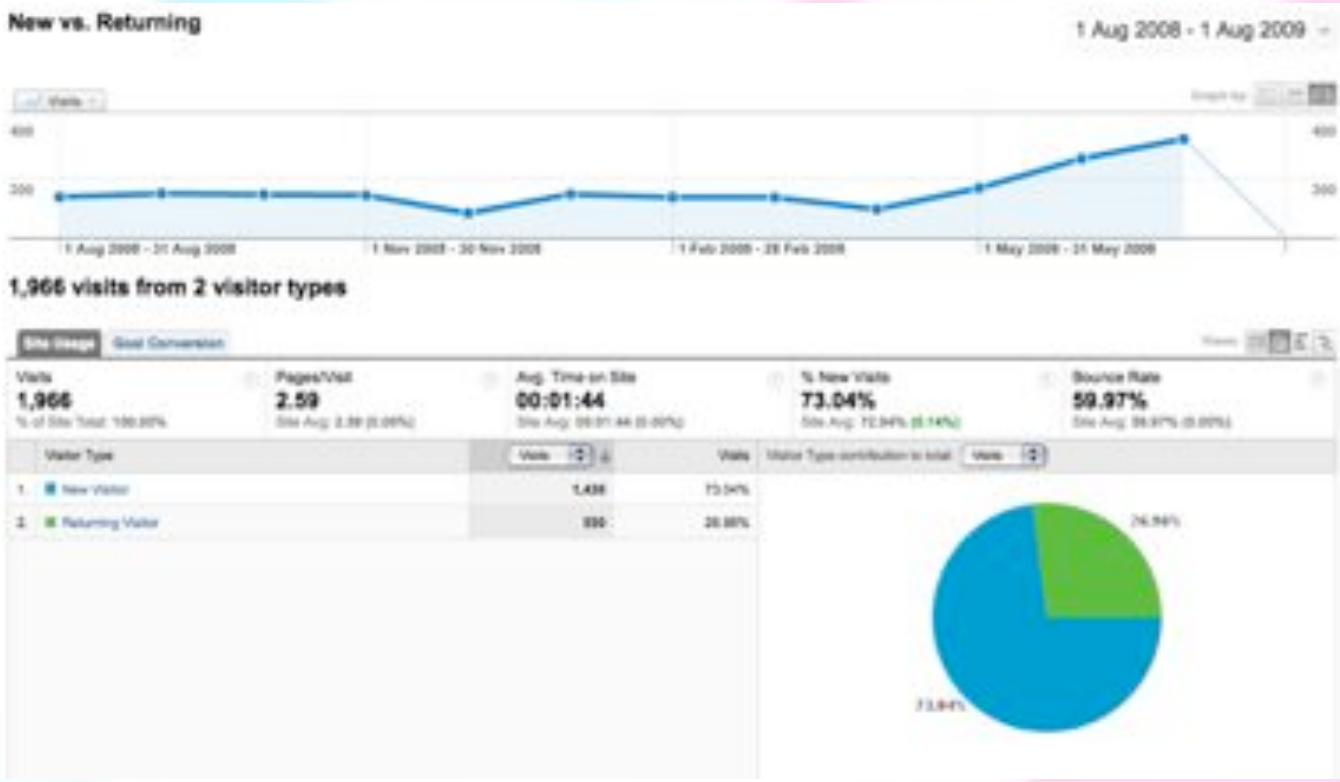
The Engineering Explained website has been going from strength to strength as *science made simple's* sister site.

Below is the Home screen as it stands when this report was written. It includes links to our current sponsors and current news as well as a drop down menu to navigate the site.

In the last year alone, there have been nearly 2000 visitors to the Engineering Explained site, viewing over 5000 pages!

Visitors have come to the site from far and wide, in fact, from 75 different countries around the world. Most people who come to the site visit from the Google search engine, or from the *Science Made Simple* site.

The highest number of page views comes from the Bloodhound News article. The next is the Engineering Explained home page.



We find that nearly 75% of people viewing the site come back for return visits.

Evaluation

Evaluation of Engineering Explained was carried out independently by Sarah Jenkins, Director of Jenesys Associates Ltd, a consultancy that specialises in evaluation and communications research and scoping in the fields of knowledge transfer, public engagement and innovation. Data were collected in the following ways:

Observational Data - the evaluator attended at least one performance of each show to gather observational data to provide information about audiences' responses and participation levels as well as interaction between audiences and presenters.
Metric data such as the number of audience members were also collected.

Audience Exit Questionnaires - these were handed out at all shows attended by the evaluator and at other shows by the presenters. In all cases they were used only where the venue/ host organisation agreed. They provided information about the demographics of audience members and their opinions about the activities and their impacts.

Feedback Focus Groups and Interviews - the evaluator was able to collect qualitative data at shows where she was able to recruit participants from the audience.

Engineers Interviews and Questionnaires - the impressions of participating engineers were collected during interviews at an Engineers training day and via a post-training survey.

Teachers/ Host Organisation Questionnaires - these provided an insight into barriers to entry and ideas as to how to improve future activities.

The aims of Engineering Explained, are:

- To enthuse students and the public about engineering
- To explain engineering to students and the public
- To inform students and the public about the importance of engineering
- To raise engineers' awareness the significance of public engagement
- To engage engineers in public communication activities

Engineering Explained was evaluated against these aims.

Conclusions

Aims - This section comments on the extent to which Engineering Explained met its original aims.

Aim1: To enthuse students and the public about engineering

Engineering Explained excelled in this area. There were generally very positive responses and the numbers of audience members who said they would continue to discuss topics or wanted to see similar shows were very pleasing. The interactive nature of the shows and including a wide range of
engineering applications were key to the success here.

Aim 2: To explain engineering to students and the public

The response of audiences at the shows indicates that this aim was met. A majority of audience members of all ages felt that the shows had increased their awareness and understanding of engineering.

Aim 3: To inform students and the public about the importance of engineering

The range of applications included in the shows meant that every demonstration was linked to a real-life application. A majority of audience members indicated that the shows had increased their awareness of engineering's impact on society.

Aim 4: To raise engineers' awareness the significance of public engagement

Engineering Explained was partially successful in achieving this aim. The response of the engineers who took part in the training workshop indicates that whilst it taught a majority more about public engagement it had not impacted on how they value public engagement. The involvement of engineers in Engineering Explained is certainly an area that could be developed to add value in the future.

Aim 5: To engage engineers in public communication activities

This aim was met in that a majority of engineers who took part in the workshop indicated that they have plans to take part in such activities. Monitoring of their participation is an area that could be developed along with the provision of an engineering experiments toolkit, similar to the physics one used in the workshop.

General conclusions

This section draws some general conclusions about the project as a whole as well as individual elements.

Engineering Explained was successful as a mechanism for engaging public and school audiences with different aspects of engineering. It was greatly enhanced by the interactive activities and demonstrations to help illustrate the science and its applications.
The shows have a sound basis but further refining is possible. The activities themselves are well-developed, but issues such as available time and venue suitability need to be ironed out if they are to reach their potential levels of engagement. The interactivity is a strong success factor, and could be developed.

There are specific areas that could be enhanced in each show. In 'Who Wants to Be a Superhero!?' the video clips could include a wider diversity of subjects and show more engineers at work rather than talking about their work. The target audience is too young to be making specific career choices and may be most suited to activities intended to inspire understanding about the subject of engineering. In 'Rough Guide to Engineering' greater emphasis could be placed on what engineers do in their daily environment as opposed to the outputs of engineering. It should be recognised that the schools audiences who see Rough Guide are at an age when subject choices and career options are important. Therefore the nature of different jobs and professions are significant to them.

The shows have definite educational value. The key learning points appeared to relate to both applications of engineering and scientific facts. The shows also appeared to have stimulated an increased interest in engineering among some audience members. This was linked strongly to the demonstrations and experiments, which some students feel is lacking in the classroom teaching of science.

The presenters' enthusiasm and approach were crucial to Engineering Explained's success. Audiences were impressed by their humour and the fact they made the subjects enjoyable and fun.

Cradle to Grave received far more school bookings than Rough Guide. The reasons for this include a subsidy that reduced the cost of the former to certain schools and the fact that teachers are more confident about booking shows they have seen previously and they know will work with their pupils.

The engineers' training workshop lacked content that was specific to engineers, which adversely affected engagement levels. This could be helped by the use of engineering examples, including the Engineering Explained shows. Inviting engineers to observe performances of the shows and asking them for feedback could also have the effect of increasing their levels of engagement and improving their understanding of public engagement in relation to engineering.

Overall Engineering Explained has resulted in several positive impacts on audience members.

Recommendations

This section includes some recommendations for the future development of Engineering Explained.

Recommendation 1: Use the existing shows and materials such as video clips as the basis of extending the reach of the shows and meeting the needs of specific audiences. For example, the video clips of engineers created for 'Superheroes' could be integrated into 'Rough Guide' to give older students an insight into the daily lives of engineers.

Recommendation 2: Create supporting materials for teachers to use in follow up lessons. Engineering does not appear as a subject on the teaching curricula but elements of it are covered in the science curriculum. Teaching materials that make direct links between the shows and the curriculum would encourage teachers to discuss the shows in lessons and improve their understanding and confidence around the subject.

Recommendation 3: Consider using taster sessions to introduce new shows to teachers. When time permits, the inclusion of very short 'taster' examples of new shows in the same way that cinemas use film trailers would help to introduce those shows to teachers and overcome the issue of schools preferring to book shows that they have seen before.

Recommendation 4: Work with the professional engineering institutions to engage more engineers in public facing activities. Organisations like the IET recognise public engagement within their CPD programmes. They are also seeking to raise public understanding of engineering, which is synergistic with the aims of Engineering Explained. Engineering Explained should seek to explore these synergies and identify ways it could work with these Institutions, e.g. using them to publicise training courses.

Recommendation 5: Public engagement training for engineers should give increased recognition to the differences between engineering and science and take into account the full range of audiences that trainees want to engage with (e.g. adults). These improvements together with inclusions of the Engineering Explained shows as examples should serve to increase the involvement of a broad range of engineers in public engagement.

The Future of Engineering Explained

Confirmed Developments...

Even though Engineering Explained has been supported only for 2 years, we plan to keep Engineering Explained in schools and in the public eye far beyond this.

Over the next year Engineering Explained has many tours planned including one in Hong Kong. The British Council has once again seen the importance of showing students how engineering affects their lives and is taking "Who Wants to be a Superhero?" to a number of schools around Hong Kong.

Additionally, as part of our work with the Bloodhound Education team, we have 6 tours planned specifically for the Bloodhound Supersonic Car show. Tours are planned to take place in many areas around England, starting in September and running throughout the year;

The Tees Valley Engineering Partnership are also keen to have us back to do the Christmas Lectures, of which we have done two of the last three years;
We will also be rolling out all the shows that Engineering Explained currently offers to anyone who requests them in addition to the arranged tours.

Subject to Further Funding...

- MORE SCHOOLS – We will be trying to find bursaries in the next year to get Engineering Explained shows into schools at a reduced price. As an example, SWIEET sponsored 20 shows last year with "Who Wants to be a Superhero?", where schools paid £75 and SWIEET paid the rest. This scheme was gratefully and hastily taken up and was a huge success;

  The cost of sending an Engineering Explained show to 10 schools would be around £4,950 depending on the location of schools.

- MORE AREAS – Last year, we had enquiries from organisations, asking if our North or East Offices will be duplicating Engineering Explained for shows in their area. Unfortunately, we haven't had the money to be able to duplicate all the shows in each area, though we have made a start with Bloodhound in all areas and "Who Wants to be a Superhero?" in the North. In the same way that our current sponsors have helped launch Engineering Explained, support would go far to have regional availability of the shows from our North and East Offices.

  To duplicate the current 4 shows and provide a van to put them in would cost just £10,000 for each region. (There are currently 2 other regions)

- MORE TOPICS - There are an almost inexhaustible list of show ideas for engineering shows including Extreme Engineering; (the engineering of extreme sports), Understanding Energy (For more details on this show, please see a taster in appendix.3), Green Engineering (showing how engineers are creating alternative energies) and 'A Day in the life of an engineer' (shows role models and what they get up to on a day to day basis).

  The cost of developing a new show on any of these topics would be £7500. This includes props and development time.

- FOLLOW ON RESOURCES – Create supporting materials for teachers to use in follow up lessons. Teaching materials that make direct links between the shows and the curriculum would encourage teachers to discuss the shows in lessons and improve their understanding and confidence around the subject.

  To develop and print teacher resources for each show in the Engineering Explained portfolio would cost around £10,000

- MORE TRAINING FOR ENGINEERS – Work with the professional engineering Institutions to engage more engineers in public facing activities. Organisations like the IET recognise public engagement within their CPD programmes. They are also seeking to increase general public engagement with engineering, which is synergistic with the aims of Engineering Explained.

Engineering Explained should seek to explore these synergies and identify ways it could work with these Institutions, e.g. using them to publicise training courses. Public engagement training for engineers should give increased recognition to the differences between engineering and science and take into account the full range of audiences that trainees want to engage with (e.g. adults). These improvements together with inclusions of the Engineering Explained shows as examples should serve to increase the involvement of a broad range of engineers in public engagement.

To further develop the engineering training courses would cost £1250 and then each course costs around £2000 to run (for up to 20 participants).

We hope to continue working in partnership with others to allow Engineering Explained to bring new experiences to even bigger audiences.

Appendix

1. Press Release - RAE Public Promotion of Engineering Medal Award
2. Press Release - Engineering Explained in Libya
3. British Council – Challenge Europe Proposal
4. MadLab Cymru Launch Feedback

1.RAE Public Promotion of Engineering Medal Award

PRESS RELEASE
9 June 2009

Cardiff engineering shows scoop national award

An innovative project that uses live shows to help inspire young people about engineering will be given a prestigious medal today by the Royal Academy of Engineering. Celebrity scientist Lord Robert Winston will present the Public Promotion of Engineering Medal this evening to Cardiff-based Science Made Simple for their *Engineering Explained* initiative, which looks at the relevance of engineering in all aspects of our lives - from bridges, to music, to playgrounds, and even nappies.

The silver medal will be presented to Huw James from Science Made Simple at the Academy Awards Dinner at Drapers' Hall in London, which will also be attended by HRH The Duke of Edinburgh. Previous winners include Johnny Ball, author and TV presenter Adam Hart-Davies and TV presenter Kate Bellingham, but this is the first time an organisation has won. The company, which is based at Cardiff University and has a team of five science communicators, developed the four one-person *Engineering Explained* shows in response to declines in the number of students taking up engineering and the need for better understanding about the role of engineers in society. *Engineering Explained* shows have since been performed to over 17,500 people at schools and events throughout Britain and overseas.

Huw James of Science Made Simple said: "I'm delighted to accept this award for *Engineering Explained*. The shows are designed to inspire young people about just how exciting engineering can be as a career choice and the extent to which it affects all aspects of our lives. Our interactive performances have been well-received by a wide variety of audiences and always get people talking and asking questions. They help to get the message out there that engineering is not something done by a stereotyped group of people, but is part of everything we do and offers a wide variety of rewarding job opportunities."

Adam Hart-Davies supported Science Made Simple's application with this statement: "Their consistent, enthusiastic and imaginative promotion at all levels in schools must have made at least as great a contribution to young people as all the BBC broadcasts on engineering. They may be small, they may be young, but my goodness they are making a difference."

Engineering Explained shows are designed to be exciting, dynamic and interactive, to help spark interest in even the most skeptical viewers. *'From Cradle to Grave'* (for 11-16 year-olds), for example, includes a live ultrasound scan of the presenter, and explains how medical engineering can improve the quality of life for people throughout their lives. This presentation has had fantastic results in engaging a teenage audience. Another performance, the *'Who wants to be a superhero?'* show (for 7-11 year old students), features interviews with several female engineers in their workplaces and has been extremely successful at changing misconceptions that girls (in particular) have about engineering. The shows have reached over 17,500 people across Britain, and *'A Rough Guide to Engineering'* (for 11-14 year olds) has recently toured Libya by special invitation of the British Council. Recently the team have developed *"Bloodhound – Supersonic Car on the Road" for* the supersonic car team where students can find out how jet engines work, the sheer scale of the forces acting on the car as it passes the sound barrier, and how engineers can overcome the problems they face by thinking logically (in partnership with STFC and Swansea University).

Science Made Simple was set up in 2002 by physicist Wendy Sadler, with a mission to inspire people about science by using interactive presentations and visual demonstrations for schools and the public. The team has won several other awards, including Welsh Woman of the Year (Science and Technology) 2004, WISE Excellence Award (Women into Science and Engineering) 2004, IOP Young Professional Physicist of the Year award 2005, EU Descartes Prize

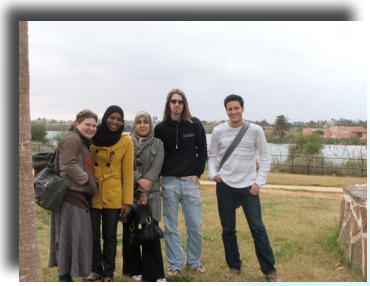
(Laureate) for innovative action in Science Communication 2006, Institute of Acoustics' Award for Promoting Acoustics to the Public 2007 and UKRC Woman of Outstanding Achievement Award 2008. The company also acts as consultants

to the Research Councils and provides training to scientists. It also has strong links with Cardiff University, which helps to communicate the findings of the researchers through their innovative, interactive shows.

2. British Council - Libya

PRESS RELEASE

Between 14th – 17th February 2009, *science made simple* presenters Huw James and Helen Lloyd visited the British Council in Libya to take the project 'Engineering Explained' into schools there.



The trip was a great success – the show, *A Rough Guide to Engineering* went down very well with the Libyan students and teachers. We found the Libyan Students to be particularly perceptive, asking some very well thought-out questions (and occasionally stumping the presenters!), and enthusiastically joining in with the demonstrations and questions and answers.

A Rough Guide to Engineering takes the audience on an imaginary tour around the world, investigating some of the different types of engineering that can improve our quality of life throughout the world, with a particular emphasis on environmental issues. The main messages of the show are

- that engineers solve problems
- that science and engineering together create new technologies, which take us forward and improve our quality of life
- That sometimes there is not one 'correct solution' but may possible alternatives
- That engineers have to create practical solutions – i.e. affordable, reasonable, low impact, etc.
- That there are many exciting and important careers in engineering, which can make a very valuable contribution to humanity.

Along with *science made simple*, the Libyan Climate Change Group also spoke to the students, with their presentation which complimented the environmental message that *A Rough Guide to Engineering* Carries. We made very valuable links with the Libyan Climate Change Group, which we are hoping will lead to a possible new British Council Project - a climate change show' being written by *science made simple* and performed by the Libyan Climate Change Group.

During the week, the two groups visited the following schools:
Donia El-Ebdai School, Tripoli – performing 2 shows to 200 students
Zouhour Al Andalous School, Tripoli – performing 2 shows to 80 students
Green Ray School, Benghazi – performing 2 shows to 100 students
Children's World School, Benghazi – performing 2 shows to 100 students.
Huw and Helen were warmly welcomed into the Libyan schools, and found Libya to be a very friendly and easy place to visit, thanks in no small part to the British Council who had done all the groundwork to arrange our visit. We thoroughly enjoyed ourselves and even managed to visit the ruins at Sabratha before flying out on the Friday. We hope to return and visit more Libyan schools in the future.

3.British Council – Challenge Europe Proposal

Challenge Europe is a 3-year campaign that aspires to make a definite and lasting impact on the climate change debate, and is ambitious in its aim to accelerate change to a Low Carbon Future.

Science made simple proposes a 50-minute interactive science show, covering how energy works, what the main differences are, and how we can save it. The show can be delivered for key stage 2 (7-11 Yrs) and key stage 3 (11-14 yrs) audiences in schools and other venues as appropriate.

The primary audience will be school pupils aged 7-14. The show will be designed to link with elements of the National Curriculum for England and Wales at key stage 2 and 3, and the Scottish Curriculum for Excellence. The show content will extend beyond the curriculum to provide enhancement opportunities for teachers and students. Science, maths and computer science will be highlighted, alongside aspects of teamwork and innovation. The show will feature active researchers as role models for the students via short video interviews related to difference aspects of their work. Delivery would take place in schools across the U.K from science made simple's offices in Cardiff, Norwich and Bolton, as well as from the British Council Team. Delivery internationally will be from the relative British Council's in subsequent countries.

Written into the show will be set questions devised by the BC and science made simple. The show will use Turningpoint Technology Electronic Voting System Handsets. Having the same show roll out in 17 countries around the world is a perfect opportunity for the BC to run a mass project on the perceptions and ideals that 7-14 year olds have on energy and climate change. We will collate all the information from every show in all the countries and produce a yearly report on the opinions of the targeted audience that experience the British Council and science made simple project

The show will be delivered through subsidised shows for schools in the UK. Shows will be subsidised for 10 schools, on a first come first served basis. The show will also be offered to other schools at science made simple's normal rate. Satellite British Councils (e.g. British Council Libya, Spain, Ukraine) may choose to highly subsidise and offer the show as part of their remit.

Delivery is anticipated to begin soon after the show is written, and after funding is approved and will run indefinitely. Performances of the show could be given to family audiences at science festivals such as Cheltenham Science and Engineering Festival and Edinburgh International Science festival. An estimate of audiences attracted to science festival based on 2 days a year has been written and can be provided on request. For the full proposal, please contact huw@sciencemadesimple.co.uk.

Ethan (9) Adrienne (7)
Emmanuel.

Great fun, really enjoyed soldering and playing with the wonky wire.

Adrienne and Ethan

Thank you very much
thank you very much

Staffan I really liked the soldering thank you
10
/10

TATE (Age 5)

Really liked the real soldering work.

En 8/10

science made simple

Engin

Luke.

It was etcelant, I hate my first day I of soldering and I think I did qiet well

from Luke MacPhie

Ellie.

the Dinosaur was nice
thankyou

Tyla Scott Owen

It was realy great I had lots of fun. Thanks.

Calum.

It was really fun and Soldering was really easy!

Madlab. Tuesday 28th Oct
very good, work on!
Blender
el Kilan
Dylan Bolton
fab! excellent

science made simple