eea

Attracting more entrants into the
World of Engineering

Could engineering careers be more attractive?

The Report which follows arose out of a strong conviction amongst representatives of leading organisations concerned with the education, training and employment of engineers, that it was time for a more searching review of the reasons why so many who would find a career in engineering rewarding and enjoyable, fail to take that path.

The Engineering Education Alliance (EEA) explored how to increase the number of well-qualified and motivated entrants to the world of engineering, identified key barriers to entry and unanimously agreed how these should be tackled. The challenges, recommendations and implications are outlined in this Report.

The EEA has fully endorsed the Report's plan and is in a unique position to lead and co-ordinate a number of the actions. However, greater co-operation between all the players in the engineering sector and genuine engagement with evidence-based practice is needed if the proposals are to succeed.   Pursuing all the objectives of the Report will require resources greater than those available to Alliance members. It is hoped that the Report will encourage other organisations, with a commitment to attracting talented people into engineering, to contribute to this important initiative.

The following activities are to be taken forward:

o Simplifying and promulgating the 'big-picture' engineering message
o Establishing a collaborative 'gateway' for engineering information & support
o Increasing closely focused support for teaching staff and learners
o A longitudinal tracking study to feed back into evaluation.

About the Engineering Education Alliance

The Engineering Education Alliance was founded in March 2002 to provide a co-ordinated, simplified and consistent approach to educational initiatives related to engineering. It is Chaired by Professor Merrick Taylor.

It is an independent group of over 30 Professional Engineering Institutions and Affiliates together with the eef, the manufacturers' organisation, the Royal Academy of Engineering, SEMTA (Sector Skills Council for Science, Engineering, Manufacturing Technology), SETNET (The Science, Engineering, Technology and Mathematics Network), the Engineering Council UK (ECUK), the etb (Engineering and Technology Board), the Engineering Professors' Council, the National Forum for Engineering Centres, and the Specialist Schools Trust (Annex 2).

The EEA task group was initially chaired by Dr. Michael Sanderson (SEMTA) and later this chairmanship was taken over by Professor Fred Maillardet (EPC).

A full copy of this report can be found on the EEA website

EEA Guidelines for developing & evaluating resources for schools

An enormous amount of effort goes into promotion of interest in engineering amongst school pupils. The EEA believes that too much of this effort lacks direction. Therefore, as its first project the EEA published guidelines about developing resources and activities for schools under an engineering and technology banner. These have been endorsed by all EEA members, for its own members, and for other organisations and businesses involved in schools projects.

Entry to the world of engineering

Building on this agreed approach, the EEA explored how to increase the number of well-qualified and motivated entrants to the world of engineering. It identified key barriers to entry and agreed how these should be tackled. The challenges, recommendations and implications, along with whom will lead and whom might support each action, are outlined here and in the table that follows. Funding and other support will be needed from internal and external sources.

Challenges

If the profession is to raise its profile among potential entrants, overriding messages are:

- the need for better collaboration between all the players in the engineering sector and
- for genuine engagement with evidence-based practice, including practitioner and learner involvement in identifying their needs.

Barriers include:

- Lack of a simple unified message
- No single point of contact
- Perceptions overshadowing reality
- Limited support for teaching & learning
- Lack of evidence-based practice

These are discussed at Annex 1.

Actions to overcome the barriers:

- Simplify and promulgate the 'big-picture' engineering message
- Establish a collaborative 'gateway' for engineering information & support
- Increase more closely focused support for teaching staff and learners
- Commence a longitudinal student tracking study.

EEA overarching role

Proposals for the way ahead on each action are set out on the next page. No attempt is made to indicate a 'priority order' among these actions as they are all of a very different nature and timeframe. However, all are inherently complementary, so the EEA will maintain an overview of the whole project and outcomes from each action will be fed into other strands as and when appropriate.

The EEA is in a unique position as an 'honest broker' to lead and co-ordinate a number of the actions but support will be required from external sources as well as greater collaboration within the engineering community.

Action	Task	Lead agents / how	Potential strategic collaborative partners	Implications
1 The engineering message	Analyse a wide range of existing publications to identify the commonality of engineering message.	The Royal Academy of Engineering has already embarked upon this task and Gatsby Technical Education Projects is supporting its extension, working with etb, ECUK, British Association for the Advancement of Science, SEMTA, eef, and the Association for Science Education.		Continued support will be necessary.
	Generate a top-line phrase or image that can be used to flag up the diversity, richness and excitement of the whole world of engineering.	The Engineering Professors' Council and the National Forum of Engineering Centres will mount a competition to identify a catch phrase. Once a phrase has been created, a piloting exercise will be carried out to test how it may be used to best effect. The EEA will promote this initiative.	eef, CBI , DTI , DfES, Equal Opportunities Commission, Teachers' TV, Teaching workforce Professional Associations & Trade Unions, all other EEA members; student voice.	Funding will be needed in order to develop and promulgate the message.
2 The 'gateway' for engineering	Collaboration is a key requirement for this project to be successful. Practice must be based on evidence and sound evidence must be generated.	The EEA will lead on drawing together all those committed to working towards the goal of establishing a genuine 'gateway' for engineering run by partners, to include a pooling of evidence upon which to base future practice.	EEA members, RAEng, etb, eef, DfES, DTI, SETNET, YEC, GTEP, Nuffield, EMSSF member SSCs, SEAs, Science Council, BA, Subject Associations, Design Council; research units etc.	Support will be needed from external agencies, including Government Departments
	The success of SETNET has been recognised and this success must be built upon. This will only be possible if a more secure long-term infrastructure can be established to support an expanded national/local SETNET/SEAs operation.	The EEA will lobby the Treasury for realistic long-term funding.	EEA members, their networks, and other support as appropriate.	
3 Support for education & training practitioners	Support current initiatives to recruit and retain more Mathematics, Design and Technology, and Science staff.	The EEA will actively support	EEA members, their networks, and other support as appropriate.	
	Encourage the development of more innovative and creative courses of study at all levels of education & training.	The EEA will actively encourage	EEA members, their networks, and other support as appropriate.	Funding will be needed
	Encourage all in the field to research and develop creative support material for all subject staff, based on sound education & training research evidence, working with curriculum development and other practitioners and learners.	The Specialist Schools Trust *[SST] is already active in the area and the EEA will support current proposals being developed by the SST to help practitioners to: • Debunk the myths' which abound about the engineering world • Access more objective evidence from many initiatives to support their teaching • Use cross-curricular material to enrich their own subject areas based on engineering topics • Encourage more creative, project led work that meets real needs and includes synthesis and student autonomy in decision making.	EEA members, DfES, TTA, QCA & its devolved sister bodies, GTEP, Nuffield, SETNET & SEAs, Subject Associations' professional development centres / networks.	Funding will be needed
4 Longitudinal study	Establish a stakeholder steering committee to plan a longitudinal study to track learners' career choices.	The Engineering Professors' Council and the Specialist Schools Trust, with the EEA. • Cost the study realistically, and seek funding • Start a database of learners' engagement with relevant initiatives • Develop best practice guidelines to monitor progress, capture successes and barriers along the way, and feed this evidence back into the system.	EEA members, EPSRC, ESRC, NFEC, GTEP, Nuffield	Funding will be needed

Notes

eef - eef, the manufacturers organisation and Skills Forum
SETNET - the Science, Engineering, Technology and Mathematics Network
BA - British Association for the Advancement of Science
GTEP - Gatsby Technical Education Projects
EPRSC - the Engineering and Physical Sciences Research Council
NFEC- National Forum of Engineering Centres

EMSSF - the Engineering and Manufacturing Standards
SEAs - Science and Engineering Ambassadors
YEC - Young Engineers Clubs & its programmes
Nuffield - Nuffield Curriculum Projects
ESRC - the Economic and Social Research Council

* The Specialist Schools Trust network currently involves around 2,400 Secondary schools in England, and international schools.

Annex 1 - Key barriers to entry

Five significant barriers identified:

1. Lack of a simple unified message

There is a proliferation of messages coming from the multitude of different bodies speaking on behalf of the profession but in the context of their current initiative. These messages often appear to be in conflict with each other and lead to confusion amongst parents and peers in particular. Some messages also suffer from a lack of appreciation of the need for genuine inclusion of all sectors of society.

2. No single point of contact 'gateway'

There is a wealth of existing initiatives providing information:
• Careers advice and support (e.g. Sector Skills Councils; Institutions)
• Support from individuals in industry (e.g. Science Engineering Ambassadors)
• Work-based opportunities (e.g. eef, the manufacturers' organisation)
• Sponsorship (e.g. Royal Academy of Engineering)
• Resource lists (e.g. SETNET)
• Statistics, analysis and research (e.g. ECUK/etb; Institutions; SSCs; HEIs)

Even this very limited selection demonstrates the challenge confronting any user who is not starting their search with pre-knowledge of what they are trying to find or where to find it.

3. Perceptions

Many current perceptions about engineering careers are simply wrong. Each one can be countered by hard evidence which has been accumulated. Alongside this, current realities must be faced. These include an unacceptable male skew in engineering & technology education, training and employment. The Equal Opportunities Commission work in investigating and tackling this must be actively supported.

4. Limited support for teaching & learning

There is a need for more subject specialists in schools in Mathematics, Design and Technology and Science so that young people can be given the appropriate building blocks to support later study. More emphasis should be given to evidence-based practice, including identifying and meeting user needs through involving practitioners and learners in research and development of curriculum support resources. For example, given appropriate and consistent support and guidance, all subject staff can enrich the curriculum using examples drawn from throughout the engineering spectrum. This applies as much to engaging in active citizenship, the humanities, the arts and studying languages as it does to mathematics, D&T and science. There is also a need to encourage more creative, project-led work at all levels of education & training that meets real needs and includes synthesis and learner autonomy in decision-making.

5. Lack of evidence-based practice

The paucity of evidence-based practice includes no serious longitudinal study of the learners involved to ascertain the influence of these initiatives on their long term choice of career. What studies there are focus on short term, immediately tangible observations (such as number-counts and satisfaction ratings) rather than deeper and longer term learning and changes in perception taking place.

Annex 2 - EEA Members

• Association of Cost Engineers
• British Computer Society
• Chartered Institution of Building Services Engineers
• eef, the manufactures' organisation
• Energy Institute
• Engineering and Technology Board
• Engineering Council UK
• Institute of Acoustics
• Institute of Healthcare Engineering and Estate Management
• Institute of Highway Incorporated Engineers
• Institute of Lighting Engineers
• Institute of Marine Science, Engineering and Technology
• Institute of Materials, Minerals and Mining
• Institute of Mathematics and its Applications
• Institute of Measurement and Control
• Institute of Physics

• Institute of Water Officers
• Institution of Civil Engineers
• Institution of Electrical Engineers
• Institution of Engineering Designers
• Institution of Fire Engineers
• Institution of Incorporated Engineers
• Institution of Mechanical Engineers
• Institution of Structural Engineers
• Royal Academy of Engineering
• Royal Aeronautical Society
• Science Engineering Technology Mathematics Network
• Sector Skills Council for Science, Engineering & Manufacturing Technologies
• The Chartered Institution of Water & Environmental Management
• The Royal Institution of Naval Architects
• The Welding Institute

Associate Members:

• Engineering Professors' Council
• National Forum of Engineering Centres
• Specialist Schools Trust