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A new network of development for Engineering Education in the UK

Caroline Baillie, Materials Subject Centre, University of Liverpool, UK
Fiona Lamb, LTSN Engineering, Loughborough University, UK
Mike Bramhall, Sheffield Hallam University, UK

Summary

Many engineering education organisations exist worldwide to enhance the learning experience of student engineers and to foster an environment conducive to preparing graduates for an ever changing future. Recent developments in UK Engineering Education are presented, together with a brief underlying philosophy, exploring a networking model to connect enthusiasts and provide support for their developments and innovations.

Discipline Specific Education Development

The Higher Education Funding Councils in the UK have recently placed a high priority on developing schemes to foster and support education developments within the disciplines. This developed in part from a review published in September 1998 of two major UK learning and teaching initiatives; the Computers in Teaching Initiative (CTI) and the Teaching and Learning Technology Support Network (TLTSN), (Higher Education Funding Council, HEFCE 1998). These two initiatives worked alongside each other in universities and colleges, both supporting the use of technology in teaching and learning. The CTI helped academic staff use technology within their given subject area while the TLTSN helped institutions and their managers to support such teaching and learning practices and provide academic staff with an institutional environment that allowed for the use of technology. The review acknowledged that academics best appreciate, assimilate and implement a pedagogic approach when presented to them within their own discipline and recommended establishing a subject-based support network to succeed the CTI and TLTSN with a broad focus across all learning and teaching activity.

In addition, many of University centrally based educational centres have not been as effective as predicted due to the ‘service centre’ approach, which encourages only the converted to ask for help and advice. It is thought that in part this is due to their generic nature and the inability to enter into subject level discussions with academics.

There are two major national schemes that provide a subject-based approach to tackling educational development issues. The Fund for the Development of Teaching and Learning (FDTL), which is largely concerned with the dissemination of good practice, has just announced its third phase and has supported many disciplinary based programmes of education development. Almost 50% of the projects supported in this phase are in the engineering discipline. Of even more powerful potential is the Learning and Teaching Subject Network (LTSN) which is a new national initiative for the implementation of 24 subject based centres for education support, development and dissemination. Three centres have been funded that cover the field of engineering: LTSN Engineering, the Materials Subject Centre and the Centre for Education in the Built Environment. The aim of the LTSN is to promote high quality learning and teaching by stimulating the sharing and dissemination of good practice and innovation in learning and teaching through the provision of subject-based support. This will be achieved by creating a national focus for academics through providing a physical location, library of teaching resources, web-site, publications, workshops, visits, discussion lists and individual support. Most
importantly, there will be the very necessary development of a national network and community of interested academic staff.

Engineering Education in the UK - LTSN and BEES

The national network of enthusiastic engineering educators that the LTSN centres are developing will build on, expand, link and involve existing UK networks such as the Engineering Education group at Sheffield Hallam University (BEES), and Education ECAD Users Group (ECAD). In particular, the Engineering Education group at Sheffield Hallam University have hosted three international conferences over the last few years and have built up a strong UK presence. They have identified a growing need for the development of an official UK society with the experience gained from our colleagues in the US (ASEE), Australia (AAEE) and Europe as a whole (SEFI). This spring has seen their launch of the new British Engineering Education Society (BEES). The LTSN centres and BEES will all be working with the main objective of providing a much needed focal point for engineering educators in Britain. They wish to be a point of contact for diverse groups with a common interest in engineering education and to provide links between secondary and tertiary education, professional and governmental bodies, and industry. Equally the needs of individual practitioners will be met by the national and world-wide networks of detailed contact information. BEES have also presented the first issue of their new publication, the British Journal of Engineering Education (BJEE) (Bramhall Ed. 2000). The BJEE will meet the needs of engineering education researchers with a British perspective. Providing a route to peer-reviewed publication, it will be a forum for the exchange of news and contemporary cutting edge research in the field. This primary focus is reinforced by a strong commitment to the application of ideas from the wider field of education and will draw on best practice experience from overseas. In addition to such research articles, the journal will include book reviews and feature articles, disseminating information on the latest techniques and best practice by reporting on developments and innovations from individual institutions. The active collaboration of existing networks with the national LTSN network will ensure their mutual success and continued enhancement, together fueling the increasing society of active individuals working with exciting new developments in the UK. Existing networks of enthusiasts working in different areas of learning and teaching will be linked together by the LTSN centres in order to enable the provision of advice and support for the entire community of engineering academics. If a lecturer wishes to gain information on a new way of teaching thermodynamics, for example, they can put out feelers to the LTSN centres who will in turn link them to knowledgeable academics, papers, or web-sites. They can also dip into the rest of the LTSN network and connect through the other subject centres to staff in different disciplines who might have very useful experience to draw on. Each of the centres will in turn be supported by the Generic Learning and Teaching Centre (GLTC) which connects key personnel and encourages the exchange of ideas. Two of the three LTSN engineering centres focus on specific subject areas within engineering - Materials and the Built Environment - while the third is more general, covering everything else. It is important that these centres do not fall into the service centre trap, described earlier. It is normal for subject centres to employ practitioners, with experience as professionals or academics in the discipline area. In this way, the community engages in subject level discussions of their teaching. It is the very community based approach of LTSN that makes it different from other education development activities. It is hoped that it will be owned by the community and this is certainly one of the key aims of each LTSN.

LTSN Materials

The Materials Engineering Community are fortunate to have gained a centre dedicated to their subject area. Directed by Professor Peter Goodhew, with Deputy Director Dr Caroline Bailie, this centre was funded to support the unique needs of the degree courses specialising in Materials Science and Engineering. In many other countries these are not separate courses but options within a programme or department. However, within the UK it is considered a very particular discipline with broad
Students need to develop their ability as physicists, chemists, and often biologists or biomedical engineers as well as applying their training to all other branches of Engineering. To be a Materials Technologist is to develop a very unique way of thinking. If a Materials degree is hosted within an Engineering department the necessary scientific abilities may be lessened unless the course is carefully planned. Engineering skills would in turn be decreased if it were hosted by physical science departments. The Materials Subject Centre will therefore have close liaison with the Engineering centre and also the Physical Science centre. At present, however, Materials programmes in the UK are closing or being subsumed by General or Mechanical Engineering. Largely due to the low numbers of school students applying for places, the deficit is considered to be due to a lack of knowledge and understanding about the subject at school level by teachers and careers advisors. One of the main aims of the new centre will be to maintain and strengthen the existence of Materials as a unique ‘interdisciplinary’ discipline.

**LTSN Engineering**

LTSN Engineering receives £240k per annum and operates as a large single site centre with a critical mass of expertise that takes advantage of a central UK location and previous experience in this field. The centre is directed by John Dickens and managed by Fiona Lamb. LTSN Engineering supports a large number of the engineering disciplines – approximately 10,000 academic staff spread across over 100 institutions and 600 departments! Whilst engineering has some common themes there is a wide diversity of subject areas within the discipline. This can be readily identified from the range of courses offered in the UCAS handbook and by the number of Professional Institutions and bodies are affiliated to the Engineering Council.

Engineering education draws on a range of underpinning subject areas and cognate disciplines and is characterised by laboratory based teaching, industrially based projects and sandwich courses. The majority of Engineering staff and students are highly computer literate. There is by necessity a close relationship with industry, as engineering students need to apply their technical, management and business skills in an industrial context. Engineering graduates require Continuing Professional Development (CPD) to cope with the sheer diversity of knowledge required by Engineers and the rapid rate of change in technology and industrial practice. Initial graduate training builds on the educational base to provide progression towards professional status. LTSN Engineering has a challenging role catering for the specific needs of the Engineering community in the context of the characteristics above. The two critical areas of concern that the Engineering Subject Centre must address are those of diversity and scale.

The many tiered approach for the national network

The model for the national network will be based on networks used in Imperial College and Loughborough University, as well as on the knowledge of the effectiveness of national networks. The resultant model provides a many tiered approach to networking the Engineering Education community within the UK. At the core will be the LTSN Contact, such as a programme tutor or someone with an active interest in innovative methods of teaching, based in each engineering department in the UK (equivalent to Education Development Coordinators at Imperial and Advisory Board members at Loughborough). At IC these academic staff act as the entry point to the Dept and to the culture. They ‘translate’ education development initiatives to the Dept. and also express the needs and concerns of the Depts.

The LTSN Contacts will be supported by the staff in their relevant LTSN Centre (equivalent to Education Development lecturers at Imperial and the team in the Faculty of Engineering Teaching and Learning Support Centre at Loughborough). They will receive information and contacts regarding the latest developments and evidence from education research, as well as providing advice about implementation issues. They will be able to provide key contacts of staff in other Depts working on similar issues, references to literature and computer
based resources, and act as the necessary moral support at times. The next tier will comprise the existing engineering education networks and working groups of the LTSN Centres, linking together larger groups of staff who want to explore, evaluate and develop an active interest in the educational issues of their discipline or a particular cross-discipline topic. An example is the emerging network of academics interested in creativity in engineering (see Forum on creativity, IJEE website). These staff will in turn link with the next outer tier, those staff in their departments who have a partial interest and wish to be kept informed (equivalent to LINKED at Imperial (London Imperial network for Education Development) and the ‘EngTLSC News’ system at Loughborough). This will be done by regular newsletters, Email lists and forum discussions, and workshops. Finally the outermost tier will be all engineering academic staff of the UK. The Materials LTSN serve a small enough community to be able to visit each Dept and to create personal links. LTSN Engineering will run regional workshops to raise general awareness and then follow this up more gradually to create the personal links.

Summary

In summary, suffice to say, ‘watch this space’. We are very encouraged by the present climate supporting innovation within the UK and are taking the opportunity to facilitate the growth of the nucleating network of academic staff interested in and developing the future of Engineering Education. This paper is a short introduction to some of the latest UK schemes, which, although in their infancy, hold much potential for our graduates.

Bibliography

Caroline Baillie is Deputy Director of the Materials Subject Centre and a Senior lecturer in Engineering. She has two complimentary research groups at Imperial College which focus on developing sustainable engineering composite materials, as well as exploring the knowledge building process in science and engineering education. A particular interest is the enhancement of links between research and teaching, through the processes of learning.

Fiona Lamb is Centre Manager of LTSN Engineering. She initially trained as a water engineer, specialising in the field of recycled water, but has since moved into the area of supporting learning and teaching. Her research interests focus on the development of strategies to best support learning and teaching in engineering in Higher Education.

Mike Bramhall is an active practitioner/researcher in engineering education and is Journal Editor of the British Journal Engineering Education which he recently co-founded alongside the British Engineering Education Society.