Supporting Engineering Education throughout the UK and Creating Resources for Engineering Educators Worldwide

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Abstract — *The Learning and Teaching Support Network for Engineering (LTSN Engineering) is receiving international recognition for its work in assisting the UK's higher education engineering community. LTSN Engineering is the support centre for all UK engineering acad emics, promoting quality learning and teaching by encouraging the sharing of good practice and innovation through a variety of mechanisms, including providing events and producing resources. All resources produced are available via the LTSN Engineering we bsite (www.ltsneng.ac.uk) and therefore can be freely accessed and used by anyone worldwide. These resources include guide books on topics such as: learning through projects, approaches to teaching health and safety, and teaching students with disabilitie s. In October 2004 LTSN Engineering becomes part of the Higher Education Academy, an organisation established by the UK Government to support quality enhancement and the student experience in higher education. The HE Academy has a remit to advise on poli cies and practices that impact on the student experience; support curriculum and pedagogic development; and facilitate development and increase the professional standing of all staff in higher education. As LTSN Engineering moves into the HE Academy its r ole in engineering education may change slightly, but it will still continue to develop essential resources to help engineering educators enhance their teaching and improve the educational experience of their students. This paper explains the national framework in place to support engineering education in the UK, describes the variety of resources that are currently available to engineering educators worldwide and outlines future plans for LTSN Engineering.*

Index Terms — *engineering education resources, H igher Education Academy, LTSN Engineering, national support structures, UK*

BACKGROUND

LTSN Engineering is one of the network of 24 subject centres of the Learning and Teaching Support Network (LTSN), which are based in higher education institutions throughout the UK. Launched in January 2000, and funded by the UK government at over nine million pounds sterling per annum, the LTSN was established following a review[1] of existing learning and teaching initiatives, which acknowledged that academics best appreciate, assimilate and implement a pedagogic approach when presented to them within their own discipline. It recommended establishing a national, subject-based support network with a broad focus across all learning and teaching activity - the first of its kind in the world. The still unique LTSN Network now promotes high quality learning and teaching through the development and transfer of good practices in all subject disciplines, and provides a one-stop shop of learning and teaching resources and information for the higher education community of the UK.

LTSN Engineering provides subject-based support to promote high quality learning and teaching in engineering education throughout the UK. This is achieved through the engagement of, and interaction with, UK engineering academics and the wider engineering community; providing a focus for discussion and debate, and creating a facility that has national ownership. The LTSN Engineering aims are shown in Figure 1.

FIGURE 1
AIMS OF LTSN ENGINEERING

- Creating a national *focus* that is an accepted and essential point of contact.
- Collating and disseminating *good practice* and innovation in learning and teaching.
- Providing co-ordination and *support* for the embedding of quality learning and teaching in higher education engineering.

The Stakeholders of LTSN Engineering

As a national network, the LTSN has something to offer to all staff involved in learning and teaching in HE, including academic staff, senior managers, learning technologists, educational development staff and staff developers. LTSN Engineering offers the opportunity for engineering academics to share ideas and develop them with like-minded colleagues in their subject area.

LTSN Engineering also has a remit to develop and sustain effective relationships and partnerships with other appropriate stakeholders who have legitimate interest in the Centre's activities, such as the Engineering Professors' Council[2], the Engineering Council UK[3] and Professional Institutions. The Centre provides activities and resources that aim to address the needs of the diversity of its stakeholders.

CURRENT ENGINEERING EDUCATION ACTIVITIES OF LTSN ENGINEERING

LTSN Engineering is now well established within the engineering community in the UK. Professional institutions and government agencies regularly make requests of LTSN Engineering to liaise between themselves and the HE engineering community. This is a good indication of our position and standing within the community. The most recent example is our participation with the Engineering Professors' Council, QAA (the Quality Assurance Agency)[4] and Engineering Council UK in reviewing the engineering benchmark statement, the outcome of which is having a major impact on all accredited engineering programmes in the UK.

The focus for LTSN Engineering's activities has been to continue to ensure actions arising from the LTSN Engineering Needs Analysis Report[5] are being met, which is producing resources aligned to the UK engineering community's needs. The Centre also has a major role in responding to national initiatives and policy issues, ensuring that resources are available to help engineering academics work with latest changes in legislation, accreditation, etc. These foci are achieved through a range of activities including: information giving (through our comprehensive website - www.ltsneng.ac.uk, e-bulletin and newsletter); facilitating networking, through the Centre's departmental contacts; running events; providing funding opportunities for the engineering community; raising the status of teaching in the UK, through our Teaching Awards programme; making available resources and commissioning new resources. These activities are explored in detail below.

Information Systems

The LTSN Engineering website - **www.ltsneng.ac.uk** - is the key communication vehicle for the Centre. Information is available on a wide variety of areas of interest to engineering academics. These include up-to-the-minute news and events; listings of national engineering education projects and networks; dedicated sections on all the latest UK engineering education priority areas (such as entrepreneurship, sustainability and disabilty); and the lighter-hearted Common Room section, containing engineering jokes and puzzles.

The UK engineering community are also kept up-to-date through fortnightly e-bulletins, distilling the important news and events that they should be aware of, and an easy to read newsletter, distributed three times a year.

Forming and Utilising the Network

Since July 2000 LTSN Engineering has been gathering named contacts in engineering departments/schools throughout the UK, creating a UK-wide network of engineering academics with an interest in learning and teaching. The Centre currently has named contacts in almost all higher education institutions in the UK that provide engineering education. These Departmental Contacts provide a voice for their department/school and their subject, helping the Centre to formulate a national strategy for the support of engineering education. The role for these Departmental Contacts is to act as a broker between LTSN Engineering and their department/school, providing a filtering service to ensure that colleagues only receive information on their areas of interest - preventing them from becoming overloaded with requests or information, with the overall aim to prevent disengagement.

This network of Departmental Contacts has proved invaluable in the past, providing quick responses and important survey data on topics such as, mathematics diagnostic testing and support, SARTOR3 (Standards and Routes to Registration as a professional engineer) and the engineering benchmark statement. This data has been used to influence the decision making of major national organisations including the QAA and the Engineering Council UK.

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Events

LTSN Engineering organises and facilitates between 15 and 20 events per annum, including national workshops on current issues and collaborative events. These events also showcase innovation within institutions and offer an opportunity for networking and the sharing of ideas across the UK. Topics have in the past included: Problem-Based Learning, Distance Learning, Maths Support, Retention and Writing & Assessing Learning Outcomes. The events are held at different higher education institutions throughout the UK, ensuring that there is always at least one event in each of the eight defined areas of the UK (including Scotland, Wales and Northern Ireland). This provides greater accessibilty for academics, giving them the opportunity to attend a 'local' event.

LTSN Engineering also promotes all known engineering education events, and general learning and teaching events that are relevant to engineering, through the Centre's website, e-bulletin and newsletter.

Funding Opportunities

An important part of LTSN Engineering's work has been being able to offer small amounts of funding back to the engineering community. This has helped engineering academics to engage with and really feel part of the work of the Centre. The range of funding opportunities available and the level of funding are as follows:
- Book Reviews - £25 (plus a copy of the book)
- Software Reviews - £25 (plus a copy of the software)
- Case Studies - £150
- Running Area Networks - £750
- Special Interest Groups - £1,500
- Mini-Projects - £3,000

The Case Studies have provided a much needed opportunity for engineering academics to share their work and ideas with the rest of the UK, whilst the Mini-Projects allow for engineering education development work within a department that can then be shared with the rest of the UK.

The engineering community has benefited from the funding streams by: sharing what's already going on; stimulating interest and providing motivation for people to get involved; and helping to promote excellence in learning and teaching in the area of engineering education. LTSN Engineering has been benefiting by increasing our resources available to the engineering community and enhancing our engineering education networks.

Teaching Awards

The LTSN Engineering Teaching Awards run annually and provide an opportunity for engineering academics to receive national recognition for their outstanding learning and teaching practices. This is achieved through identification of engineering academics (through self-application or nomination by a colleague) who have developed, or are using, teaching methodologies that have been proven to enhance the student learning experience. A shortlist of six academics is drawn up from the applicants, who are then allocated a member of the LTSN Engineering Team to work with over the academic year to develop a 2-page Case Study, which includes student feedback.

All shortlisted applicants receive £150 on completion of their Case Study and an expenses paid trip to present their ideas at an engineering education event. All Case Studies are published on the LTSN Engineering website and in print-form. An overall winner is selected by the LTSN Engineering Steering Group and presented with a certificate at the same event, where they also receive an additional £500 towards towards expenses to present their work at a future conference of their choice.

The LTSN Engineering Teaching Awards are helping to raise the status of teaching in engineering in the UK, and recognise and reward excellence in engineering education.

PROVIDING RESOURCES FOR ENGINEERING EDUCATORS WORLDWIDE

LTSN Engineering promotes quality learning and teaching by encouraging the sharing of good practice and innovation throughout the UK. To enable sharing of good practice and innovation the Centre commissions members of the UK engineering community to produce resources through Mini-Projects, Special Interest Groups and Special Projects. All resources produced are available via the LTSN Engineering website (www.ltsneng.ac.uk) and therefore can be freely accessed and used by anyone worldwide. The types of resources produced by the Centre include reports, guides and case studies, and topics have included:

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Curriculum Development
- Interpreting and Using the Engineering Benchmark Statement

Group Work
- Enhancing Transferable Skills Development in Group Projects through use of Training Exercises
- Group projects in a virtual environment: A study of group dynamics and the effectiveness of self and peer assessment
- Assessment of Individuals in Teams

Learning and Teaching Theory
- Learning and Teaching Theory for Engineering Academics
- Developing the Independent Learner
- Systematic Learning Guidance For Engineering Students (and Student Reflections on the Learning Process)

Health and Safety
- Evaluation of a Zero Tolerance Assessment Strategy for Incorporating Risk Assessment into Undergraduate Construction Related Courses

Baseline Knowledge Determination
- Diagnostic Testing for Mathematics
- The Development of a Web-Delivered Diagnostic Instrument for Detecting Misconceptions of Physics Principles

Whilst these resources are based on practice in the UK, the learning points contained within them are suitable worldwide. For example, the resource "Learning and Teaching Theory for Engineering Academics" breaks down the often inaccessible language of learning and teaching theory publications and puts it into a language that makes it easy to read and understand for the non-enthusiast. This publication has been distributed in Europe, where it received excellent feedback and was found extremely appropriate for all nations.

Anticipatory Resources

LTSN Engineering is in a priviledged position of being nationally funded, through government, and having a remit to support all UK engineering academics. Support is provided to the Centre itself to ensure that it is made aware of the coming agendas, that it understands them and is in a position to inform and help the engineering community with any changes they may be required to make in the way their departments/schools operate.

This anticipatory attitude has been applied to the commissioning of relevant resources in the past. The first example of this kind was the changes to the Disability Discrimination Act to include higher education, which came into force in September 2002. Early in 2001 LTSN Engineering commissioned a consultant to development a guide to "Working with Students with Disabilities", which included details about how the new legislasion would take effect, practical advice and examples of how others in the UK had already adapted their pratice to teach students with disabilities. The guide was published in May 2002, following an awareness-raising event on the subject, ensuring that the information was available to the engineering community before they were faced with the changes.

The latest example is the new agenda to make available to all students in the UK Personal Development Planning (PDP), from September 2005. LTSN Engineering has produced a guide on implementing and effectively using PDP, specifically for the engineering community, which will be published in October 2004 and launched at an event to raise awareness of the issues associated with PDP.

The Resource Database

The LTSN Engineering Resource Database was launched in October 2003 and currently contains over one thousand richly described resources. The resources have been carefully sourced and selected, and originate from within the Centre, UK engineering education projects and other external sources. The Resource Database is becoming the definitive source of learning and teaching resources for engineering academics. There is already a large number of search requests per month, including usage from Europe, the USA and Canada, as well as the UK.

The Resource Database is fully integrated with our catalogue of electronic resources for use with students, SearchLT Engineering, so visitors can find all the material they need in one place. This one-stop-shop for engineering education can be accessed at **www.ltsneng.ac.uk/er/resources**.

THE HIGHER EDUCATION ACADEMY

Recommendations in the UK Government's White Paper "The Future of Higher Education" (Jan 2003)[6] proposed the creation of a single, central body to support the enhancement of learning and teaching in higher education in the UK, namely the Higher Education Academy. The Higher Education Academy is now formed and incorporates the Learning and Teaching Support Network (and therefore LTSN Engineering) and the Institute of Learning and Teaching in Higher Education. The HE Academy has an extended remit to advise on policies and practices that impact on the student experience; support curriculum and pedagogic development; and facilitate development and increase the professional standing of all staff in higher education.

LTSN Subject Centres, including LTSN Engineering, will continue to exist in their present format and role, and will be a core part of the HE Academy. They will contribute to the HE Academy's outreach to subject communities and ensure the effective dissemination and sharing of good practices with these communities. As part of the move into the HE Academy it is necessary for all Subject Centres to re-name and re-brand, and as of October 2004 LTSN Engineering will become known as the Higher Education Academy – Engineering Subject Centre. However engineering educators from across the globe will still have access to all existing resources, as well as new resources, through the website.

CONCLUSIONS

The UK's Learning and Teaching Support Network (LTSN) has been a unique, national framework for higher education learning and teaching support, directly to academics within their own disciplines. LTSN Engineering has been part of this framework and has worked hard to form a large network of UK engineering academics that have been proven to have a strong voice in terms of influencing the decision-making of major national organisations.

The Centre's funding allows it to bring together engineering educators through a variety of mechanisms, allowing them to share their current practices and learn from one and other. This sharing has enabled LTSN Engineering to make available a wealth of resources that can be used to effect change in other departments or schools. These resources can also be accessed by any engineering academic worldwide via the internet.

The higher education environment within the UK is changing, with the aim to place more emphasis on learning and teaching than has been in the past. The formation of the Higher Education Academy is testimony to this change. As LTSN Engineering moves into the HE Academy its role in engineering education may change slightly, but it will still continue to develop essential resources to help all engineering educators enhance their teaching and improve the educational experience of their students.

REFERENCES

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