

The effectiveness of self and peer assessment in a virtual world

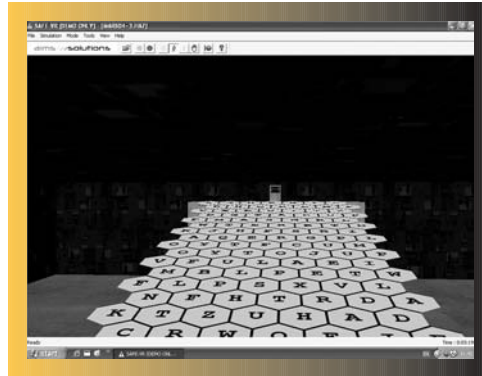
▶ **Engineers solve complex problems which require a wide skills base. This necessitates the need for teamwork as no engineer can be an expert in every field.**

During their degree students on engineering programmes have to work in groups and it is apparent that some are better at this than others. There are also problems with group work for the academic, especially when looking at group dynamics and assessment. Self and peer assessment may be a potential means of quantifying the relative input to a task, but how reliable will they be? Do group dynamics affect the way individuals perceive their own input and that of their peers?

Work is underway at the University of Nottingham to create a virtual chemical plant which will be integrated into the 4th year chemical engineering programme and there is interest in understanding how groups work with virtual environments and how they assess themselves. During our recent study, 26 groups of three students were asked to navigate around a specially created virtual reality (VR) environment whilst solving logic problems. Afterwards each member of the group filled in a questionnaire to award marks to themselves and their peers.

Only 12 out of the 26 groups could unanimously agree who contributed the least to the exercise and only 14 out of the 26 groups could agree on who contributed the most. No group could agree on both. Comparing self to peer allotted marks, students had a 2 in 5 chance of receiving the degree classification they felt they deserved, if awarded by their peers.

It is clear that group dynamics, self and peer assessment, and temperament all have some bearing on the activities and engagement



One of the seven virtual reality puzzle rooms that each student group must solve

with VR tasks. The following characteristics were found to be related directly to temperaments:

- the tendency to value others more highly than oneself
- consistency in mark allocation
- the tendency to participate and make contributions to the group

In a virtual reality environment, 'good group practice' did not appear to correlate well with 'success' – some groups managed to complete all the tasks but at the expense of group functionality. Therefore when considering the use of new technologies such as VR, one needs to consider assessment methods very carefully and think hard about what really constitutes a good learning outcome for all the individuals in the group.

This work was undertaken as part of a 2nd Phase LTSN Engineering Mini-Project.

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LTSN Engineering Progress Report

April - July 2003

▶ Another Successful Year

■ The 31st July 2003 marks the end of another successful year for LTSN Engineering. Throughout 2002-2003 notable highlights have included organising 15 events and workshops attended by over 400 delegates, publishing three guides (*Interpreting and Using the Engineering Benchmark Statement; Assessment of Individuals in Teams and HE Engineering Provision in FE Colleges*) and continuing to engage the engineering higher education community in our activities.

▶ Discussion of Output Standards

■ In May 2003 the QAA and EC(UK) asked LTSN Engineering to canvass the views of the engineering academic community on whether they want to see a single set of standards produced, to combine the QAA Benchmark Statements, the EPC Output Standards and the Competency Statements in UK-SPEC. Responses were received from 162 individuals with 94% of respondents thinking the opportunity should be taken to create a single output standards document that could be used for both accreditation and QAA audit. Obviously there would be a number of issues to be considered on how the different sets of standards should be brought together, and many respondents provided useful comments which can be found at

www.ltsneng.ac.uk/nef/news/stories/qaa_ec.asp

▶ Events

- This workshop on **Open and Distance Learning in Engineering**, hosted and facilitated by staff at the Open University, attracted delegates from universities and colleges across the country. The workshop was 'problem-focussed' and delegates worked in small groups to specify and develop small distance learning packages for use in their own institutions.
- This year's workshop in Northern Ireland, **Departmental Learning and Teaching Strategies**, provided colleagues from Queen's University Belfast and the University of Ulster the opportunity to raise their awareness of current strategic issues and discuss how these issues could be addressed at departmental level through the development of a Departmental Learning and Teaching Strategy.
- Our workshop on **Working with Students with Disabilities** attracted 40 delegates from across the university sector and included presentations from the National Disability Team, engineering-related HEFCE funded disability projects and experts in the area of working with students with disabilities.
- **Assessment – the Basics and Beyond**, hosted by University of Essex, provided delegates from across the Southeast with a fun and interactive introduction to setting and marking against assessment criteria.
- Reports on all past events can be found at www.ltsneng.ac.uk/nef/events/past_ltsn.asp

▶ LTSN Engineering Team News

■ LTSN Engineering would like to bid a fond farewell to academic consultant Warren Houghton, who will be finishing his work with the Centre at the end of July. Staff at the centre would like to take this opportunity to thank Warren for his contributions over the last 12 months and wish him every success in his future.

▶ LTSN Engineering Mini-Projects and Special Interest Groups

LTSN Engineering received 18 proposals for funding under the 3rd phase of our Mini-Project and Special Interest Group stream. We would like to take this opportunity to thank all those who applied for the effort in putting together their submissions. After a vigorous assessment procedure we are pleased to announce the funding of the following six Mini-Projects (at a max of £3000) and two Special Interest Groups (at £1500).

▶ Mini-Projects

The accessible electronics lab

This Mini-Project is based on an existing laboratory space for undergraduates in electronics and electrical engineering and will examine the range of design features necessary to achieve a workspace which is accessible to all. The concept of "Universal Design" or "Design for All" will be used to guide this feasibility study with input from a range of disabled people. The results will be in the form of a case study with design suggestions, a 'how to' guide book and web-based materials which will be presented at a workshop. It is hoped that these resources will provide support to others hoping to do similar changes to their own laboratories.

Marion Hersh, Electronics and Electrical Engineering, University of Glasgow

"Day Projects" : intensive skills training for engineering students

The acquisition by students of key skills required by engineering employers is a challenge within an academic environment. We have begun to address this issue through intensive Day Projects, where students are given a specific problem and required to produce a working solution within an 8-hour laboratory session. Through this process, students gain useful experience of commercial engineering issues, including: problem analysis/breakdown, working to restricted deadlines, hardware/software interaction, fault diagnosis, negotiation and cooperative working, etc. This Mini-Project will further develop this novel teaching approach, based on Experiential Learning in the area of Embedded Systems, as well as collating and disseminating other examples of good practise in this area.

Do your students undertake projects of one week or less?

We would like to here from anyone who runs intensive projects with their students. Please contact enquiries@ltsneng.ac.uk if you could share an example or case study giving details of the length, level and discipline of the project.

Kate Williams, Electronics, Communication and Electrical Engineering, University of Hertfordshire

A guide for creating and using engineering digital video content to innovate teaching and learning

To expand the scope of an existing project which provides academics with a generic 'how to' guide for editing and using existing movie clips in their teaching, this Mini-Project proposal will create specific 'how to' guides on creating your own movie clips with specific guidance and tips for engineering disciplines such as, 'creating movies on-site' or 'recording laboratory exercises'. The guide provided will be viewable as web pages but with tailored interactive content to provide a more 'hand-holding' approach for novice IT users.

Geoff Hodgson, Civil and Building Engineering, Loughborough University

Evaluation of a zero tolerance assessment strategy for incorporating health and safety into undergraduate civil engineering courses

This Mini-Project is analysing the results of three years experience of applying a zero tolerance assessment strategy on undergraduate construction courses. Coursework submissions are assessed by pass/fail criteria, with a pass requirement being set at a high level. Students who do not achieve this level are given further opportunities to resubmit the work for a reduced mark. The coursework grade awarded is based on the reciprocal of the number of opportunities the student has taken to achieve the pass criteria. The strategy can be applied to all engineering courses and is seen as being particularly useful in integrating Health & Safety attitudes into a conventional engineering syllabus.

John Reynolds, Civil Engineering, University of Portsmouth

The application of computer algebra software in the teaching of engineering mathematics

The use of computer algebra software in the teaching of maths to a mixed ability class of first-year chemical engineers is being investigated. The intention is to engage both strong and weak students in an interactive and stimulating study of maths, without requiring them to slog through turgid algebra to obtain every result. The students will work through an integrated series of interactive Maple® worksheets and will solve abstract and applied problems using rule-based methods for algebraic, differential and numerical operations. The software is not simply a black-box, since it allows line-by-line analysis, similar to a pen and paper solution, but without the fear of making algebraic errors. This approach will allow students to concentrate on the underlying mathematical principles, without worrying about detailed manipulations and explore different solution methods for a given problem. The aim is to improve student achievement and understanding in maths, whilst introducing them to a useful tool that can be applied in other contexts throughout the course.

Chris Rielly, Chemical Engineering, Loughborough University

Improving student success and retention through greater participation and tackling student unique tutorial sheets

To actively encourage and improve student participation within a first year first 'fluid mechanics and thermodynamics' module this Mini-Project seeks to develop a set of 'student unique' tutorial sheets. The Mini-Project will not only develop an appropriate 'resource bank' of tutorial sheets but will also provide a set of 'how to' notes to allow other tutors to set up similar sheets, and will therefore not only be of immediate interest to those teaching fluid mechanics or thermodynamics but it will also be of value to the wider community of engineering educators. The Mini-Project will also look to exploit existing computer tools to automate the associated processes of setting, delivering, assessing, feeding back and tracking student participation and success.

Hertfordshire already have tutorial questions for the course but would be interested in incorporating appropriate fluid mechanics and thermodynamics questions from other first year courses.

Do you have questions that could be used in this questionbank?

If you would like to become involved in this Mini-Project, or require further information, please contact enquiries@ltsneng.ac.uk

Mark Russell, Aerospace, Automotive and Mechanical Engineering, University of Hertfordshire

Special Interest Groups

YAN-CE: Fostering collaboration in teaching across engineering disciplines

The Young Academics Network for Chemical Engineering YAN-CE was launched in January 2003. This SIG is concerned with establishing a Networking Group on Learning and Teaching within the YAN-CE aimed to:

- Share experience and good practice in learning and teaching
- Promote effective collaboration in teaching across chemical engineering departments in UK
- Act as a ginger group to stimulate development of new teaching methods that will be beneficial to the wider engineering community

Some 60 young academics working in Chemical Engineering departments have joined the YAN-CE. The initial role will be to gather information and encourage:

- Sharing of teaching resources and teaching tools
- Collaboration in teaching through development of shared programmes between departments/universities
- Dissemination of knowledge on learning, teaching and skills transfer through organisation of workshops in collaboration with other groups.

Dr Paola Lettieri, Chemical Engineering, University College, London

Dr Mark Simmons, Chemical Engineering, University of Birmingham

www.yance.bham.ac.uk

The Dyslexia and Dyscalculia Interest Group

The Dyslexia and Dyscalculia Interest Group aims to create a greater awareness and understanding of the ways in which the difficulties experienced by dyslexic and dyscalculic students affect their study of mathematics. This SIG aims to consolidate an already established informal network, comprising representatives from the Universities of Loughborough, DeMontfort and Coventry and develop it into a more substantial network – other interested parties are invited to join the activities of the Group. The SIG will:

- exchange information and experiences in working with dyslexic and dyscalculic students and the mathematical requirements of their engineering courses
- create guidelines for identifying and working with these students
- develop samples of mathematical resource material, appropriate to the needs of students with dyslexia and dyscalculia.

Clare Trott, Mathematics Learning Support Centre, Loughborough University

<http://ddig.lboro.ac.uk/>



▶ Mini-Project Progress

LTSN Engineering funded 12 Mini-Projects in the first two Phases of funding which are all progressing well. The following five Mini-Projects are nearing completion and all their guidebooks, case studies and papers will be available on the LTSN Engineering website shortly. Details about all our funded Mini-Projects can be found at www.ltsneng.ac.uk/hec/mini_projects/

Working as part of a balanced team

Team based work has previously been undertaken by groups of students chosen by the academic supervisor in an undiscerning way. Therefore, the Mini-Project aim was to consider the effects of defining the teams using a systematic method - the Belbin technique. This technique is based on the concept of nine specific team roles that for any individual can be classified as preferred, manageable or least preferred. By selecting team members, the team profile is predicted. Final year mechanical engineering students each undertake two out of three design projects. Students undertaking the building design project were placed in teams that were defined with the Belbin technique, whilst the teams for the other two projects were self-selected or selected by the academic supervisor. Analysis of the teams throughout the project has shown that the building teams experienced the least problems and that the Belbin technique is a useful method for selecting teams.

Daphne O'Doherty, School of Engineering, Cardiff University

Portable learning and assessment - towards ubiquitous education

A team at the University of Glasgow are investigating the effectiveness of the Personal Digital Assistant (PDA) as a computer aided assessment platform (CAA) and investigating how and when the 14 students in the trial use their PDA.

Each PDA contains a logging application to record when the PDA is used along with a quiz application to deliver formative self-assessment questions. The quiz application has stimulated discussions about important aspects of the course and these have helped to improve the students understanding of the relevant subject areas and the discussions between students has promoted group working.

Students say that they liked the mixture of questions, from the easy ones that "could be done on the bus" to the more difficult ones that required additional time and calculation to answer. Early results also suggest that the students are using the PDAs organisational tools for scheduling and planning.

Jon Trinder, Department of Electronics and Electrical Engineering, University of Glasgow

Systematic learning guidance for engineering students

120 first year engineering students at Exeter were asked to review their learning regularly throughout their first term. At the end of each week, they filled in a form comprising a range of questions about their academic studies. A study skills counsellor then provided written feedback on every form before they were returned to students via personal tutors. The aim was to engage students in a dialogue about their learning processes and to encourage reflective habits. The student reflections were transferred into a database for analysis along with entry qualifications, attendance records, end of year summative assessment marks etc. Students were also asked to complete a more open-ended self-appraisal covering the whole year. Analysis showed that (i) the process was valued by many students and helped them to become better managers of their work, but

(ii) most students were extremely poor at judging the effectiveness of their own study.

A detailed case study of the findings of this Mini-Project will be shortly available from LTSN Engineering.

Warren Houghton, School of Engineering and Computer Science, University of Exeter

Minimal-mathematics introduction to engineering

Many engineering departments in the UK currently face student recruitment and retention challenges, a situation that coincides with a widely reported problem of declining mathematical skills amongst new university intakes. The effectiveness of measures to remedy these deficiencies will be affected by a student's attitude to mathematics.

This Mini-Project was funded by LTSN Engineering to measure the maths attitude amongst new engineering students in UK universities and to determine the perceived cause of any negative attitudes. The study revealed important findings to be published shortly in a journal article. For example, 52% of new engineering students prefer a teaching approach that uses maths only when unavoidable; 29% do not enjoy maths, and 36% of these claim they were put off by poor pre-university maths teaching. A report titled "Putting engineering first and mathematics second in engineering education" was also produced to demonstrate the student-preferred engineering-first approach.

This report can be accessed at:

www.ltsneng.ac.uk/downloads/maths_report.pdf

Dr Ifiok Otung, School of Electronics, University of Glamorgan

The development of a web-delivered diagnostic instrument for detecting misconceptions of physics principles

It is believed that many entrants to engineering courses have major, inconsistent misconceptions about some of the fundamental concepts of physics. These topics are covered in the entrance qualifications and so are not taught. A web-delivered diagnostic instrument has been developed to be administered to entrants to reveal the presence of misunderstandings. The question-base devised had to meet the criteria of being a valid and reliable measure of understanding, not involve mathematics and test conceptual knowledge and technical language knowledge separately. A categorised question base of about 200 items has been developed. Piloting has been used to assess how effectively the design criteria have been met, and initial results show that this is an effective instrument. The test will be administered to the 2003 entrants both to gauge their understanding and further to prove the instrument. The findings of this Mini-Project will be put together as a case study and, along with the test, be available from the LTSN Engineering website shortly.

Norrie Edward, The School of Engineering, The Robert Gordon University, Aberdeen



▶ **Introducing... LTSN Engineering Awards 2003-2004**

LTSN Engineering Teaching Award

What would you identify as the best component of your teaching? Do you have or know of an example of teaching that is worthy of recognition? This could include any aspect of teaching, support of teaching, use of technology in teaching or development of teaching methodologies or technologies.

If so... nominate yourself or a colleague for an LTSN Engineering Award!

LTSN Engineering is looking to recognise and reward good practice in the teaching of engineering. These new awards provide an opportunity for engineering academics to receive national recognition for the high quality of their learning and teaching practices.

The awards are open to any UK engineering academic who works in higher education or who teaches higher education in a further education establishment. All you need to do is submit a brief abstract of your practise by Friday 5th September 2003. A maximum of 6 applicants will be then shortlisted to work with members of the LTSN Engineering Team over the academic year to develop a 2 page case study. All shortlisted applicants will be paid £150 on completion of their case study and their work published on our website. The winner(s) will be announced in June 2004.

For more details and the abstract submission form, please look at:
www.ltsneng.ac.uk/fundopps/teaching_awards.asp

*You may also contact Louise Donaghy
on 01509 222710
or enquiries@ltsneng.ac.uk
to discuss this in more detail.*



LTSN Engineering Student Award

**What makes a good lecturer?
This year we are going to ask
the students!**

**LTSN Engineering is offering
a £150 prize to the UK
undergraduate engineering
student who writes the best
essay (500-1000 words) on the
topic 'What makes a good
engineering lecturer?' by 31st
December 2003.**

We hope that this competition will highlight good practice in this area and hope students will be motivated to think about how they have been taught as well as what they are being taught.

All short listed entries will be published on our website and the winner will be presented with their prize during the early part of 2004. So get your students writing as soon as they come back in the autumn. Posters will be sent out in September to all engineering departments and it is hoped that you will actively advertise the competition to your students.

translate translate

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July 2003

transferring learning & teaching throughout engineering

about

LTSN Engineering is one of the 24 subject centres of the Learning and Teaching Support Network. The Centre provides subject-based support to promote high quality learning and teaching in engineering education.

If you would like to express your own opinions on this edition of **translate**, then please write to us at:

enquiries@ltsneng.ac.uk

and we will publish a summary on our website and in future editions of **translate**.

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Talking Point



'When universities begin charging differential fees, isn't there a danger that students will be put off studying science, technology and engineering, which are the most expensive courses to run?'

This was one of the questions posed in John Clare's "any questions?" section of the Daily Telegraph last month.

Both the question and John Clare's reply raise a number of talking points. A section of his response is printed below:

"Yes, which is why the Engineering Employers' Federation is urging universities to charge the highest fees for the most heavily oversubscribed courses, such as law and english, and the lowest for those, such as engineering, that are least in demand – sharing marketing practice. However, as the average failure rate in engineering courses is a dismal 44%, it may be no bad thing if more are put off studying it – at least at degree level."

John Clare, Daily Telegraph, Saturday 7 June 2003

It is not known where the figure of a 44% failure rate was taken from. The HEFCE 'Performance Indicators in Higher Education' (2002) show that engineering is comparable to maths and computing in terms of drop-out rate in the first year (10% in 2000). HESA statistics on HE qualifications obtained, show that of 18425 obtaining an engineering first degree only 1365 were "unclassified".

The Engineering Employers' Federation was invited to answer our Talking Point and voice the opinion that is shared by many in the engineering community:

"Allowing HEIs to vary the amount which they charge students could result in higher fees for courses which are expensive to deliver. Engineering and science courses are comparatively costly (both in terms of equipment and specialist staff) and are therefore likely to engender the highest fees. It would be unfortunate if fees influenced the choice of course for any young person; the return on investment, the graduate premium, is not the same for each course.

We suggest that, given the government's recognition of the importance of engineering (as expressed in the Roberts Review), consideration should be given to "manipulating the market" in terms of fees. This could involve universities charging high fees for those degrees which may be inexpensive to deliver, but which contribute less directly to the wealth of the country, and using the surplus to fund lower fees in areas such as science and engineering."

Engineering Employers' Federation

future events

A more comprehensive listing of events can be found on our website:

www.ltsneng.ac.uk/nef/events/

3 - 4 September 2003

LTSN Engineering Workshop - Project and Group Work in Engineering
Loughborough University

10 - 11 September 2003

EEUG Autumn Workshop
Lancaster University

15 - 18 September 2003

32nd International Symposium - International Society for Engineering Education
Karlsruhe, Germany

25 - 26 September 2003

PROGRESS 3 Conference - Strategies for Student Achievement in Engineering
The University of Hull

29 September - 1 October 2003

14th Annual Conference for Australasian Association for Engineering Education
RMIT University, Melbourne, Australia

October 2003

LTSN Engineering and PROGRESS Workshop - Maths and Progression
London

Autumn 2003

Look out for:

LTSN Engineering Workshop - Key Skills and PDP

LTSN Engineering Workshop - Interactive Lecturers

stop press

Following the recommendations in the Government's White Paper 'The Future of Higher Education' progress towards establishing the Higher Education Academy (which will encompass LTSN, ILTHE and HESDA) is gaining momentum. The funding bodies and UUK/SCOP have appointed Professor Leslie Wagner, currently the Vice-Chancellor of Leeds Metropolitan University, as Interim Chair for the Academy. Professor Wagner is charged with taking forward the TQEC's proposals and delivering the Academy. Further developments will appear on our website.