The Universities of Loughborough and Coventry were awarded a Centre for Excellence in Teaching and Learning (CETL) in Spring 2005 based on their track record of university-wide mathematics support and their commitment to extend this support. The CETL aims to develop university-wide mathematics and statistics support and this article discusses the various initiatives which will be explored to support non-specialists in their study and usage of statistics.

**Rationale and aims for the CETL**

Both universities have well established Mathematics Support Centres and these provide the impetus for the CETL’s activities. SIGMA aims to radically influence both the culture amongst staff and students and the mode of teaching and learning for many different groups in Higher Education. To achieve this shift SIGMA will be developing further university-wide support for both mathematics and statistics, and will be seeking innovative approaches that address the widely differing curricula and individual needs of different students. It will be looking to take advantage of the pedagogical research that is already underway at both institutions and also to work with the Higher Education Academy, the Royal Statistical Society Centre for Statistical Education and others to build cross-disciplinary and sector-wide dissemination.

SIGMA’s main aims can be summarised as:

- To develop an environment in which it is the norm for all students to expect to succeed, to rectify shortcomings and to build confidence in their ability in mathematics and statistics.
- To research and promote enhancement in teaching and learning of the mathematics and statistics taught at the two institutions.
- To stimulate and encourage growth of similar proactive activity across the HE sector.
- To be a responsive, efficient and accountable organisation.
Where do we start for statistics?

Given recent concerns about the general health of statistical knowledge and expertise in non-specialists especially [1], it was seen as crucial that SIGMA engaged with the need for learning and teaching of statistics. The CETL bid recognised the need to enhance the statistics staffing base and posts were allocated to each of the partner institutions. These posts have now been filled and colleagues will be working together to identify and share good practice. Links are being built with the Royal Statistical Society Centre for Statistical Education and with the Higher Education Academy.

The support for statistics at each institution at the moment is variable. There is some support offered to students through the drop-in facilities at each mathematics support centre. Advice for researchers is given through consultancy-style services and some ad-hoc provision of training and short courses is also provided. However, there is a need to coordinate and focus these and other activities.

So what do we hope to achieve?

There are a number of areas of support and development that the two institutions are looking to build and enhance. Immediate areas are:

- Drop-in facilities
- Consultancy
- Diagnostic testing
- Focused support for targeted non-specialists
- Training courses/workshops
- Short courses
- Research methods support
- Teaching and learning methods

as well as engaging in pedagogical research and dissemination of SIGMA’s activities.

And what do these mean?

Drop-in facilities are provided for statistical help at both institutions. This is on a limited basis and is usually for those who have identified they need help. We are intending to be more proactive in provision of this support. More targeted assistance will be made available, at Loughborough to Economics and Human Sciences students, and at Coventry, to Business Studies students. We intend to work with the host departments to identify areas of difficulty that students have and address these through specific drop-in sessions.

Consultancy services have always featured strongly at Coventry, this is less the case at Loughborough. At both institutions we are aiming to provide advice to students and staff engaged in research or other scholastic activities where statistical analysis may be required. The aim is not to do the statistical work, rather to advise on how it might be carried out. Our aim is to create a service where users come to us before they start their work rather than as a means of rescuing after an investigation has been carried out!!! At present our definition of consultancy does not include external and/or commercial advice.

Just about all the diagnostic testing that currently takes place within the two institutions is focussed on mathematical aptitude. Non-specialists in a number of areas are more reliant on statistical awareness and we will be looking to design diagnostic tests which cover both statistical and mathematical needs. Some work has been carried out with Masters level students in Economics and this will be expanded to cover other subject areas as well as other levels of study, focussing particularly on first year level.

As well as the focussed drop-in sessions, we will be working with departments to identify other support that can be offered. This will include provision of extra tutorial sessions, one-off remedial workshops and the use of focus groups to determine which types of support, in which forms are most appropriate and helpful. These focus groups will consist of students and staff, both separately and together.

At both universities there is a professional development unit. We will be working closely with these units to identify and deliver “training courses” or workshops which cover research student and staff needs with regard to statistical training. One programme of eight two hour sessions is now in place. The sessions are designed to be stand-alone but also allow a development of statistical knowledge. The sessions cover questionnaire design, types of data and experimental design, basics of statistical methodology, t-tests, chi-square tests, non-parametric tests, regression and correlation, and basic ANOVA. We are already being asked about workshops addressing particular software such as SPSS and Excel.

There has been some interest from departments in being provided with short courses on a particular topic or topics e.g. regression with coverage of estimation, testing and diagnostics. We have made the distinction of short course to mean a course with more than one session, although there is clearly potential overlap with the training course/workshop provision and remedial
workshops etc. This type of provision is to be investigated further.

Research methods, especially experimental design (in its broadest sense), has been a recurring theme in our initial discussions with academic and professional development colleagues. We will be looking at how to engage researchers in planning and carrying out their work so that they can gain maximum analytical benefit from their data.

Attention is focussing more and more on the approaches we should adopt for the learning and teaching of statistics. Some say we should adopt a mathematics based approach, others say we should treat statistics completely separately to mathematics or consider statistics within a computing context [2]. Some advocate a problem-based approach whilst others insist a theory-based approach is necessary [3, 4, 5, 6]. What everyone agrees is that we need to do something to arrest the downward trend in interest and understanding of statistics as a subject. As part of SIGMA’s activities, we will be experimenting with different approaches to delivering learning and teaching of statistics. These will range from adaptations of traditional lecture/tutorial approaches through to the potential of technology, whether it be an electronic classroom, virtual classroom, hand held device or the internet. Both Coventry and Loughborough are investing in kitting out electronic classrooms and updating video conferencing facilities. We will be exploring the potential of providing cross-institution support through these means.

To understand more fully the needs of those studying statistics, we will be engaging in pedagogic research. A postgraduate studentship is to be provided (part funded by the HEA) from September 2006 with the aim of investigating and evaluating pedagogic approaches to statistics education. In particular the research will seek to:

- Identify the reasons for the lack of demand for studying statistics and acquiring statistics qualifications, and develop ways to improve take-up.
- Track students who study mathematics and statistics at ‘A’ level and who go on to study at university.
- Build on and develop recent statistical education research evidence from the US and develop a methodology to improve statistics teaching and learning.
- Recommend improvements to the content and delivery of the statistics curriculum at schools (‘A’ level) and university.

The research will investigate both specialists and non-specialists in statistics, with supervision being provided from Loughborough University with help from the Royal Statistical Society Centre for Statistical Education.

Finally, dissemination will initially be awareness raising of the work SIGMA is doing in relation to statistics. This article and planned further articles are an example!! We will be offering workshops and seminars as well as publishing our findings. SIGMA will be running conferences throughout this project and we will use these to report regularly on our progress. Information will be provided on the SIGMA website as well as for an electronic newsletter.

In conclusion

SIGMA offers an exciting opportunity to take forward statistical education over the next few years. We are looking forward to the challenges outlined above. If you want to be involved or just kept informed, let us know. Our website is www.sigma-cetl.ac.uk or please contact me directly by e-mail r.j.gadsden@lboro.ac.uk.

References