

Item 10(a). Issues and Developments in Teaching and Learning Statistics (Neville Davies)

This document summarises some of the main UK activities in teaching and learning statistics.

1 Centres for Excellence in Teaching and Learning (CETLs)

The following three projects have some direct links with statistics and its promotion in teaching and learning.

(i) Postgraduate Statistics Teaching for Specialists and Non-Specialists (Lancaster University, www.maths.lancs.ac.uk/department/consulting/cetl)

Aim

The main aim is to extend and disseminate existing excellent practice in teaching to additional partner departments across the University and in other universities, and to secure Lancaster University's position as the leading training centre for postgraduate statistics in the UK.

Objectives

1. To provide a regional, national and international centre of excellence in the postgraduate training and development of statisticians, producing highly employable graduates.
2. To motivate and encourage quantitative inquiry-led training for disciplines in the natural, social and management sciences, producing students who are enthusiastic and knowledgeable about the quantitative aspects of their discipline.
3. To give Lancaster-trained postgraduate students in all disciplines quantitative skills which will influence and enhance their whole approach to research.
4. To develop critical statistical thinking at a mathematical level appropriate for each group of students, thus enabling students to use specific statistical techniques appropriately and to recognise when standard techniques are not appropriate.
5. To reward existing excellence in postgraduate teaching through improved facilities and increased personal time for course development, experimentation in new approaches to teaching, and to increase the possibilities for career development of staff working in this area.

(ii) Centre for Effective Learning in Science (School of Biomedical and Natural Sciences, Nottingham Trent University)

Aims

The Centre has two core aims relating to horizontal integration across science subjects and vertical integration throughout the levels of NTU and reaching out into schools and the workplace. These aims are:

1. Integration of best higher educational practice across interdisciplinary and established science subjects;
2. Outreach work developing student employability and school to university links within Science.

Objectives

1. Apply existing models of learning - eg: Concept Learning (CL), Context-Based Learning (CBL), to develop new materials in a range of delivery formats.
2. Develop supporting learning material for entrants to HE with non-standard backgrounds.
3. Apply the results of the (HEFCE) Fund for the Development of Teaching & Learning (FDTL) Phase 4 project *Effective Feedback, Enhanced Learning* (EFEL).
4. Draw on materials from the Achieving Accessible Assessment project at NTU.
5. Raise aspirations of local people to enter higher education through outreach work. A credit-rated school placement system for science undergraduates will be developed.

The link with statistics

The RSS Centre for Statistical Education (RSSCSE) *ExperimentsAtSchool* project (www.experimentsatschool.ntu.ac.uk) will be used as a conduit to connect the learning of science by students in HE with students at school studying for appropriate 'A'- level

science subjects and, in some cases, appropriate GCSE subjects. For example, the plan is to design and write link experiments that can be carried out at school, and at university. These will be designed to complement and enhance the school curriculum, and will lead directly to follow-up experiments done at levels one or two in HE. This approach will help with the transition from school science studies to university science. At school, pupils will be able to appreciate experimental practice and will connect this with what they will do in university. The more advanced experimental direction needed at university will enable the students to reflect and evaluate their school level activities and connect them to the thinking needed to get trustworthy information from the data generated by experiments at university.

(iii) The Loughborough- Coventry Centre for Excellence in the University-wide provision of mathematics and statistics support. (<http://mec.lboro.ac.uk/mathcetl>)

Aims

- 1 To develop an environment in which it is the norm for all Loughborough and Coventry University students to:
 - expect to succeed in the mathematical or statistical components of their mainstream studies;
 - rectify shortcomings in their mathematical or statistical knowledge;
 - build confidence in their ability to apply mathematics and statistics in their mainstream studies.
- 2 To promote the enhancement of the teaching and learning of the mathematics and statistics taught throughout Loughborough and Coventry Universities.
- 3 To stimulate and encourage growth of similar proactive activity across the HE sector.

Objectives

There 19 objectives for this project, including the provision of drop-in services, development of short courses, effective and extensive dissemination of material, rewarding excellence and development of innovative ways of teaching and learning mathematics and statistics.

2 Higher Education Academy Maths, Stats & OR Network
(www.mathstore.ac.uk)

(i) The *DayBreak* Programme of specialist statistics topics

This programme is designed to enhance the professional development of statistics teachers in those topics. This is done, for example, by examining new material (sometimes at a research level) that can be incorporated into university undergraduate teaching.

(ii) Creation of an interactive resource from the STEPS glossary of statistical terms

The Statistical Education through Problem Solving (STEPS) glossary of statistical terms is being updated and modified to run in an interactive Internet environment, with applications in several discipline areas.

(iii) The RPANEL Project

RPanel is a way of making R more accessible to students. In particular it gives some of the functionality of XLispStat to R. It is being used to control R graphics in teaching - animated plots controlled by buttons, scrollbars and so forth. Other features include playable videos, zoomable graphics and the options are only limited to anything which can be done by a PC. It has been designed to make it easy to use for R users. Windows and controls are produced by R code. Rather than a new interface for R, it is an extension to R.

(iv) Cataloguing Electronic Statistical Resources

This project conforms to RLLMAP standards and will contain simple assessments of the pedagogic usefulness of each resource listed.

(v) RSS Certificate *Teaching Statistics in Higher Education*
(www.rsscse.org.uk/???)

This distance learning course is targeted at three markets.

- (i) Members of staff, usually at the start of their teaching statistics careers, who are teaching, or about to teach, statistics course
- (s) in mathematics/statistics-type departments. Also, it is ideal for those whose main subject discipline is other than statistics,

but who are expected to teach the statistics within, or to students in, that discipline. In addition these staff may wish to acquire a qualification that is accredited by the Royal Statistical Society.

(ii) Members of staff who need to participate in university new staff induction programmes. The practicalities of running such programmes have led to an emphasis on generic issues of teaching, so that normally staff from many disciplines receive induction as a group. Government requirements for the induction of staff, recommended to be in place the end of 2006, requires discipline-specific elements within induction programmes. There are a number of models under which universities and their staff development units can incorporate the material.

(iii) Members of staff who wish to develop their educational skills - the emphasis is on an individual's personal continuing professional development and their growth as a reflective practitioner.

(vi) *Connections* - the newsletter of the Maths, Stats & OR Network

Colleagues are reminded about *Connections* - it contains news, events, activities, software reviews and articles about aspects of teaching and learning in mathematics, statistics and OR.

4 The State of Teaching Statistics in the UK

(i) Higher Education

What can (should?) COPS do about the continuing demise of teaching statistics at *all levels* in UK HE (and elsewhere?). Is it too late?

(ii) Schools - The RSS Centre for Statistical Education QCA Project

(www.rsscse.org.uk/qca)

This project is a direct result of Adrian Smith's recommendation 4.4 in *Making Mathematics Count*.

Project remit

'To review the statistics and handling data content of GCSE Mathematics to determine what should be retained as part of the core curriculum for mathematics and what may be beneficially seeded for delivery through other subjects, particularly science'.

The project will investigate:

- i. the extent of expertise in statistics and data handling within a school;
- ii. the implications for the mathematics curriculum;
- iii. practical difficulties that may arise from seeding identified topics through other subjects;
- iv. the resulting impact on the other subject areas;
- v. the extent of adaptation needed in other subject areas to offer these identified aspects;
- vi. the ways the identified part(s) of the curriculum could be delivered;
- vii. measurement of (impact of) the benefit to the learner