Learning Statistics Teaching In Higher Education Using Online And Distance Methods

Neville Davies
Royal Statistical Society Centre for Statistical Education
Nottingham Trent University
NG1 4BU, Nottingham, UK
neville.davies@ntu.ac.uk

Vic Barnett
Royal Statistical Society Centre for Statistical Education
Nottingham Trent University
NG1 4BU, Nottingham, UK
vic.barnett@ntu.ac.uk.

1. Introduction

In 2000 the UK Government published a paper on Higher Education (HE) outlining, amongst other things, its desire that all new staff should receive proper training in lecturing/teaching at the induction stage of their careers and existing lecturing/teaching staff should undertake Continuing Professional Development (CPD). The general expectation was that in most universities the CPD material would be generic (non-subject-specific) and would be delivered by educational or staff development groups. At a similar time a Learning and Teaching Support Network (LTSN) comprising 24 Subject Centres was established for HE to promote good practice, and its dissemination, in teaching and learning. One of these Centres was in Mathematics, Statistics and OR (MSOR), with responsibility for Statistics and OR resting jointly with the University of Glasgow and the Royal Statistical Society (RSS) Centre for Statistical Education (CSE) at Nottingham Trent University. Also at the same time the Institute for Learning and Teaching in HE (ILTHE) was set up to establish a UK professional body of teachers in HE.

2. Early Developments

In 2000 the RSS CSE gathered information from the statistics community about what it wanted from the new LTSN MSOR Network Subject Centre. One of the most popular needs expressed was for subject-specific learning and teaching development, especially in statistics. Using a combination of funding from the subject Centre and a government-funded teaching and learning development initiative, five regional workshops were run across the UK between August 2001 and July 2002.

Each workshop had the broad theme of *Teaching Statistics in HE*, with the aim of simply learning from and sharing experiences with participants about teaching, learning and assessment in statistics at all levels. By the end of the series of workshops a great deal of material was assembled, in hard copy and electronic form. It was clear that the problems faced by teachers of statistics in HE were quite distinct from most other subjects. It was also clear that there was an urgent need to (i) support induction for new lecturers/teachers of statistics and (ii) provide CPD opportunities that were subject-specific.

Part of the statistics team (Neville Davies, Warren Gilchrist and Peter Holmes) that ran the workshops decided to try to convert the material, together with their collective experience of teaching statistics over many years, into written and electronic resources. The aim was to create and write a distance learning-type course that would meet the two needs (i) and (ii) above.

3. Course Content

During the writing period from June 2002 – July 2003, the team commissioned independent reviews of the material from Professor Helen Macgillivray of Queensland University of

Technology, who also attended one of the five workshops in 2002, and Professor Trevor Spedding of the University of Greenwich. Their input was crucial to the development of the material and helped it to become a full and deliverable course. It was constructed around the themes of teaching, learning and assessement, at the same time integrating computer and Internet technology, these tools being equally important for teaching, learning and processing the data that are the lifeblood of statistics teaching. The course now comprises:

- six distance learning sections (five paper-based, one e-delivery/learning based);
- a *Reader* of articles and recommended course texts;
- a Blackboard-based Virtual Learning Environment (provided by Sheffield Hallam University) with support material, web links, conferencing, bulletin boards, group e-mail etc;
- tutorial support by phone and e-mail.

During the period 2000 – 2004 a total of 10 people were involved in the development and implementaion of the course, this being approximately equivalent to about 1.5 person-years of work with an estimated cost of £40k - £60k. There are two key factors that should help the HEA Maths, Stats & OR Network make the *Certificate* a success. First, the backing of the Royal Statistical Society as an academic and professional statistical organisation that has existed for 170 years that has been awarding statistical qualifications for 50 years, gives the course credibility within the statistics profession nationally and internationally. Second, the HEA accreditation makes it clear where the course fits into the UK teaching and learning scene. Even so, the course team realises there is still much room for improvement and expansion in the course as it progresses.

A brief overview of the six sections follows and links to further details about the course can be found at http://science.ntu.ac.uk/rsscse/activities/distanceLearning.htm.

Section I An Overview of Statistics in HE
Section 1 helps the new teacher to see his or her work in the national and international context and to become aware of the variety of support mechanisms that exist

Section II Learning Statistics
This section presents those elements of learning theory that have an immediate impact on the teaching of statistics, and contains many illustrations and examples.

Section III Teaching Statistics – General
Section 3 covers a broad study of issues faced by the statistics teacher, including many aspects of teaching methods for statistics and of the choices of method available.

Section IV Teaching Statistics – Specifics
This enables teachers of statistics to look at specific topics that they do or may teach, and at the contexts in which this teaching can occur.

Section V Assessment and Feedback in Statistics
Section 5 provides a study of the specific methods appropriate to the development and assessment of student's understanding and skills in statistics.

Section VI Computer Supported Statistics Teaching
This explores the use of calculators, statistical and educational software, Computer Aided Learning and use of the Internet in the teaching of statistics. Even though we provide a hard copy version of this section, it is written specifically for online delivery using the electronic environment provided by Blackboard.

Overall the course aims to enable candidates from a wide variety of backgrounds to develop a set of skills that will help them to be competent and professional teachers of statistics in HE.

These skills will enable them to contribute to the teaching of statistics at a high level and to gain the ability to learn by experience from their own environments.

The course has two main ways of achieving its aims, namely through the course material and through a major assignment described below, which is not just a test of the understanding of the material. It is a fundamental part of the learning experience provided by the course. Through an initial set of suggested activities within each Section, coupled with the assignment, the material stimulates the candidates to explore and develop these ideas in their own teaching contexts. The material and the assignment are *both* designed to help participants to achieve the following learning objectives:

1. competence in a range of areas that underpin the design and planning of learning activity and present evidence of such design and planning for a statistics course;
2. expertise in the development of learning environments appropriate to the teaching of statistics;
3. evidence of reflective practice and development.

Participants are recommended to spend about 200 study hours in total on the course, normally over a year, including the crucial integral time spent on the assignment. Assessment of this is made through a *Portfolio* of work that presents in detail how they would go about planning, teaching and assessing a specific module in statistics. This needs to relate directly to each of the six sections of the course.

4. Accreditation and Modes of Study

In the UK an important consideration in *doing* CPD is whether it is recognised professionally and can contribute to a portfolio of activities, many that are now *expected* in a statistician's career. One way of achieving this, especially with regard to recognising the content of CPD-type courses, is for them to be professionally accredited. Hence the course team decided that, in order to provide academic and professional credibility, it would seek accreditation and validation for the course from both the RSS and the ILTHE.

In March 2003 the course was submitted to the RSS Professional Affairs Committee for accreditation. An independent reviewer was appointed and, after implementing many suggested changes to the course, in December 2003 the RSS accredited it as a *Certificate in Teaching Statistics in HE*. It is now part of the portfolio of professional qualifications awarded by the RSS, and it forms a component of its policy of helping statisticians to carry out CPD. Professor Vic Barnett had previously been appointed course leader in October 2003.

In January 2004 the ILTHE validated the course, but subsequently there were some structural changes in both the LTSN and ILTHE. In May 2004 the ILTHE and the 24 Subject Centres comprising the LTSN merged to become the UK *Higher Education Academy* and the accreditation committee of the HEA now has the responsibility for awards and accreditation. Consequently those participants on the course who get awarded the RSS Certificate are also entitled to be *Associate Practitioners* of the HEA.

Even though the main mode of study of the material leads to award of the *Certificate* (see Mode 1 below), there are two other modes that teachers of statistics in HE can register for instead.

Mode 1 Individual HE staff teaching, or about to teach, statistics at HE level can register for the course, with the support of an internal mentor or tutor and take it as a one-year external distance-learning *Certificate in Teaching Statistics in HE*. Tutorial support and assessment is provided by the Course Management Team (involving the Course Leader, course tutors and the RSS-appointed External Examiner).

Mode 2 Registered participants might wish to use the course as a single (possibly optional) unit in a university PgCert or Diploma in Learning and Teaching; with additional tutorial support and assessment from the appropriate university staff development unit. It has built–in activities for assessment and is equivalent to approximately 20 M-level credits.

Mode 3 The course materials may be obtained by individuals for self-study or by university or HE departments (e.g. staff development units) for review and trial.

During the academic year 2003 – 2004 the course was run as a pilot in all three modes (at nominal fee levels) as we wanted to get feedback from participants so that we could improve the material for future implementations. In the next section we describe our experiences with running the pilot.

5. Experience, Feedback, Lessons and the Future

Following just one advertisement in the November 2003 issue of RSS NEWS and widespread personal contact with staff development units, the course attracted 22 registered participants. These were from a wide range of subjects across many universities. The numbers in brackets below correspond to those who registered for that mode of study and the main subject areas of participants are also given together with the host university in brackets.

Mode 1: *Royal Statistical Society Certificate in Teaching Statistics in HE (16)*
Tropical Medicine, Public Health and Psychology (Liverpool); Dentistry (Manchester); Mathematics & Computer Science (UWIC); Pharmacology (BARTS); Meteorology (Reading); Mathematics (York); Mathematics (Lagos);Univ of West Indies; Okanagan, British Columbia; University of Wales College of Medicine (3).

Mode 2: *University staff Development Units (2)*
Reading & Warwick Universities.

Mode 3: *Self study (4)*
Management (Buckingham); Mercy College (USA); United Arab Emirates; Private (Stoke Newington).

There were 18 other expressions of interest, 15 from the UK and the rest from West Indies, Namibia and South Africa.

Feedback from the 22 participants has been very useful. The course material content was greatly appreciated but the Blackboard facility was rather under-utilised. Unfortunately, there was not enough sense of community between participants on the course and, initially at least, there was some confusion over exactly what the *personal learning objective* should be and how it could be measured. Also, as all the assessment is made through one long portfolio it tends to encourage participants to concentrate efforts at the end of studying all the six sections, rather than tackle it as each section is completed. Consequently the content of submitted portfolios will need to be monitored very closely.

For the 2004 – 2005 cohort of participants all six sections of the course were revised in the light of feedback and it was advertised extensively in the UK, USA, Australia and New Zealand. The course team is interested is running the *Certificate* in other countries on a more formal basis. This could be done in a number of ways, for example through a franchise with a university statistics/mathematics department and/or through a country's statistical association. Translation into other languages will provide another way to help provide CPD opportunities for teachers in other countries. Changing the material to reflect each country's approach to statistics is also possible, conditional, of course, on the standard required by the RSS being maintained.

Please make contact with either of us if you wish to discuss ways of implementing the *Certificate*.