Overview of Electronic Voting Equipment for lecture classes

In October 2001 we first introduced here the PRS handsets, which provide a voting system for lecture theatres whereby any MCQ (multiple choice question) can be posed, and the aggregated results immediately displayed. The main aim was and is to achieve significantly better interactivity in lectures (for all group sizes). A lecture augmented by use of this equipment might typically use three or four questions with voting, although some sessions have been specially designed to focus mainly on the use of such questions.

This initiative originated in a theoretical analysis based on Laurillard's (1993, 2002) model of learning and teaching in HE. Lectures form a prominent part of teaching at Glasgow, and the analytic question was "what is the weakest aspect of this with respect to teaching and learning quality, and is there a generic remedy?". The purpose of seeking a weakest point is that that is where enhancement (i.e. relative improvement) can most readily and usefully be achieved. The point of seeking a generic problem and solution is that the costs of change are much more easily justified when benefits are spread across many subjects and (therefore) students. (This line of thinking comes from the failure of many learning technology projects too repair the attunement between speaker and audience, from both a pragmatic (there isn't time for many people to ask questions) and a social (it just feels too embarrassing) viewpoint. An electronic voting system addresses this by allowing everyone to participate, and to do so anonymously, even though it is limited to the MCQ format. In line with this aim of generic, cross-university improvement, we kept the equipment mobile and purchased enough (650 handsets) for the university's two largest lecture theatres to use it simultaneously, so that lecturers would not need to change either the time or place of their room bookings.

Uses in first two years (2001-3)			
Department	**Level**	**Target class size**	**Lectures x repeats**
Computing Science	1	450	20 x 2
Dental School	CPD	18	1
Life sciences	2	300	1 x 2
Life sciences	2	150	1
Medicine	3	250	3
Medicine	4	250	1
Philosophy	2	100	9
Psychology	4	40	3
Psychology	1	500	3 x 2
Psychology	3	100	5
Statistics	1/ 2	200	9
Veterinary Medicine	4	100	1

In the first two years (October 2001 - June 2003) the handsets have been used in a range of departments right across the university (about 8 departments and 15 lecturers). Evaluation data has been gathered, and papers published. In May 2002 we gave an interactive presentation and demonstration on this at the

university's TLS (Teaching and Learning Service) conference. In May and June 2003 a series of three workshops were given and a Newsletter article published, and 20 additional lecturers are definitely keen to use them. Provided these are followed up and well supported, then in the next session (2003-4) we may have about 30 lecturers using them, and over 5,000 students (over a third of all undergraduates at Glasgow University) would be exposed to them: some for only an hour, some others for up to 20 lectures during the session.

The justification for this expansion has been the positive evaluations received from each new use. We have been able to use a part time research assistant to gather better evaluation data (from observation, questionnaires, and student interviews) than is normally the case in teaching. In some cases, student complaints rose: e.g. if equipment problems were seen to disrupt lectures, or it was perceived that the equipment was being used more as a hobby of the lecturer than a direct aid to the current teaching. (Full reports are available from the website.) We therefore decided that the key standard measure to use was to ask students in each case to say whether, on balance, the benefits outweighed any disadvantages. In almost all cases, a large majority did judge it to have a definite net benefit.

More detailed analysis of the benefits (from both the student data, staff data, and theoretical analysis) have refined our view of this. One type of benefit is that of increased "interactivity" in the simple sense of keeping students mentally active. A further benefit in many cases is giving them feedback on their understanding of the topic to hand: essentially formative self-assessment questions of the kind the Open University uses in all their textbooks. However possibly more important, and less obvious in advance, is the feedback to the lecturer on what this audience needs now. This allows the prepared presenter to do true contingent teaching: coming with a diagnostic tree of questions, and homing in on issues that this particular audience needs more time and material on. This allows even large group teaching to move away from "lectures" with fixed scripts that are unresponsive to the audience, towards sessions tailored on the spot. At Glasgow, the Statistics department has led the way in using the handsets for this.

Financial support in the first two years came from an EPSRC research grant (£13k), from a pre-existing internal university grant ("TLC") on educational technology developments (£42k), and an additional sum from learning and teaching funds specifically for the handsets (£10k). In this, the third, year we have just received £5k to develop the educational evaluation and £20k from the Chancellor's fund to assist the rollout. Part of this will fund an MSc by Chris Mitchell. He has been employed part time as an assistant with the equipment for most of this period, but will now develop the software further in line with requests by lecturers and to improve aspects of the user interface. Another part goes towards promoting the transition of this equipment from the original enthusiasts, with most influence in their own departments, to central university support units.

Adoptions of innovations are often seen as following a sigmoid (S-shaped) curve. The rollout of handsets at Glasgow is turning the lower corner from early adoption by enthusiasts to the beginning of the rapid growth portion. The issues will probably change somewhat. It will become increasingly likely that a given lecturer will already know someone who has used the handsets: this will aid adoption. On the other hand the supply both of those most open to changing their teaching methods, and the cases where it will make the easiest and biggest gains, will progressively diminish: this will reduce adoption. We shall not know the resulting slope of the middle portion of the curve for a while yet.

We have gathered (http://www.psy.gla.ac.uk/~steve/ilig/people.html) a list of those we have heard about elsewhere in the UK that use similar equipment. It seems fair to claim that at the moment, Glasgow has the most widespread use of it, although clearly it is being adopted more and more widely in the UK. However it was first adopted at our neighbouring university Strathclyde, by Jim Boyle, who has been generous with his advice, and with whom we hope to set up a joint project to develop this initiative further. It was originally adopted there by a different route: derived from the "Interactive Engagement" approach to teaching Mechanics, developed originally without technology.

Conclusions

This initiative does use ICT (information and communication technology) but the important educational effects were first achieved before using ICT for this (Hake; 1998). Furthermore they still depend sensitively from hour to hour on whether the presenter keeps his or her mind on the educational benefits, and keeps the technology in a strictly subordinate role. However the technology, if properly supported, does tend to make it significantly easier for more teachers in more contexts to achieve the benefits of interaction (just as, say, central heating reduces the effort and extends the time during which a constant desired temperature for a room is achieved in practice).

More information on this, including brief overviews, practical advice, evaluation reports, and peer-reviewed published papers by us and by others can all be found through the web site: http://www.psy.gla.ac.uk/~steve/ilig/

References

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Hake,R.R. (1998) "Interactive-engagement versus traditional methods: A six-thousand-student survey of mechanics test data for introductory physics courses" Am.J.Physics vol.66 no.1 pp.64-74

Laurillard, D. (1993, 2002) Rethinking university teaching: A framework for the effective use of educational technology (Routledge: London).

Interactive Lectures The web site for our initiative. http://www.psy.gla.ac.uk/~steve/ilig/