

“Ask the audience...”

Increase Interactivity. Increase Learning?

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Outline

- Electronic Voting Systems (EVSs)
- Large-scale use in Glasgow University
 - How are they used, what are the benefits?
 - Software developments
- Educational underpinning
- Do they promote learning?
- Next steps

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Electronic Voting Systems

- Consists of
 - Handsets, receiver, laptop and projector
- Increasingly available...
 - as part of publishers' E-armoury
 - emphasis: “testing, standards, reporting, accountability” ☺
- In this case...
 - PRS – Personal Response System
 - www.educue.com, www.gtcocalcomp.com/Interwriteprs.html
- Varying methods of use
 - Differing teaching needs
 - Different software setups

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So, let's try them out...



- Find your handset id number
 - written on reverse
 - you are looking for this number in the 'response collector'
 - Switch on – black and red button – green light comes on
- Remember
 - point straight at receiver, press button corresponding to your chosen answer, look for number in 'collector'
 - Infrared cannot go through a body, chair, bag etc!
 - Answer may not get in first time due to clashes – just try again...

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Vote (15): My view of these systems is:

- 1 no educational value at all
- 4 gimmick - at least they'll keep students' attention for a while
- 5 probably useful
- 3 I can see applications immediately
- 2 Fantastic, the faculty should buy some
- 0 other

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Vote (16): My experience of these systems is....

- 4 Never heard about them before this seminar announcement
- 9 Heard about them informally
- 1 Been to one or more presentations about them
- 1 Watched them being used or been in a group during use
- 0 Led their use in a group myself once or twice
- 1 Led their use in a group many times myself
- 0 other

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Vote (14): There is a path up a mountain. On Monday at 8am, I walk to the top and camp. On Tuesday at 8am I walk on the same path to the bottom. Is there a time on Tuesday when I was at the same place at the same time on the path as I was on Monday?

- 6 Yes
- 4 No
- 4 Unsure

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- 7 No
- 1 Unsure

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EVS use at Glasgow University

- Key issue
 - *supporting* lecturers to use the kit as *widely* as possible
- Mobile kit
 - 850 handsets – enough for 2 largest theatres simultaneously
 - One large theatre with wired-in receivers
- Support team
 - Two lecturers (Quintin, Steve) in spare time
 - A part-time evaluator, rsch assistant and final year student
 - Plus student helpers (sometimes) from each class
 - Reflection amongst the team members crucial to the research development
- Roll-out
 - 10-15 departments now used the kit (largest in UK)
 - Reported in Draper et al 01, Draper & Brown 04

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Glasgow software – “QRS”

- PRS comes with proprietary software
 - Simple questioning interface, no integration with Powerpoint
 - Limited ability to analyse response data during/after lecture
- QRS
 - Either Quintin’s RS, or “*kruss*” after Chris Mitchell, the author
 - Initially a PowerPoint add-in, binding PRS software with PP
 - Integration never very smooth
 - Now a VB-6 application
 - From serial port decoding right up to data storage analysis and presentation
 - Design derived directly from lecturers’ needs
 - Programmer on-site, eager to deliver!

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Principal features

- Optional integration with Powerpoint
- Flexible graphing
 - response can be separated from question
 - simple on-the-fly data analysis possible
 - responses from many questions can be combined
- Supports multiple question format – *class test* mode
- Access database stores all interactions, for
 - for post lecture review
 - for inclusion in future presentations
 - for presentation back to students, via notes, on web, next session– *takes dialogue out of the classroom*
- “Worm” or “clappometer” for asynchronous feedback from audience
- DLL available
 - To add distributed input device to any application

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The *Pedagogical Scripts*

- Getting a new group acquainted
- Gaining feedback
 - For both students and staff
 - Maybe in one, a few, or every lecture in a course
- Test knowledge levels at course start
- Engaging students with subject matter
- Diagnostic questions to drill down to find and address problems
- Remediation sessions after a written-test
- Promoting discussion
 - Lectures and seminars
- Attendance checking
- Exam preparation
- Summative assessment

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Student Evaluation

- For
 - Breaks up lectures, more interactive, involves the whole class
 - Anonymity good
 - Comparison with rest of the class
 - Problems identified, lecturers can change presentation
 - Twice as likely to respond using handsets compared to hands-up
 - Students view EVS more positively over a period of use
- Against
 - Setting up, using, takes too much time
 - Can distract from the learning point
 - Questions for benefit of the lecturer/future students, or for the sake of it

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Lecturer feedback

“With the handsets, I could see exactly which points I had not conveyed clearly and could rectify it straight away ...

Although most (68%) got it right, an astonishing number chose [incorrectly]. I could see that they hadn't fully understood that many antibody positive cats are not infected.

It was great because the students who got the wrong answer are very likely the same ones who never utter a word in interactive lectures and it gave them a chance to participate anonymously”

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Increase Learning?

- Does an EVS make any difference to outcomes?
 - No definitive results yet in the literature
 - Although Physics' Interactive Engagement is a strong pointer
- With Gregor Kennedy, undertaking analysis of
 - Semester-long use in Computing Science
 - Attendance and performance data across the whole course
- Why *would* responding with a handset affect outcomes?

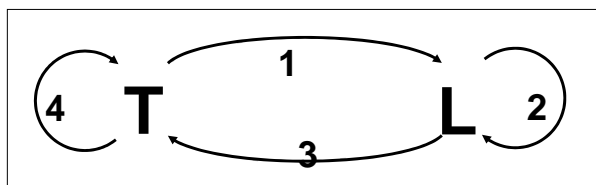
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Dialogue, reflection, cognitive processing, feedback – keys to learning

- Pask, Kolb, Laurillard
 - Contain elements of activity, reflection and communication
 - Also, active & collaborative learning, social constructivism
- Lectures *cannot* support true dialogue (Laurillard)
- Adjusted forms of lecturing involving dialogue clearly improve learning
 - Questioning, discussion
 - Mazur's Peer Instruction, Novak's Just-in-Time-Teaching – *Interactive Engagement*

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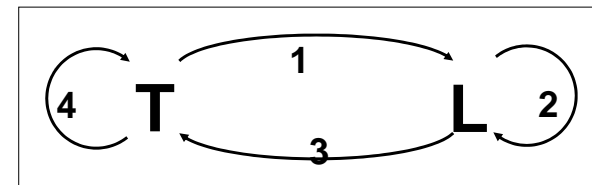
Simplified model based on Laurillard



- 1,3 Communications between teacher, T, & learner, L
- 2,4 Processing of information received
- Identified 8 impediments to dialogue in lectures (Cutts et al 04)
 - 3 is hard in traditional lectures, and levels of 2 patchy at best
 - 4 based usually on very limited 3 - visual observation only!
 - Very little repeating of the cycle or dynamic adjustment to flow

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Laurillard and EVS



- Use of an EVS maps onto Laurillard as follows
 1. lecturer poses a question
 2. students work to construct answer
 3. each individual has a means of responding that is seen by the lecturer and other students
 4. lecturer can process responses and adjust flow accordingly – starting the process again at 1

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Initial investigation

- Analysis of use in first computer programming class
 - Primary aim of EVS use – actively engage students
 - Does EVS *use* increase engagement and hence outcomes?
 - Feedback/remediation obviously important, but *not* measured in this initial study
- Based on (2) and (3) from Laurillard's model
 - If students respond (3), *assume* active engagement - reflection and cognitive processing of the lecture material (2) - is taking place
- Hence
 - EVS use (3) will be associated with better understanding of the course, as measured by course assessments

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Method

- 330 students in CS1P - 241 with complete data sets.
 - All issued with a handset in first week
 - No requirement to use the handset of any kind
- PRS usage recorded automatically in 13 of 22 lectures.
- 33 Questions
 - 9 'general' study attitude questions
 - 24 'thinking' questions (16 with correct answers)
- Two assessments (end of semester and year).
- Used both response frequency & accuracy measures
- Cluster analysis and Manova tests

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Results

- 2 clusters emerge
 - High and Low frequency responders
 - *Not* differentiated by correctness
- The clusters correlate significantly with outcomes (ie understanding)
 - The higher the response frequency, the better the marks

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Explaining low responders

- Many non-responders – why?
 1. Unable to formulate an answer in time limit
 2. Response not accepted by system
 3. Forgot handset
 4. Not motivated to respond
 - a. Don't understand what they're asked, unwilling to admit it
 - b. Don't like this kind of learning
 - c. Understand material fully, can't be bothered to answer
 5. Not present at lecture
 - Note – persistent non-attenders not included in this data set
- How would this affect result?
 - 1,2,3,4 **may** gain from EVS lectures – flattens correlation
 - 5 will not gain – strengthens correlation

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Next steps for the educator

- Address the low responders
 - Raise value of responding – attach (minimal) marks
 - Enforce out of lecture preparation – so all can respond
 - Look at technical issues
 - Improve remediation – keep all on board
 - Motivate this style of learning
- Further analysis

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Improving remediation...

- Limited time for remediation in lectures
- Use the data to link lectures with other activities
 - Lecturer – inter-lecture remediation
 - Comments on question responses
 - Further questions
 - Tutor – access to lecture activity
 - Personalised record of students' progress
 - Student – continue the dialogue
 - Review lecture questions
 - Ask for or offer advice on a web-board per question
 - Join the dialogue by answering late if lecture missed

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Further discussion

- Handset support in Glasgow
- Styles and benefits of handset use
- Software – features and using it
- The investigation
- Underpinning theory

- We'll use the clappometer
 - Press any button when *you're bored of a topic*
 - When we reach the boredom threshold, I'll move on!!
 - Your 'vote' lasts for about a minute

- QRS software freely available, if you have PRS
- Contacts
 - quintin@dcs.gla.ac.uk, www.dcs.gla.ac.uk/~quintin

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Conclusions

- Introduced EVSs and typical uses
- Explored Glasogow Uni deployment
 - And current evaluations
- Proposed a rationale for use based on Laurillard
- Presented an investigation
 - To test whether EVS use raises outcomes
 - There is a correlation...
 - ...and many further questions have been raised

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