Ways to improve learning with EVS

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www.psy.gla.ac.uk/~steve/ilig/

EVS = Electronic Voting Systems
a.k.a. PRS, clickers, audience response systems, ….

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Part A.

Introducing ourselves, and EVS

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Starter question

Which talk is this: the 1st, 2nd, ….?

Enter the number from, 1 to 9 …

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Job roles

Which option best describes your job / role?

1. You teach some undergraduate or FE students
2. You offer pedagogical advice or support to teaching staff
3. You offer technology advice or support to teaching staff
4. Other: you are a vice chancellor, janitor, ….

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Insider / outsider

Do you work for / in the University of St.Andrews?

1. Yes AND work for a support unit e.g. SALTIRE
2. Yes AND I work for a regular academic department
3. No I work in FE
4. No I work in HE elsewhere
5. I don't work in either FE of HE

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Preliminary attitude to EVS

Which of these best describes your present, provisional attitude to using EVS?

1. Already know I'm going to use it
2. Have a good idea and hope it's practicable for me to use it
3. Waiting to see if a good idea occurs to me or is mentioned
4. Doubt if I'll use it, but could be convinced
5. Very unlikely to use it
6. Would never use it, and am here to monitor the enemy

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Hands up

Who has (does anyone have) a notion of how they might use EVS in their own classes / audiences?

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Why use handsets? -- initial idea

Main problem with large classes (thought to be):
    Lack of interaction, extreme passivity

A simple theory: learning depends on the time spent actually thinking.
    Answering questions at least requires thinking.

Benefits to learners: Requires thinking (about topic)
1. Allows all learners, not just one, to generate an answer
2. And to register that answer
3. In privacy
4. And so to affect what happens next

Benefits to teachers:
    Checking if ideas were grasped
    Finding out a class' state of understanding and where its difficulties are   8

Part B.

Dramatic learning gains

Hake
Mazur

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Hake

Hake (1998) published a survey of 62 courses (6,542 students) all studying the same subject, all using the same standardised test, and using it both pre- and post-.

He graphed the mean gain on each course against whether or not it had used the method of "Interactive engagement".

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See fig. 1 in:

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 66(1), 64-74

Hake's results

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Mazur

Crouch & Mazur (2001) published an analysis of 10 years of Mazur's MIT course.

Again, the standardised pre- and post-test.

He concludes he has doubled the amount of learning, but the graph suggests that really, he tripled it.

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See:

Crouch, C.H. and Mazur, E. (2001), "Peer Instruction: Ten years of experience and results" <u>American Journal of Physics</u> 69, 970-977

Mazur's gains

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Part C.

Alternative pedagogic aims / applications for EVS

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Which do you think experienced EVS lecturers value the most?

1. Engaging students with subject matter.
2. Feedback to the learner on what they do and don't know
3. Exam practice, combined with interactive remediation.
4. Feedback to the teacher to adapt their teaching.
5. Attendance checking
6. Summative assessment
7. Getting a new group acquainted with each other

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Techniques (question uses)

1. SAQs ("self-assessment questions")
2. Diagnostic tree of questions
3. To initiate a discussion (brain teaser questions)
4. Multi-step worked problem.
5. Course feedback: Formative feedback to the teacher.
6. Class exam, marking and feedback done in same session
7. Peer assessment
8. Community mutual awareness building.
9. Collecting data in experiments using human responses
10. Student designed EVS questions

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Question design

There's a whole art to question design, depending on the purpose. Only touch on it here.

Sources:
    A bit on my website
    Bloom's taxonomy
    CAA centre:
http://www.caacentre.ac.uk/resources/objective_tests/

Assertion-reason questions (next slide)
Brain teaser questions (slide after that)

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Slide 18

Assertion-reason questions

The idea here is not to ask about the truth of facts, but about which of several true reasons explains a (true) fact.

In an atom, electrons do not spiral into the nucleus despite the strong electrostatic attraction. Is this due to:

1. The Pauli exclusion principle
2. Heisenberg's uncertainty principle
3. Planck quantization,
4. de Broglie's wave-particle relation

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Brain teaser questions

Mazur calls them "ConcepTests".

The point is to provoke debate, internal and between peers.
Cf. Socratic questioning, and "catalytic assessment"

Remember the old logo or advert for Levi's jeans that
    showed a pair of jeans being pulled apart by two teams of
    mules pulling in opposite directions.
If one of the mule teams was sent away, and their leg of the
    jeans tied to a big tree instead, would the force (tension)
    in the jeans be: half, the same, or twice what it was with
    two mule teams?

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Part D.

Some specific EVS applications that I'm impressed with

Mazur's peer instruction
Student-generated questions
Diagnostic trees of questions
Class exam with instant interactive feedback

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Which one of these do you most want me to say more about?

1. Mazur's peer instruction

2. Student-generated questions

3. Diagnostic trees of questions

4. Class exam with instant interactive feedback

5. Student-generated PDP sessions

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Mazur's peer instruction

Mazur's peer instruction is a method of teaching that may
    (but need not) use EVS;
Is grounded in a psychology of how peers aid learning
Is addressed at a long researched principal weakness of his
    particular subject matter (mechanics)

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Peer Instruction: Mazur Sequence

1. Concept question posed (brain teaser)
2. *Individual Thinking*: students given time to think individually (1-2 minutes)
3. Students provide individual responses
4. Students receive feedback – poll of responses presented as histogram display
5. *Peer Discussion*: students instructed to convince their neighbours that they have the right answer.
6. Retesting of same concept
7. Students provide individual responses (revised answer)
8. Students receive feedback – poll of responses presented as histogram display
9. Lecturer summarises and explains 'correct' response

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Getting students to design the EVS questions

Basic idea (for a class that has seen EVS used as part of lectures?):
Students have to design a test MCQ,
    complete with reasons why each response option is right or wrong
Have to aim for a question that discriminates (splits class)
Why? Same reason underneath as Mazur: the factual question requires
    them to generate reasons ….

Andy Sharp has done this (see his paper in REAP online conference)
Nick Bowskill is trialing this as part of his PhD
See my wonderful new paper in BJET "Catalytic assessment:
    understanding how MCQs and EVS can foster deep learning"

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Diagnostic trees: Feedback to <u>teachers</u>

We all get into EVS to "engage" the students I.e. to get feedback to them.
But talking to experienced EVS teachers, they say what they now personally value the most is the feedback from learners to teachers

Can make this the centre: <u>contingent teaching</u>, using diagnostic trees of questions e.g. for revision sessions.
Ernst Wit (teaching statistics)
Tim Drysdale (electrical engineering)

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Class test: Feedback to <u>learners</u>

But feedback to learners is crucial too.

The class test:
30 minutes privately working out their answers
5 mins keying them in
Then Lecturer goes through the aggregated answers, explaining the right answers, and responding to questions.

Essential point: solo work, on the spot marking, explanatory feedback that is not a monologue (guessing what learner needs to hear) but interactive I.e. dialogic
This is actually better than standard "good" practice

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Student-generated PDP

Elicit from a class e.g. at induction, what their main concerns are about the course e.g. money, passing exams, ….
Get first solo contributions
Then discuss in 4s, and each group sends up one
Then plenary assembles a short list

Vote on how important each is

Part 2: Introduce mentors (previous students) to discuss possible solutions for each concern on the short list.

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Which one of these do you most want me to say more about?

1. Mazur's peer instruction
2. Student-generated questions
3. Diagnostic trees of questions
4. Class exam with instant interactive feedback
5. Student-generated PDP sessions

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Part E.

Evidence that EVS is (almost) always seen as good => safe to try

Draper & Brown, 2004

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Does it work? Evaluation overview

<u>Exam results</u>: At Strathclyde in Mechanical Engineering, first year dropouts have were 20% in 1998, but since using EVS are 3%.

<u>Attendance</u> (when voluntary): in Glasgow Statistics large group tutorials for level 2: rose from roughly 20 to 80 (out of 200) when EVS introduced.

<u>Attitude data</u>: (see handout) over all the applications at Glasgow, in all cases except one, a large majority of students said it was of overall benefit.
The same is true of teachers.

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Net benefit as judged by students

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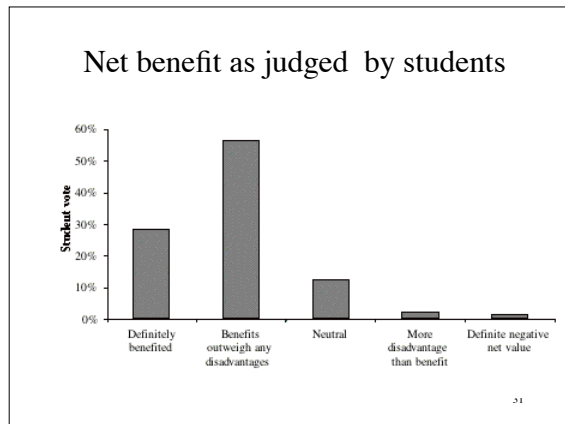
Part F.

Another angle

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Question for discussion

When does most of the learning in HE happen?

1. At the moment the teacher speaks
2. During the lecture: could test it at the end of the hour
3. During the following 24 hours
4. During the following month
5. During revision for exams
6. Years later

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What will you do with the answers?

One way of looking at EVS use is to ask: what will you, the presenter, do with the responses?

1. (Mazur) Peer discussion not expert answer
2. Nothing. (SAQs. Catalytic assessment argument)
3. Shared information e.g. "demographic" questions
4. Real contingent teaching: vote on which subtopic to do next
5. Collect (and share) real data e.g. questionnaire for whole class, open-ended text input on a topic

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Slideshow vs. Workshop session plans

A slideshow plan, like viewing the neighbours' holiday pix, is a rigid sequence with no branching, no response to the audience's reactions.

A workshop plan may have, say, 3 activities; and within those large periods the content depends on the audience.
Usually, what they produce IS the product of the session.

If what happens does not depend on the learners, what is the point of a face to face meeting?

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Demands on software

However what you need from software depends on your session plan type.
Slideshows are well supported by powerpoint, but also, it only supports slideshows well.
Workshops are usually supported by sheets of paper and flipcharts.

WordWall assumes the opposite: that the presenter will create questions on the spot from "resources", but doesn't represent fixed sequence well.

There are intermediate cases (chunks, <Phil Hanlon>)

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Part G.

Time to take stock,
before ending

Summary (1)

It's safe to introduce (students almost certain to welcome it)
So starting with minimal change to existing habits is OK

But big gains depend not on the technology but on the
teaching method it is used to support.

AND not on generic educational aims but on attacking
specific defects with your current course

Given such a diagnosis, there are many general kinds of
learning activity that EVS can serve

Summary (2): what to do

So what you should do to benefit from EVS adoption:

1. Identify a significant defect in your current course

2. Imagine how EVS could contribute to a solution (a novel
   learning activity) that addresses the defect

3. Implement this redesign (drawing on technical support as
   necessary: you have to focus on the pedagogy, and
   content, and class management, ….

Attitude to EVS

<u>Which of these best describes your attitude to using EVS at this
moment?</u>

1. Already know I'm going to use it

2. Have a good idea and hope it's practicable for me to use it

3. Still waiting for a good idea on why/how to use it

4. Doubt if I'll use it, but might still be convinced

5. Very unlikely to use it

6. Would never use it

7. Too desperate for coffee to answer this thoughtfully

What issues do you want me to talk
about in question time?

The End

All my other answers are hiding somewhere here:
www.psy.gla.ac.uk/~steve/ilig/

… but you can ask me anyway:

Questions?