Clickers in the Classroom:
Supporting Active Learning in Large Group Teaching

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Outline

What are clickers – and how do they work?

Clickers in the context of large group teaching
• CONS

Clickers in context of Active Learning (TeL)
• PROS

10 ways effective use of clickers will support your teaching

Clickers in Action at RCSI

Clickers – The Debate
Clickers: The How & Why

Clickers are an interactive technology that enables lecturers to pose questions to students and answers can be immediately aggregated, analysed, displayed and subsequently discussed in lectures.

Instructors present MCQs (verbally or on screen)

Students click in their answers using remote radio frequency transmitters,

The system instantly collects and tabulates the results, which instructors can view, save, and (if they wish) display anonymously for the entire class to see.

Embodiment of...
- Critical thinking & Teaching by Questioning
  - Socratic Questioning
- Information Transfer
- Peer Instruction
- Social Constructivism
- Active Learning
- Participatory Learning
- Adapting the performance space (amphitheatre or lecture theatre) as a teaching space

... one of many learning technology tools that promote active learning.... Participatory learning helps students to contribute to the classroom discussion and quickly provide feedback to the instructor about their level of understanding or perspective.
Clickers: The Who, and When

c. 1960s - 1992

“Game Approach”
Student Feedback Loop
Faculty / Student Interaction
Class size limits
Research: Students Enjoy it
Stanford & Cornell, 1960s, becomes Commercially available 1992

C. 1999 - 2003

Class discussion
Radio Frequency
Student perception of their learning
Widespread use, 2003

C. 2003 - 2013

Flipped Classroom
BYOD
Impact on Learning Outcomes (Martyn, 2007)
Peer Instruction (Mazur, 2007)
Peer Discussion (Smith et al. 2009)
Clickers: ....and with whom

- 11 - 300+ *

- Nursing, Engineering, Philosophy, Chemistry, etc.

- Variety of Settings
  - Small Group Tutorials
  - Large Group Teaching
  - Co-operative learning
  - Team Based Learning
  - PBL
  - Peer Instruction

* Smith, Trujillo & Su, 2010; Draper & Brown, 2004
Make sure clicker channel number is set to 41. If not, change it by doing the following:

1. Press “Ch” button
2. Press “4” button
3. Press “1” button
4. Press “Ch” button to save
5. Feedback button
Question 1: How experienced are you in teaching with Clickers

A. I have never used clickers.

B. I’m just getting started with clickers.

C. I’m comfortable with the basics.

D. I’m a power user.
Question 2: Which of the following is the most significant challenge to engaging students in deep learning in your classes?

A. Students are hesitant to speak up in front of their peers.

B. Students focus on taking notes, not engaging.

C. Students do not prepare adequately for class

D. Students do not prepare adequately for class

E. Something Else
Clickers in the context of large group teaching

Martina Crehan
The lecture

“The lecturer must guide this collection of individuals through territory the students are unfamiliar with, towards a meeting point, but without knowing where they are starting from, how much baggage they are carrying, and what vehicle they are using.” (D. Laurillard 1993).
Limitations of lecture

Figure 1. Level of Performance During a Lecture

Source: Bligh, 1972
Figure 2 - bowing effect counteracted with pauses
We may be preparing good clickers, but are we preparing thoughtful students?
I DID IT MY WAY...

IN REGARD TO LEARNING FROM THE 'X FACTOR' WE MAYBE SHOULDN'T HAVE STOPPED WITH THE AUDIENCE RESPONSE SYSTEM
The “Caveat Emptor” Studies

• Decline in student engagement (Carnagahan and Webb 2007)
• strong evidence for increases in test scores and/or course grades associated with the use of clickers minimal (Draper & Brown, 2004; Judson & Sawada, 2002).
Background Information

Audience Response Systems (ARS) are a technology used in classrooms that consist of an input device controlled by the learner, a receiver, and a display device connected to the receiver (Cain & Robertson, 2008).

An affordable ARS was marketed in 1999, and by 2003 it began to have widespread use in postsecondary institutions (Abrahamson, 2006; Kay & LeSage, 2009).

Health professions training programs have increasingly implemented ARS.

To date, there have been no systematic reviews evaluating the effects of ARS in health professions training programs despite increasing number of studies in this field.

Review Characteristics

This review protocol was prospectively registered with BEME (see flow diagram).

Total number of participants involved in the included trials reviewed was 2,637.

The 21 included trials describe undergraduate (13), graduate (6), and professional (2) education in the fields of medicine, nursing, pharmacy, veterinary medicine and dentistry.

Kirkpatrick's learning outcomes were used to categorize and evaluate each trial (Kirkpatrick, 2006). All 21 trials were rated as Level 3 or 4.

Assessment of Methodological Quality

Type of study | Number | Common sources of bias
---|---|---
Randomized controlled trials | 9 | 1. Incomplete randomization 2. Incomplete data presentation
Cohort studies | 10 | 1. Incomplete comparison of cohorts 2. Incomplete participant follow up
Non-randomized controlled trials | 2 | 1. Inadequate blinding

Results

- Learner reaction to the ARS was nearly all positive.
- The RCTs showed no significant difference between immediate or long-term knowledge scores.
- The non-randomized studies demonstrated a significant, moderate effect of ARS favoring ARS for both immediate and long-term knowledge.
- However, the latter analysis was based on only one trial.
- The most significant impact was observed when ARS was used as a tool for summative assessment.
STUDENT AS PRODUCER

Student as Producer restates the meaning and purpose of higher education by reconnecting the core activities of universities, i.e., research and teaching, in a way that consolidates and substantiates the values of academic life. The core values of academic life are reflected in the quality of students that the University of Lincoln aims to produce. Student as Producer emphasises the role of the student as collaborators in the production of knowledge. The capacity for Student as Producer is grounded in the human attributes of creativity and desire, so that students can recognise themselves in a world of their own design.

WHAT IS STUDENT AS PRODUCER?

Student as Producer is a development of the University of Lincoln’s policy of research-informed teaching to research-engaged teaching. Research-engaged teaching involves more research and research-like activities at the core of the undergraduate curriculum. A significant amount of teaching at the University of Lincoln is already research-engaged. Student as Producer will make research-engaged teaching an institutional priority, across all faculties and subject areas. In this way students become part of the academic project of the University and collaborators with academics in the production of knowledge and meaning. Research-engaged teaching is grounded in the intellectual history and tradition of the modern university.

WHO IS STUDENT AS PRODUCER?

The focus of Student as Producer is the undergraduate student, working in collaboration with other students and academics. Undergraduate students will work alongside staff in the design and delivery of their teaching and learning programmes, and in the production of work of academic content and value. Students will be supported by student services and professional staff so they can take greater responsibility not only for their own teaching and learning, but for the way in which they manage the experience of being a student at the University of Lincoln. Staff and students can apply for development funds to the Undergraduate Research Opportunities Scheme (UROS) and the Fund for Educational.
Pedagogy before Technology
Clickers in the context of Active Learning

Catherine Bruen
**Breaking News…. During Lectures, Students’ Physiological Arousal Flatlines…**

Eric Mazur’s model of peer instruction with Clickers

*From Questions to Concepts: Interactive Teaching in Physics*

**MIT Study on Electrodermal Activity (EDA)** by Picard, R. (2010) where subjects were fitted with **wristbands** that measured skin conductance as an index of the “arousal associated with emotion, cognition and attention.”

Research shows that students must be active participants in the learning process in order for deep learning to occur (Mayer et al., 2009).
Active learning engages students in two aspects – doing things and thinking about the things they are doing

(Bonwell and Eison, 1991).
Active Learning

- *Modern Students are active learners and lecture courses may be increasingly out of touch with how students engage their world*
  - Guthrie & Carlin

Seven Principles of Good Practice in Higher Education
  - Chickering & Gamson, 1987

1. Encourages contact between students and faculty,
2. Develops reciprocity and cooperation among students,
3. Encourages active learning,
4. Gives prompt feedback,
5. Emphasizes time on task,
6. Communicates high expectations, and
7. Respects diverse talents and ways of learning.
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<th>Pedagogical Theories (Active Learning + Clickers)</th>
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<td>Active Learning (Bonwell &amp; Eison)</td>
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<td>Think-pair-share</td>
<td>Games</td>
<td>Agile teaching (Bruff)</td>
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<td>PBL &amp; CBL</td>
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<td>Spacing Effect (Greene)</td>
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**Active Learning in a Blended Ecosystem**
Pedagogical value of using clickers

*Primum non nocere* for Learning Technologists
*Pedagogy before Technology*

No technology automatically enhances learning; rather, it must be used thoughtfully and deliberately to advance the learning objectives of a particular course or learner.

**Activity**
- Engaging students and motivating learning (ARCs model of motivation, Keller 1983)
- Learning Novelty value – perceptual arousal of attention
- Test newly acquired knowledge (relevance & confidence)
- Feedback on performance (satisfaction)

**Expectations**
- Monitor students’ understanding of course content in real time
- Improve student future orientation
- Identify class goals
- Moving context out
- Formative feedback on learning
Pedagogical value of using clickers

Cooperation
- Elicit student participation and engagement to prompt deeper thinking about a particular question or problem.
- Identify and address areas of confusion and adjust the pace of the course appropriately.
- Just in time learning - fine-tuning instruction based on student responses.

Interaction
- Spark discussion among students as they compare, justify, and (perhaps) modify their answers.
- Interaction in lectures with mobile devices + Team based learning
- Understanding fundamental concepts;
- Catalyze debate and discussion, turning a passive lecture into an interactive exchange.
Pedagogical value of using clickers

Diversity
• Anonymity - gives all learners a voice (confidence)
• Controversial or Ethical Issues

Responsibility
• Provide students with instant feedback on their comprehension to help them monitor their own understanding.
• Efficiently deliver and grade formative assessment (in-class quizzes), to hold students accountable to learning contract
• Gauge understanding of their learning
• Validate their own learning, helping them identify areas that need improvement
Best practice for implementing clickers in the classroom

1. Keep slides short & legible
2. Max of five questions per hour
3. Don’t make questions overly complex
4. …but then, ramp up the complexity to keep them engaged
5. Keep the voting straightforward – avoid the complex branching (to start)
6. Allow sufficient time for answering
7. Allow discussion and / or feedback between questions
8. Encourage active discussion
9. Think about your lesson plan, and position questions at periodic intervals
10. Test the system on site and rehearse
11. Provide clear instructions and rationale to students and allow time for clickers to be distributed
12. Do not overuse or it will lose its “engagement” potential
13. …….Talk to Niall Stevens, Helene McDermott & the Microbiology team!

Refs: Robertson (2000), Martyn (2007), Duncan (2005), Beatty (2004), Turning Point Technologies
Peer Instruction

Lecturers poses a questions

Student answers independently

Lecture views the results

If students are split, have them discuss in pair & revote

Majority correct, Briefly discuss & move on

Majority Incorrect, back track

Lecturer leads class wide discussion

Good questions = Deep Learning

- Misconception Questions
- Student Perspective Questions
- Critical Thinking Questions
- Peer Assessment Questions
Not just a case of snapping your fingers.....
Phil, the professor hasn't asked us to click yet!

I'm trying to change the damn channel!
Clicker Pilot at RCSI

- Microbiology (Prof. Hilary Humphries, Dr Niall Stevens, Dr Helene McDermot & the team)
- Multidisciplinary Teaching (MDT) programmes for IC1
- Clinical Microbiology (lead), Departments of Surgery, Pathology and Radiology
- Rehearsal – 14th Nov 2013
- Research pilot begins – Jan 2014
- Aim: To assess the impact on learning and the benefit(s) of using an interactive student response system or “Clicker” in an undergraduate medical multidisciplinary session while also measuring the attitudes of the student body to the use of such devices during large group teaching.
To click or not to click?

A. Can’t wait, sign me up!

B. I need to reflect a little and weigh up the pros and cons

C. Hmmmmm, Jury’s Out

D. No
Key Reading


