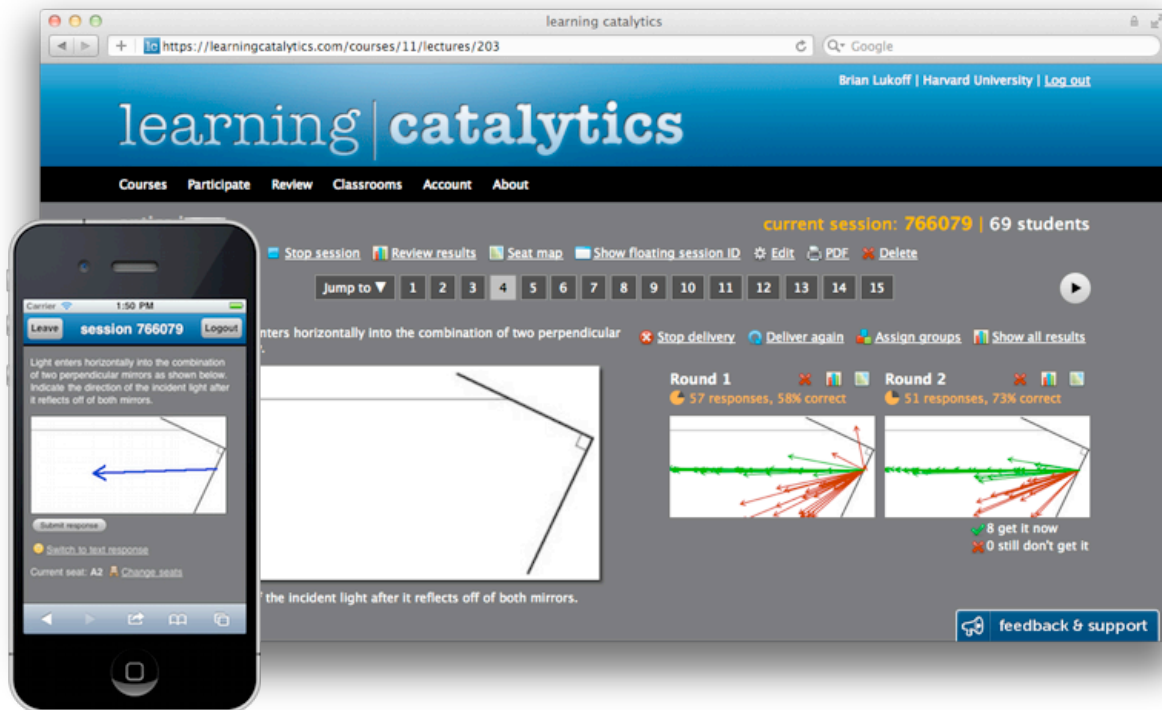


Peer Instruction 2.0: The Next Generation of Catalyzing Learner Engagement in STEM Classrooms



The Education Group: HHMI/MIT Biology
MIT
Cambridge, MA
10 May, 2012

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Brian Lukoff
Postdoctoral Fellows
Harvard University
School of Engineering and Applied Sciences



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Outline

Teaching and Learning in STEM education

- Problems
- Solutions
- Learning Catalytics

Problems: Learning

Students are

not **learning** effectively

unprepared for advanced work

not **retained** in STEM majors

lacking **attachment** to STEM careers

Problems: Teaching

Teachers are not

teaching effectively

helping students learn best

preparing students

inspiring students to stay in STEM
or attach to to STEM careers

Solutions: Interactive Teaching

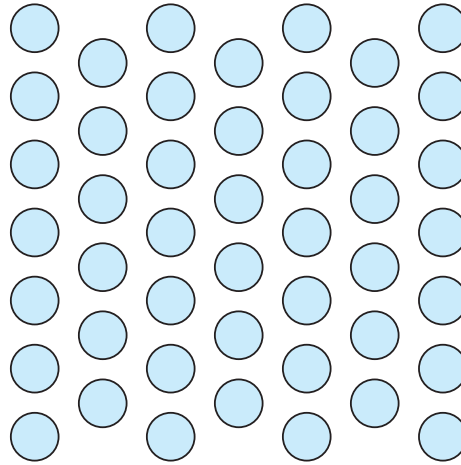
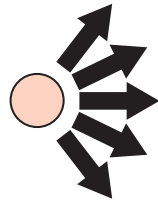
“[Science] should be taught in a rational way, objects and instruments in hand—not from books merely, not from memory chiefly, but by the seeing eye and the informing fingers...to develop and discipline those powers of the mind by which science has been created and is daily nourished—the powers of observation, the inductive faculty, the sober imagination, the sincere and proportionate judgment. A student in the elements gets no such training by studying even a good text-book, though he really master it, nor yet by not sitting at the feet of the most admirable professor.”

Solutions: Interactive Teaching

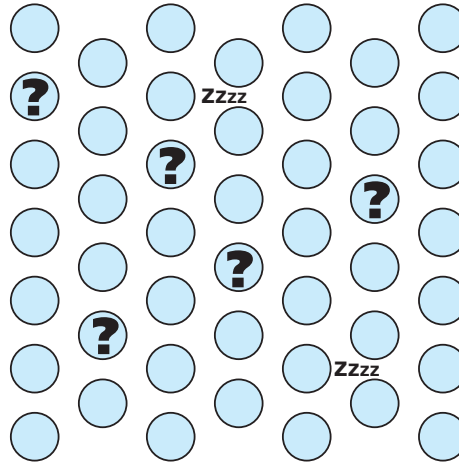
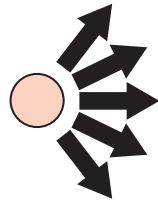
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Charles Eliot, Harvard University 1869

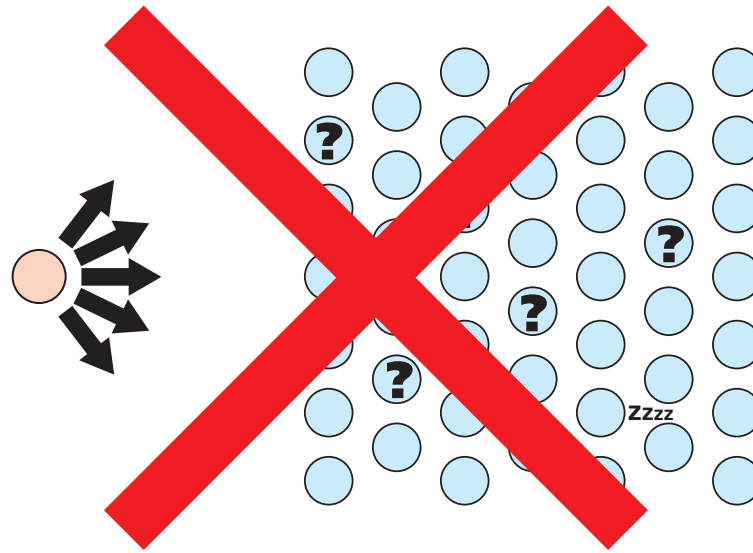
Solutions: Interactive Teaching



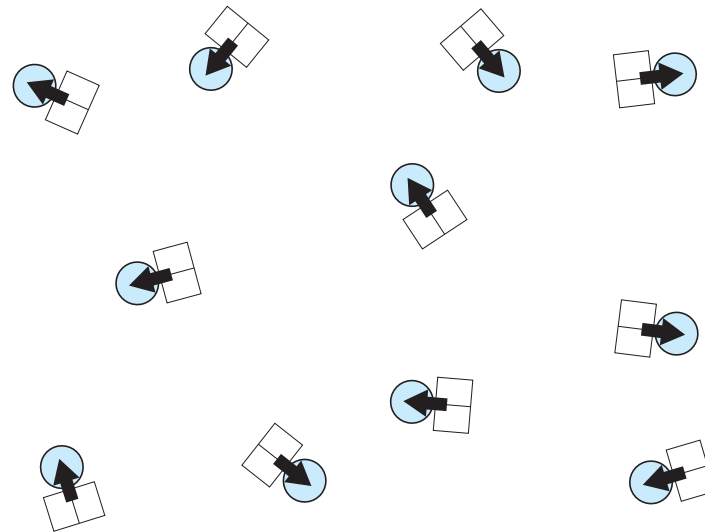
Solutions: Interactive Teaching



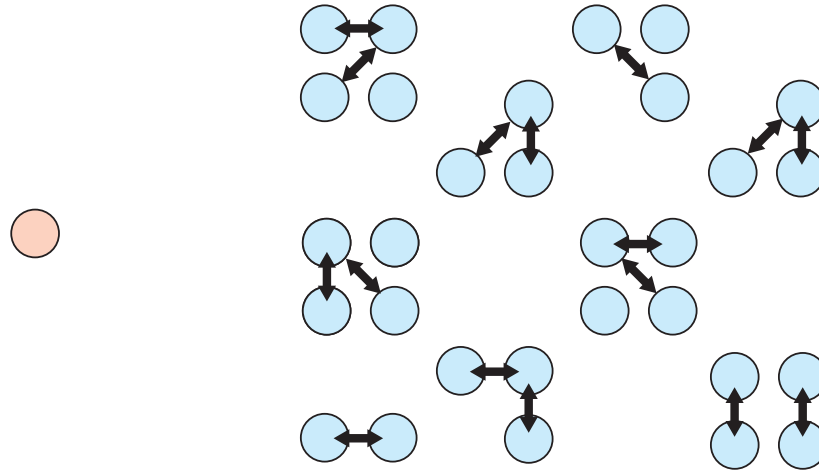
Solutions: Interactive Teaching



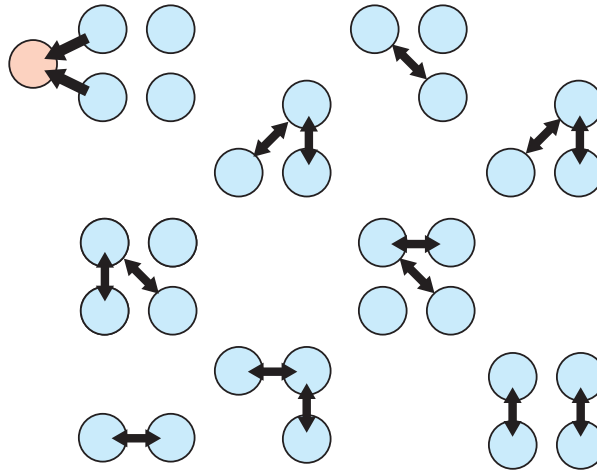
Solutions: Interactive Teaching



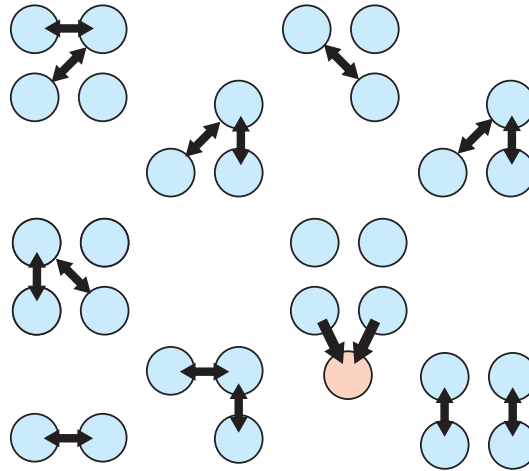
Solutions: Interactive Teaching



Solutions: Interactive Teaching



Solutions: Interactive Teaching



Solutions: Interactive Teaching

Peer Instruction

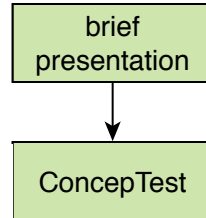
Solutions: Interactive Teaching

Peer Instruction

brief
presentation

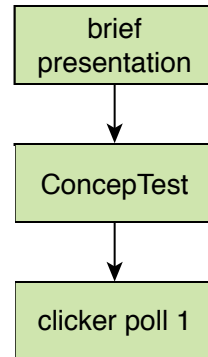
Solutions: Interactive Teaching

Peer Instruction



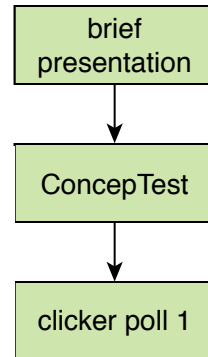
Solutions: Interactive Teaching

Peer Instruction



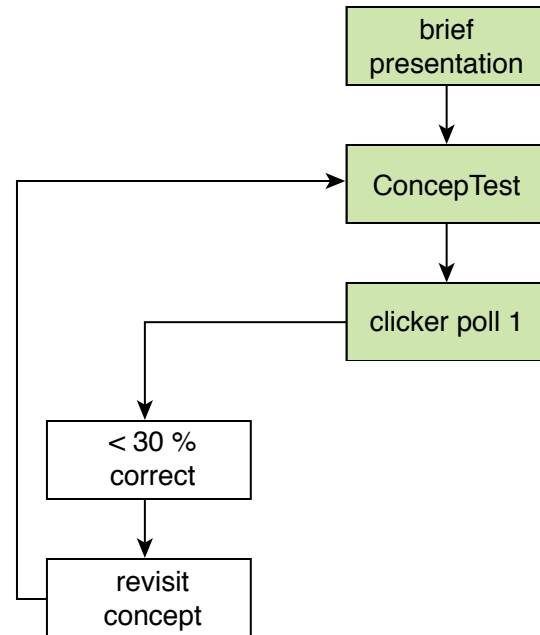
Solutions: Interactive Teaching

Peer Instruction



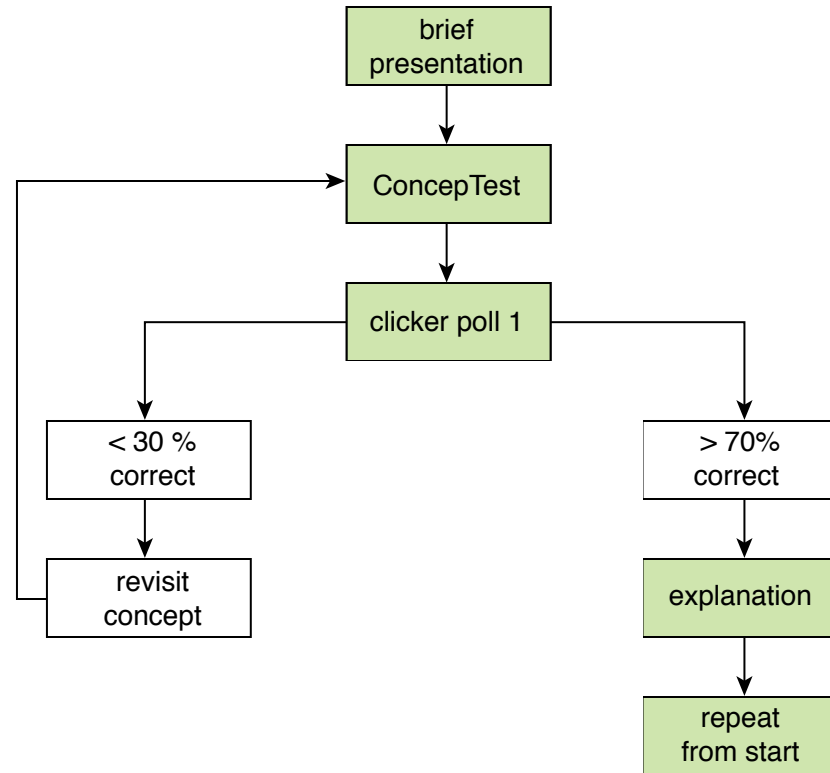
Solutions: Interactive Teaching

Peer Instruction



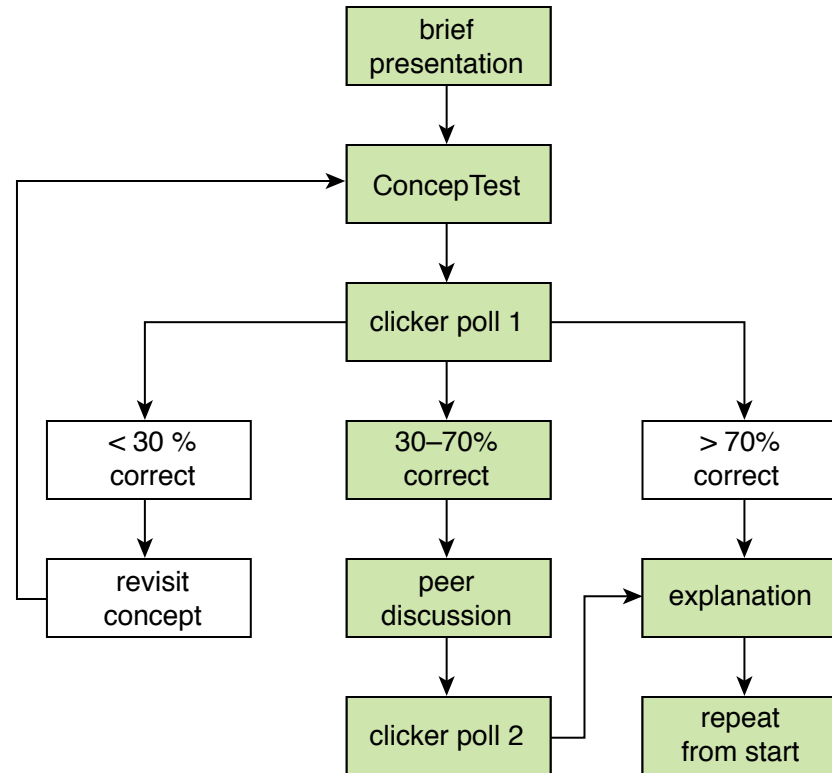
Solutions: Interactive Teaching

Peer Instruction



Solutions: Interactive Teaching

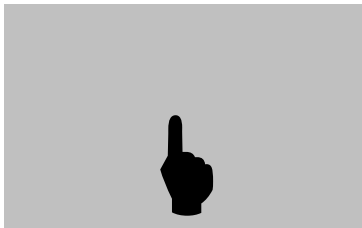
Peer Instruction



Solutions: Interactive Teaching

Peer Instruction

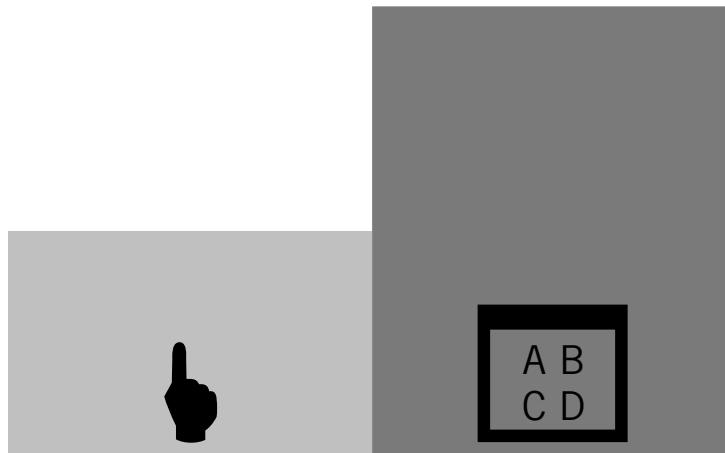
Evolution of Audience Response Systems



Solutions: Interactive Teaching

Peer Instruction

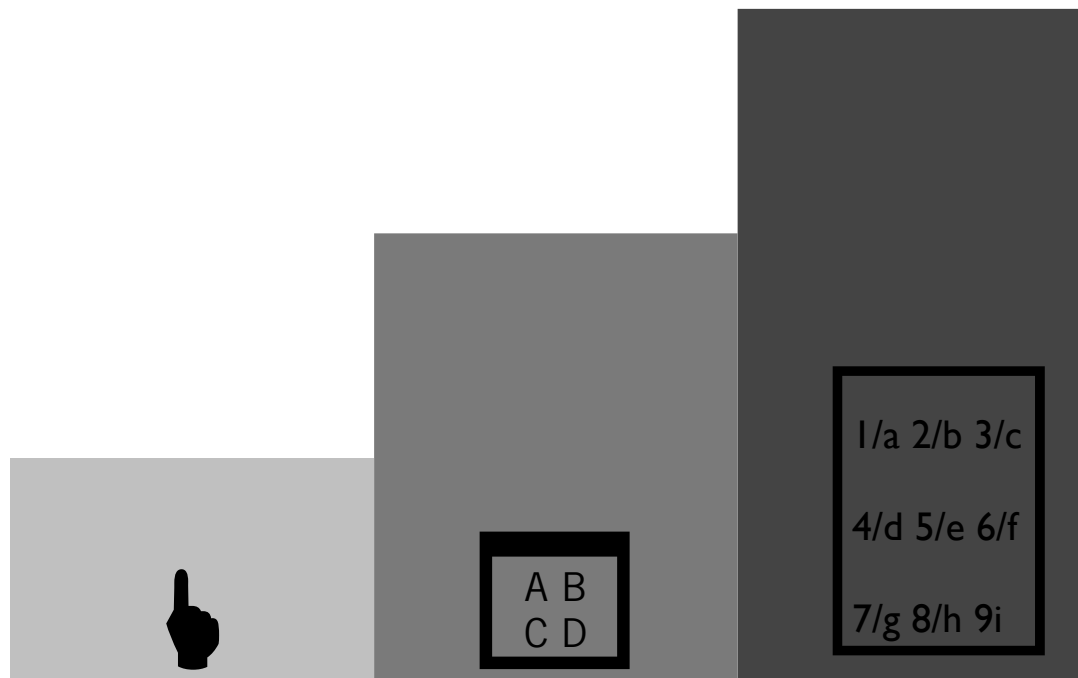
Evolution of Audience Response Systems



Solutions: Interactive Teaching

Peer Instruction

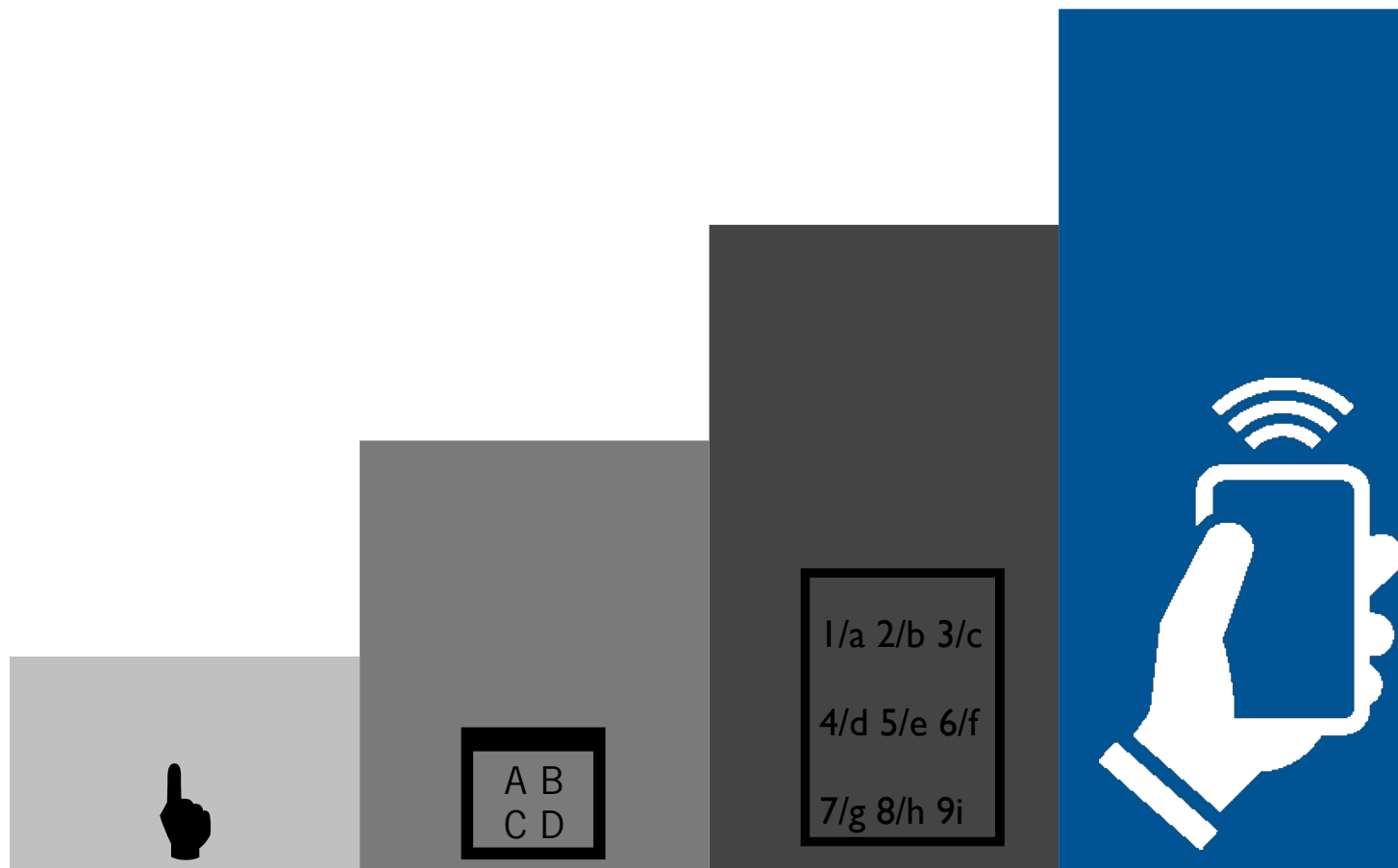
Evolution of Audience Response Systems



Solutions: Interactive Teaching

Peer Instruction

Evolution of Audience Response Systems



Limitations: Interactive Teaching

Limitations to current solutions

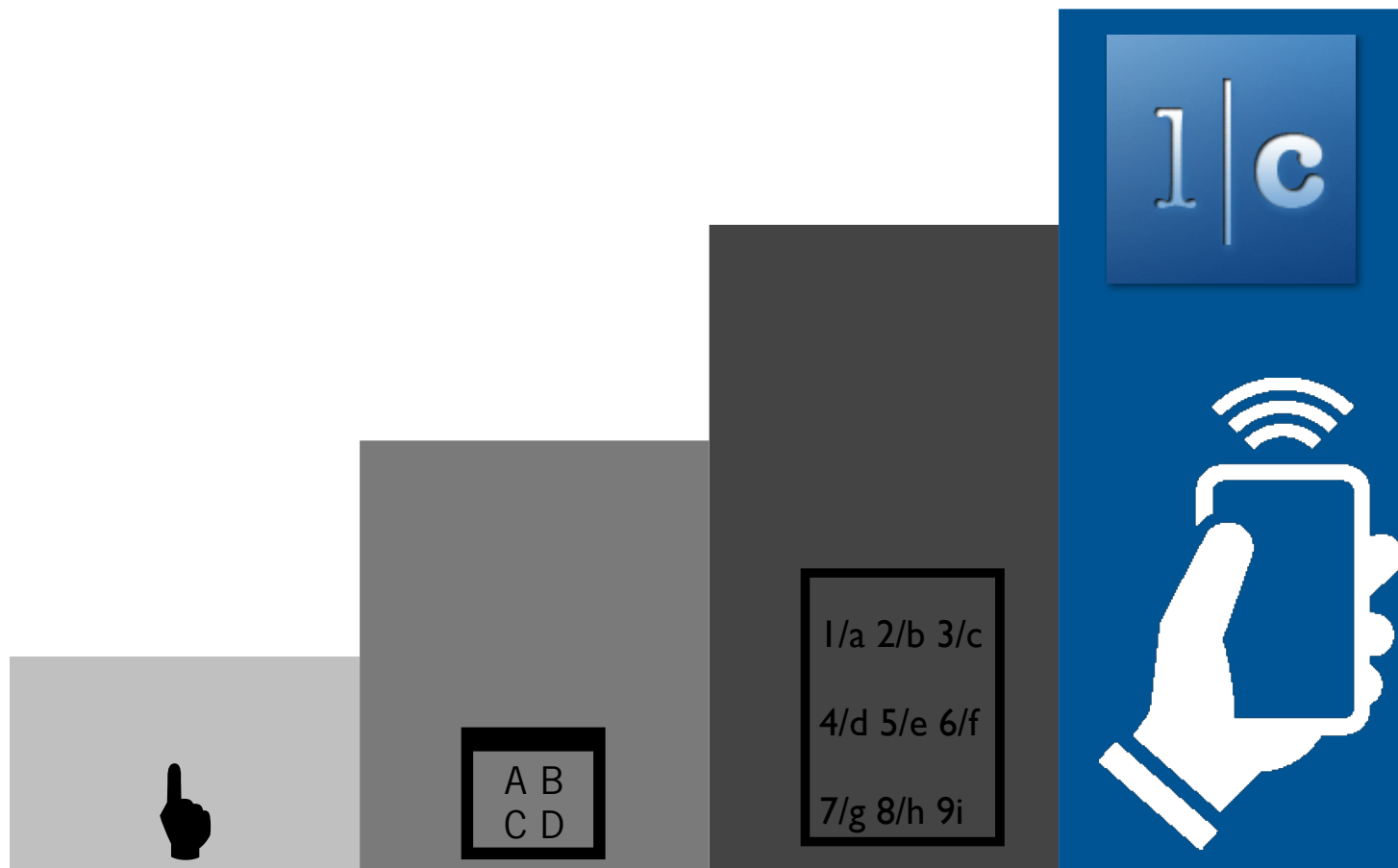
Largely restricted to multiple-choice questions

Limited productivity of some peer instruction groups

Solutions: Interactive Teaching

Peer Instruction

Evolution of Audience Response Systems

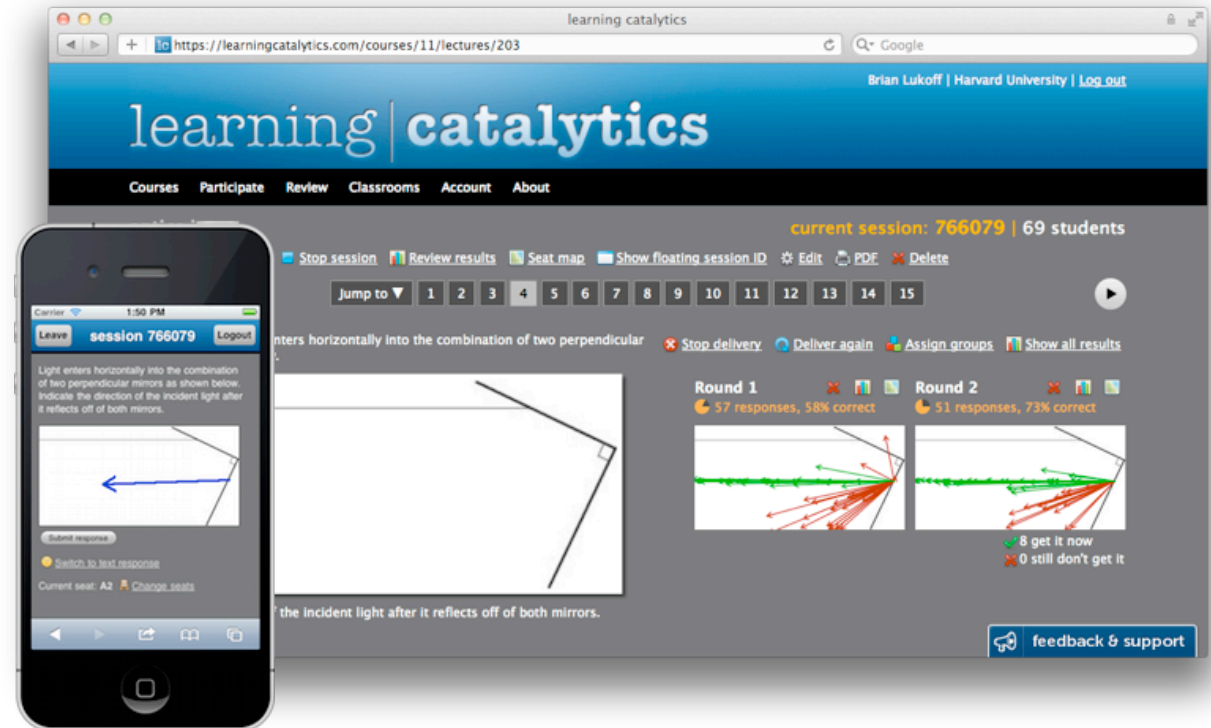


Learning Catalytics (learningcatalytics.com)

**Cloud-based technology
- students “BYOD”**

**Piloted for the first time
in Spring 2011**

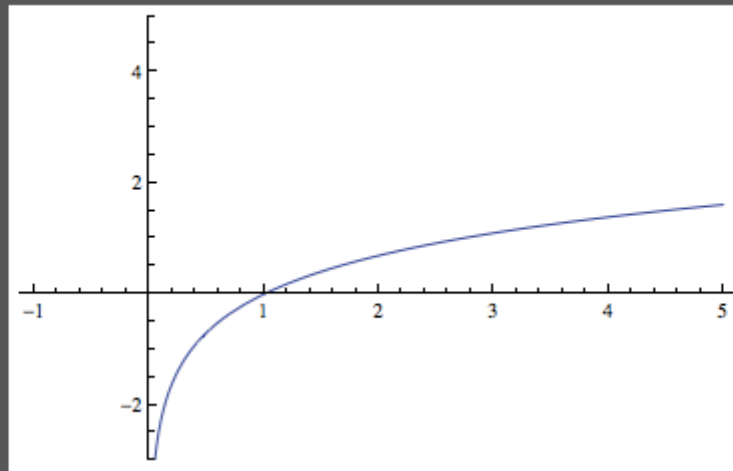
**Now used both in K-12
and higher education
(including the Singapore
University of Technology
and Design)**



Not restricted to multiple-choice questions

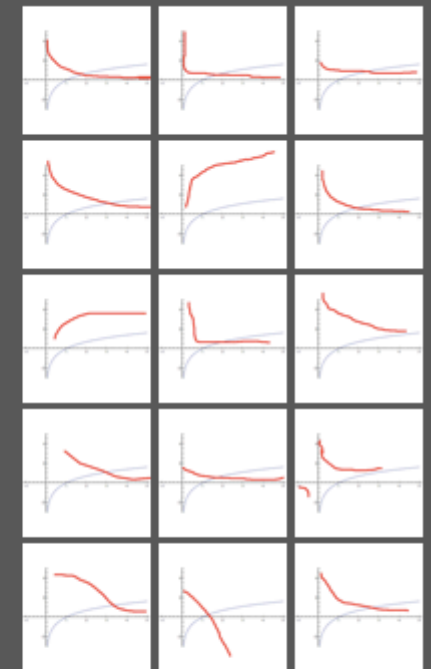
Learning Catalytics (learningcatalytics.com)

This is a graph of $f(x) = \ln x$. Sketch a graph of the derivative $f'(x)$.



Round 1

15 responses





✓ 6 get it now
✗ 0 still don't get it

Learning Catalytics (learningcatalytics.com)

2. word cloud Now describe in a couple of words how you became good at whatever it is you entered in the previous question.

[Deliver](#) [Show all results](#)

Round 1  

● 123 responses

experiences

learning observing

reading people being

experience time

practice

work others school

working through family

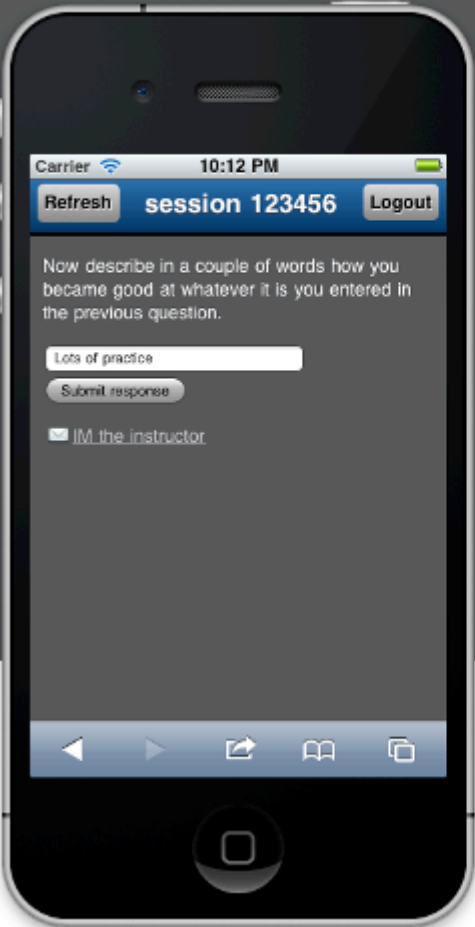
good

watching many

listening



✓ 61 get it now

✗ 4 still don't get it



The smartphone screen displays the Learning Catalytics interface. At the top, it shows 'Carrier', signal strength, and the time '10:12 PM'. Below this is a blue header bar with a 'Refresh' button, the session ID 'session 123456', and a 'Logout' button. The main content area contains the question text: 'Now describe in a couple of words how you became good at whatever it is you entered in the previous question.' Below the text is a text input field containing 'Lots of practice', a 'Submit response' button, and a message 'IM the instructor' with an envelope icon. At the bottom of the screen is a navigation bar with icons for back, forward, share, book, and a document icon.

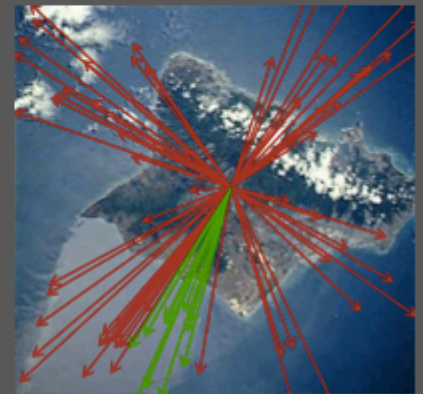
Learning Catalytics (learningcatalytics.com)

4. direction This image shows Oahu as seen from the Space Shuttle. The image provides several clues about the direction of prevailing winds in Oahu. Indicate this direction by drawing an arrow on your screen.  [Deliver](#)  [Show all results](#)



Round 1  

77 responses, 16% correct



✓ 17 get it now
✗ 3 still don't get it

**Use real-time analytics
to improve discussion productivity**

Learning Catalytics (learningcatalytics.com)

The image displays the Learning Catalytics web interface on a desktop browser and its mobile app interface on a smartphone. The desktop browser shows a course page for Brian Lukoff at Harvard University, featuring a grid puzzle and a multiple-choice question about electrostatics. The mobile app shows the same question and a discussion section.

Desktop Browser Interface:

- URL: <https://learningcatalytics.com/courses/11/lectures/189>
- User: Brian Lukoff | Harvard University | Log out
- Grid Puzzle: A 10x10 grid with letters A, B, and C. The letters are arranged in a pattern that forms a shape resembling a 'C'.
- Question 2: multiple choice. A positively charged rod is held near a neutral conducting sphere as illustrated below. A positively charged particle is moved from point A to point B at constant speed. The potential difference from A to B is
- Diagram: A positively charged rod is held near a neutral conducting sphere. A positively charged particle is moved from point A to point B.
- Options:
 - A. positive
 - B. zero
 - C. negative
 - D. depends on the path taken from A to B
 - E. cannot be determined without knowing more about the polarization induced in the sphere
- Round 1: 74 responses, 61% correct
 - A. 61%
 - B. 4%
 - C. 35%
 - D. 0%
 - E. 0%
- Round 2: 75 responses, 83% correct
 - A. 83%
 - B. 0%
 - C. 17%
 - D. 0%
 - E. 0%

Mobile App Interface:

- Carrier: Carrier
- Time: 11:17 AM
- Session: session 399757
- Logout
- Question: A positively charged rod is held near a neutral conducting sphere as illustrated below. A positively charged particle is moved from point A to point B at constant speed. The potential difference from A to B is
- Diagram: A positively charged rod is held near a neutral conducting sphere. A positively charged particle is moved from point A to point B.
- Please discuss your response with:
 - Brian Lukoff (to your left)
- Green checkmark: I am talking to this person/people

Demo

If you have a laptop, smartphone, iPad, etc:

Go to LCatalytics.com

Click “Create student account”

Click “I have a signup code”

Enter your name, email address, and create a password; use the signup code DEMO

Peer Instruction Network

Connect. Share. Learn.

@julieschell

scholar.harvard.edu/julieschell

blog.peerinstruction.net

learning | **catalytics**

@LCatalytics

learningcatalytics.com