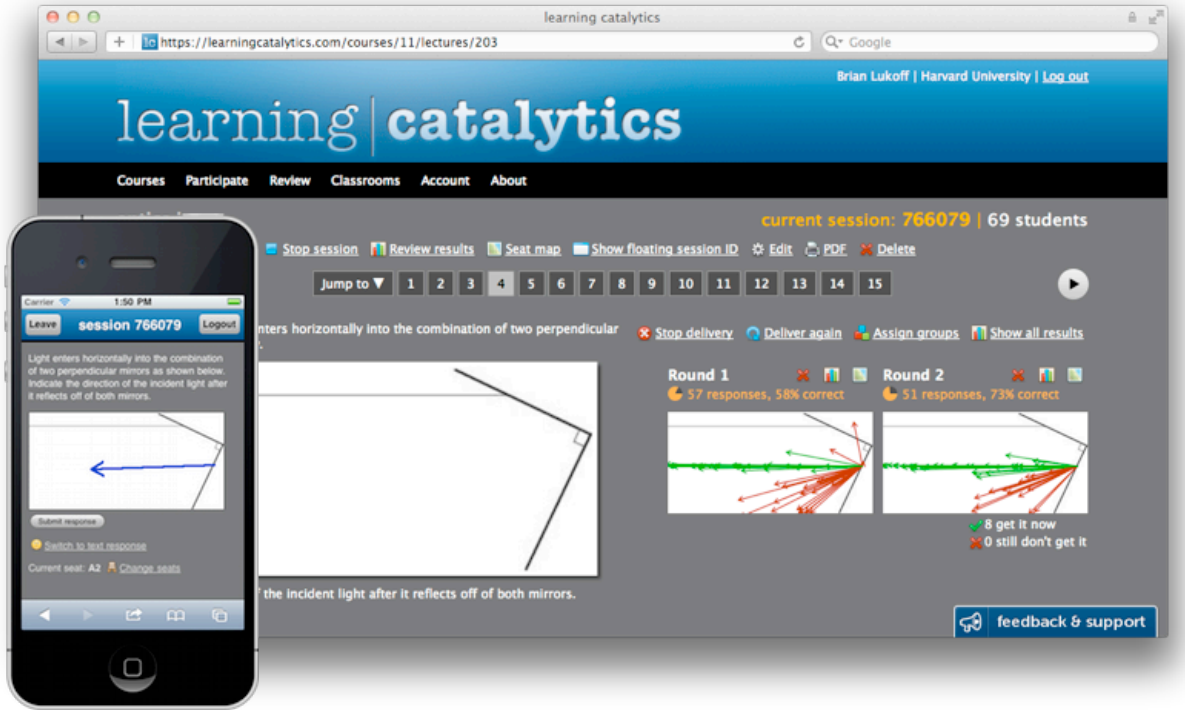
Flipped Classrooms: Web-Based Tools for Facilitating In- and Out-of-Class Engagement



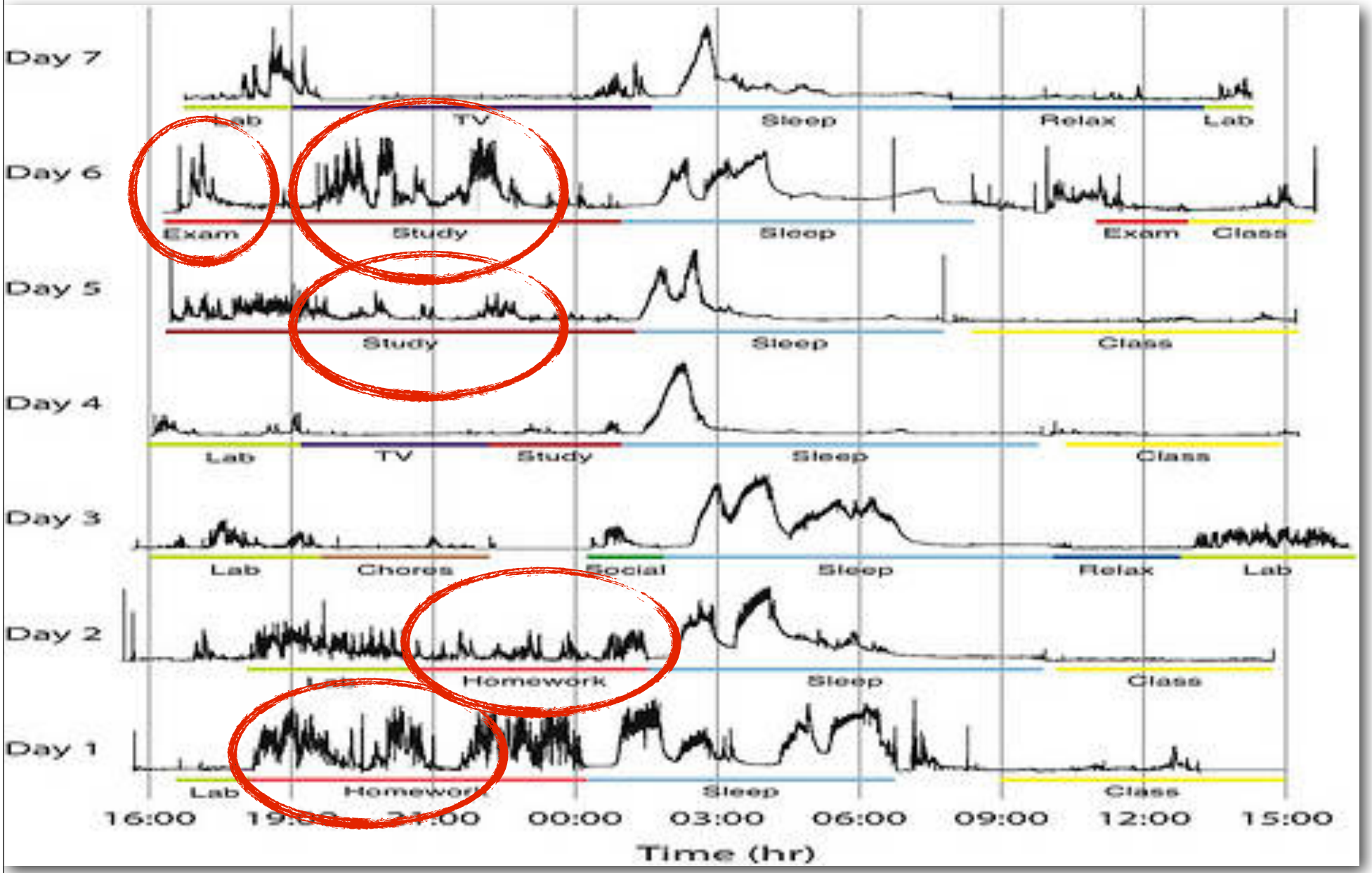
Academic Transformation Series
University of Texas, Austin
Austin, TX
24 Aug, 2012

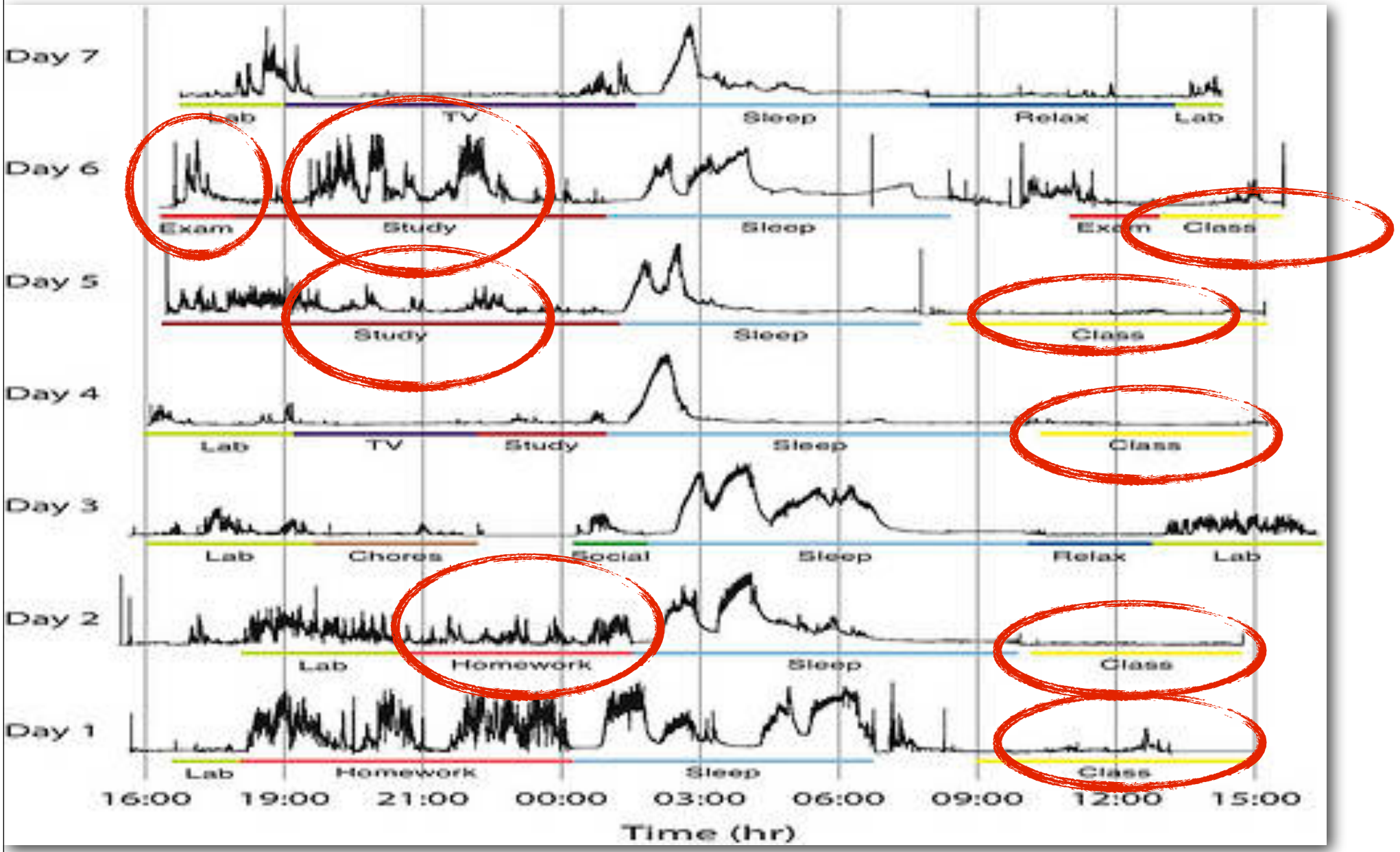
Julie Schell
Research Associate
Harvard University
School of Engineering and Applied Sciences

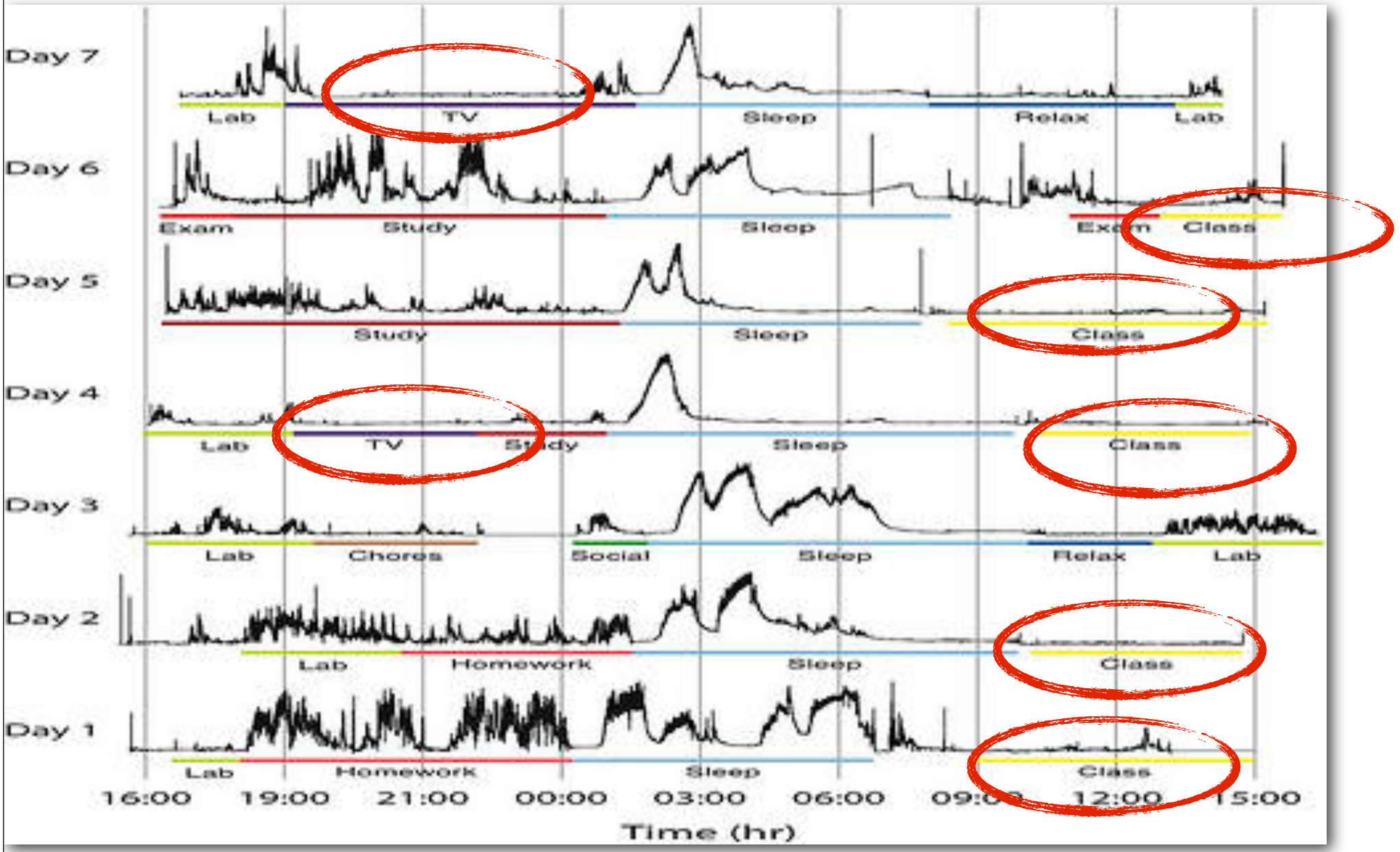
Think of something that you are good at, preferably something that has helped you in your career.

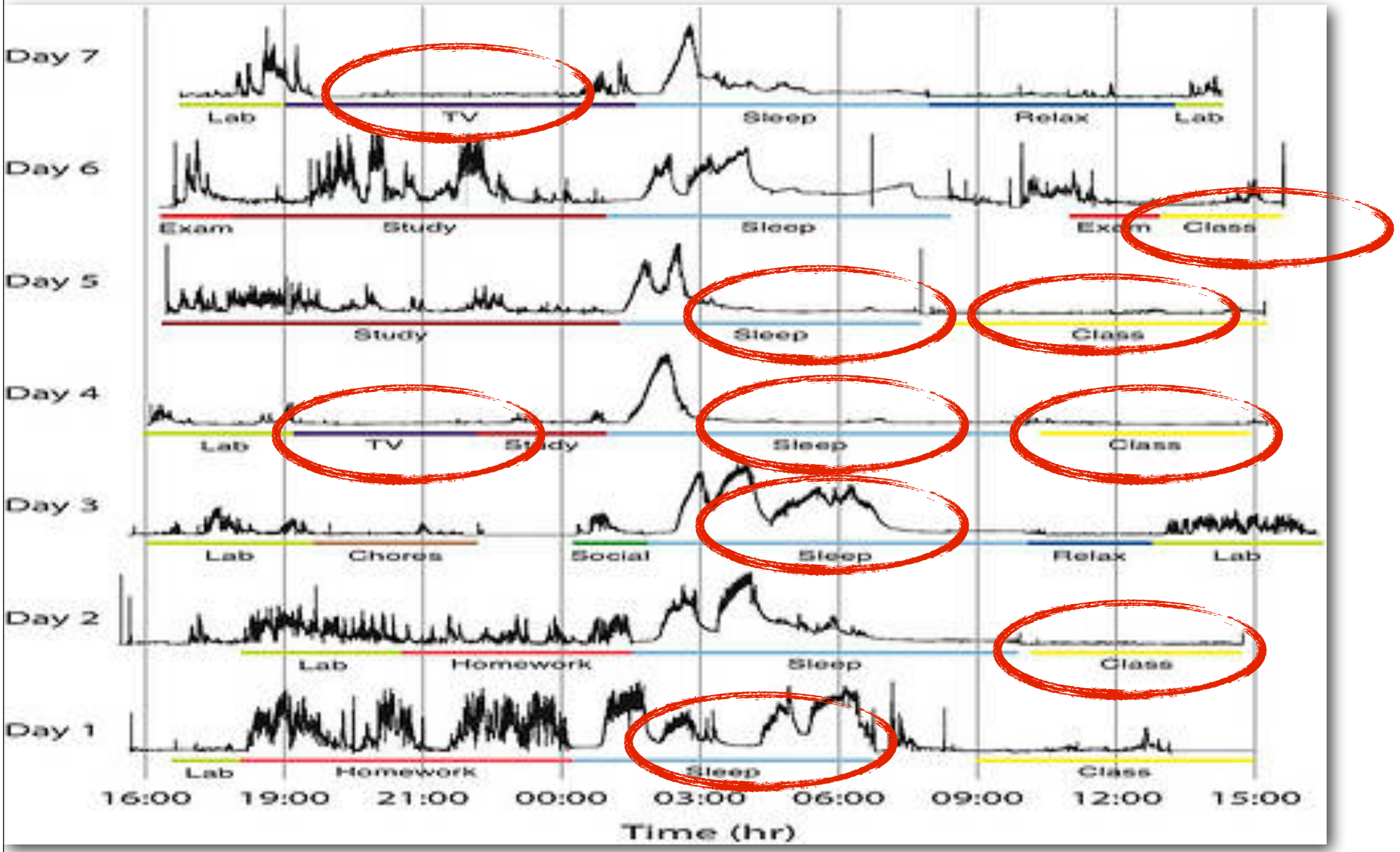
Think of something that you are good at, preferably something that has helped you in your career.

In a few words or a sentence, how did you get good at that skill?

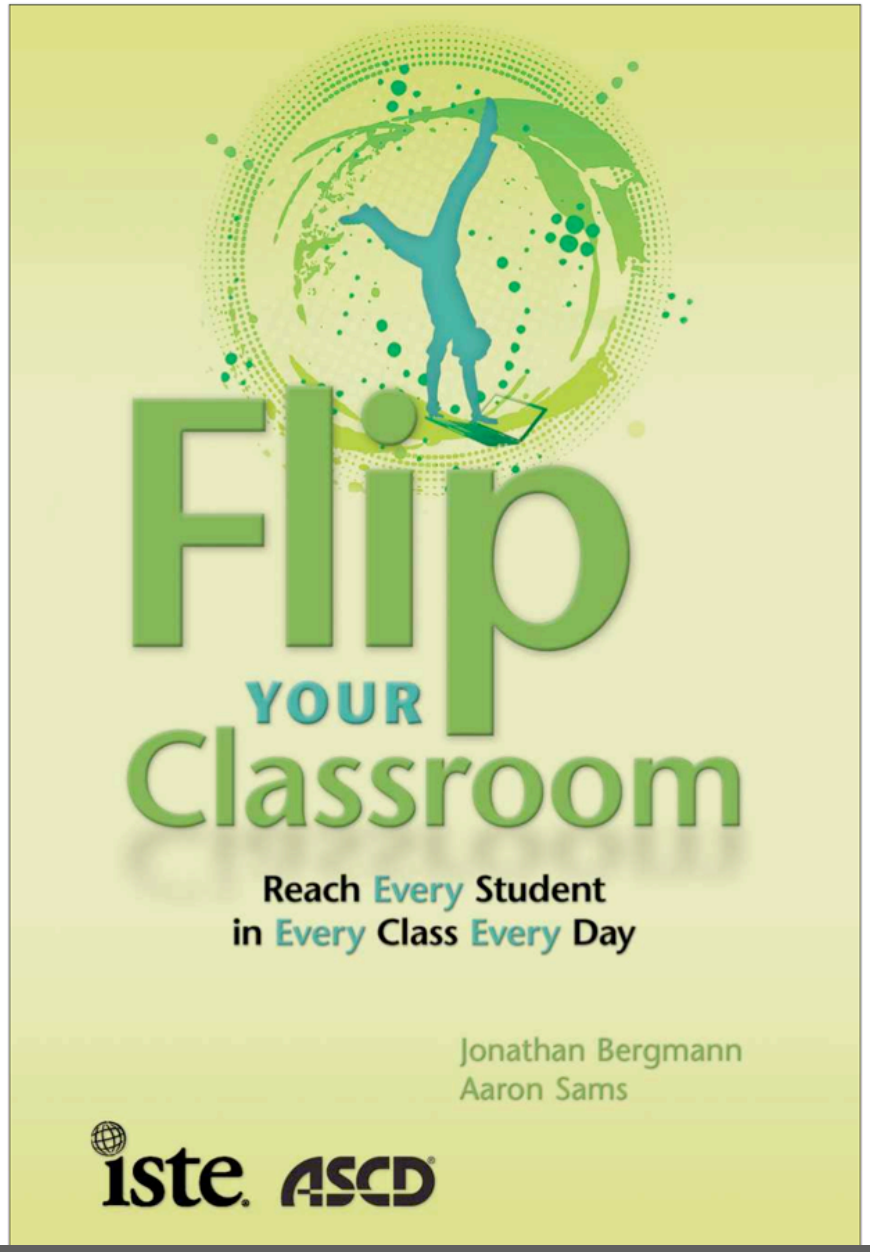

Day 7
Lab
TV
Sleep
Relax
Lab
Day 6
Exam
Study
Sleep
Exam
Class
Day 5
Study
Sleep
Class
Day 4
Lab
TV
Study
Sleep
Class
Day 3
Lab
Chores
Social
Sleep
Relax
Lab
Day 2
Homework
Sleep
Class
Day 1
Lab
Homework
Sleep
Class
16:00
00:00
03:00
06:00
09:00
12:00
15:00
Time (hr)


Day 7
Lab
TV
Sleep
Relax
Lab
Day 6
Exam
Study
Sleep
Exam
Class
Day 5
Study
Sleep
Class
Day 4
Lab
TV
Study
Sleep
Class
Day 3
Lab
Chores
Social
Sleep
Relax
Lab
Day 2
Lab
Homework
Sleep
Class
Day 1
Lab
Homework
Sleep
Class
16:00
19:00
21:00
00:00
03:00
06:00
09:00
12:00
15:00
Time (hr)


Day 7
Lab
TV
Sleep
Relax
Lab
Day 6
Exam
Study
Sleep
Exam
Class
Day 5
Study
Sleep
Class
Day 4
Lab
TV
Study
Sleep
Class
Day 3
Lab
Chores
Social
Sleep
Relax
Lab
Day 2
Lab
Homework
Sleep
Class
Day 1
Lab
Homework
Sleep
Class
16:00
19:00
21:00
00:00
03:00
06:00
09:00
12:00
15:00
Time (hr)


Day 7
Lab
TV
Sleep
Relax
Lab
Day 6
Exam
Study
Sleep
Exam
Class
Day 5
Study
Sleep
Class
Day 4
Lab
TV
Study
Sleep
Class
Day 3
Lab
Chores
Social
Sleep
Relax
Lab
Day 2
Lab
Homework
Sleep
Class
Day 1
Lab
Homework
Sleep
Class
16:00
19:00
21:00
00:00
03:00
06:00
09:00
12:00
15:00
Time (hr)

What is a Flipped Classroom?



What is a Flipped Classroom?

Traditional Class	Flipped class
Lecture happens during class time	Lecture happens at home
Homework at home	Homework in class

What is a Flipped Classroom?

Flipped Class Protocol

Bergmann and Sams version

1. Video record lecture using screencast software

2. Put lecture online and require students to watch the lecture, give them some instruction on how to watch the videos effectively

3. Spend 10 mins during class time talking about the video

4. Do homework problems during class, where you can help students work out issues

What is a Flipped Classroom?

Traditional Classroom		Flipped Classroom	
Activity	*Time*	*Activity*	*Time*
Warm-up activity	5 min.	Warm-up activity	5 min.
Go over previous night's homework	20 min.	Q&A time on video	10 min.
Lecture new content	30–45 min.	Guided and independent practice and/or lab activity	75 min.
Guided and independent practice and/or lab activity	20–35 min.		

Bergmann and Sams, p. 15

What is a Flipped Classroom?

Flipped Class Protocol

Bergmann and Sams version

1. Video record lecture using screencast software

2. Put lecture online and require students to watch the lecture, give them some instruction on how to watch the videos effectively

3. Spend 10 mins during class time talking about the video

4. Do traditional "homework" during class, where you can help students work out issues

Why we vary this method:

1. videos and screencasts too high threshold for most teachers - other people's lectures don't really fit our clasrooms

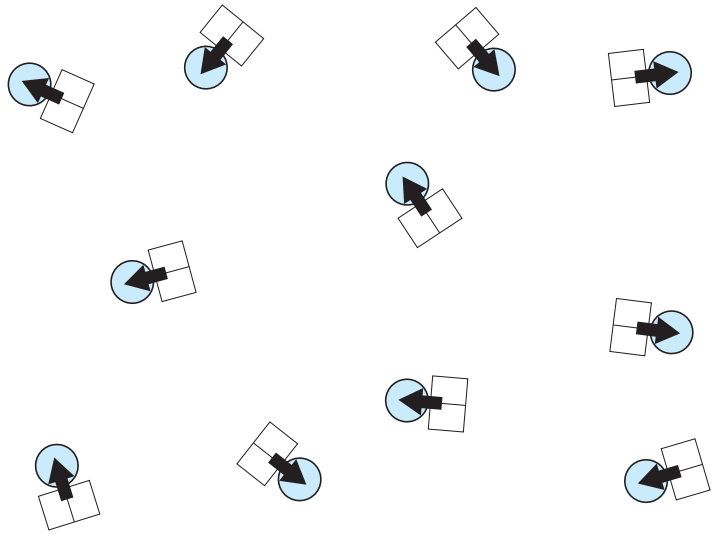
2. unless there is an interactive component, watching lectures at home has the same limitations of watching lectures in class, with the exception that students can reply the information delivery

3. We vary 3 and 4 by engaging in a process that elicits, confronts, and resolves students' misconceptions about subject matter, specifically Just-in-Time teaching and Peer instruction.

Research-based Flipped Classroom

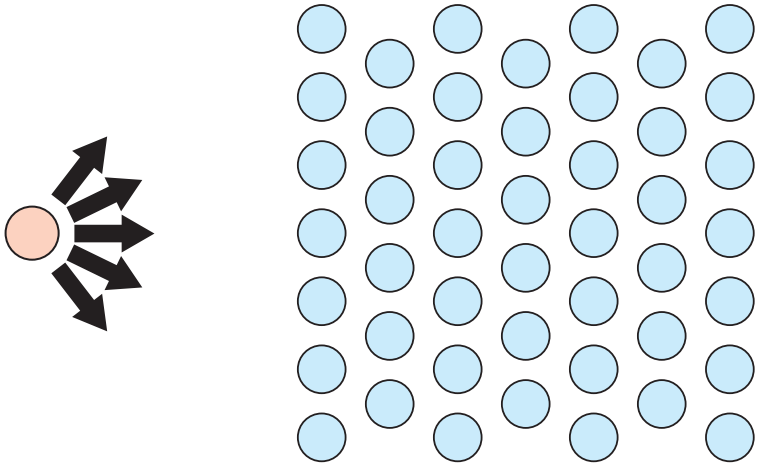
Research-based Flipped Classroom

Students do some kind of interactive subject mater coverage at home



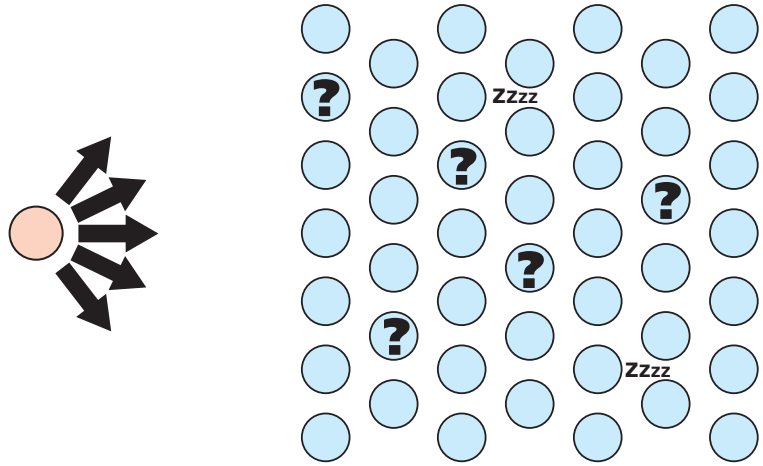
Research-based Flipped Classroom

Using their feedback we lecture a little in class



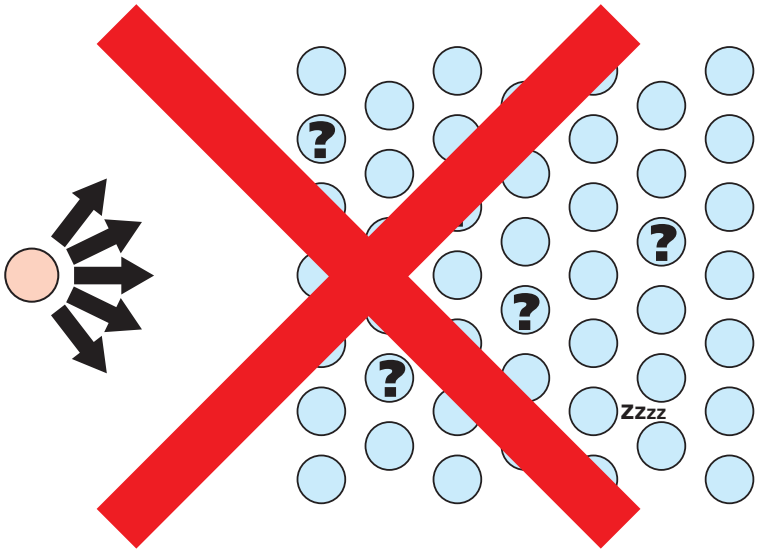
Research-based Flipped Classroom

But only a little bit, lest they fall asleep (which they will)



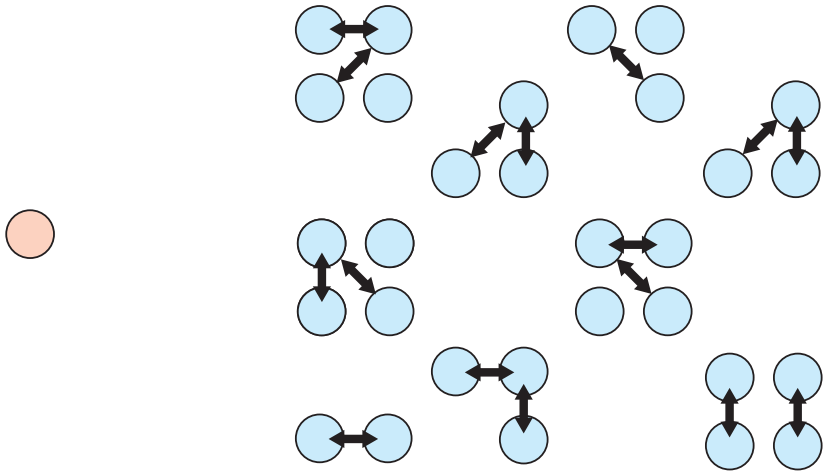
Research-based Flipped Classroom

Which we don't want!



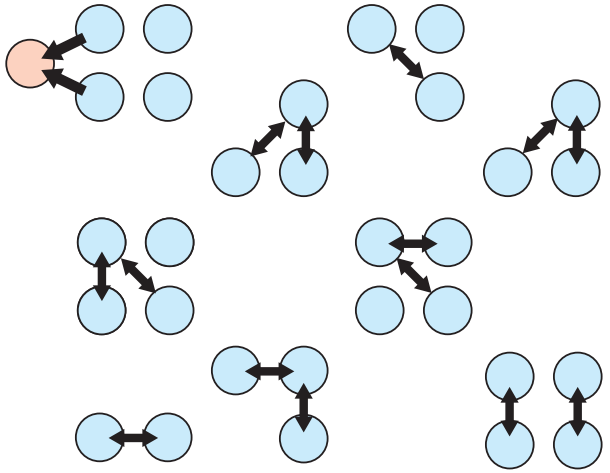
Research-based Flipped Classroom

In class, use questions to elicit, confront, resolve student misconceptions



Research-based Flipped Classroom

Interact with them and help them to use, versus receive, information

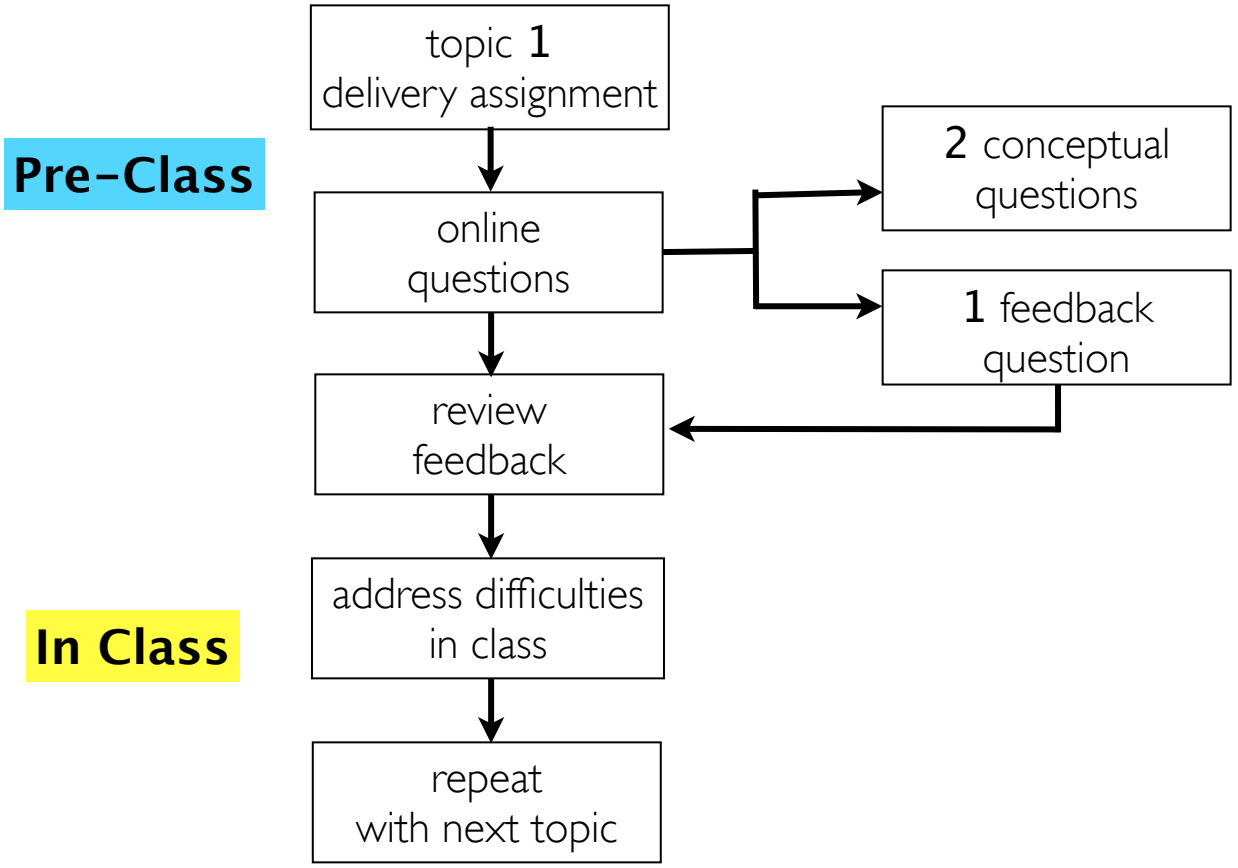


Research-based Flipped Classroom

Tools for out-of-class engagement

Tools

Just-in-Time Teaching



Tools

http://nb.mit.edu

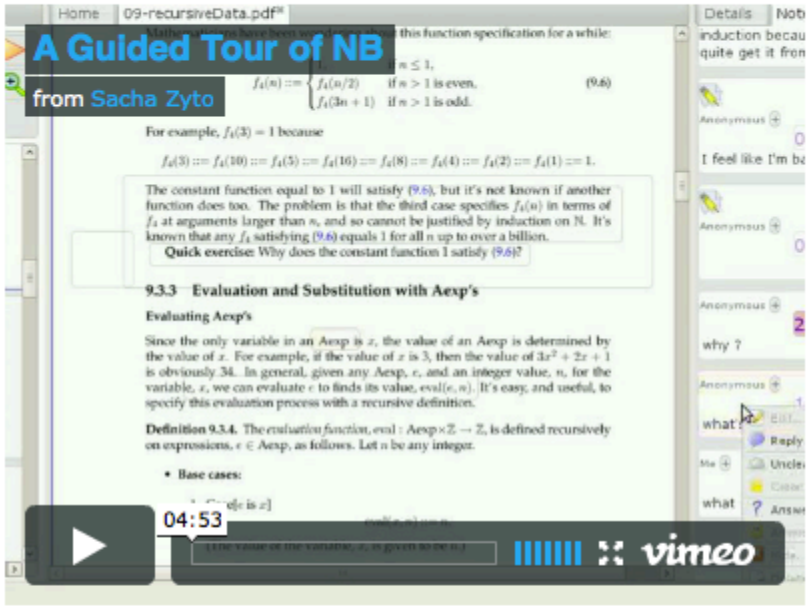
nb

About | New:NB@CHI2012 | Tutorial | Contact Us

Features

With nb, you can annotate course material online, either for yourself, or to discuss it with the class.

- Did you notice something interesting ?
  Jot a note for others to read...
- Do you have a question ?
  Jot it down to get an answer...
- Did you see a question you can answer ?
  Right-click on it to post an answer...
- Do you like or dislike a note ?
  Moderate it up or down...



For Teaching Staff

- See how you can benefit from nb.
- Create a new nb site now
- Take a 5-minute tutorial
- Already a user ? Access your Staff Console

Give it a try now

nb sandbox

Material courtesy: Professor Albert Meyer

Notes in the sandbox may be discarded.

Login

Email

Password

Lost password ?

OK

Tools

strips of tape and various nearby objects, the magnitude of the electric force depends on distance — it decreases as you increase the separation.

22.2 Suspend a freshly pulled strip of transparent tape from the edge of your desk. (*a*) Pull a second strip of tape out of the dispenser and hold it near the first strip. What do you notice? (*b*) Does it matter which sides of the strips you orient toward each other?

As Checkpoint 22.2 makes clear, not all electric interactions are attractive. Even if you increase the mass of the strip by suspending paper clips from them, the repulsion between the strips is large enough to keep the paper clips apart (Figure 22.2). Now place your hand between two repelling strips and notice how both strips fly toward your hand! Then run each tape several times between your fingers and notice how the electric interaction diminishes or even disappears.

22.3 Suspend two freshly pulled 20-cm strips of transparent tape from the edge of your desk. Cut two 20-cm strips of paper, making each strip the same width as the tape, and investigate the interactions between the paper strips and the tape by bringing them near each other. Which of the following combinations display an electric interaction: paper-paper, tape-paper, tape-tape?

22.2 Electrical charge

As we saw in the previous section, electric interacti
are sometimes attractive and sometimes repulsive
addition, the experiment you performed in Checkpo
22.3 demonstrates that paper strips, which do not
teract electrically with each other, do interact elec
cally with transparent tape. What causes th
interactions? To answer this question, we need to ca
out a systematic sequence of experiments.

Figure 22.3 illustrates a simple procedure for rep
ducibly creating strips of tape that interact electrica
A suspended strip created according to this proced
interacts in the following ways: it repels another s
created in the same manner, and it attracts any ot

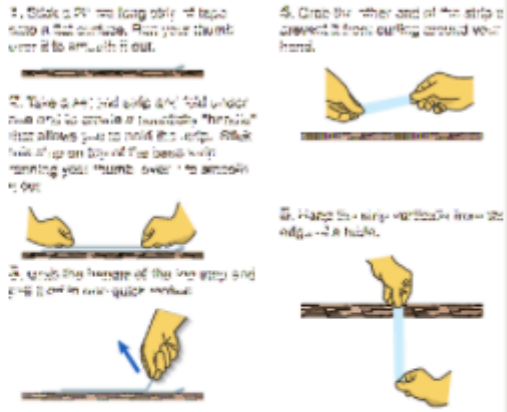


Figure 22.3 Procedure for making strips of transparent t
that interact electrically. The lower strip is used to provi
standard surface—the top side of a piece of tape — beca
surface properties may vary from one tabletop or deskto
another.

Welcome to NB !

Use your mouse or the ❶ and ❶ keys to move from discussion to discussion.
Use your mouse or the ❷ and ❷ keys to scroll up and down the document.
Drag across any region on the pdf to create a new discussion
Right-click on any comment to post a reply

More help...

New note...

- The entire class
- Instructors and TAs
- Myself only

☐ Anonymous to students

Save

Tools

Name	Assignment	Download PDF	Stats
ch22	No	original	me 1 unread 39 all 50
ch32	No	original	me 0 unread 73 all 73
ch25	No	original	me 0 unread 131 all 131
ch33	No	original	me 0 unread 99 all 99
ch26	No	original	me 0 unread 96 all 99
ch24	No	original	me 0 unread 169 all 180
Ch30	No	original	me 0 unread 81 all 81
ch29	No	original	me 0 unread 38 all 38
ch27	No	original	me 0 unread 53 all 55
ch23	No	original	me 0 unread 154 all 172
ch28	No	original	me 0 unread 79 all 79
ch31	No	original	me 0 unread 41 all 41

Tools

http://peerwise.cs.auckland.ac.nz

PeerWise

Ask | Share | Learn

JOIN NOW

Get started!

Welcome to PeerWise

To log in, select your school / institution from the list below

Go »

Just type the first few characters...

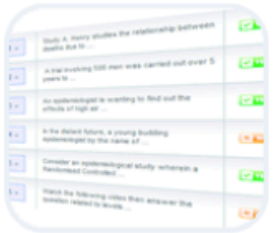
PeerWise supports students in the creation, sharing, evaluation and discussion of assessment questions.

What is PeerWise?

Students use PeerWise to create and to explain their understanding of course related assessment questions, and to answer and discuss questions created by their peers.

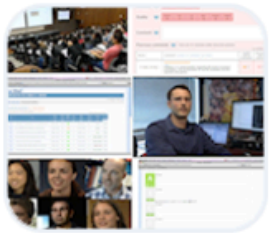
Any subject

PeerWise is used in a wide range of subjects, including Anthropology, Biology, Chemistry, Computer Science, Physics, Population Health, Pharmacology, Medicine, and many more...



Free and easy to use

PeerWise is free and very easy to use. Students are presented with a simple, intuitive interface and instructors can easily view student content and monitor participation.

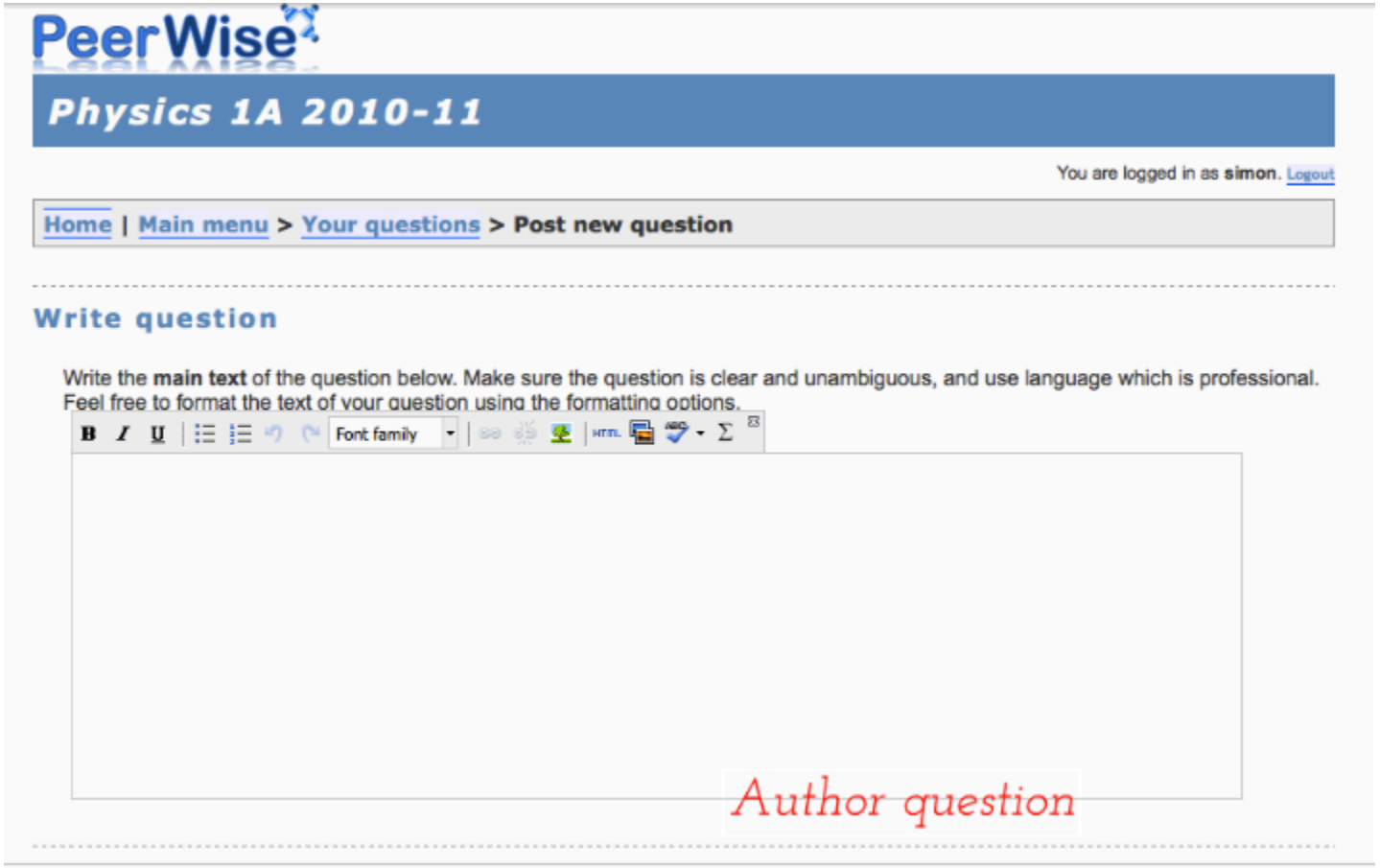


Find out more

Want to get started? View student and instructor guides, watch screencasts of PeerWise in action, and hear what students and instructors think in the Information about PeerWise section.

Tools

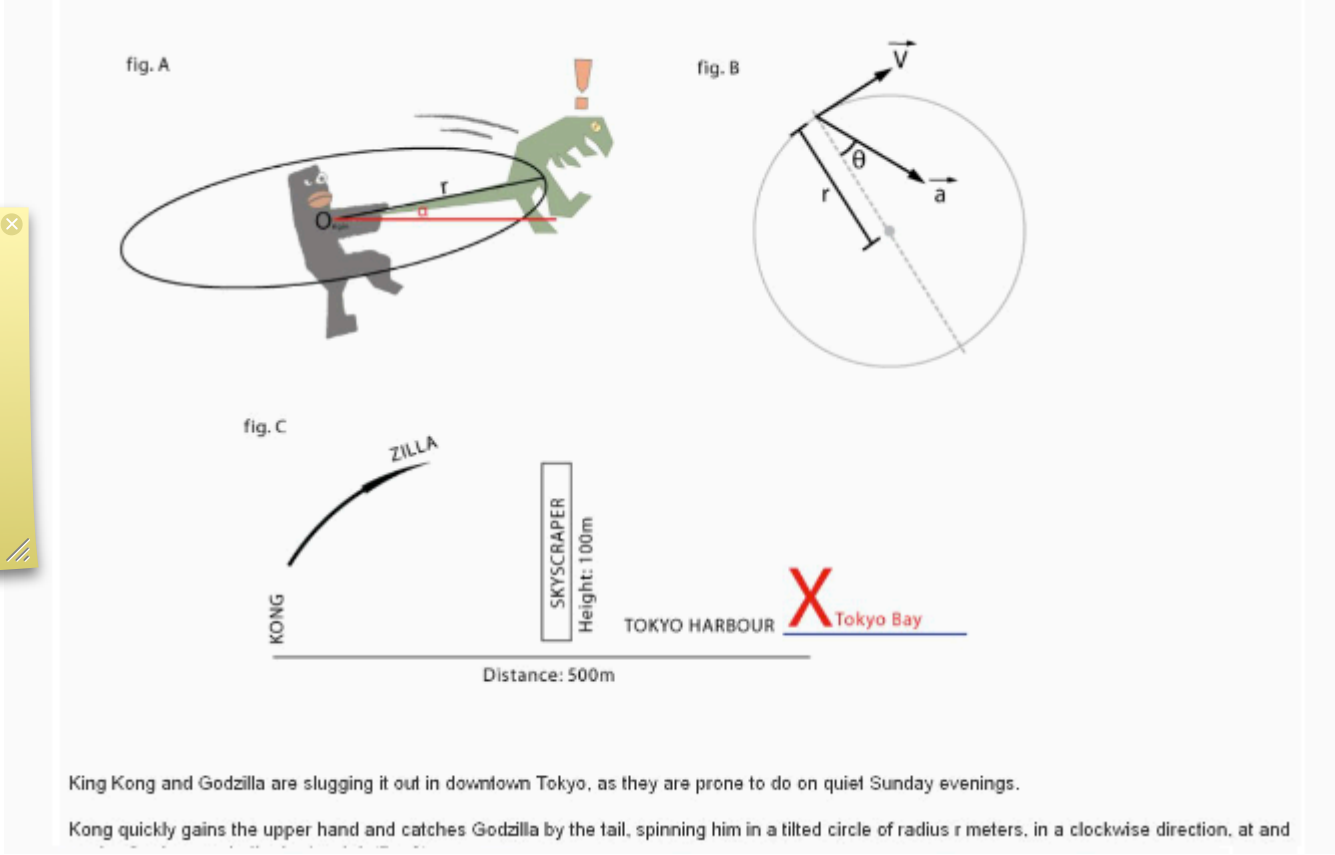
http://peerwise.cs.auckland.ac.nz



Tools

http://peerwise.cs.auckland.ac.nz

student question contributed through PeerWise



King Kong and Godzilla are slugging it out in downtown Tokyo, as they are prone to do on quiet Sunday evenings.

Kong quickly gains the upper hand and catches Godzilla by the tail, spinning him in a tilted circle of radius r meters, in a clockwise direction, at and

Tools

http://peerwise.cs.auckland.ac.nz

Student feedback on their peer's question

957

Very very excellent question. I made one tiny mistake at the start of it. Instead of taking centripetal acc. to be acos(theta), i took it as asin(theta) then ended up with 100.3m when it is halfway through thus resulted in me thinking the godzila would not hit the tokyo tower. Anyway, it did take awhile to manipulate this question but I did enjoy solving it and also taught me a lesson not to get confused with tangential acc. with centripetal acc. . Awesome !

918

awesome question.

66

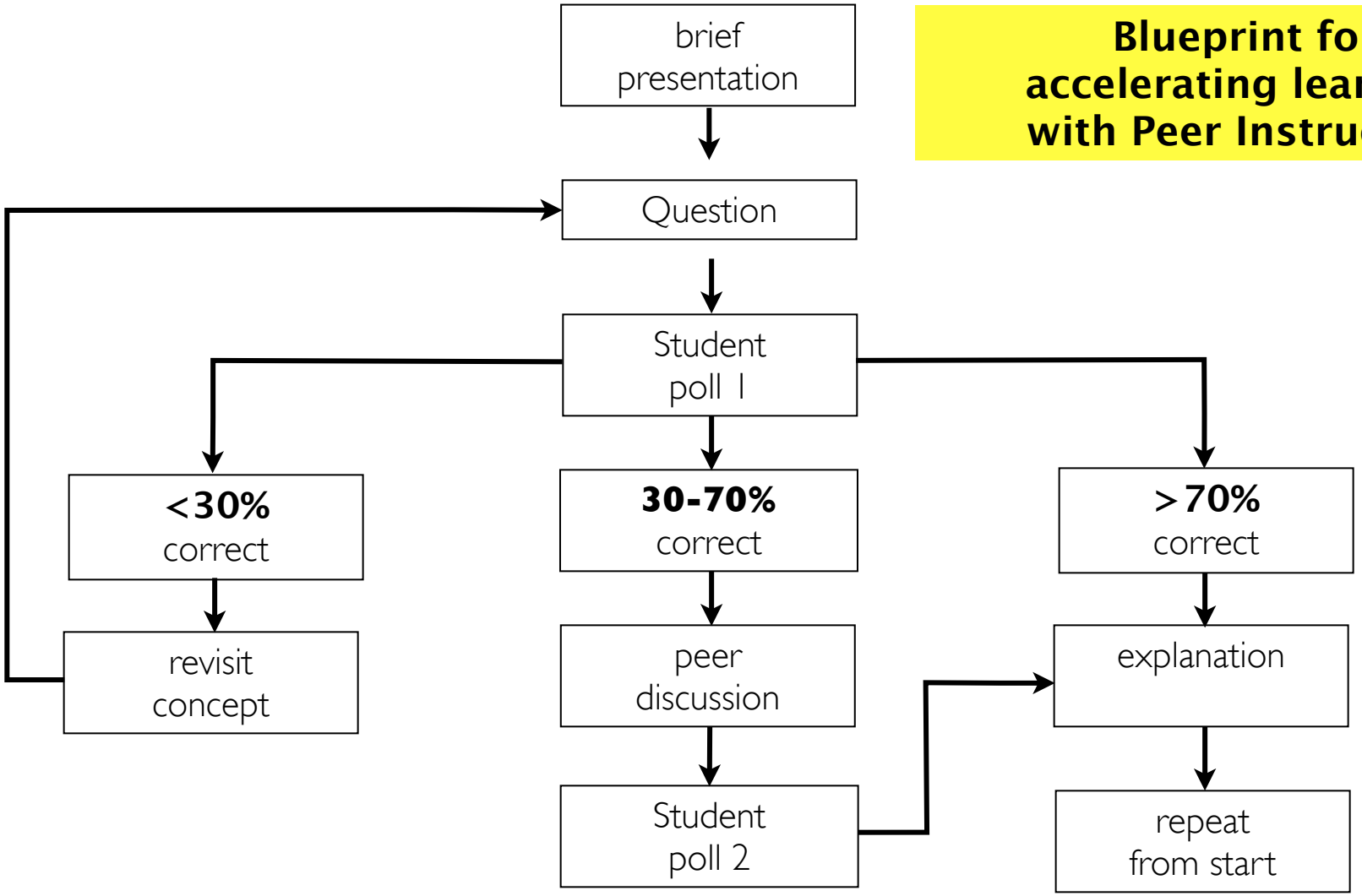
The way you've worked this out centripetal acceleration= acostheta would mean the centripetal acceleration is smaller than a which cant be right seen as centripetal acceleration is the hypotenuse of the right angled triangle. the centripetal acceleration be equal to a/costheta. you can correct me if im wrong but this is the way i worked the question out and it gave a different answer

> ***Author's reply:***
> The centripetal acceleration IS less than *a*, since the centripetal acceleration is a component of the force Kong is excerting.
> The diagram in my explanation is incorrect, *a* is the vector sum of the centripetal and tangential accelerations, so *a* should be the hypoteneuse.
> However the centripetal acceleration is still *a*cos(theta) and the answer is still correct.

Research-based Flipped Classroom

Tools for in-class engagement

Tools



Blueprint for accelerating learning with Peer Instruction

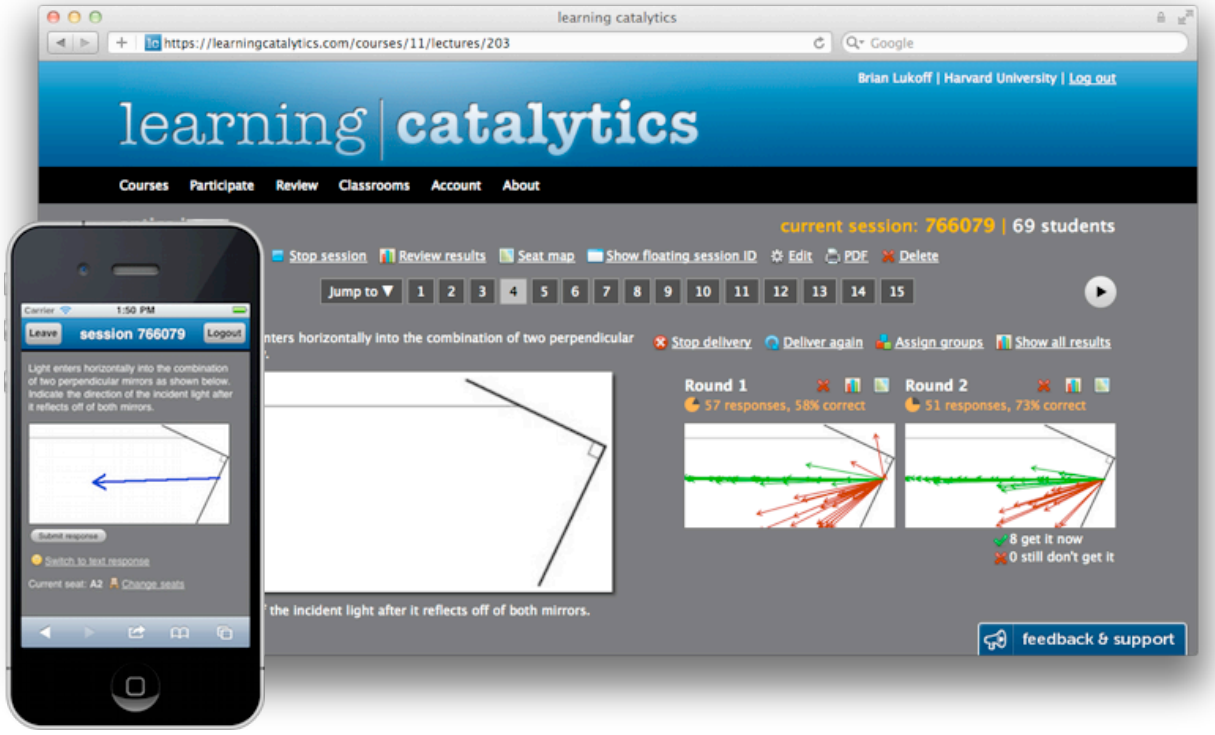
Tools

Learning Catalytics

Cloud-based technology - students "BYOD"

Piloted for the first time in Spring 2011

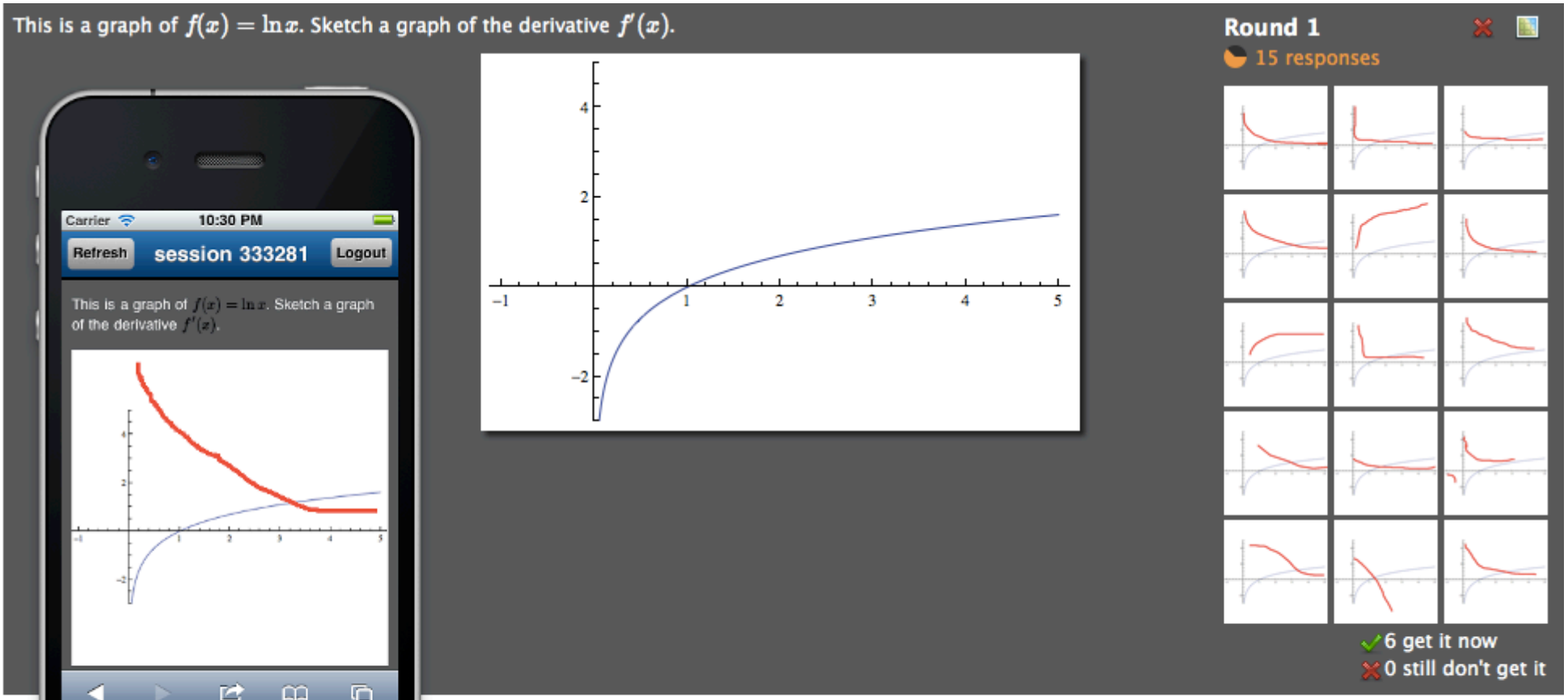
Now used both in K-12 and higher education (including the Singapore University of Technology and Design)



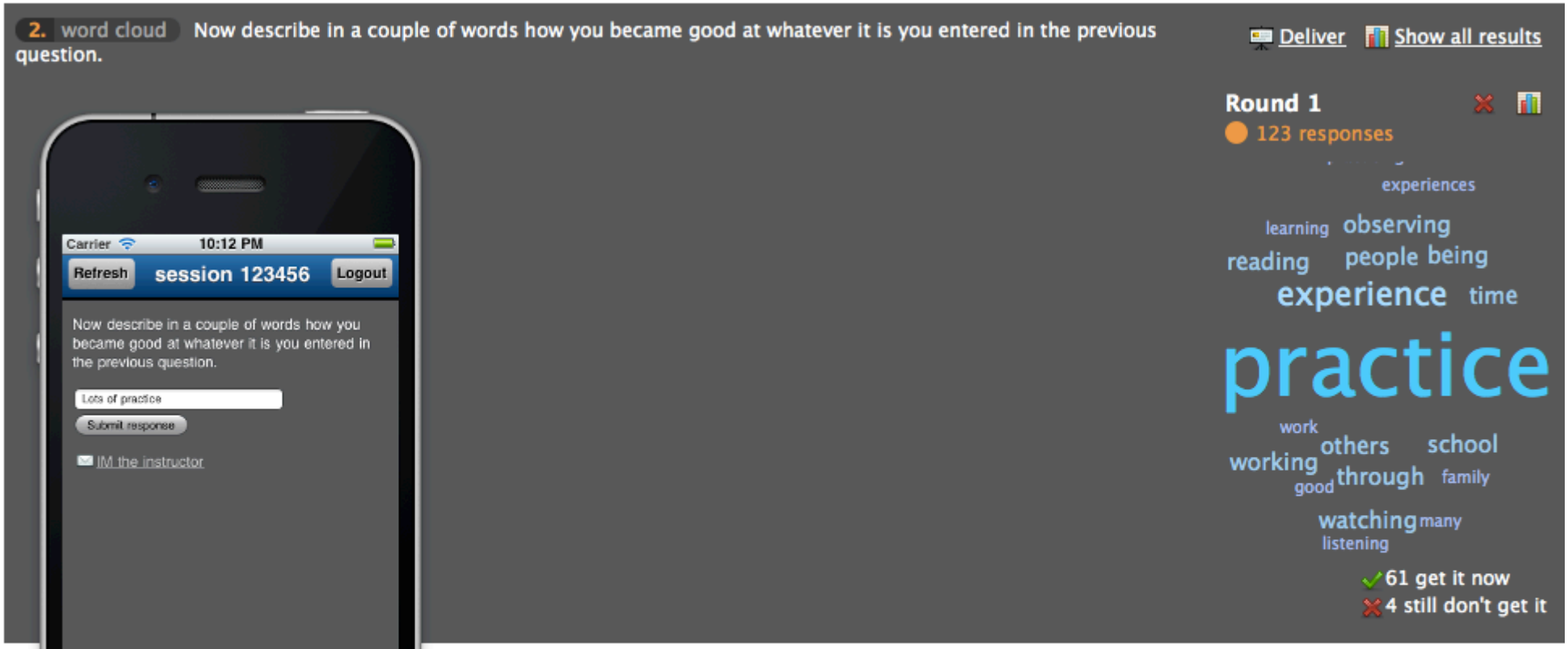
Tools

Not restricted to multiple-choice questions

Tools


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
Carrier
10:30 PM
Refresh
session 333281
Logout
This is a graph of $f(x) = \ln x$. Sketch a graph of the derivative $f'(x)$.

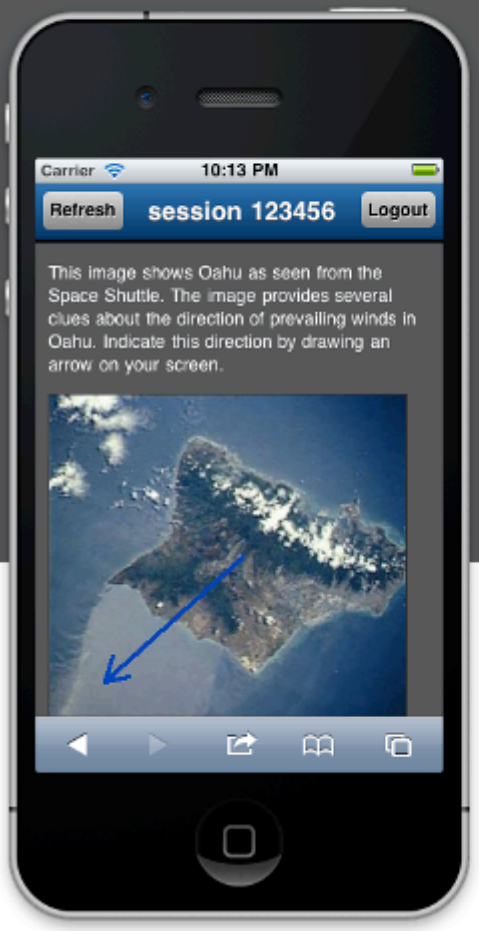
Tools


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
working
others
school
good
through
family
watching
many
listening
61 get it now
4 still don't get it
Carrier
10:12 PM
Refresh
session 123456
Logout
Now describe in a couple of words how you became good at whatever it is you entered in the previous question.
Lots of practice
Submit response
IM the instructor

Tools

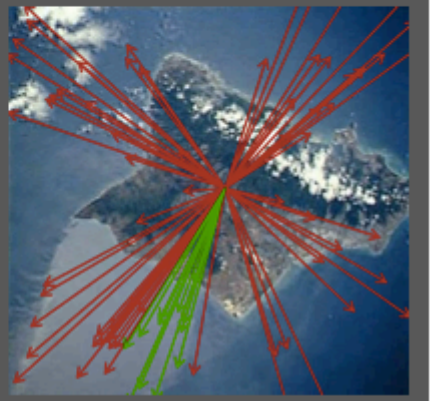
4. direction This image shows Oahu as seen from the Space Shuttle. The image provides several clues about the direction of prevailing winds in Oahu. Indicate this direction by drawing an arrow on your screen.

Deliver Show all results



Round 1

77 responses, 16% correct



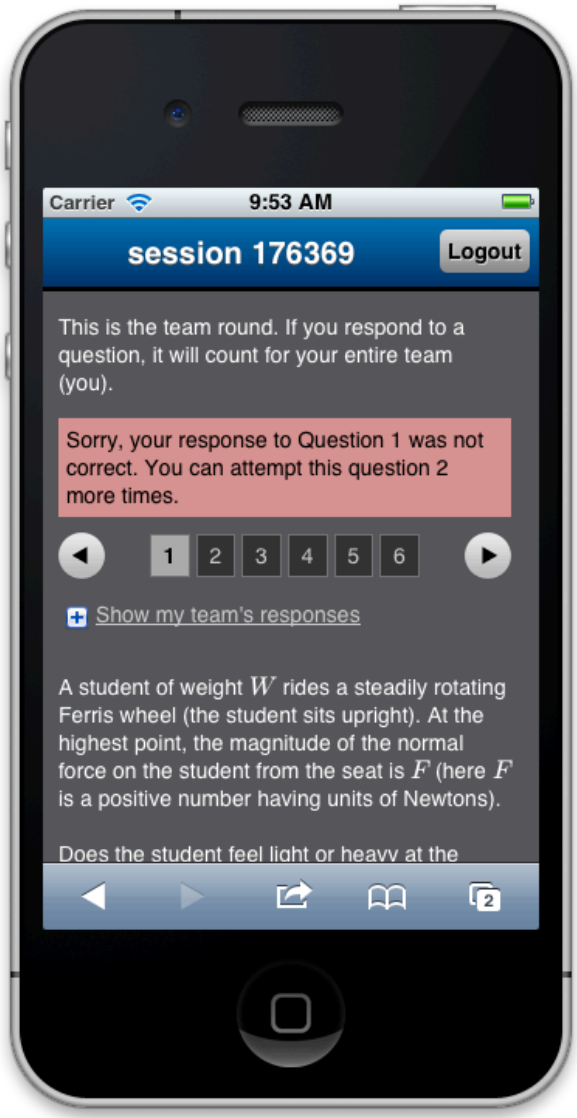
17 get it now

3 still don't get it

Tools

Can Facilitate Immediate Feedback Assessment

Tools



Immediate Feedback

Tools

Different Modules for Assessment

In-class quizzes

Out of Class quizzes

Tools

learning catalytics

https://learningcatalytics.com/courses/834/modules/2026

Brian Lukoff | Harvard University | Log out

learning | catalytics

Courses Questions Classrooms Licenses Account Tour Help Participate Review

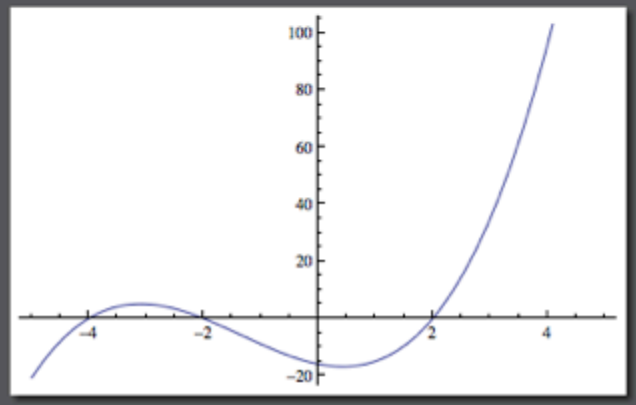
my courses > sandbox > quiz 1

current session: 98044 | 1 student

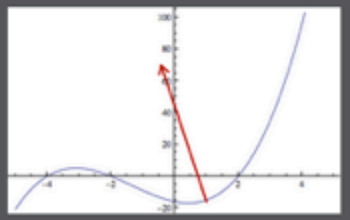
Stop session Review results Show session ID window

1 of 1 students (100%) have completed the module

1. direction Draw an arrow pointing in the positive x direction that is tangent to this graph at $x = 1$.



Responses
1 response, 0% correct



2. expression What is $\int x^2\,dy$?

Responses
1 response, 0% correct
yx^2: 100%

3. multiple choice At $(0,0)$ the graph of $f(x) = |x|$

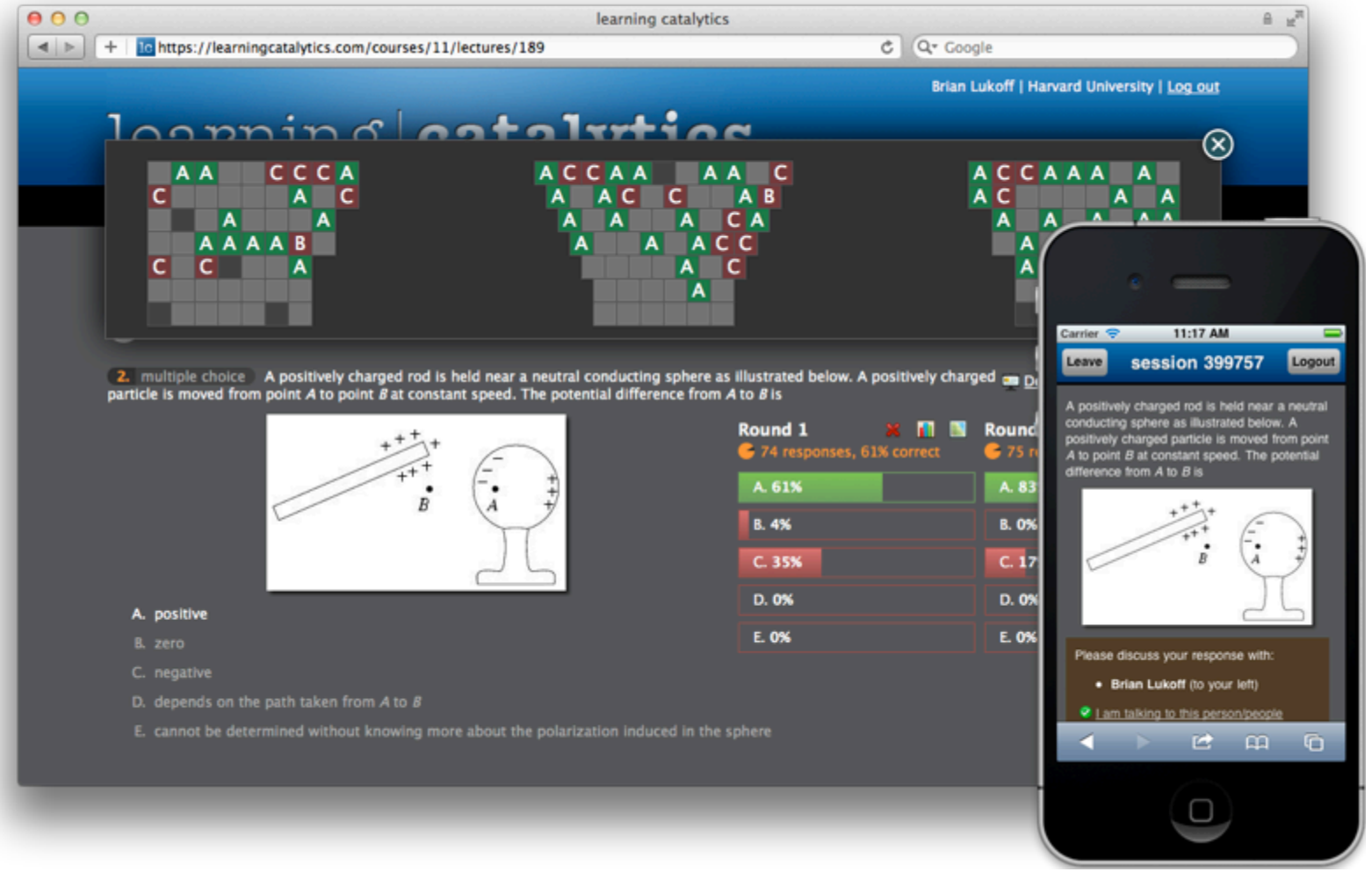
A. has a tangent line at $y = 0$
B. has infinitely many tangent lines
C. has no tangent line
D. has two tangent lines $y = -x$ and $y = x$.

Responses
1 response, 100% correct
A. 0%
B. 0%
C. 100%

Tools

Use real-time analytics
to improve discussion productivity

Tools


learning catalytics
https://learningcatalytics.com/courses/11/lectures/189
Google
Brian Lukoff | Harvard University | Log out
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
Round 1
74 responses, 61% correct
A. 61%
B. 4%
C. 35%
D. 0%
E. 0%
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
Carrier
11:17 AM
Leave
session 399757
Logout
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
Please discuss your response with:
Brian Lukoff (to your left)
I am talking to this person/people

Learning Catalytics (lcatalytics.com)

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

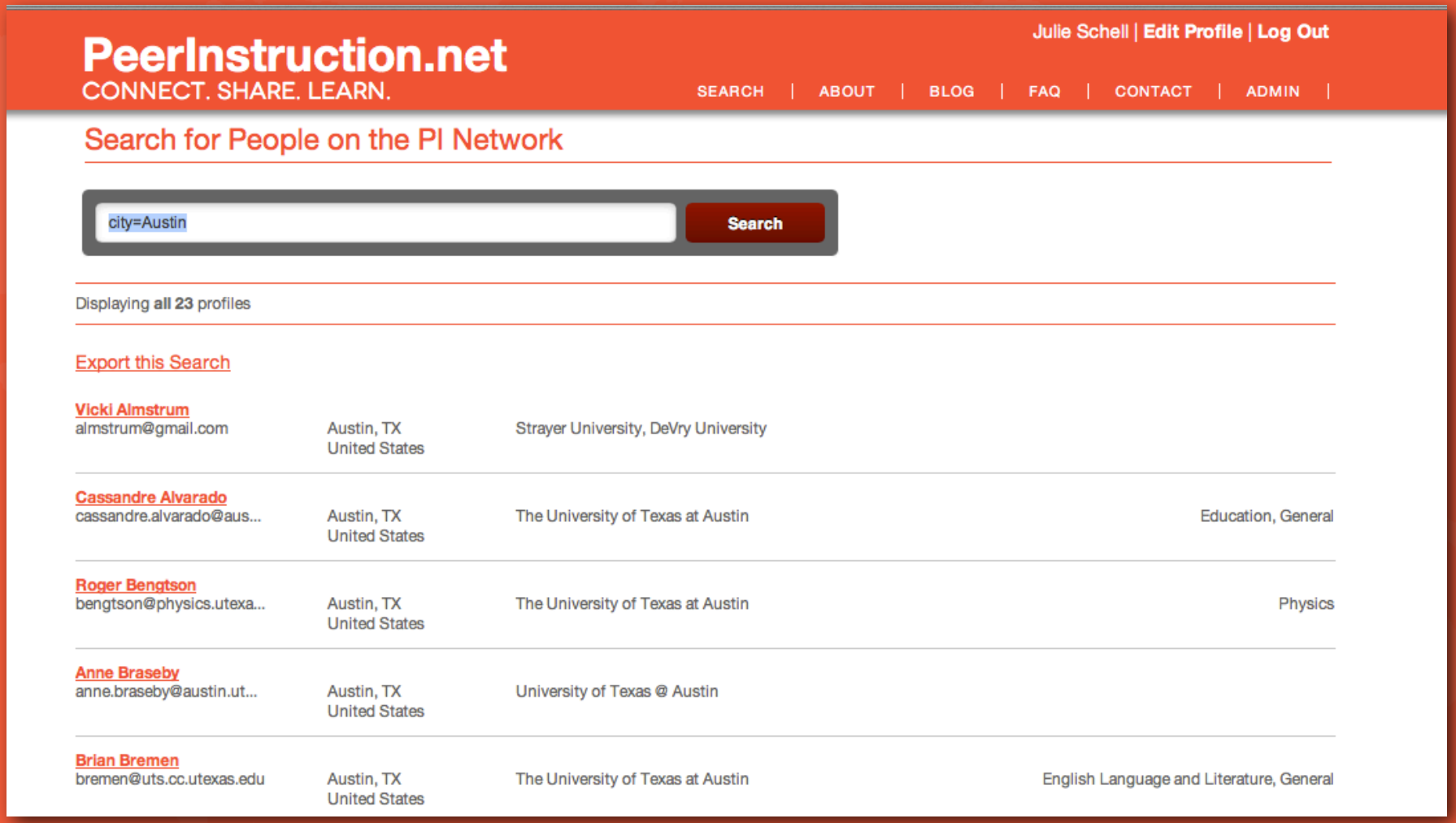
Resources for Flipping using Research-Based Tools

www.peerinstruction.net

learn

blog.peerinstruciton.net

connect


PeerInstruction.net
CONNECT. SHARE. LEARN.
Julie Schell | Edit Profile | Log Out
SEARCH | ABOUT | BLOG | FAQ | CONTACT | ADMIN |
Search for People on the PI Network
city=Austin
Search
Displaying all 23 profiles
Export this Search
Vicki Almstrum
almstrum@gmail.com
Austin, TX
United States
Strayer University, DeVry University
Cassandre Alvarado
cassandre.alvarado@aus...
Austin, TX
United States
The University of Texas at Austin
Education, General
Roger Bengtson
bengtson@physics.utexa...
Austin, TX
United States
The University of Texas at Austin
Physics
Anne Braseby
anne.braseby@austin.ut...
Austin, TX
United States
University of Texas @ Austin
Brian Bremen
bremen@uts.cc.utexas.edu
Austin, TX
United States
The University of Texas at Austin
English Language and Literature, General

share

PI Member since: 06/05/2012

I use PI in:

Mechanics, Electromagnetism

Eric Mazur

eric@learningcatalytics.com

Physics

Cambridge, MA
United States

Harvard University

PI User? Expert

Show Eric's ConcepTests on Learning Catalytics

What should the PI community know about me?

Physicist, educator, author, lecturer, Harvard professor, founder SiOnyx & Learning Catalytics, developer of Peer Instruction, early adopter of new technologies

Other Information:

I teach: :	Introductory Undergraduates Intermediate Undergraduates Faculty (e.g. Workshops) Other Audiences
Professional Role:	Primarily research, some instruction, some admin
Class (or Audience) Size:	Small (1-25) Medium (26-75) Large (76-200) Extra-Large (201-500) Mega (500+)

Peer Instruction Network
www.peerinstruction.net

scholar.harvard.edu/julieschell

twitter - @julieschell