University of Nebraska - Lincoln
DigitalCommons@University of Nebraska - Lincoln

DBER Speaker Series | Discipline-Based Education Research Group

11-2013

Put Your Phone Down Please: Digital Devices and Student Performance

Douglas Duncan
University of Colorado at Boulder

Follow this and additional works at: https://digitalcommons.unl.edu/dberspeakers

Duncan, Douglas, "Put Your Phone Down Please: Digital Devices and Student Performance" (2013). *DBER Speaker Series*. 46.
https://digitalcommons.unl.edu/dberspeakers/46

This Presentation is brought to you for free and open access by the Discipline-Based Education Research Group at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in DBER Speaker Series by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

Abstract for DBER Group Discussion on 2013-11-07

Presenter(s), Department(s):
Douglas Duncan
Director of Fiske Planetarium
Senior Instructor, Department of Astrophysics and Planetary Science
University of Colorado at Boulder

Title:
Put Your Phone Down Please: Digital Devices and Student Performance

Abstract:

The recent increase in use of devices such as laptop computers, iPads and web-enabled phones has generated concern about how technologies affect student performance. Combining observation, survey, and interview data, our two years of research quantifies the effects of this technology use on student learning. Faculty policy has a strong effect on student behavior, although all 8 faculty members whose classes were studied far underestimated the amount of off-task use taking place during their teaching (primarily phone use for texting).

Our in-depth interviews with 24 students give insight into the students' attitudes about technology use, and confirm results from Stanford that indicate students consistently overestimate their ability to multi-task. A general approach to deciding when and if to introduce technology into teaching will be briefly discussed. This approach and our data can be especially useful in universities where non-faculty (administrators, IT departments) push faculty to adopt new technology.

Digital Devices and Student Learning

Dr. Douglas Duncan, University of Colorado Boulder

© City of Boulder

Plan of today's talk

- How to think about the adoption of technology
- How technology affects student learning:
  - Gains and losses
- Why you <u>must</u> talk with your students about technology use!
- How to keep advances in technology from *decreasing* the allocation of faculty FTEs to your department (or mine).

The Researchers

Dr. Douglas Duncan (astronomy), Dr. Angel Hoekstra (sociology)

- Co-PIs, Duncan was on Hoekstra's thesis committee
- Extension of Hoekstra's research on the effects of clicker use for learning and behavior across disciplines

Ms. Bethany Wilcox (physics)

- NSF Fellow
- Physics graduate student, former Learning Assistant and current Teaching Assistant in Physics

Funding sources:

CIRTL - Center for the Integration of Research, Teaching and Learning at CU Boulder
President's Teaching and Learning Collaborative
National Science Foundation

Discipline-based Education Research @CU

Faculty Collaborators:

Michael Dubson	Physics
Steve Pollock	"
Noah Finkelstein	"
Kathy Perkins	"
Carl Wieman	"
Valerie Otero	Education
Mike Klymkowsky	Biology
xMichelle Smith	"
xLeilani Arthurs	Geology
Stefanie Molburn	Sociology
Doug Duncan	Astronomy
Seth Hornstein	Astronomy

X= faculty at other universities

Postdocs:

Angel Hoekstra
Steve Goldhaber
Laurel Mayhew
Noah Podolefsky
Rachel Pepper
Wayne Schlingman

Ph.D. Students:

Angel Hoekstra
Chandra Turpen
Charles Baily
Lauren Kost
Ben Spike
Kara Gray
Heidi Iverson
May Lee
Mike Ross
Robert Talbot
Colin Wallace
Bethany Wilcox

Introduction

How to think about the [illegible]n of technology into your teaching?

aware of the latest
nology and decide how
can use it in teaching?

What the ***Most Successful*** technology implementers do:

1. Decide what we want our students to do
2. Find the best technology to encourage that behavior

e.g. “encourage discussion in class.”

Or: more personal engagement

Determine your ***goal*** first!

One more reason: it’s in your class anyway, more than you think!

Research Questions

- Does “digital distraction” affect performance (grades)?
- Do digital distractions bother other students?
- What are student attitudes and beliefs about technology such as laptops and cell phones?

Motivation

CU Professor Diane Sieber's experiment:

- Track laptop use; note performance correlations
- With their permission, share this information with students so they can make their own choices

Assessment	Total students	Students with laptops open (consistently) prior to test	Test average, entire class	Test average, laptop subset	Average test score improvement, subset that stopped using open laptops in class
Test #1	96	17	83	71 (=-12)	--
Test #2	96	13	85	72 (=-13)	+16 (av of 4 students)
Test#3	96	6	82	69 (=-13)	+11 (av of 9 students)

Note that this was a pure lecture, non-clicker class.

First (full) year

- **5 large (100-200 student) non-major science classes**
- Participant Observation (anonymous; in class)
  - 100 pages of notes; 31 observation dates
  - Both quantitative & qualitative data recorded
- Survey Questions, with anonymous clicker system
  - 23 Qs, N = 345 (77% response rate)
  - Qs request demographic data, student attitudes
- Qualitative Interviews
  - 24 semi-structured interviews; 13 men, 11 women

Second year

- Expand to Majors vs. Non-majors courses
- Traditional vs. Non-traditional lecture halls
- Effects of interactive engagement

- Survey & observation data from 6 courses.
  (34 days, N=541)
  - 3 large introductory astronomy
  - 1 small middle-division physics
  - 1 small workshop biology
  - 1 large introductory sociology

Phone use is much more common than faculty observe…

Frequency of Cell Phone Use (per class)	Never	1-2 times	3-5 times	Over 5 times
Self-reported (N=445, Spring 2012)	22% (N=97)	38% (N=167)	21% (N=95)	18% (N=80)
Observed (N=178, Spring 2012)	53% (N=94)	19% (N=34)	12% (N=21)	16% (N=29)

Among phone users, average is ~6 times per class, but some are much higher.

Texting is an integral part of students' lives…

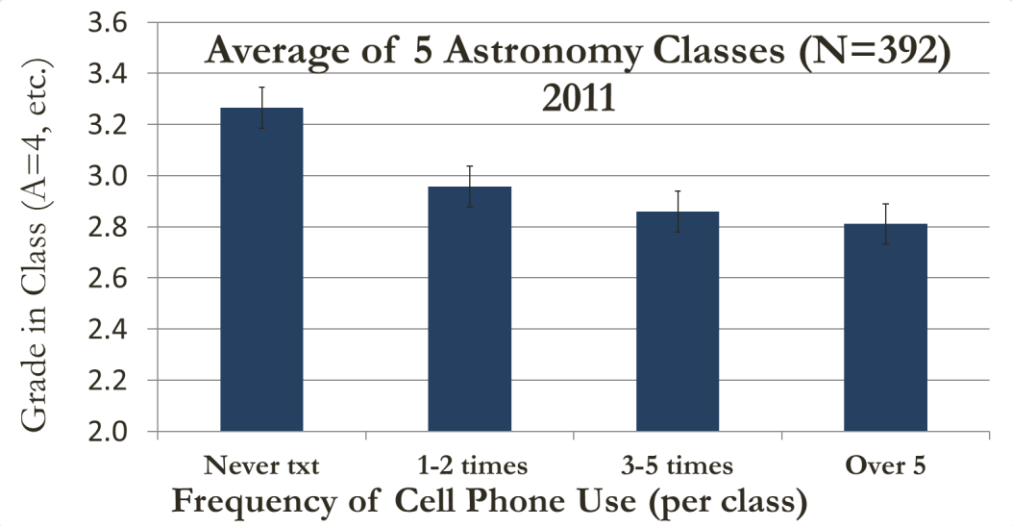
Interview Quotes

"When you go to class, it's a time to sit down and text."
"Sometimes people are texting all the time and it really gets annoying."
"I would say that I probably send sixteen text messages in a class, definitely."

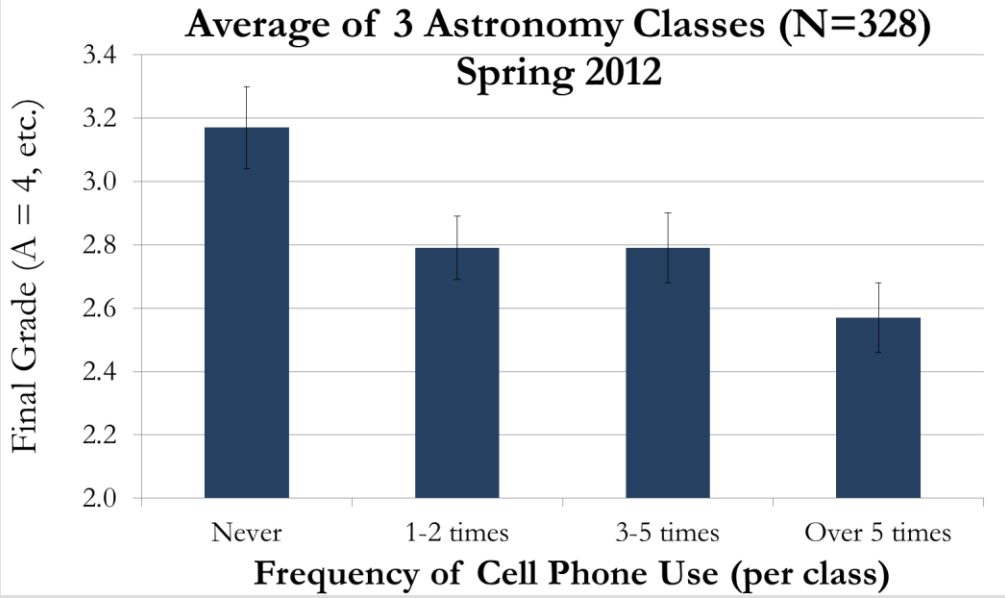
"There was a time I was getting 200 text messages a day, so every time I'd look at my phone there was something to look at…When the semester started, I remember trying to make a pledge to go through one class without looking at may phone. I did it once, and it's tough. I had to keep pulling my hand out of my bag because…it's just staying connected. I know if I look at my phone, there's a good chance that someone's gonna want to know if I want to go get a beer after class. There's an email… I could be doing something else right now." -- Female Geology student

Texting is correlated with grades, in a repeatable way

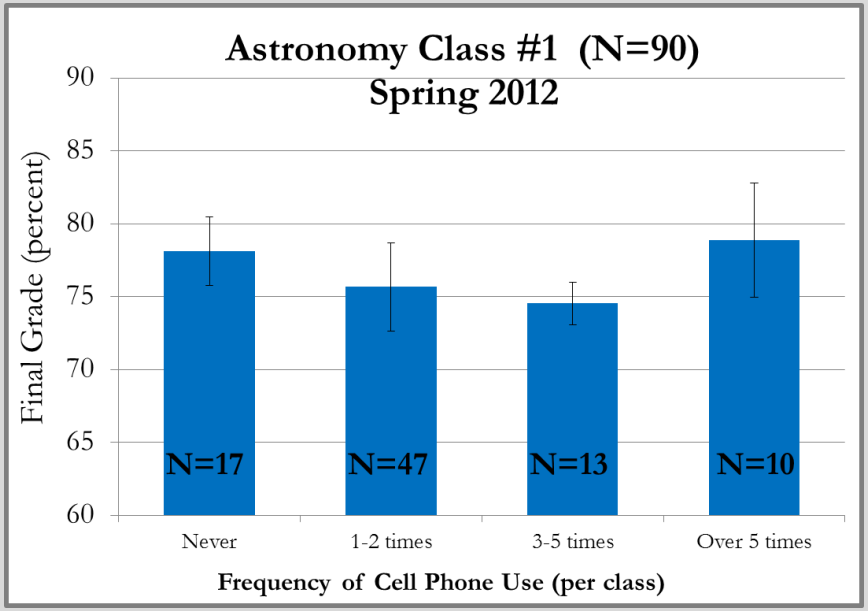
-0.36 ± 0.08

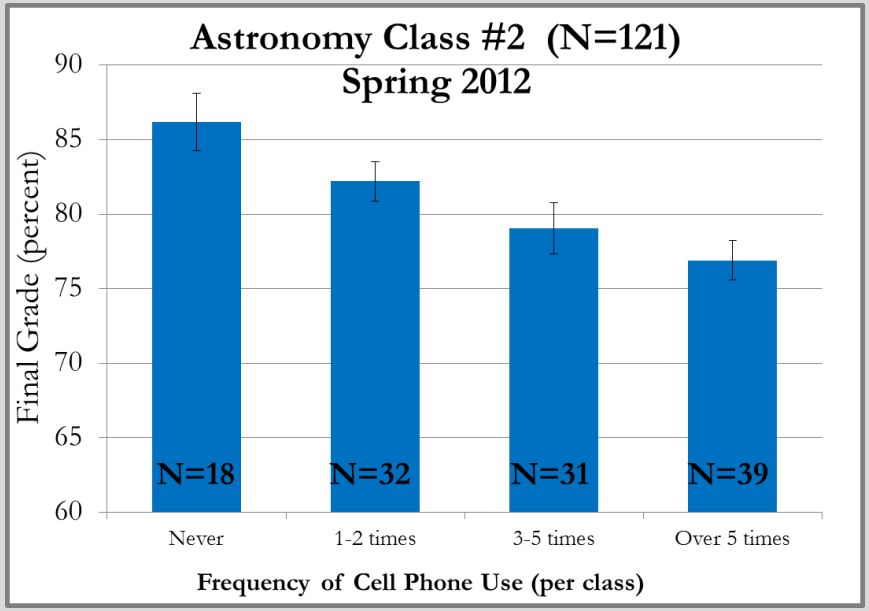


-0.47 ± 0.14



There is a large variation among classes, and this is related to instructor policy





Instructor 1, Male – ASTR, N = 120

Technology policy in syllabus? YES

Instr. Talk used in class @ policy? NO

Evidence of instructor behavior in class to enforce technology policy? YES

Student-centered pedagogy? YES

Instructor 2, Male – ASTR, N = 165

Technology policy in syllabus? YES

Instr. Talk used in class @ policy? NO

Evidence of instructor behavior in class to enforce technology policy? No

Student-centered pedagogy? YES

…It’s weird sitting in class taking notes and somebody’s on Facebook looking at their pictures from a party they had two nights ago. Sometimes the guys are sitting there watching a snowboard video. I’ve seen people Skyping, I don’t know how they get away with that in class, I don’t know why you’d have just the video feed. It’s just distracting in general if somebody’s playing a game.

Oh, yeah. People text all the time. It’s worse in biology, because it’s larger and it’s more difficult to get a seat down front, but I don’t like showing up 10 minutes early and just sitting. That drives me insane. I try to get there at least 5 minutes before class starts, but a lot of times, by then it’s full, so you sit farther back, and the further back you sit, the more people are in front of you, so more people with laptops. It’s hard to believe, but there’s still a lot of people who do Facebook, ESPN, who aren’t paying attention. It’s just distracting and annoying.

[Researcher:] *I watch these four people, two on my left and two on my right, and all four of them texted within the context of that class. I count an act of texting. Pick it up, look at it, or type, either one, and then when people put it back down, that's an act. I had, let's see, one of the guys did it nine times, one did it once, the girl next to me did it 16 times in one 50-minute period, and the girl in front of her, it was, like, six.*

I probably did it in this past class 15 to 20 times.

As someone who does text, what is it that makes it okay to text in class?

I do feel kind of bad because I know he can see me, since I sit in the front, and I feel rude, but— I don't know. He doesn't have a policy about it. Some teachers are like, "Put your cell phones away," and in most classes I do. But he doesn't care.

When you look at your phone during class, what do you do with it?

I will look through and see if I need to text anybody back. Answer an email, do Facebook, just check, check, check.

Keep up-to-date? Keep on top of it?

Yeah, it's pretty weird. I can't believe that I'm like that, because I'm just not that technological of a person. And now I see the other psychological effects that it has.

It's not like people are angry with you if you don't check it?

No. In fact, people more so get angry that I'm checking it so much.

People that are with you, in your presence? I can understand that, if I'm talking to you and you're on the phone.

And I've taken classes on this, all of it.

Communications major, that's really interesting.

[laughs] Yeah, I see a lot of what I read about in my own behavior.

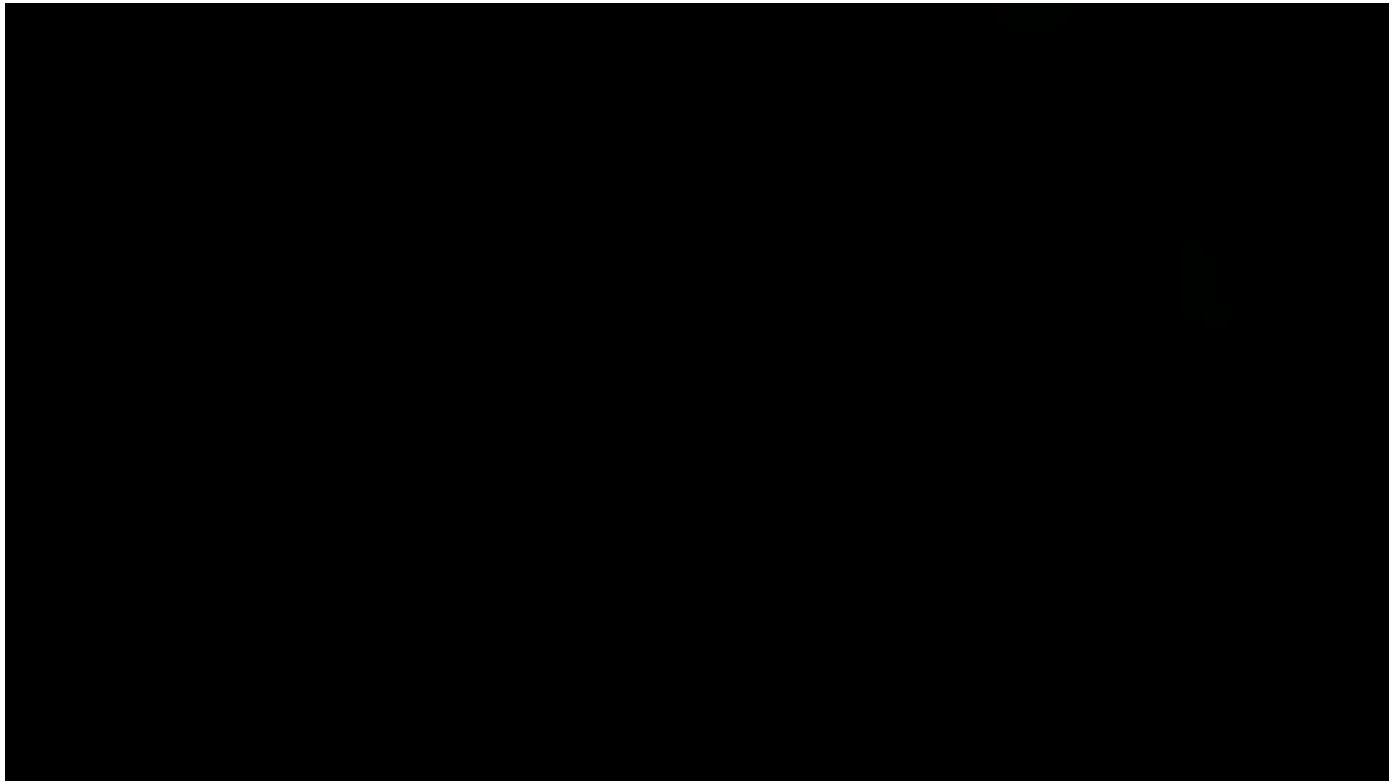
Do you think that people could get addicted to texting? **Totally.**

Cognitive control in media multitaskers

Eyal Ophir[a], Clifford Nass[b,1], and Anthony D. Wagner[c]

[a]Symbolic Systems Program and [b]Department of Communication, 450 Serra Mall, Building 120, Stanford University, Stanford, CA 94305-2050; and [c]Department of Psychology and Neurosciences Program, Jordan Hall, Building 420, Stanford University, Stanford, CA 94305-2130

Edited by Michael I. Posner, University of Oregon, Eugene, OR, and approved July 20, 2009 (received for review April 1, 2009)



Your students are POOR judges of their own abilities and their own learning. They are not metacognitive. [These are Stanford students.]

Canadian Study of Laptop use

- Students were asked to use laptops to take notes on a lecture.
- ½ the students – randomly assigned – were also asked to look up stuff "when you feel you can spare some time…."

- What do you think was the effect on grades?

Contents lists available at SciVerse ScienceDirect

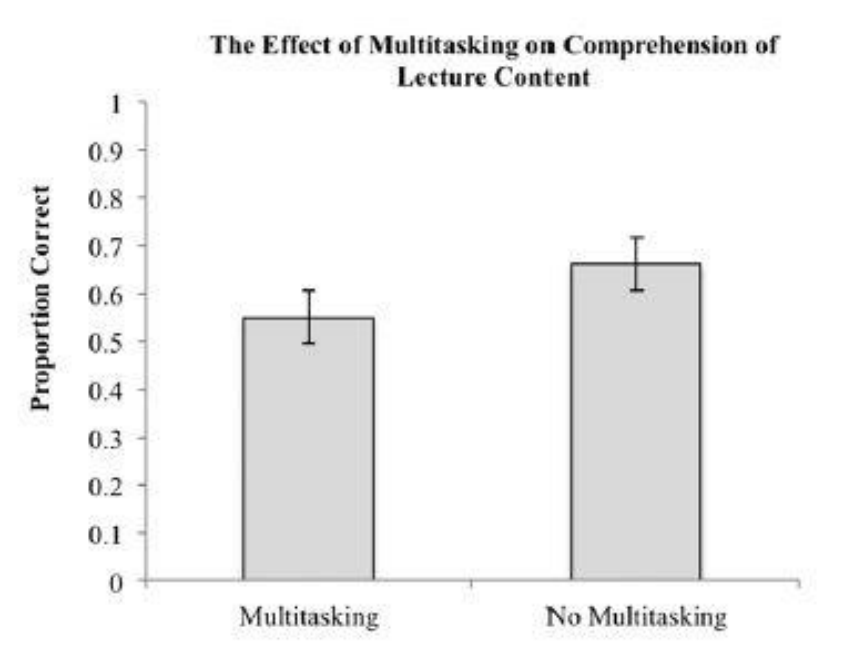
Computers & Education

journal homepage: www.elsevier.com/locate/compedu

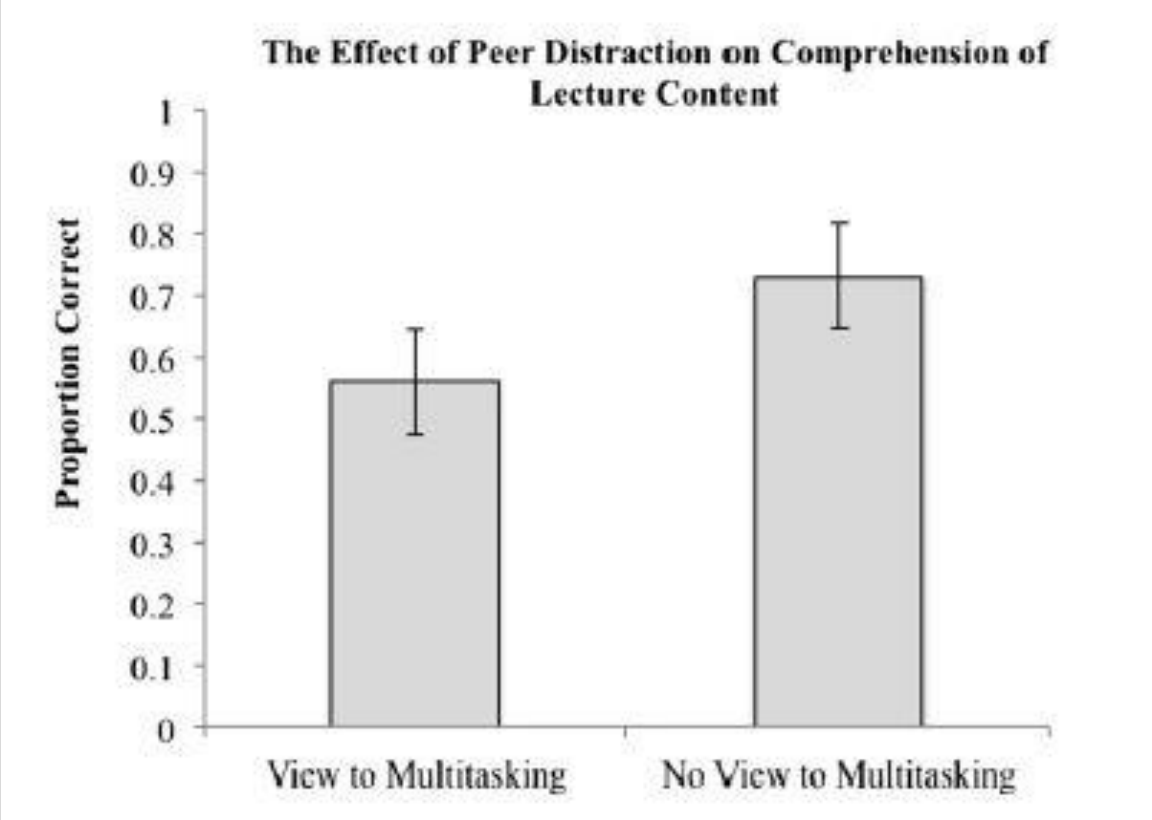
Laptop multitasking hinders classroom learning for both users and nearby peers

Faria Sana [a], Tina Weston [b,c], Nicholas J. Cepeda [b,c,*]

[a] McMaster University, Department of Psychology, Neuroscience, & Behaviour, 1280 Main Street West, Hamilton, ON L8S 4K1, Canada
[b] York University, Department of Psychology, 4700 Keele Street, Toronto, ON M3J 1P3, Canada
[c] York University, LaMarsh Centre for Child and Youth Research, 4700 Keele Street, Toronto, ON M3J 1P3, Canada



Those sitting in view of a laptop did even worse!



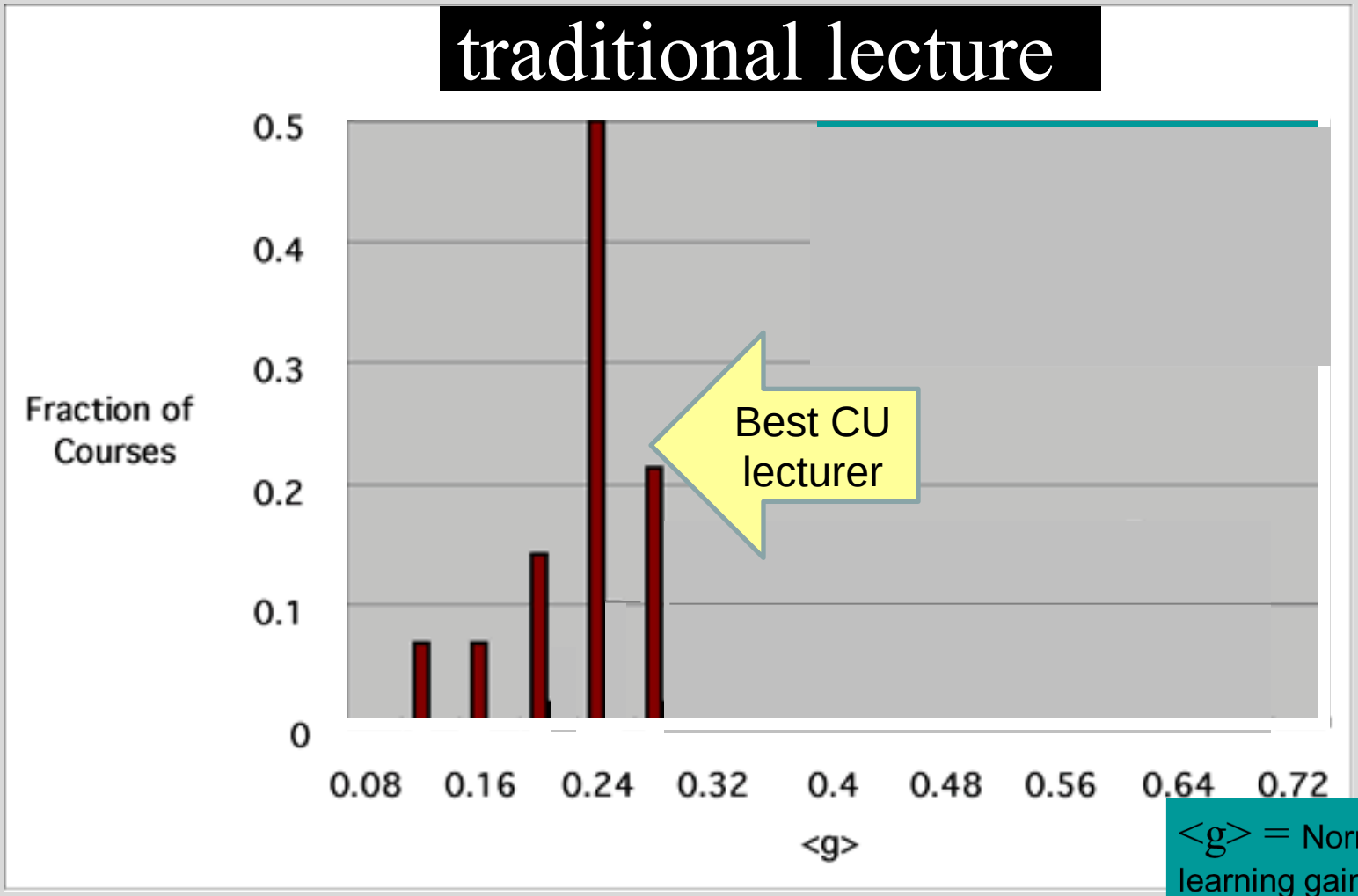
Our students are not experts. Experts don't just know a lot of stuff….

- They
- Their k deep understand
- They self-check (metacognition)

Our students are not very good at this. Coaching their learning behavior helps!

This is NOT to say ALL technology reduces learning. Some improves it…

In a traditional lecture class, students master about 25% of the concepts (that they don't already know).

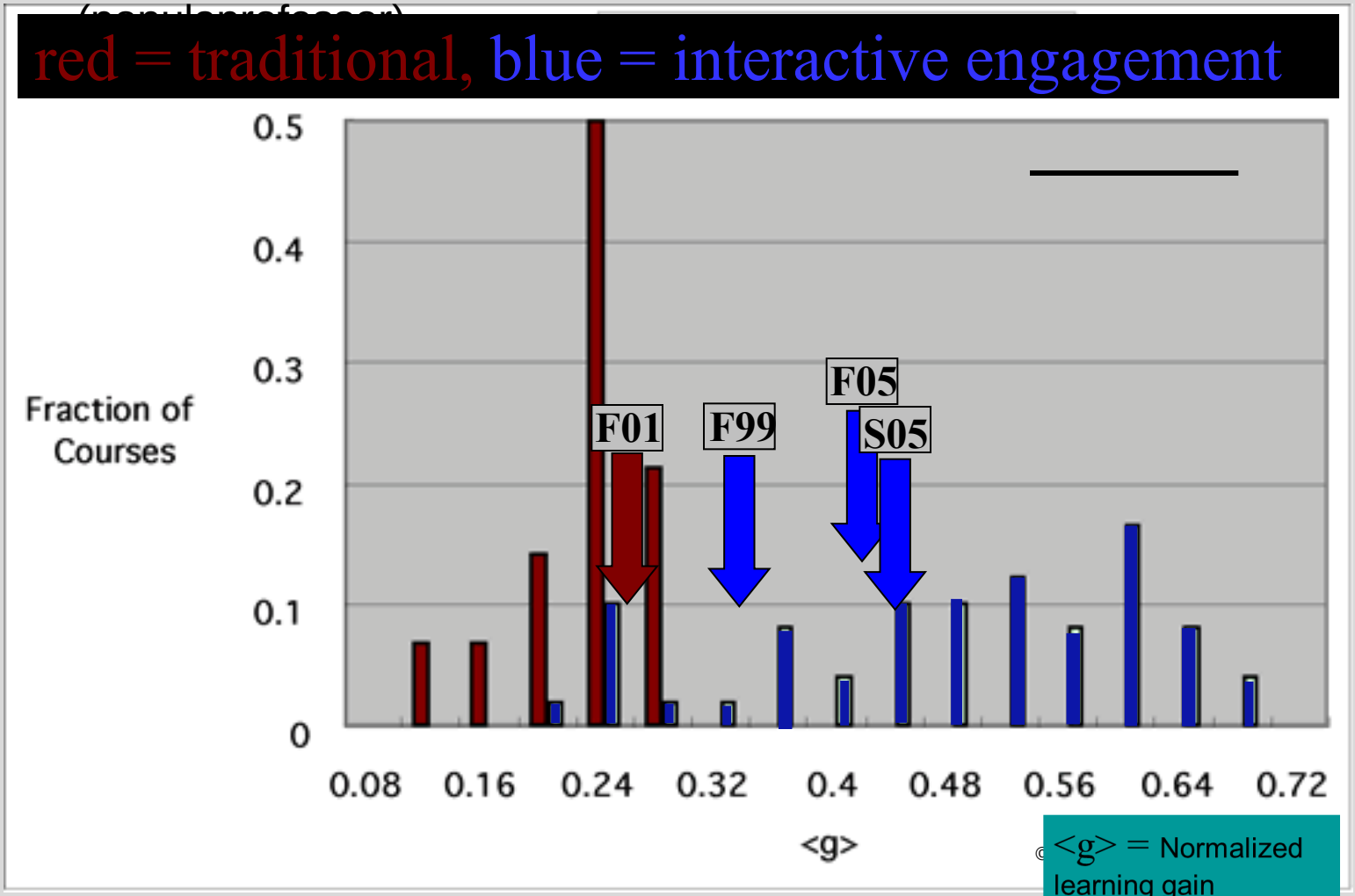


<g> = Normalized learning gain

R. Hake, "…A **six-thousand-student survey**…" AJP **66**, 64-74 ('98).

What difference does interactive engagement make?

Traditional lecture (popular professor) | Colored cards | Clickers + peer discussion



The graph shows the fraction of *everything taught* students learn *thoroughly* during the semester. Red and blue histogram bars are for 52 classes throughout the US.

Clickers

So does clicker technology increase student learning?

If you use clickers…

- Not only to check
- Require or e
  students *know* ticipate
- Mix of diffe
- Use results to tion

Stress
Metacognition.

No brain – No gain

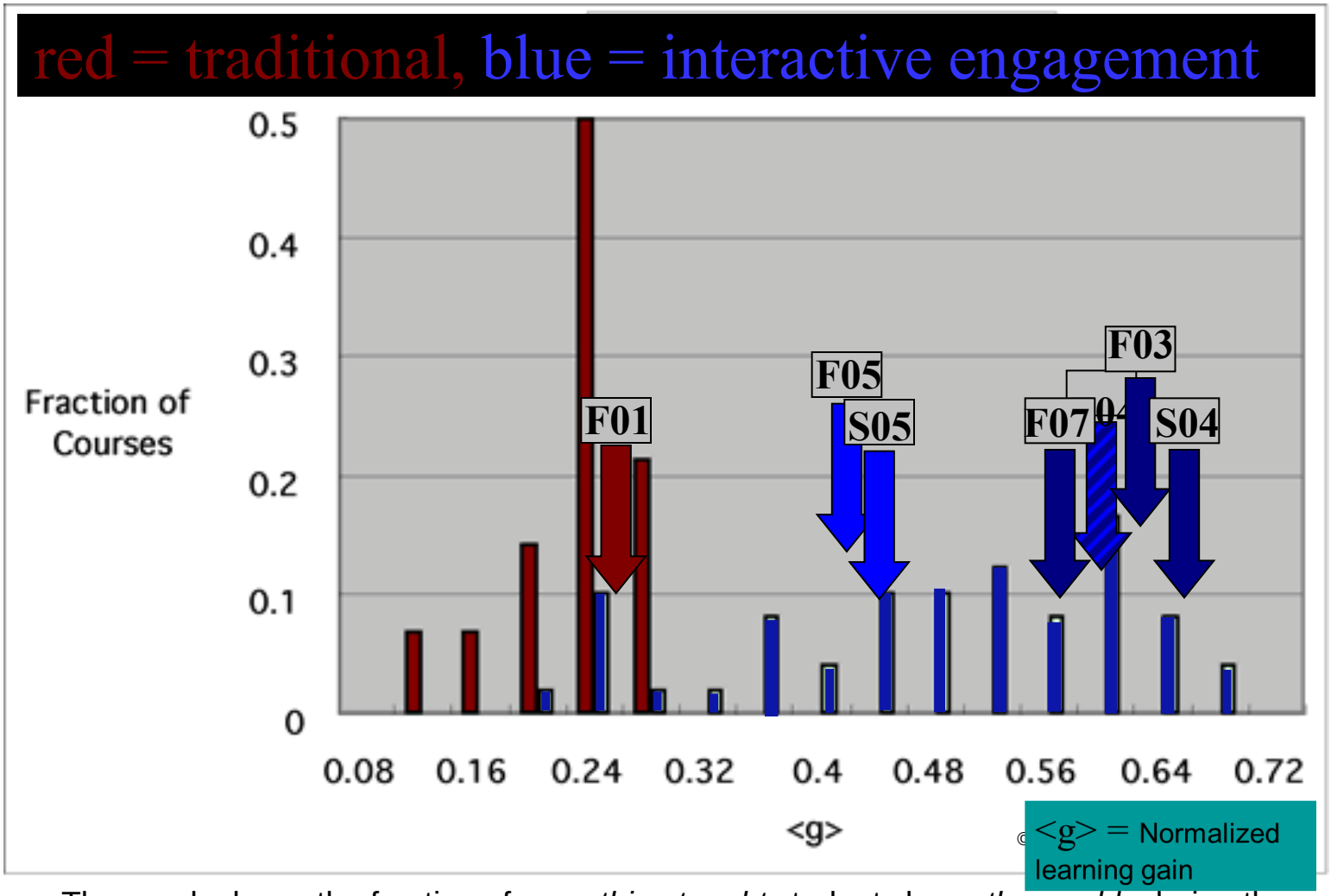
Journalism student comments

"In this class, no, they do not help us learn class material. It feels like she uses them just for attendance purposes and then doesn't really fully go over them. It's mostly just a waste of time… My physics professor used them very well… let us discuss them with our classmates, and then went over the right answer, thoroughly explained [the clicker question], and then told us why the other options were wrong, that really helped."

(journalism student)

What difference does interactive engagement make?

Traditional lecture (popular professor) Clickers Clickers **+ tutorials**



The graph shows the fraction of *everything taught* students learn *thoroughly* during the semester. Red and blue histogram bars are for 52 classes throughout the US.

Colorado LA Program as a model for institutional change: critical elements, national impacts, local implications

Learning Assistant (LA) Model

UNIVERSITY OF COLORADO **BOULDER**

CU-Boulder LA Model Emulation

Auburn University
Black Hills State University
Boise State
Boston University
California Polytechnic State
California State University - LB
Cornell University
Florida International University
Indiana University (UTA Program)
James Madison (Planned 11/12)
Louisiana State University
Marshall University (Planned 11/12)
New Jersey Institute of Technology
North Dakota State University
Rutgers University
Seattle Pacific University
South Dakota State
Towson University
UNC Chapel Hill
University of Arizona
University of Arkansas
University of Maine
University of Maryland
University of Minnesota - St Paul
University of Oklahoma
University of Texas - Austin
University of Texas - El Paso
Utah State University
Virginia Tech
Western Kentucky University

SCIENCE & MATHEMATICS TEACHER IMPERATIVE

Learning takes place in the mind of your students.

They must actively construct their understanding.

This requires focus.

(Poorly encoded knowledge is poorly retrieved.)

Nobel laureate Daniel Kahneman:

(Author of "Thinking Fast and Slow")

- You can do several things at once, but only if they are easy an undemanding.
- You have a limited budget of attention – cognitive load – and if you go beyond that you fail. It is a mark of effortful activities that … you cannot do more than one at a time.

Say this series: 10, 9, 8, ….1. Fast.

Say this series: a, b, c….f. Fast.

Say this series: 10, a, 9, b, 8, c….. Fast.

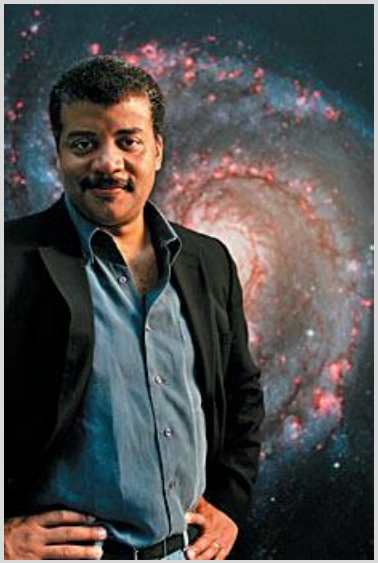
It’s NOT about the technology.

It’s about what your students *do*.

Which of these lead to students constructing their own knowledge?

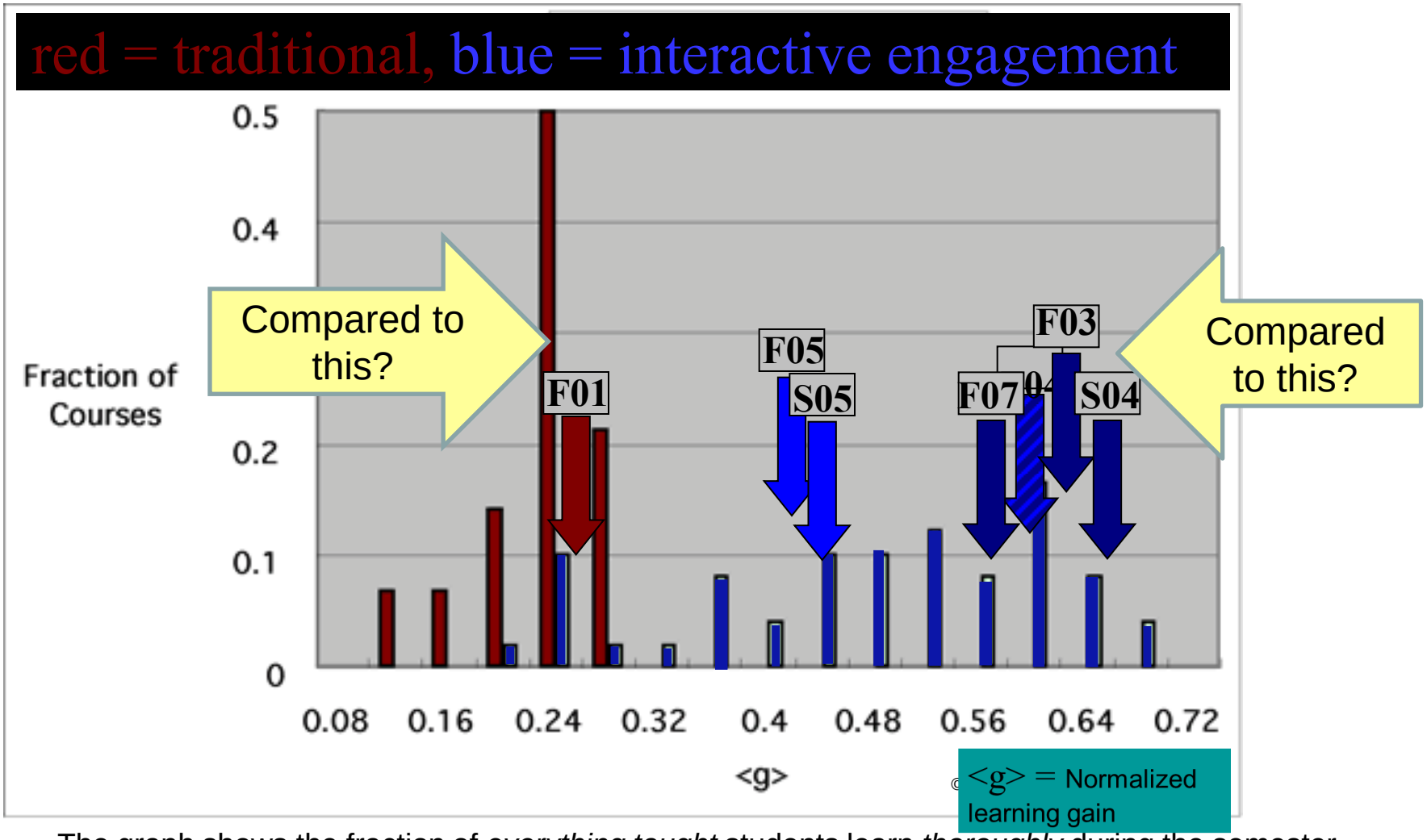
- PowerPoint?
- Videos or computer apps <u>shown in class</u>?
- Demonstrations?
- Lecturing as well as Jay Leno or Neil Tyson?

Is a MOOC with a great lecturer good?!



Is a MOOC good?

Traditional lecture (popular professor) Clickers Clickers **+ tutorials**



The graph shows the fraction of *everything taught* students learn *thoroughly* during the semester. Red and blue histogram bars are for 52 classes throughout the US.

Teaching in today's technological environment…

You are competing for the attention of your students. To benefit learning, instructors must set clear policies – for cell phone and laptop use, and use regular meta-narrative explaining "**appropriate device behavior**" and "**good learning behavior**" to students.

[Metacognition]

Survey: Student attitudes toward cell phone use in class

How disrespectful do you think using a phone during class is to your professor?

2010-11 – 3 courses, N = 345	
22%	A) Very disrespectful, especially if a student uses their phone often
15%	B) Very disrespectful, regardless of how often a student uses their phone
47%	C) Somewhat disrespectful but **it depends on the instructor's policy**
7%	D) Not disrespectful at all
9%	E) Other

Spring 2012 – 6 courses, N = 541	
25%	A) Very disrespectful, especially if a student uses their phone often
15%	B) Very disrespectful, regardless of how often a student uses their phone
25%	C) Somewhat disrespectful
29%	D) Somewhat disrespectful but **it depends on the instructor's policy**
6%	E) Not disrespectful at all

Where is the wisdom we have lost in knowledge?

Where is the knowledge we have lost in information?

T. S. Elliot

Teach your students metacognition – what true learning means.

My speculative warning: if students can multi-task in your class and succeed, in the future your teaching will be replaced by a MOOC….

Or by a machine!

…*and your department will lose FTEs…*