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Harvard Medical School

Using Multimedia & Education Technology to Enhance Teaching

David H. Roberts, MD

Associate Director, Carl J. Shapiro Institute for Education & Research

Associate Director, The Academy at HMS

Associate Professor of Medicine, HMS

Education is at the heart of patient care. —



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Conflicts “of interest”

- Financial
 - Co-creator of www.knowyourph.org with Dr. Michael Parker, HMS Center for Ed Tech
 - Licensing fees from Gilead, Inc.
- Academic interest
 - This topic and relation to Millennial learners
 - CME courses training faculty to teach
- Genetics



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idge Educator In On Plans For Sesar Stree

JOAN OMINSKY

homes with small
p.m. is a happy hour.
thers heave a sigh of
youngsters flop
in front of their
s and begin one
interrupted viewing.
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d pleases their
usual children's
and cowboys.
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and comic
children the
vocabulary
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pizazz of a
but the
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educators
n people
tings to
Street's
or from
initial

Harriman Estate (an hour's drive from New York City), Linda said, "I imagine I was invited through people I'd met while doing graduate work at Harvard." Linda holds a master's degree in education from Harvard. She's also done reading research at Cornell, where she met her husband.

Linda explains that she's not the only member of her family interested in education. Michael, a physicist at Oak Ridge National Laboratory, is president of Friends of Responsible Education. FORE is a community group which brings issues in the schools before the public, in the hopes of improving the city's public schools through community involvement.

According to Linda, Michael also is an understanding husband who helps out with the children, Rachel, four and David, 14 months, when she's off to conferences. "I never could have done anything without Michael's understanding," she says. "He was a big help with the children when I was in New York."



Mrs. Roberts, David, Rachel

Street. She loves the puppets. few minutes a member of the

Goals for our time together today

- Share an approach to using technology in teaching ***
- Demonstrate a few of the multitude of possible multimedia and education technologies available
 - Resources at many medical schools
 - Free resources online
- Provide examples of how students are using technology to enhance their learning
- Encourage you to try something new in your own teaching

*****Merely a curious, risk-taking teacher
interested in trying new things**



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A large, tiered lecture hall filled with students. Many students are holding open laptops, suggesting a lecture or presentation. The text "Let's begin with a framework" is overlaid in the center of the image.

Let's begin with a framework

Our current challenge

Technology

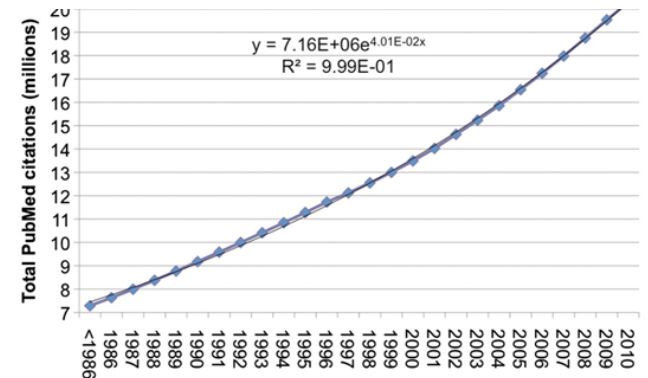


Learners



Teaching
Faculty

Medical
Knowledge



Teaching & Education Technology, Part I

Good teaching is about good content.
Technology is merely a tool.



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Teaching & Education Technology, Part II

Using technology in teaching is a
(learnable) skill.

**Learning those skills = faculty
development**



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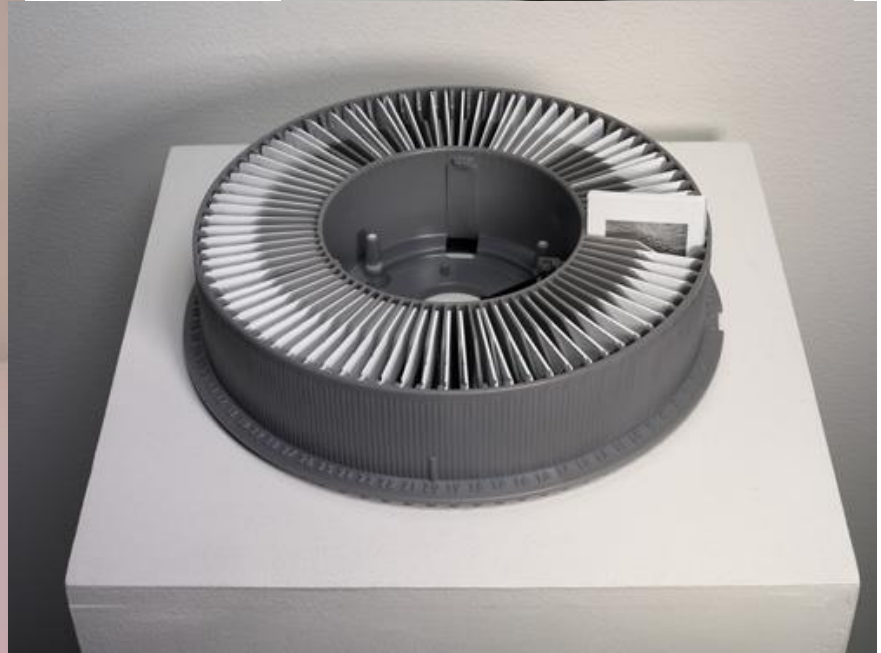
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Education technology is not new!

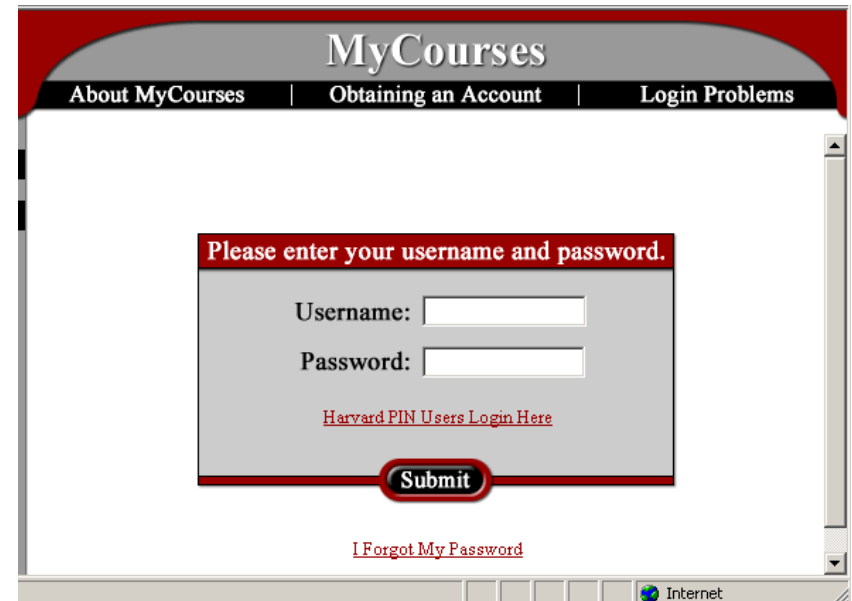


“The only thing certain is change” -- Socrates



Emergence of Education Technology

- E-learning or computer-based learning has been around for decades
- Adoption accelerated by
 - Internet
 - Learning management systems – ie MyCourses, Blackboard
 - Many free or low cost tools
- Many institutions have education technology / media centers



The image shows a screenshot of a web browser displaying the MyCourses login page. The page has a red header with the title "MyCourses" and three navigation links: "About MyCourses", "Obtaining an Account", and "Login Problems". The main content area is white and contains a login form with a red border. The form has a title "Please enter your username and password." and two input fields: "Username:" and "Password:". Below the password field is a link "Harvard PIN Users Login Here" and a "Submit" button. At the bottom of the page, there is a link "I Forgot My Password". The browser's status bar at the bottom shows "Internet".



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The Impact of E-Learning in Medical Education

Jorge G. Ruiz, MD, Michael J. Mintzer, MD, and Rosanne M. Leipzig, MD, PhD

Academic Medicine, Vol. 81, No. 3 / March 2006

- E-learning is complementary to and is as effective as instructor-led learning (*)
- Advantages include improving
 - Learning “delivery”
 - Learning “enhancement”
- Unique opportunities
 - individualized or adaptive learning
 - collaborative learning



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***Chumley-Jones et al, Web-based learning, Acad Med 2002**

Foundations of Multimedia Learning

- Constructivist learning theory
 - Piaget and many others
 - Active engagement
- Dual coding theory
 - Paivio and many others
 - Visual and verbal information processed independently
- Cognitive load theory
 - Sweller, Miller and others
 - Linking information and problem solving
 - “Chunking” of information



"For those of us who aren't visual learners...
AAAUUUGGGGHHHHHH!!!!!"



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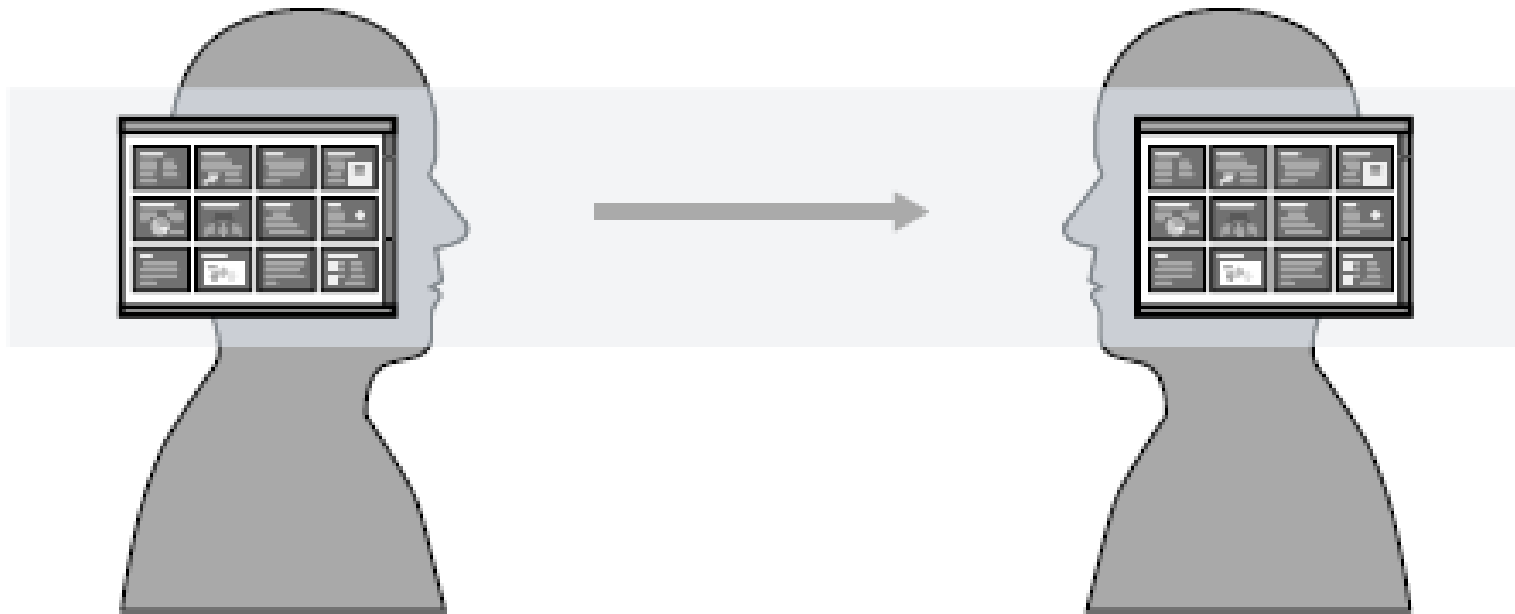


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What you present to your audience

What you assume the audience learns



Atkinson, Beyond Bullet Points, 2008



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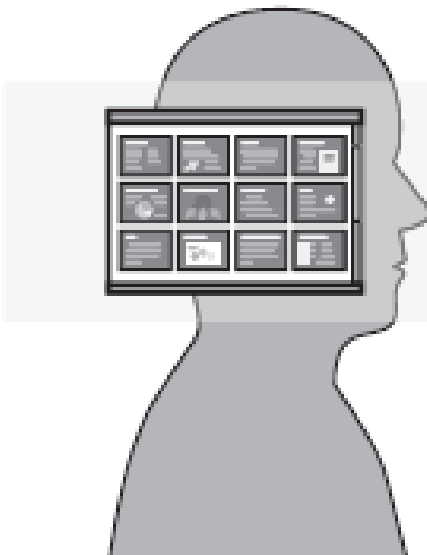
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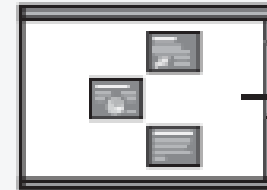
What you present to your audience



What actually happens



No learning



Fragmented learning



Meaningful learning

Atkinson, Beyond Bullet Points, 2008



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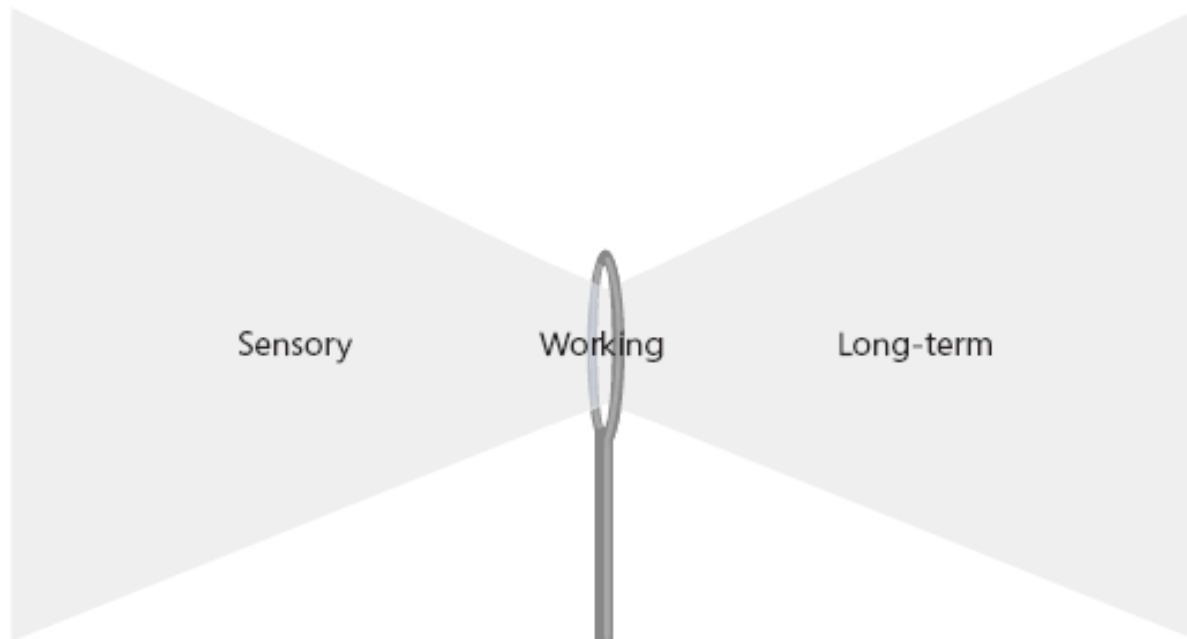
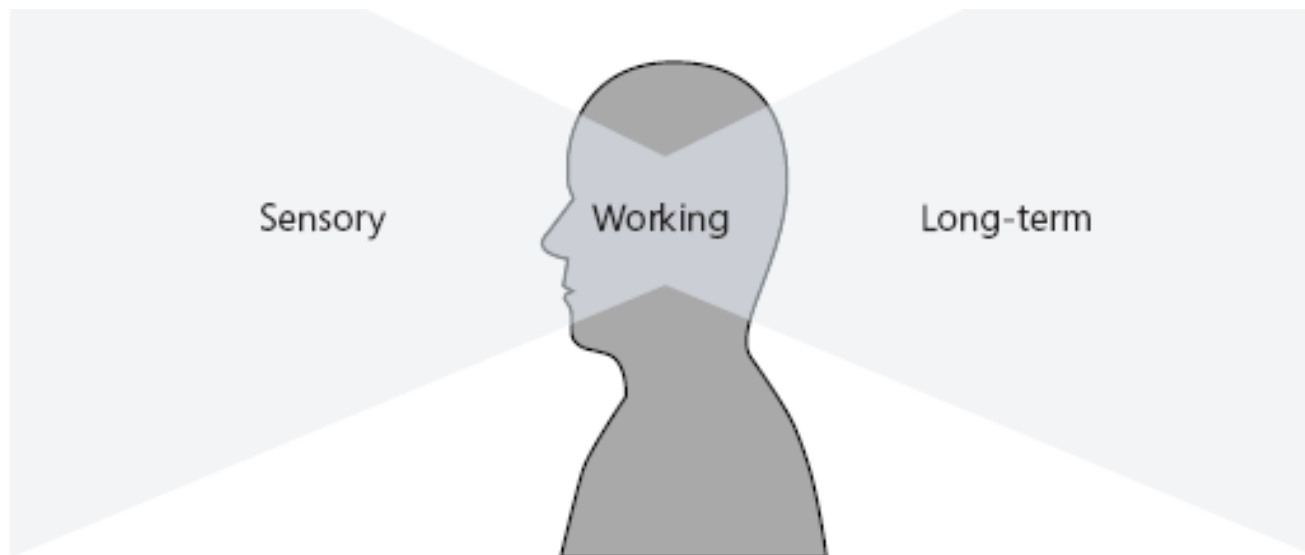


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Atkinson, Beyond Bullet Points, 2008



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"I need someone well versed in the art of torture—do you know PowerPoint?"

Applying multimedia design principles enhances learning in medical education

Nabil Issa,¹ Mary Schuller,¹ Susan Santacaterina,¹ Michael Shapiro,¹ Edward Wang,¹ Richard E Mayer² & Debra A DaRosa¹

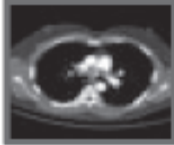

Medical Education 2011; 45: 818–826

- Better short term recall (retention)
- Better “learning” (overall quiz score)

BEFORE

[IV] Obstructive Shock

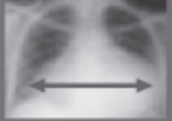
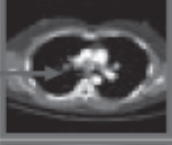

- Tension Pneumothorax: results in hyperinflation of the hemithorax resulting in kinking of IVS and decreased preload
- Pulmonary Embolism: results in obstruction of the R ventricular outflow and decrease in L ventricular stroke volume resulting in cardiac failure



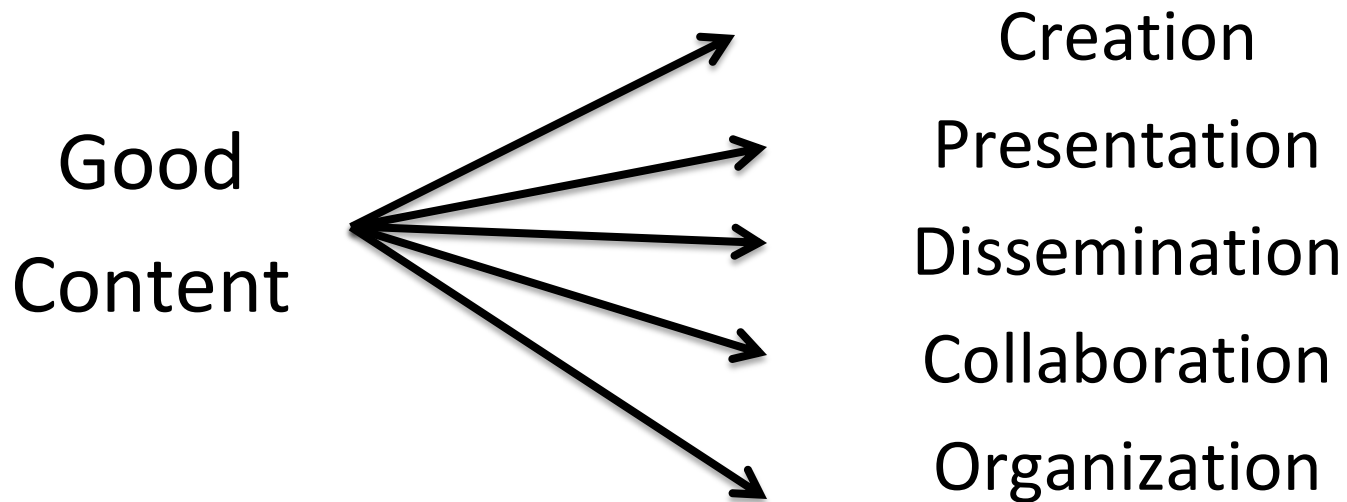
AFTER

[IV] Obstructive Shock

- Tension Pneumothorax
- Pulmonary Embolism
- Cardiac Tamponade



Technology can enhance many aspects of learning and teaching



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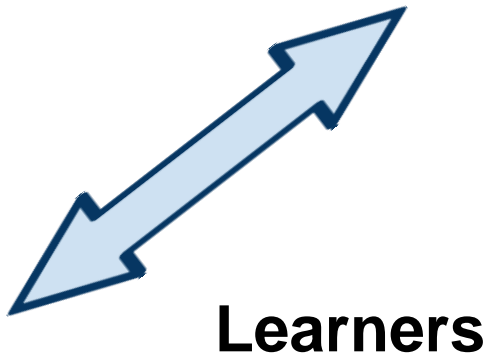


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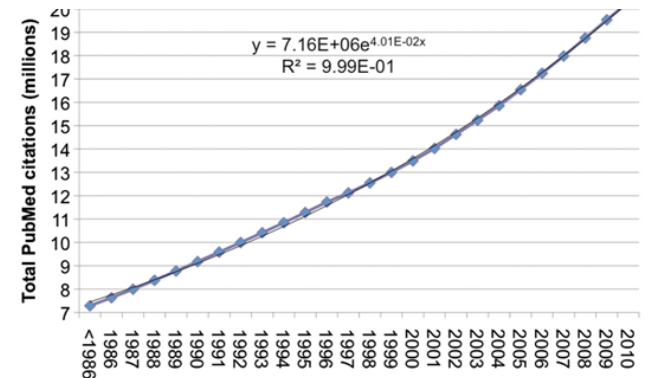
Returning to our framework

Technology



**Teaching
Faculty**

**Medical
Knowledge**



How will we respond to this challenge?

- “...The world is changing very rapidly. Yet ...education changes remarkably little over time.
- ...Education will be more about how to process and use information and less about imparting it...factual mastery will become less and less important.
- ...Tasks will be carried out with far more collaboration...
- ...New technologies will profoundly alter the way knowledge is conveyed.”



Larry Summers

What you (Really) need to know
NY Times, Jan 22, 2012



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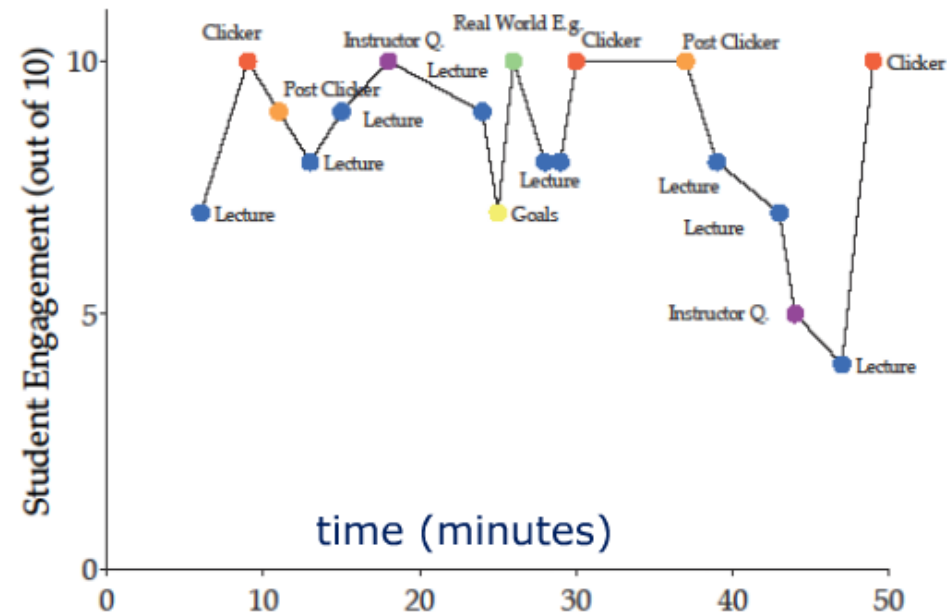
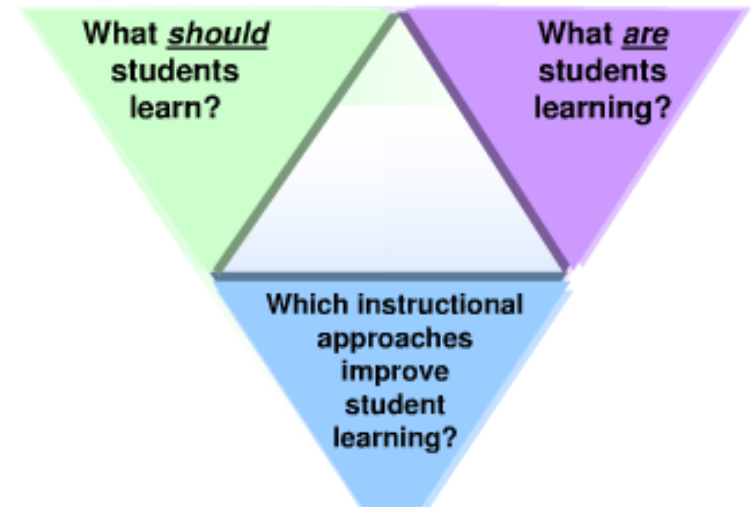


Physics Nobel Laureate Professor Carl Wieman

Improved Learning in a Large-Enrollment Physics Class

Louis Deslauriers,^{1,2} Ellen Schelew,² Carl Wieman*†‡

SCIENCE VOL 332 13 MAY 2011



'Flipped' classrooms take advantage of technology

By Greg Toppo, USA TODAY

Updated 10/7/2011 2:39 AM

Comment

39



Recommend

502



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583

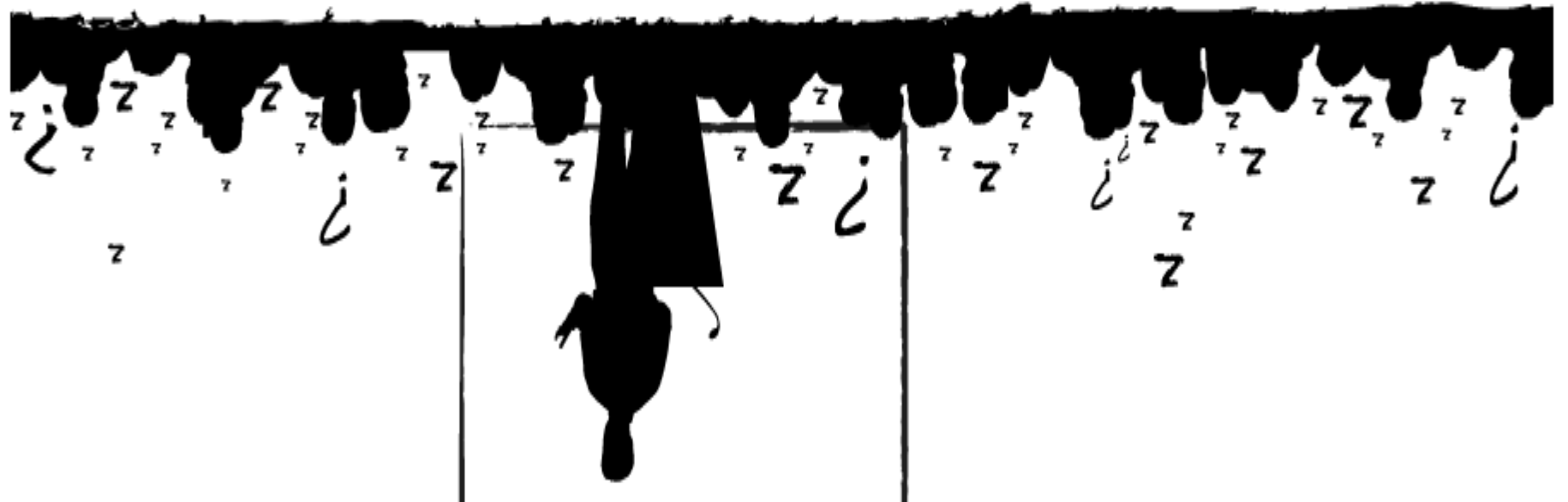


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POTOMAC, Md. – Step into Stacey Roshan's Advanced Placement calculus class some morning and two things become apparent: The students don't seem stressed-out, as AP students often do. And the teacher is barely teaching.



FLIPPED OUT: THE NEW MODEL FOR EFFECTIVE TEACHING



Khan Academy - Windows Internet Explorer

http://www.khanacademy.org/

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Why Gravity Gets So Strong Near Dense Objects

$$F = G \frac{m_1 m_2}{r^2}$$

$$F = G \frac{m_1 m_2}{\left(\frac{r}{1000}\right)^2} = G \frac{m_1 m_2}{\frac{r^2}{1,000,000}} = 1,000,000 \times \frac{G m_1 m_2}{r^2}$$

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- Andres Vega



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COURSES (325)



Natural Language Processing

Columbia University

Started 6 days ago (10 weeks long)



How Things Work 1

University of Virginia

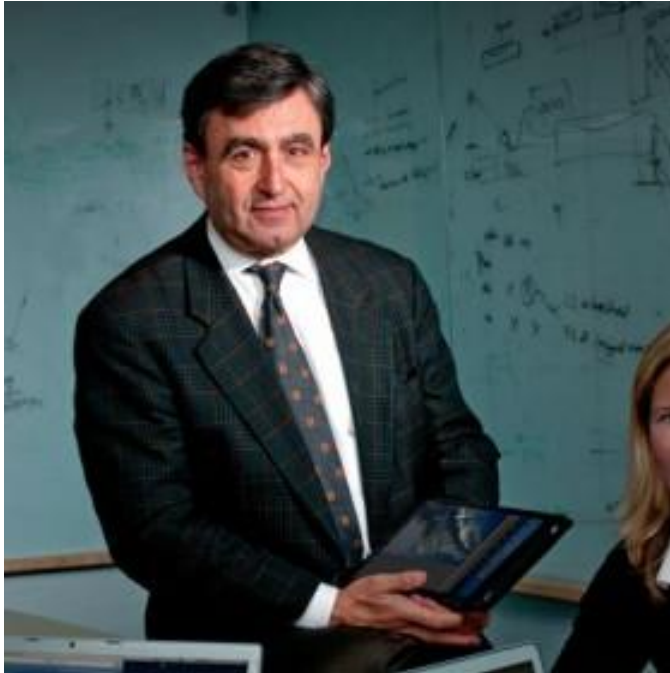
Starts in 3 days (6 weeks long)



AIDS

Emory University

Started 5 days ago (9 weeks long)



**Harvard Physics Professor
Eric Mazur**



Mazur likes a Camus quote: "Some people talk in their sleep. Lecturers talk while *other* people sleep."

Think-Pair-Share

- What is most commonly missed fracture in the Emergency Department?
 - A) Clavicle
 - B) 4th Metatarsal
 - C) Lunate (wrist)
 - D) 10th Rib
 - E) None of the above



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The complete solution for managing the interactive classroom.

✓ Instructors: Get started now

The image displays the Learning Catalytics web interface in a browser window and a mobile app interface on a smartphone. The browser window shows the URL <https://learningcatalytics.com/courses/11/lectures/203> and the user is logged in as Brian Lukoff | Harvard University. The page title is "learning | catalytics". The navigation bar includes "Courses", "Participate", "Review", "Classrooms", "Account", and "About". The current session is 766079 with 69 students. The interface includes buttons for "Stop session", "Review results", "Seat map", "Show floating session ID", "Edit", "PDF", and "Delete". A "Jump to" dropdown menu shows slides 1 through 15. The main content area displays a physics problem: "Light enters horizontally into the combination of two perpendicular mirrors as shown below. Indicate the direction of the incident light after it reflects off of both mirrors." The problem includes a diagram of two perpendicular mirrors and a blue arrow indicating the incident light. The interface also shows "Round 1" and "Round 2" results, with "Round 1" having 57 responses (58% correct) and "Round 2" having 51 responses (73% correct). A "feedback & support" button is at the bottom right. The mobile app interface shows the same session (766079) and the same physics problem, with a "Submit response" button and a "Switch to text response" option.

learning catalytics

https://learningcatalytics.com/courses/11/lectures/203

Brian Lukoff | Harvard University | Log out

learning | catalytics

Courses Participate Review Classrooms Account About

current session: 766079 | 69 students

Stop session Review results Seat map Show floating session ID Edit PDF Delete

Jump to 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Light enters horizontally into the combination of two perpendicular mirrors as shown below. Indicate the direction of the incident light after it reflects off of both mirrors.

Round 1 57 responses, 58% correct

Round 2 51 responses, 73% correct

View student responses in real time; aggregated to quickly give you a sense of student understanding or opinions.

8 get it now 0 still don't get it

feedback & support

Can screen capture technology improve learning of complex concepts?



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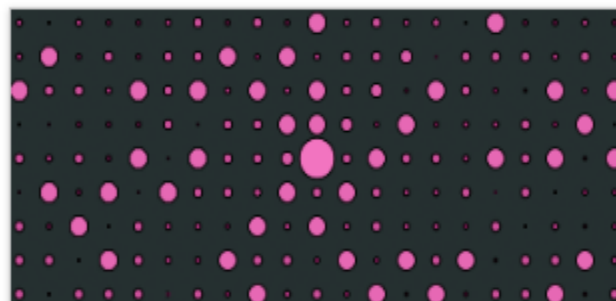


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WATCH ▾ PRACTICE COACH VOLUNTEER

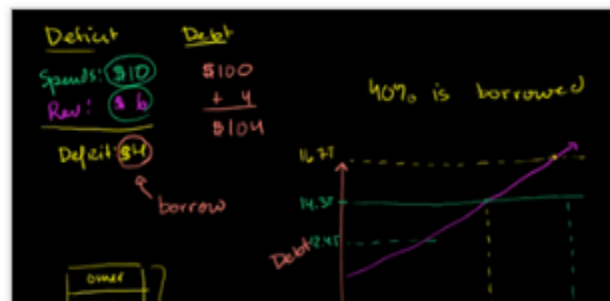
Learn almost anything for free

Q Examples: Napoleon, mitosis, Taylor Series, deflation



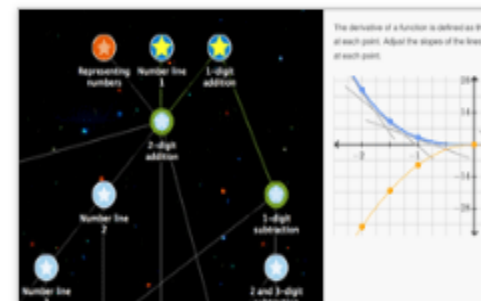
CS number pattern challenge

Sal challenges you to create a new number pattern visualization.



Debt ceiling crisis

Sal covers the basics of the federal deficit and what the debt ceiling is.



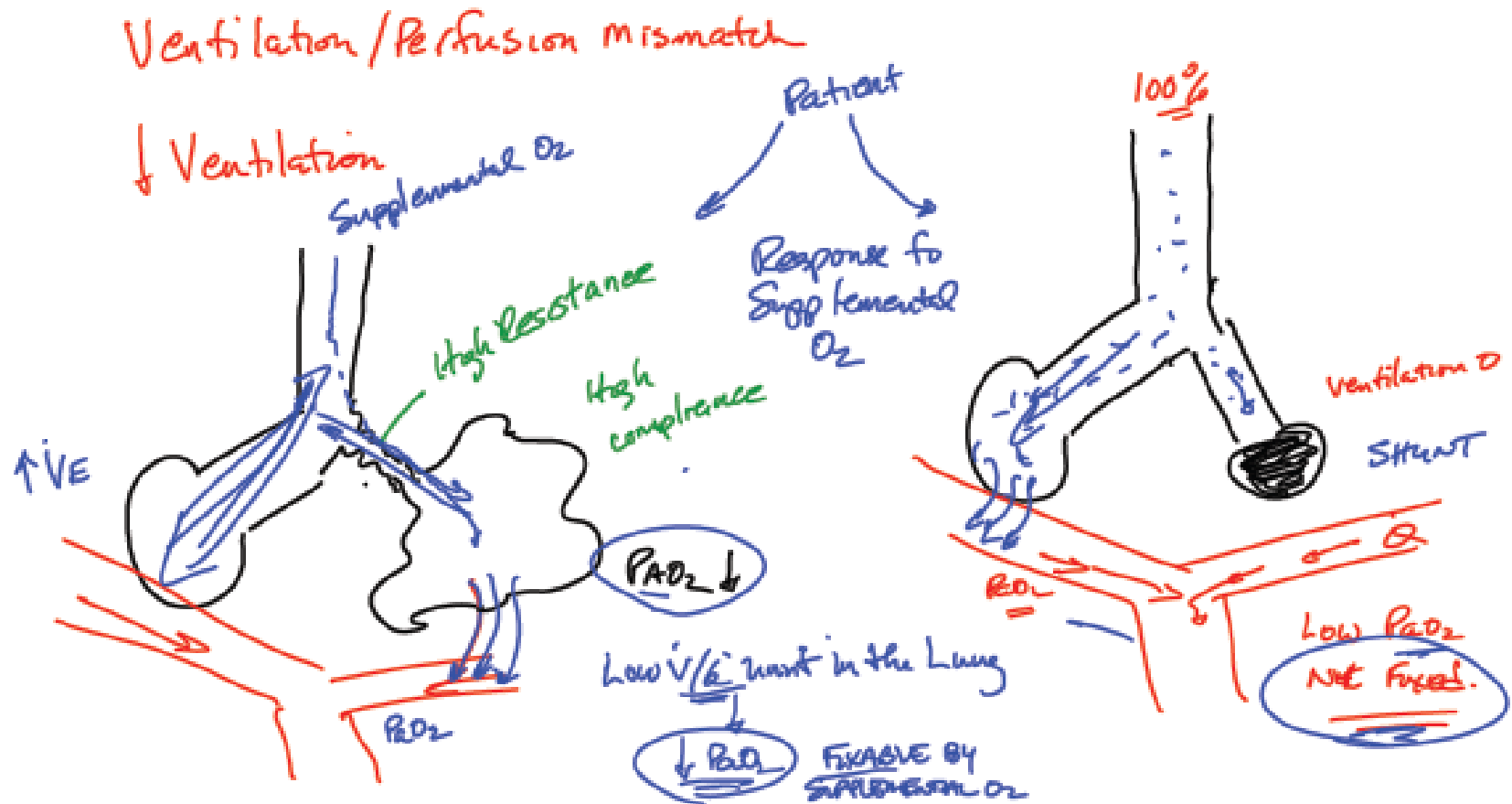
Practice your math skills

Practice your math skills from addition, calculus and everything in between.

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Can the classroom be designed to enhance learning using technology?



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WINTER STREET ARCHITECTS

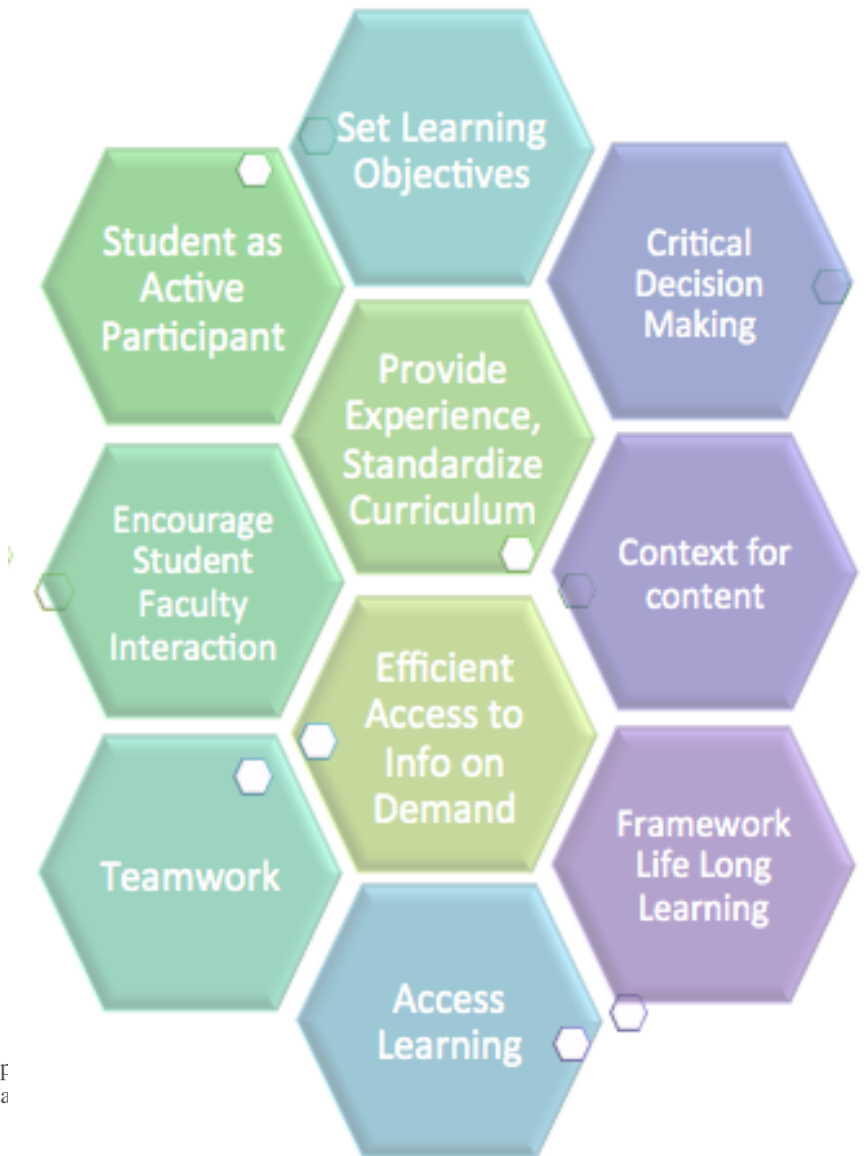




As teachers, what should we ask?

How can technology assist in maximizing principles of adult learning?

**What is the “value add” to technology?
Why is it better than not using technology**



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The Twenty-First-Century Student

Student Use of Technology

1. Student Computing Trends
2. Student Software Trends
3. What students want changed?

2012 Student Educational Technology Survey



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Student Use of Technology

- Students use technology to enhance learning
 - Complex concepts
 - Exploring resources
 - “Saving time”
 - Mobile devices
 - iPad Apps
 - Social networking

36% Students have iPads
Higher % in pre-clinical years
iPad is top “next purchase”



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COPD: Progressive airflow limitation that is not fully reversible

↓ FEV₁/FVC ratio:

w/ quit smoking + treatment
FVC will improve

- **Emphysema:**

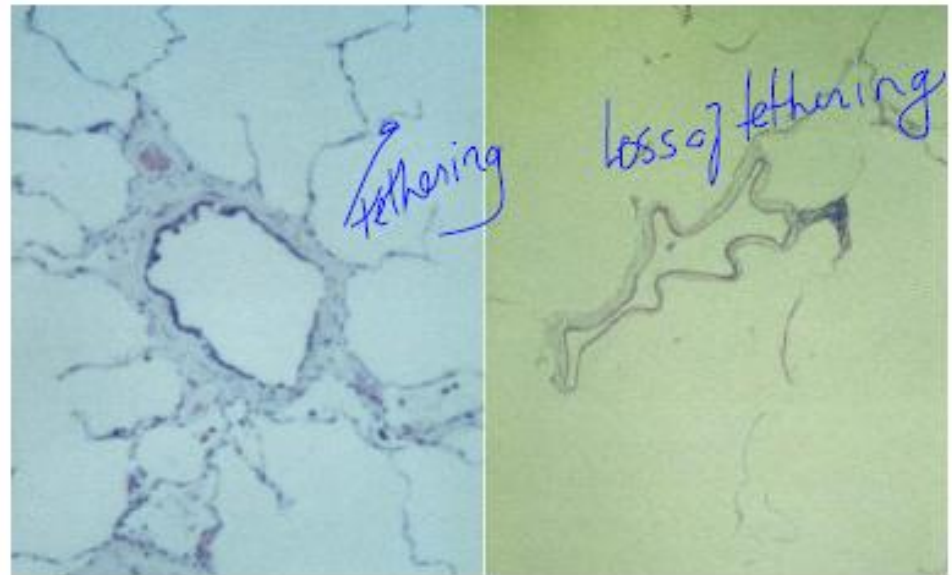
Lung tissue destruction
& air space enlargement

↳ also involves a decrease of elastin/capillary volume

↳ can have overlap.

- **Chronic Bronchitis:**

Productive cough for at least 3 months in 2 successive years



Normal

Emphysema

Asthma = Reversible



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2012



4 “ages” of information

**fundamental
changes to how information
and ideas are shared and
disseminated**

**Harvard English Professor
Steven Pinker**



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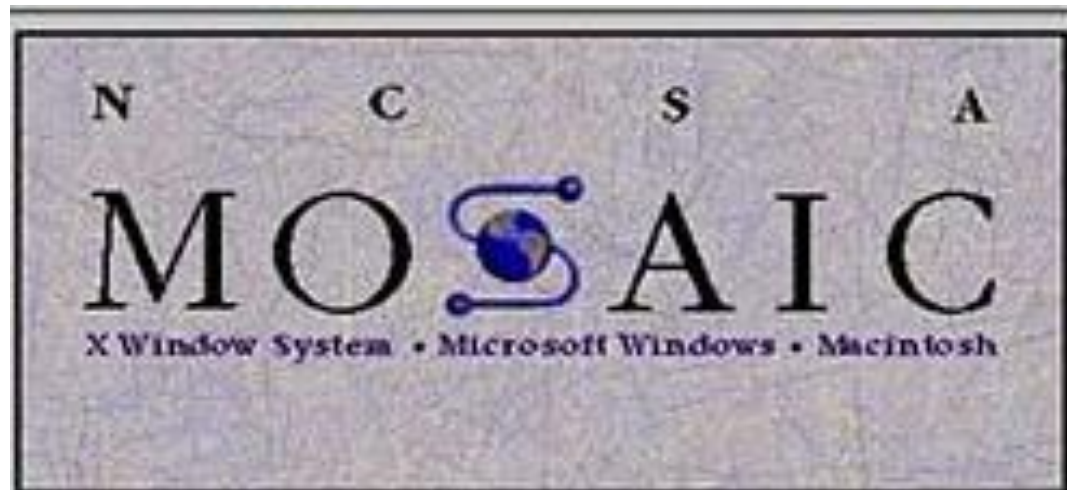
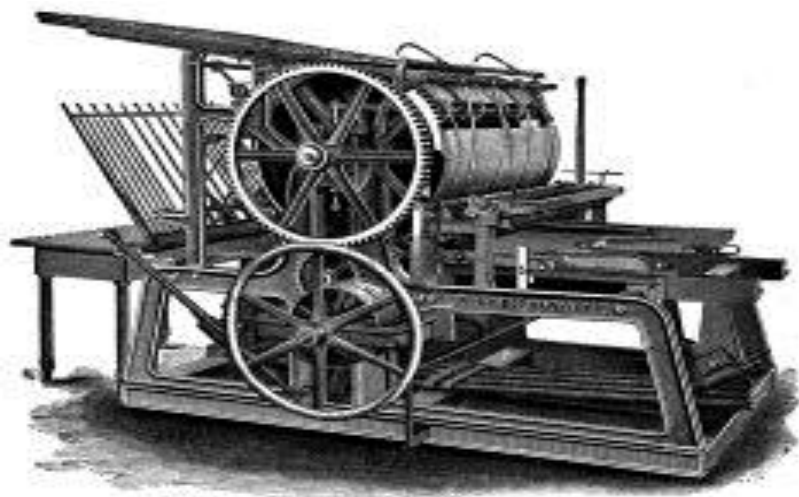


Writing on Tablets, Sumeria, 3000 BC



Gutenberg, Movable Type, c. 1440

Printing press, c. 1800



Mosaic 1.0 (web browser) 1993

The Times They Are a-Changin'



1998



2004



2005



2006



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Are you learning this...?

2013; 35: 8–14



TWELVE TIPS

Twelve tips for using Twitter as a learning tool in medical education

SARAH EDITH FORGIE, JON P. DUFF & SHELLEY ROSS

University of Alberta, Canada



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FOLLOW
ONPOINT

TODAY IS THURSDAY, FEBRUARY 23, 2012

SEARCH

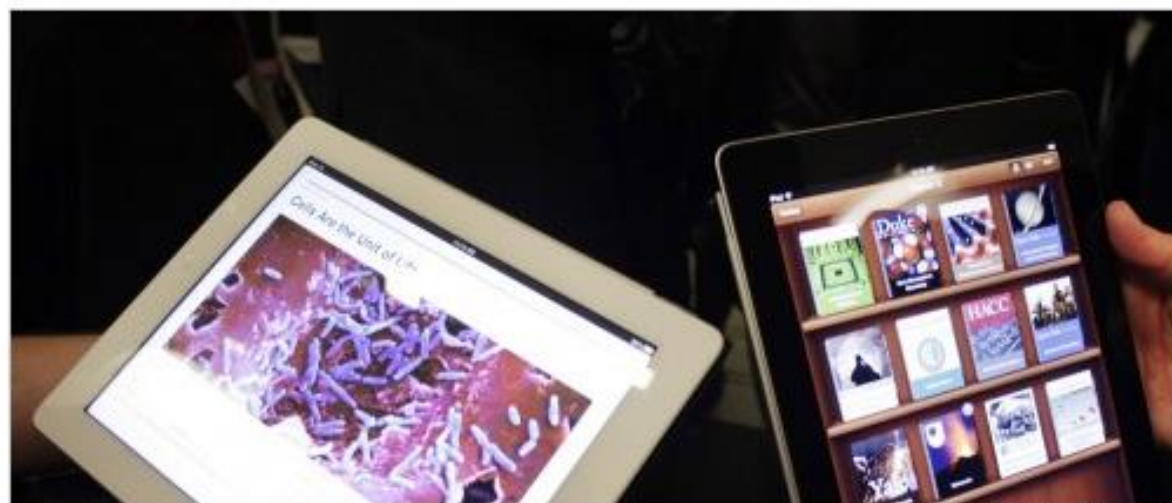
LISTEN TO THIS SHOW ▶▶

Tuesday, January 24, 2012 at 11:00 AM EST

[E-mail](#) [Twitter \(68\)](#) [facebook \(68\)](#)

The Digital Future Of Textbooks

The revolution brewing in your child's backpack. One little computer tablet may soon replace all those big old textbooks.



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Can we create a truly integrated,
multimedia tool to enhance learning?



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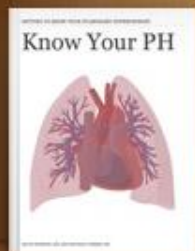
Store

Collections

Books



Edit



Technology enhances teaching and learning during medical training



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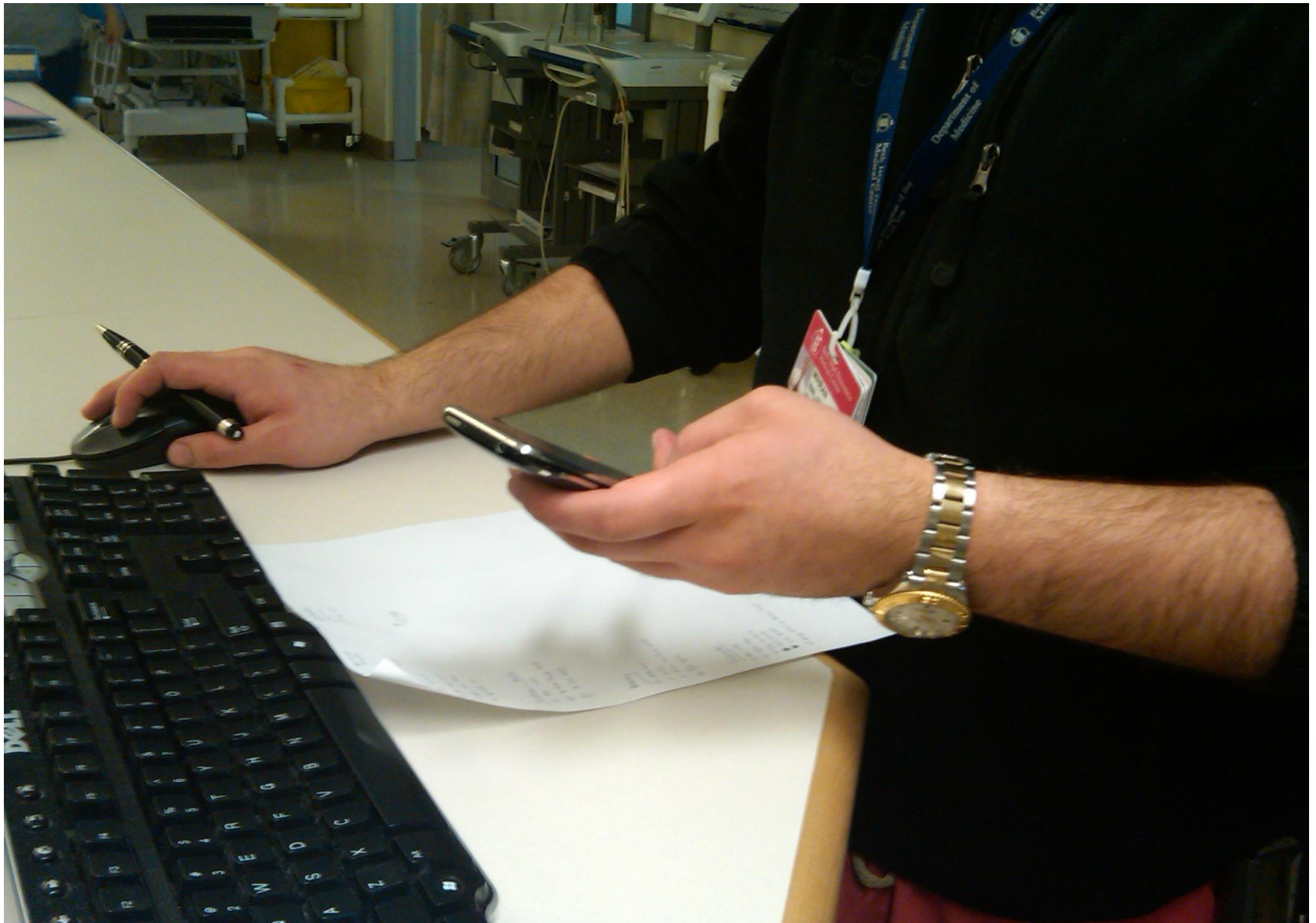
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Are there downsides to technology in medical training?



As Doctors Use More Devices, Potential for Distraction Grows



Doug Benz for The New York Times

"My gut feeling is lives are in danger," said Dr. Peter J. Papadakos, of the University of Rochester Medical Center.

By MATT RICHTEL

Published: December 14, 2011

Hospitals and doctors' offices, hoping to curb medical error, have invested heavily to put computers, smartphones and other devices

 RECOMMEND

 TWITTER



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Technology poses new challenges for students in the realm of professionalism

- Medical blogging
- Interruptions by ringing phones
- Cameras ubiquitous
- Privacy settings on Facebook
- Linking to patients via email and social networking



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Are there pedagogic downsides to technology?

“The Knowledge Constrictor”

New York Times
September 19, 2010
Ben Greenman

Anaconda



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Are there pedagogic downsides to technology?

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New York Times

September 19, 2010

Ben Greenman

Reticulated
Python

Loss of

“Productive Frustration”



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Medical Center



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Why should you try to incorporate technology in your teaching

- It's engaging
- It's easy (w/practice)
- It's fun
- Our learners are digital natives and want / demand this



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Try something new!

- Teach beyond CONTENT
- Disseminate your work
- Think about the HOW's
 - How will students best learn?
 - How will they engage?
 - How will they view this?
 - How will they share this?



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