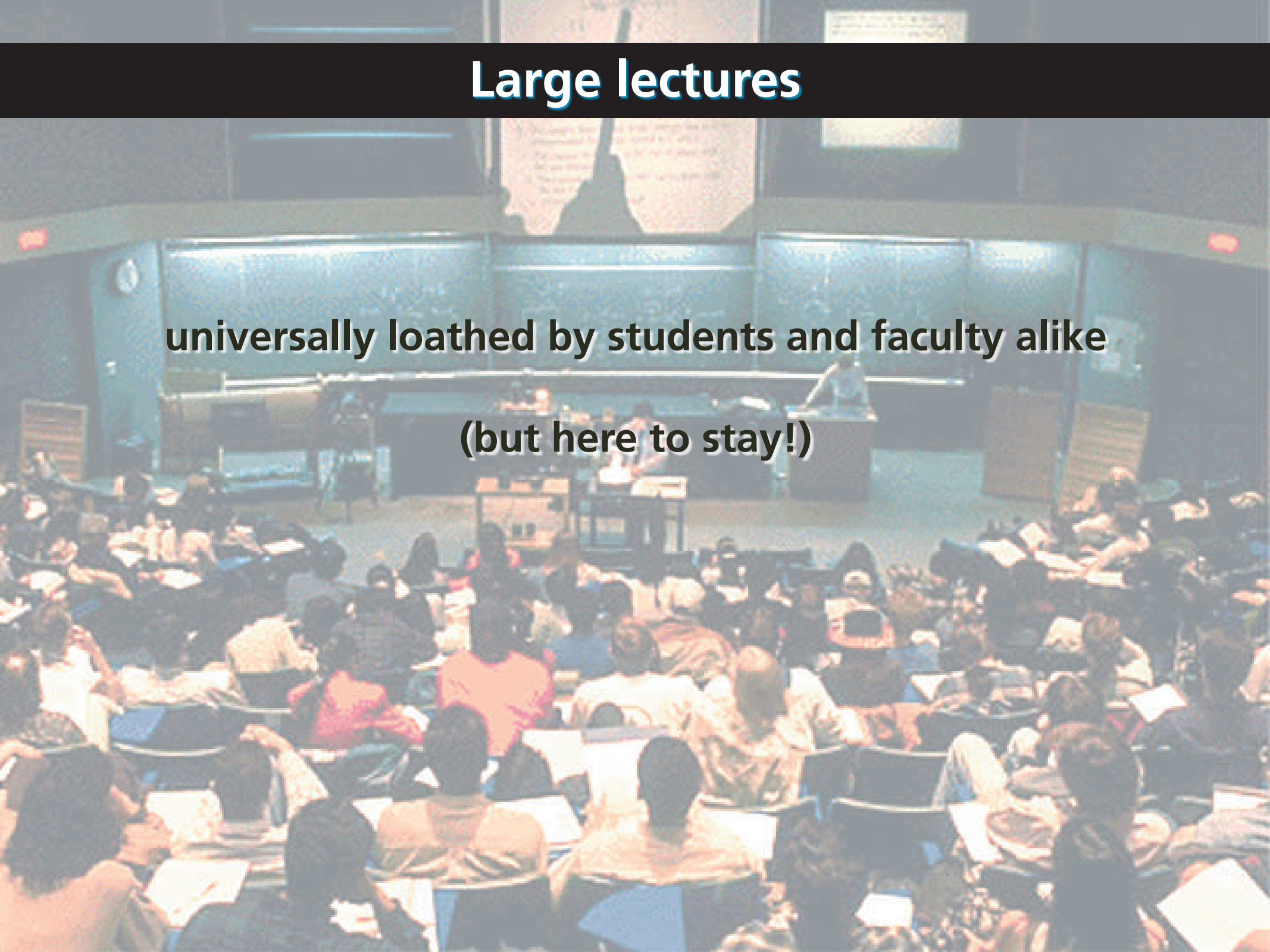
The Interactive Learning Toolkit

Davis Foundation Site Visit
Cambridge, MA, 14 April 2006

Large lectures

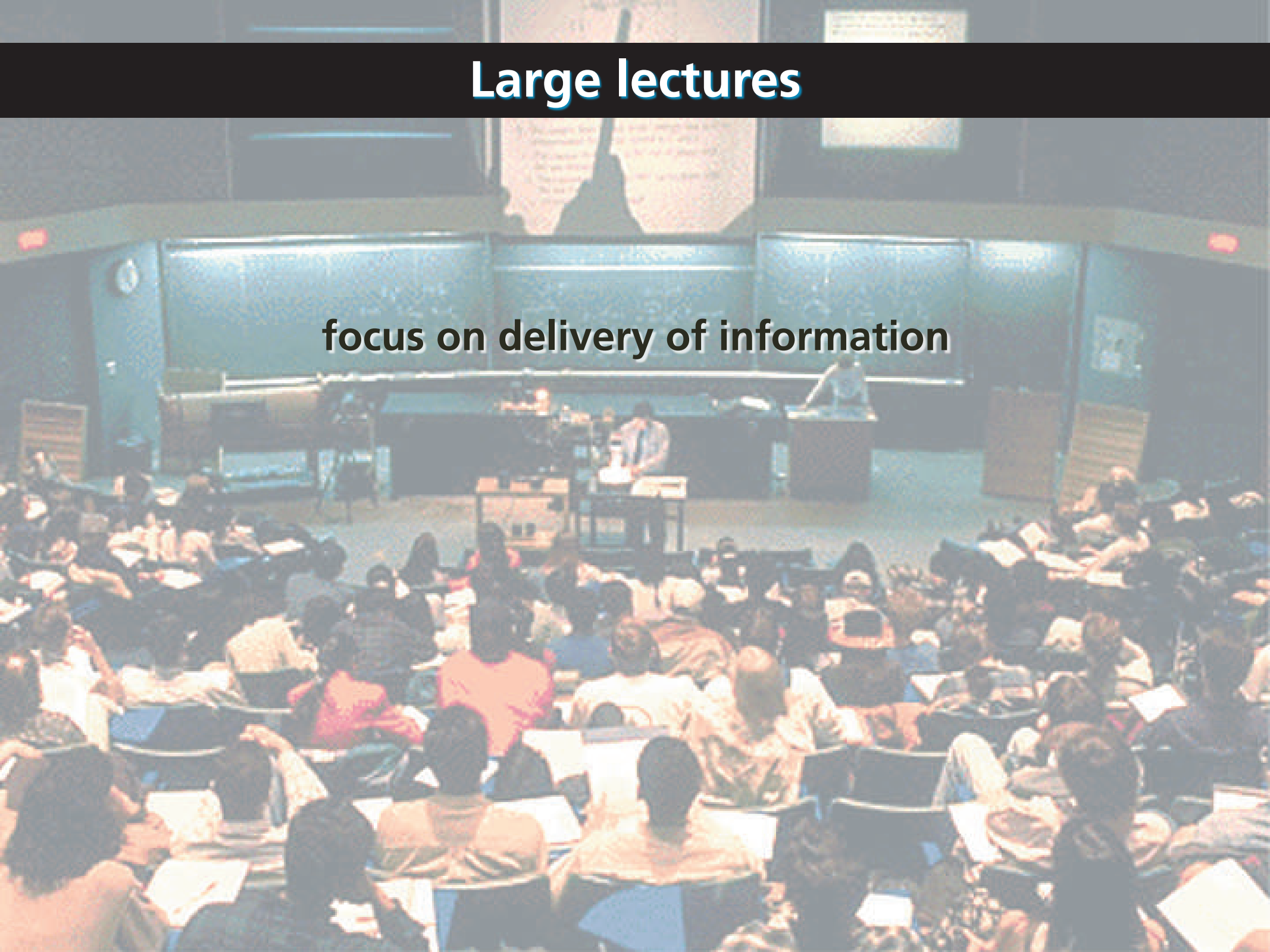
Large lectures



universally loathed by students and faculty alike

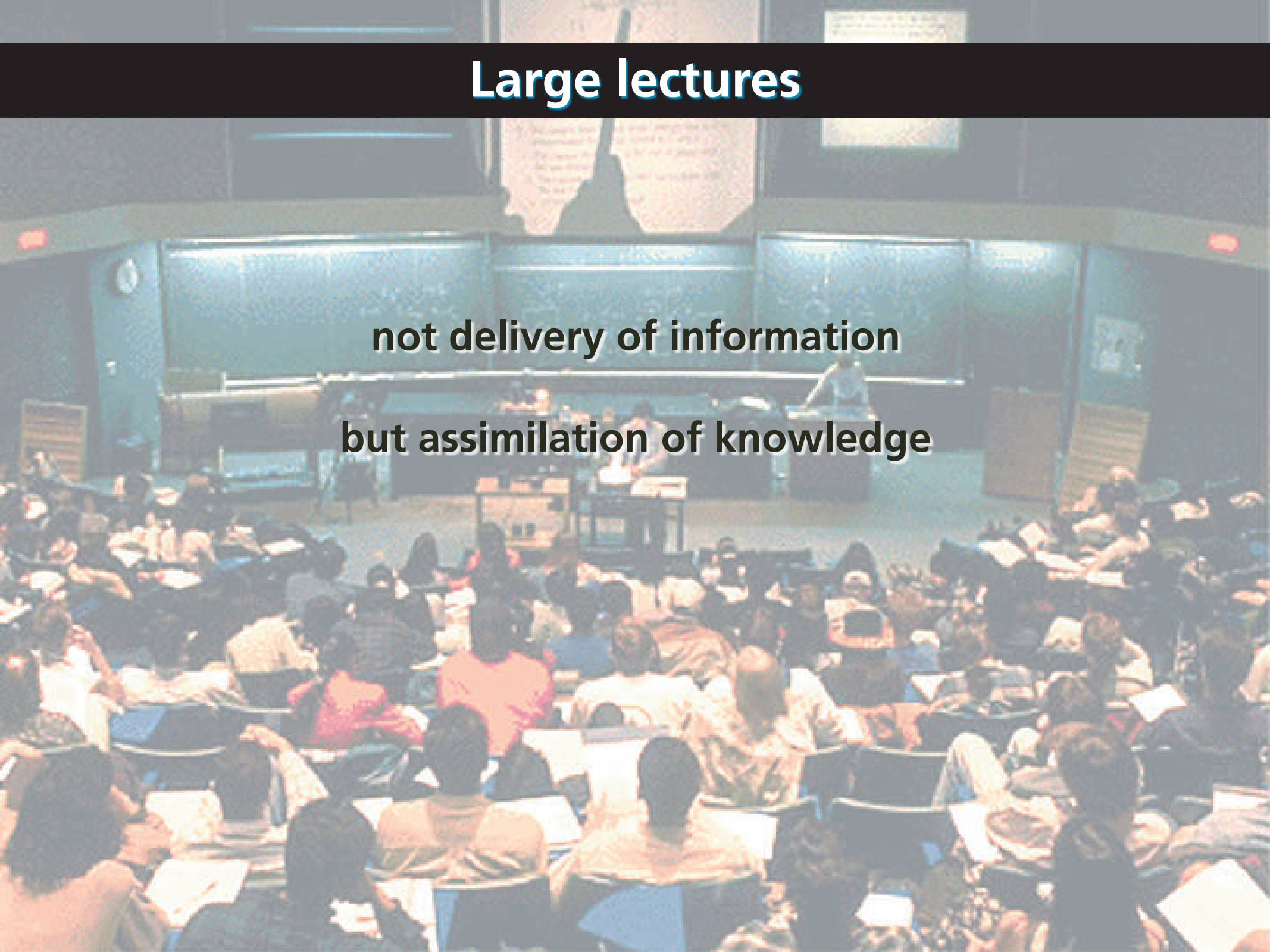
(but here to stay!)

Large lectures



focus on delivery of information

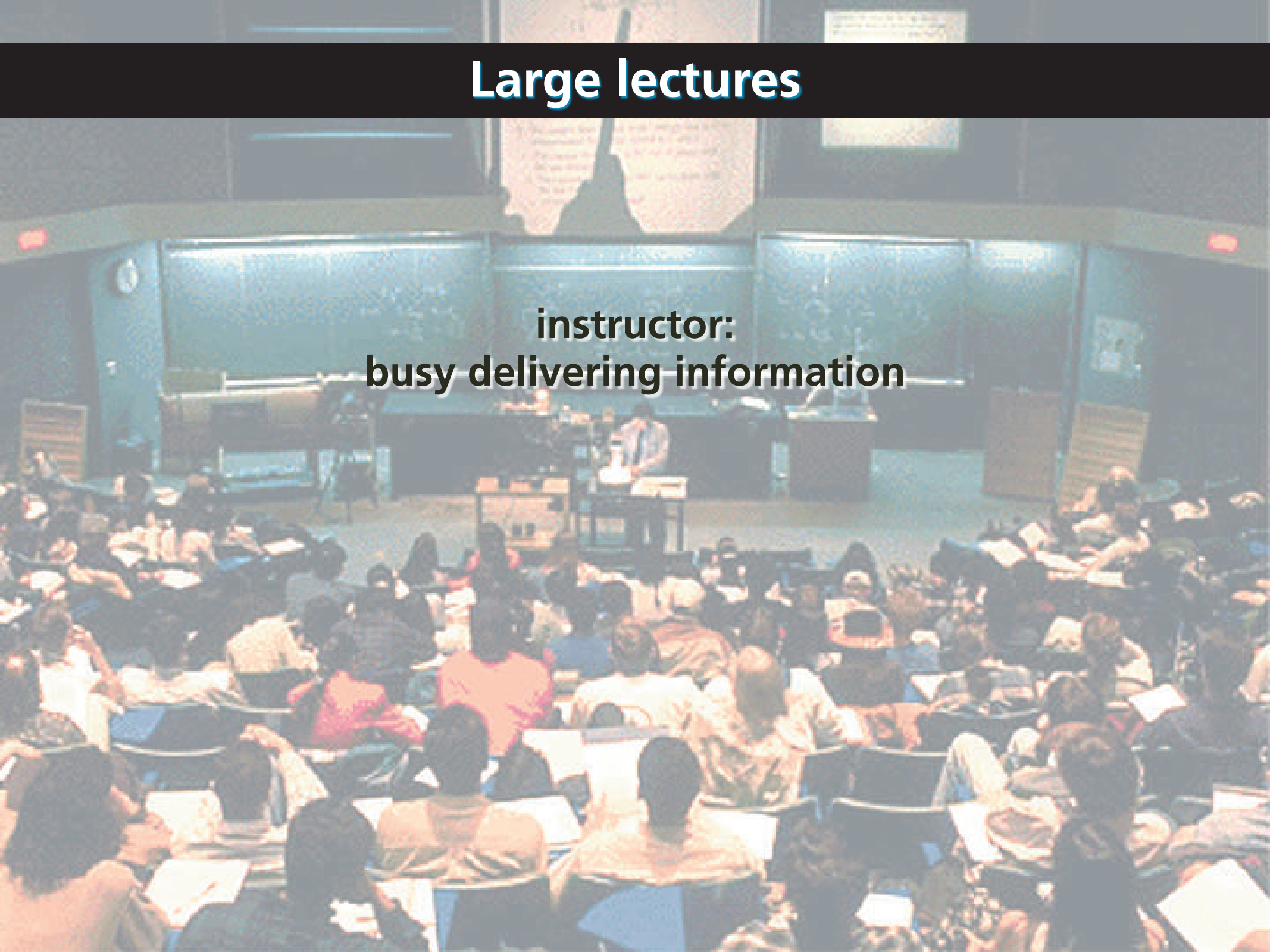
Large lectures



not delivery of information

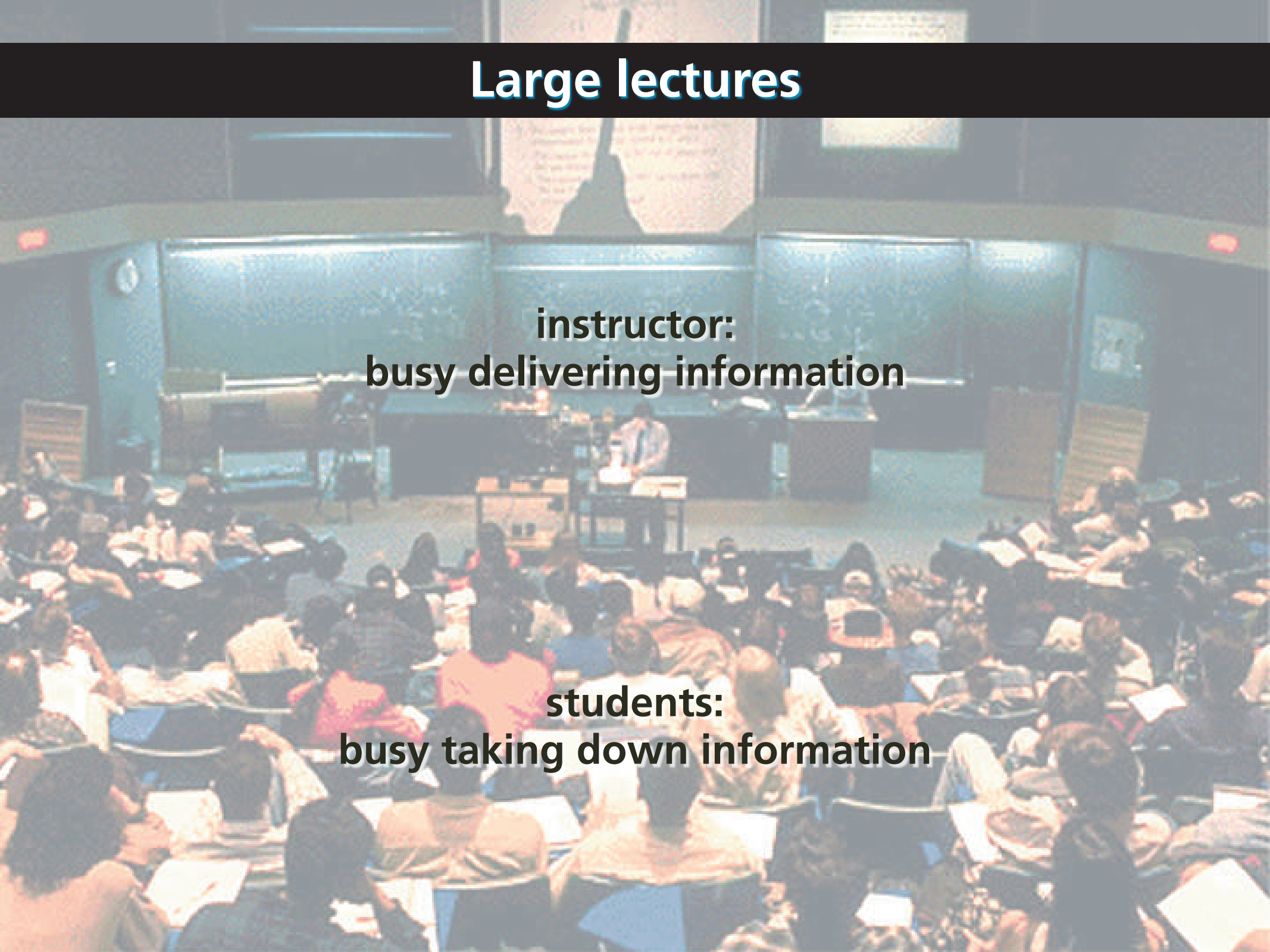
but assimilation of knowledge

Large lectures



instructor:
busy delivering information

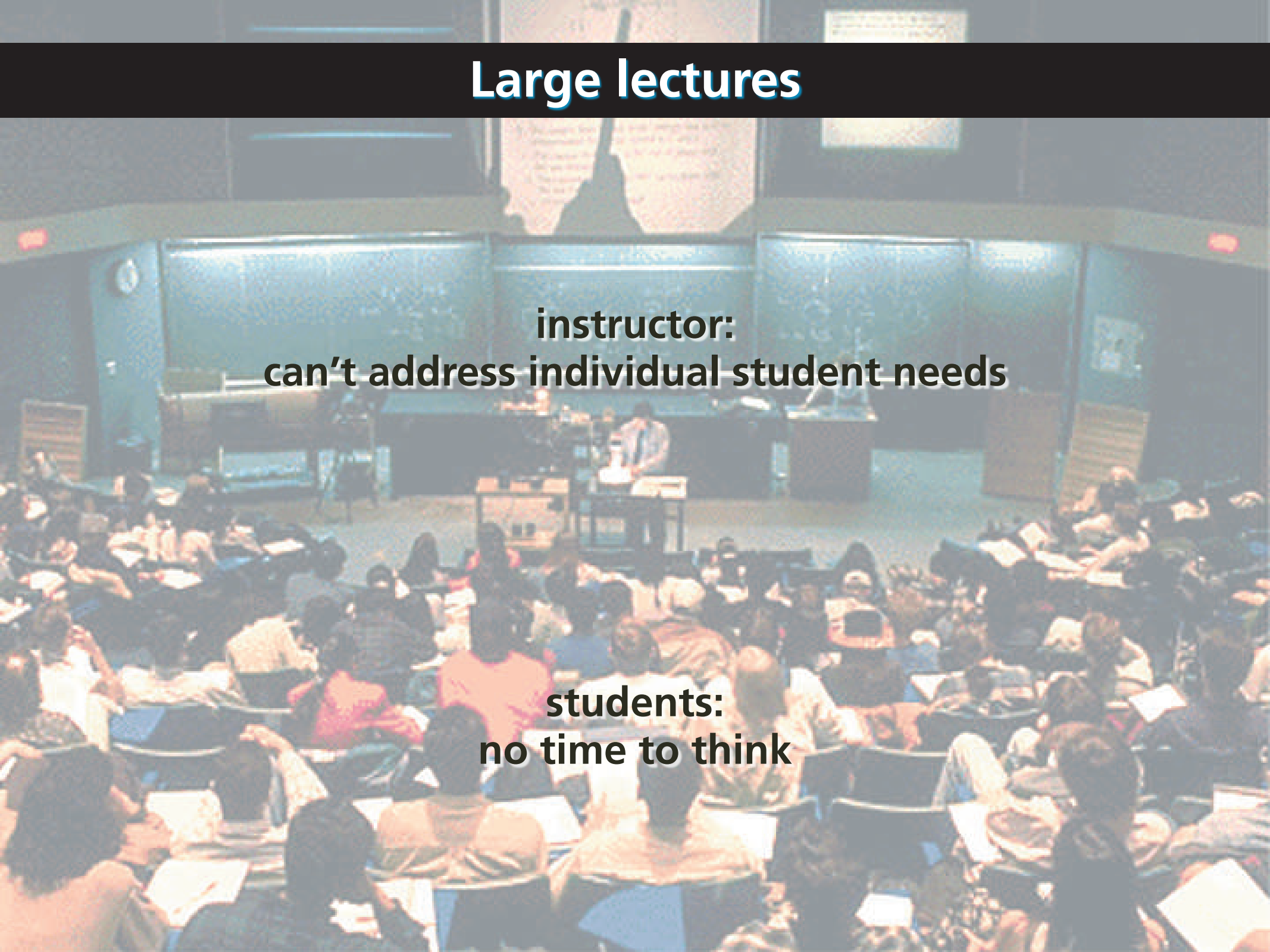
Large lectures



instructor:
busy delivering information

students:
busy taking down information

Large lectures



instructor:
can't address individual student needs

students:
no time to think

Technology

Technology

not a magic bullet

Technology

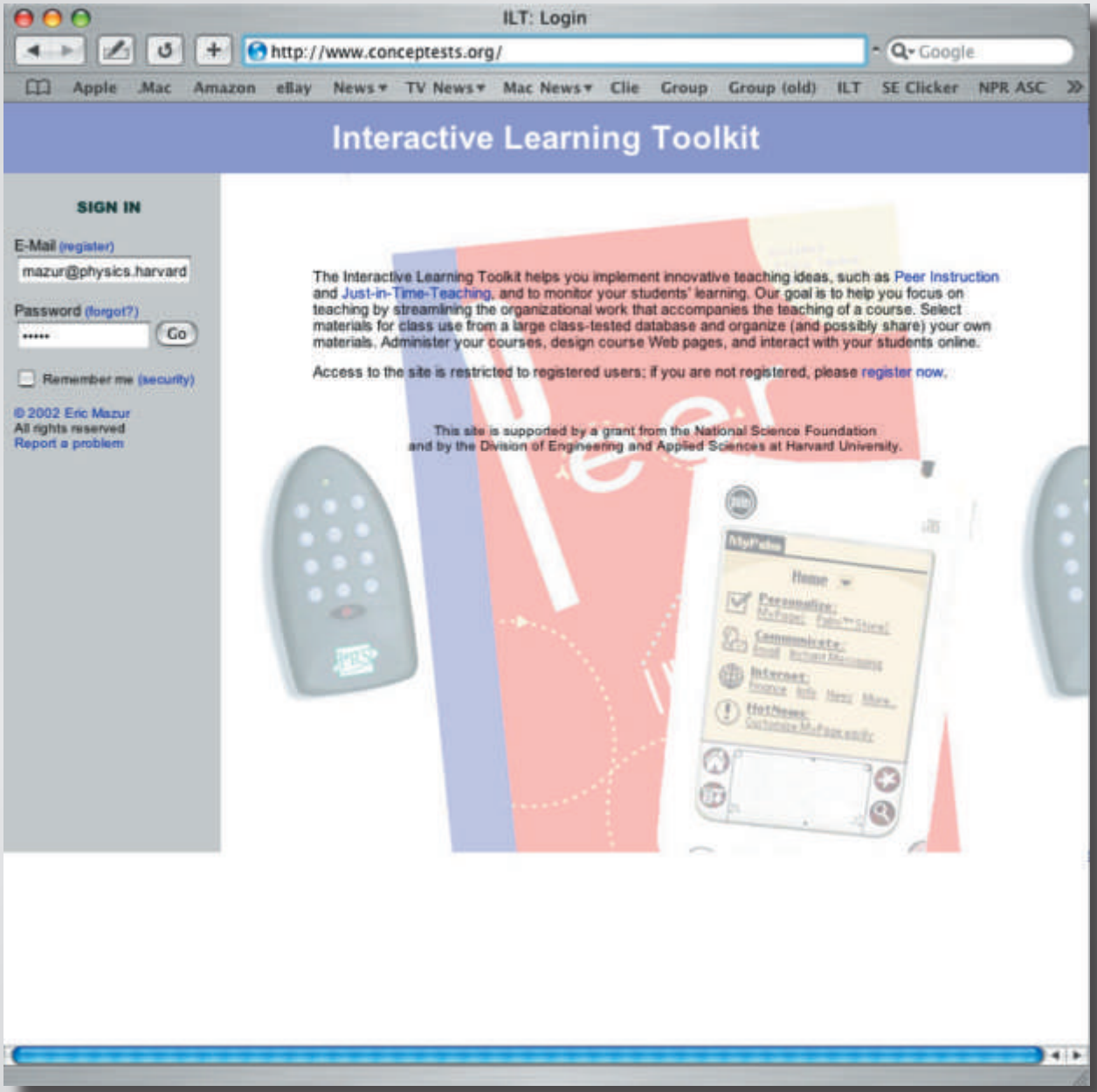
new method for delivering old content

Interactive Learning Toolkit

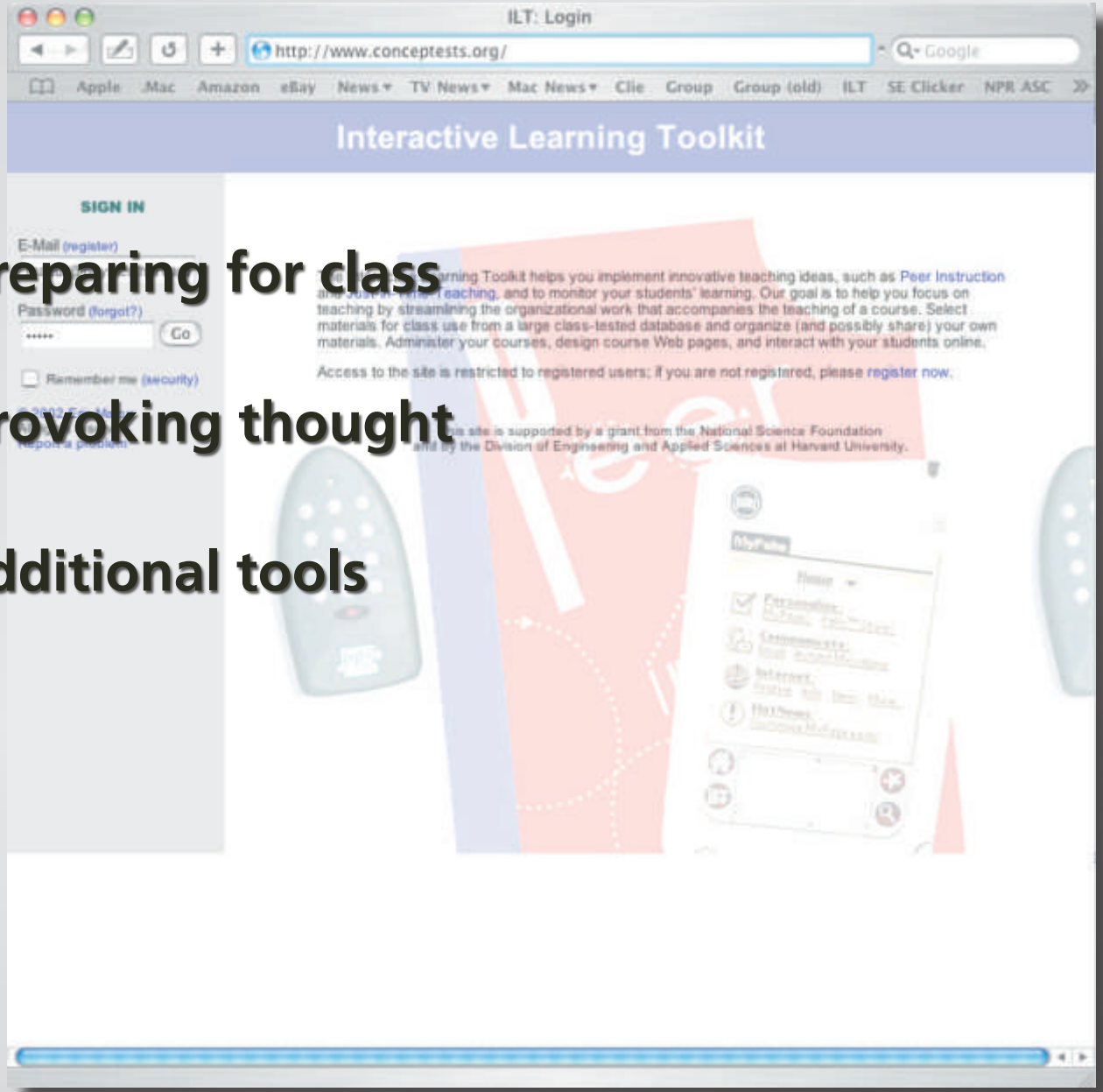
Use technology to

- facilitate new modes of learning
- increase interaction
- help instructor address student needs

Interactive Learning Toolkit

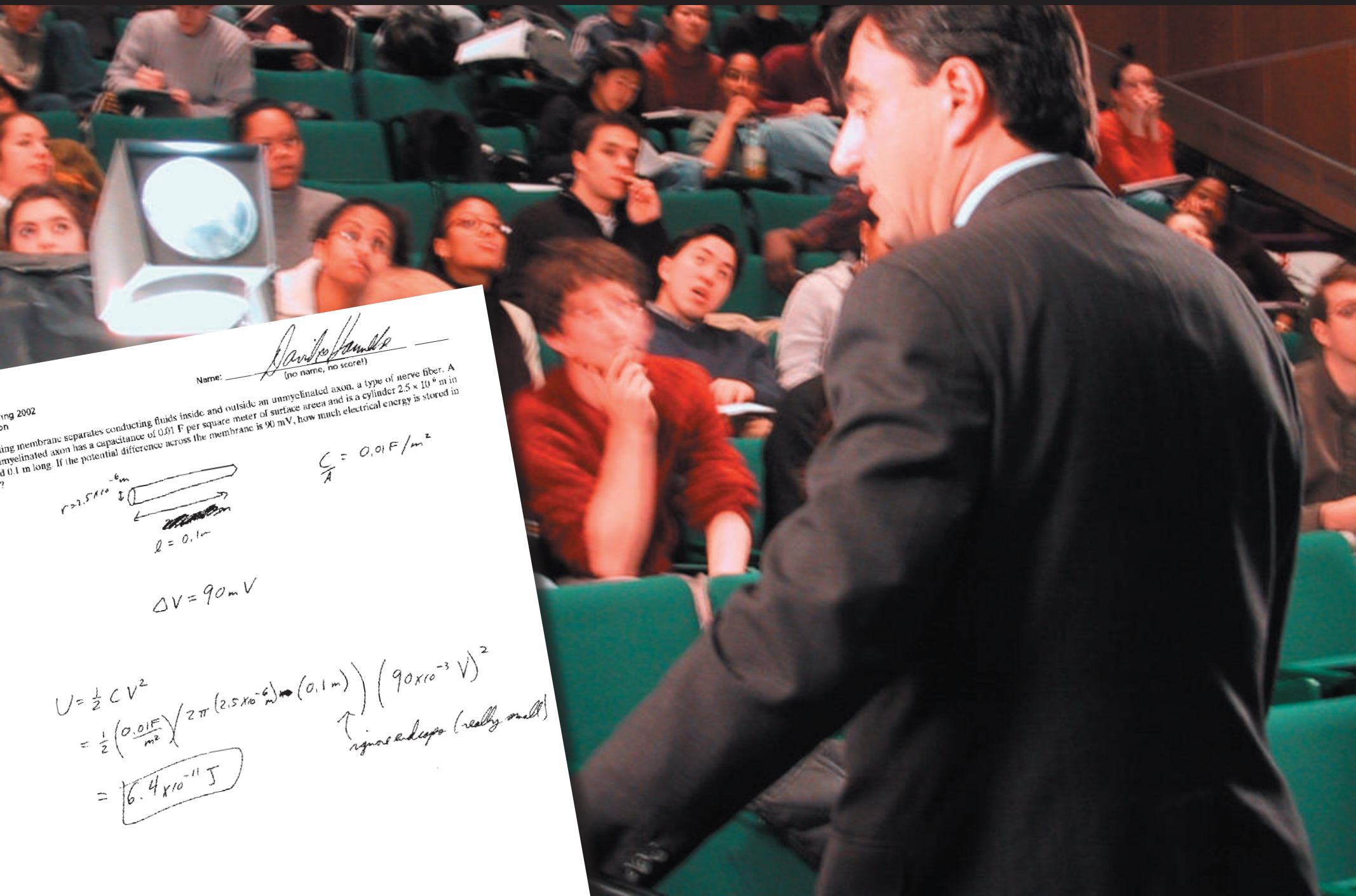


Outline

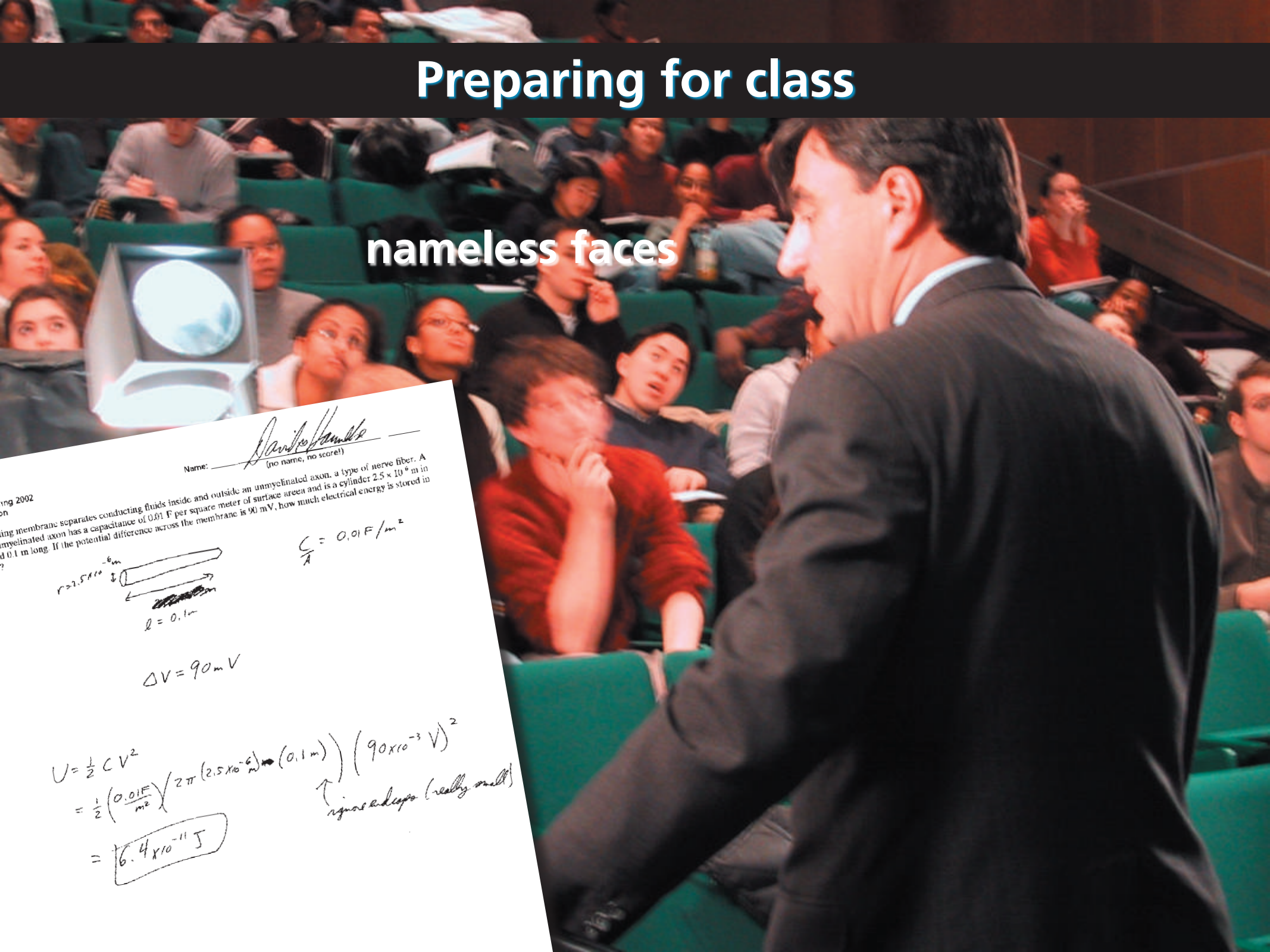


- preparing for class
- provoking thought
- additional tools

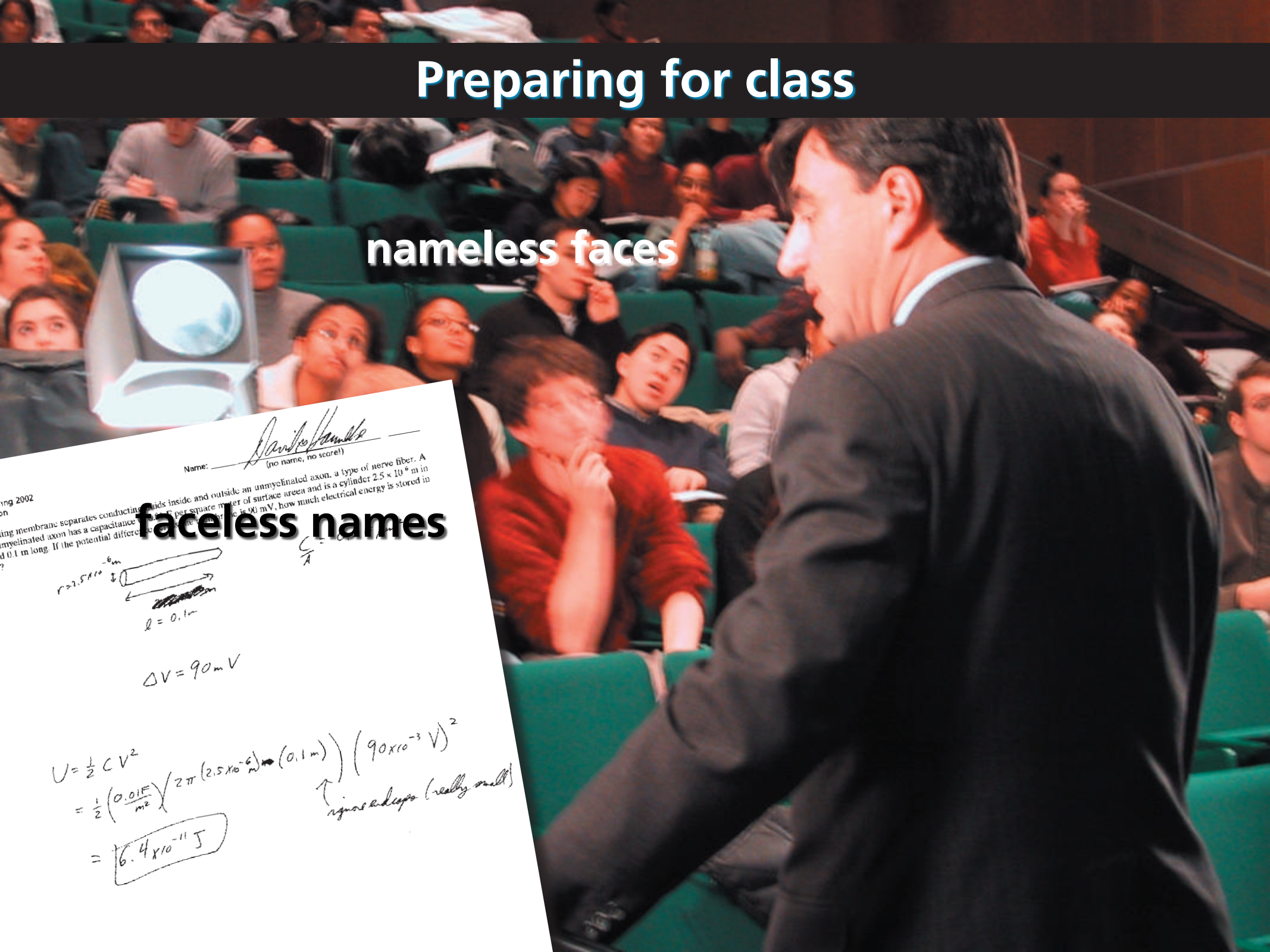
Preparing for class



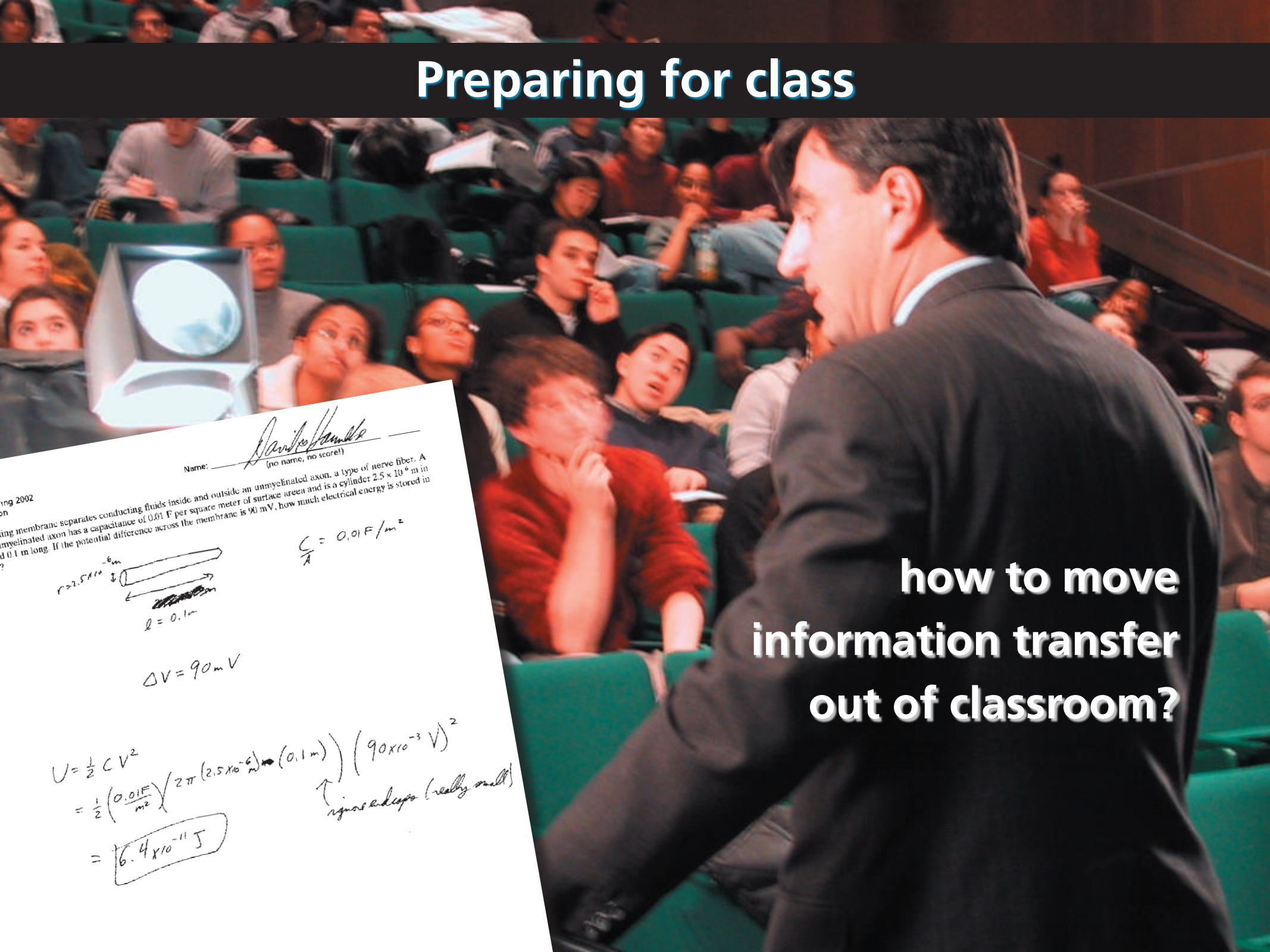
Preparing for class



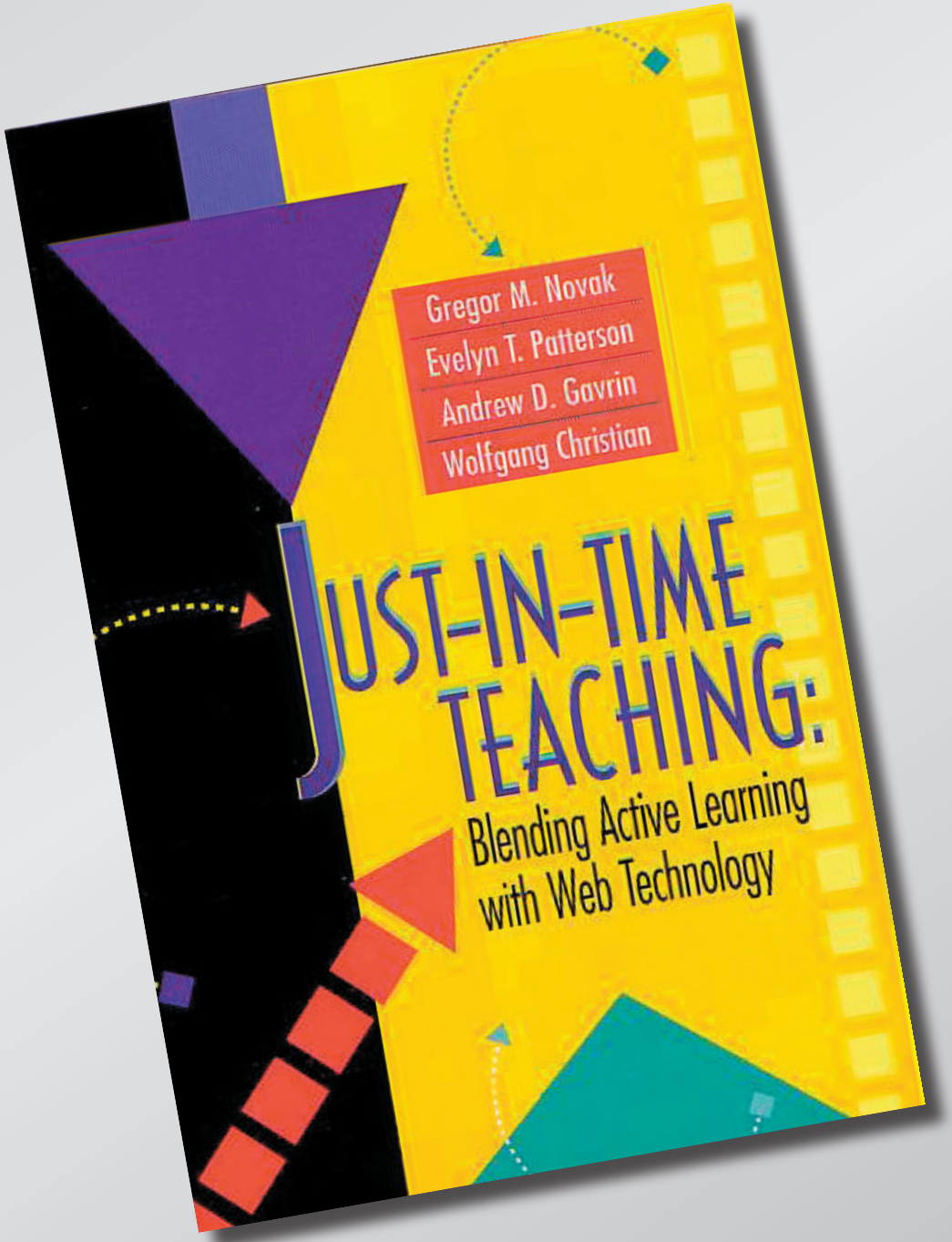
Preparing for class



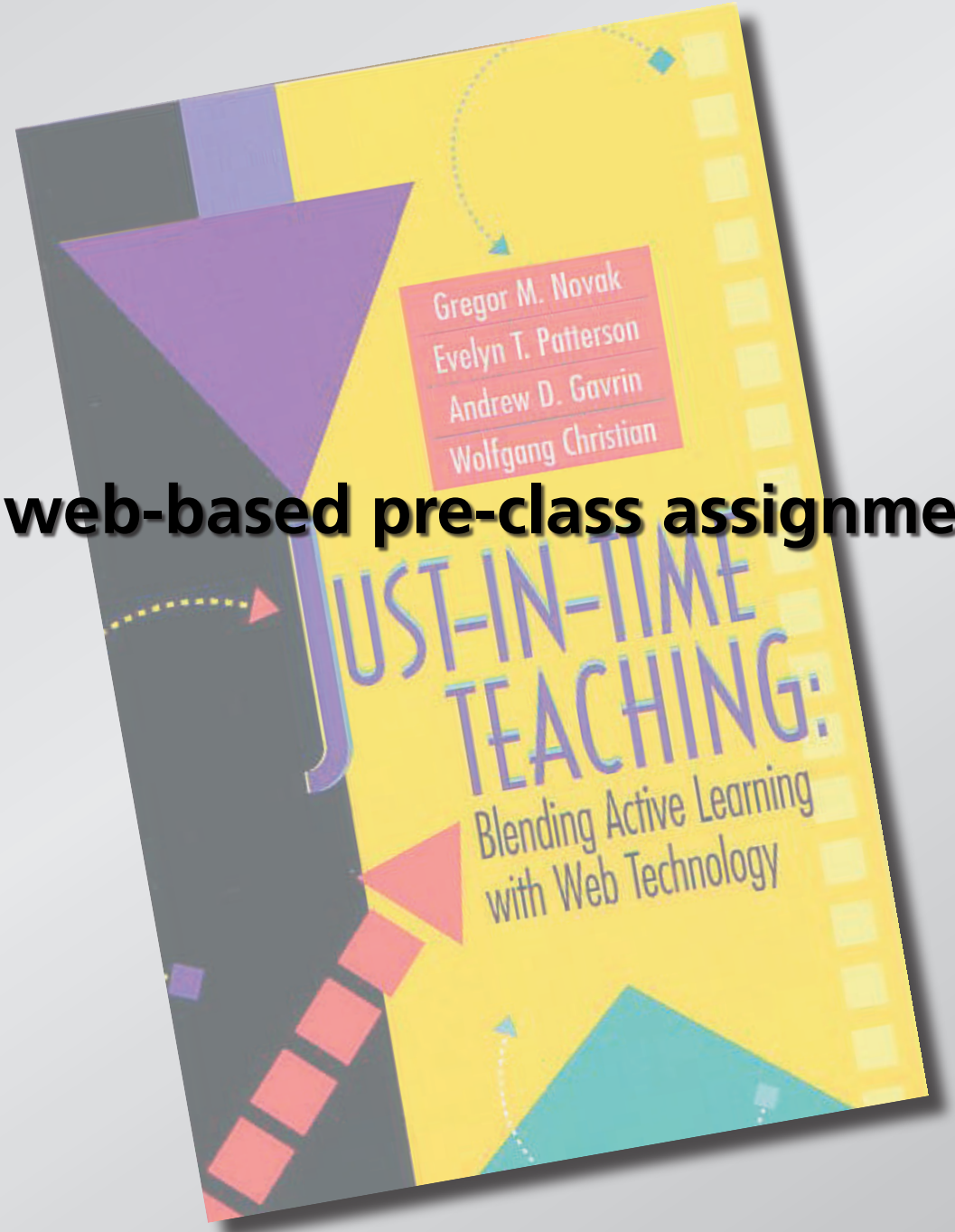
Preparing for class



Preparing for class



Preparing for class



web-based pre-class assignment

Preparing for class

ILT: Students

http://www.conceptest.org/

ILT ▾ DEAS ▾ Apple ▾ Visualization ▾ HPC ▾ Education ▾ Local Info ▾ IBM ▾ Culture ▾ General Computer ▾ Mazur ▾

Physics 1b

Logged in as Eric Mazur
Sign out

HOME | READING | LECTURES | ASSIGNMENTS | FORUMS | NEWS | HANDOUTS | ?

E-MAIL
Manage email connection
Email (3)

COMING UP
5/2 Assignment 1

TOOLS
Run Similarity Check

QUICK LINKS
Standardized tests
Students

Sections
Select Section

Report a problem

SITE ADMIN
Users
Conceptests
Topics
Bugs
Standardized test

Courses > Physics 1b > Reading > Changing magnetic fields II > |< < **Student Responses**

Please tell us briefly what **single** point of the reading you found most difficult or confusing. If you did not find any part of it difficult or confusing, please tell us what parts you found most interesting.

See notebook for an overview of common difficulties.

Click name to respond

Flag similarities closer than: 60 go

1 - 100 of 153 answers > >|

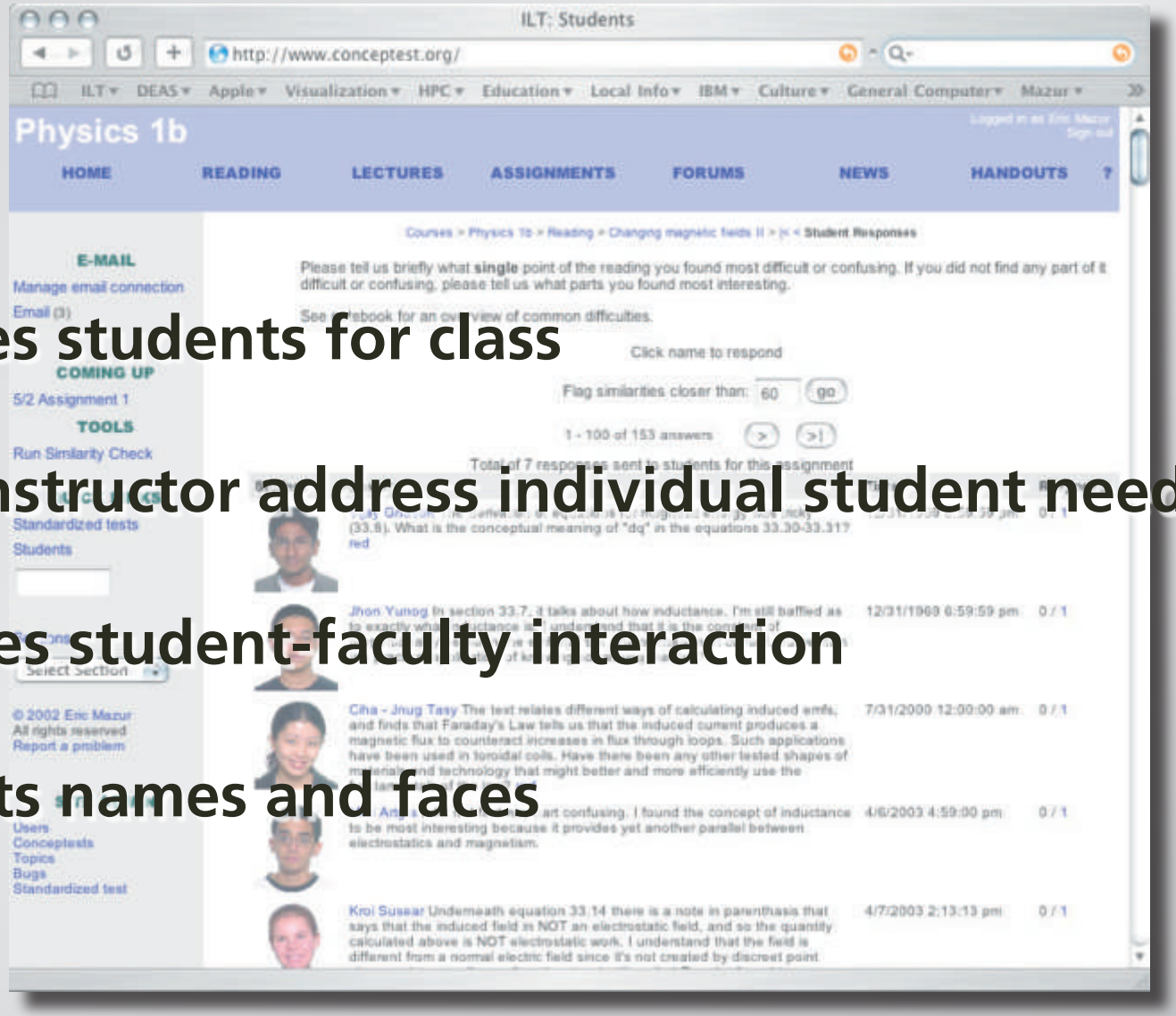
Total of 7 responses sent to students for this assignment

Student	Answer	Time	Response
	Vijay Gnaseh The derivation of equations for magnetic energy was tricky (33.8). What is the conceptual meaning of "dq" in the equations 33.30-33.31? red	12/31/1969 6:59:59 pm	0 / 1
	Jhon Yunog In section 33.7, it talks about how inductance. I'm still baffled as to exactly what inductance is. I understand that it is the constant of proportionality between the emf and the rate of change of current, but what is the practical application of knowing something like this?	12/31/1969 6:59:59 pm	0 / 1
	Cha - Jnug Tasy The text relates different ways of calculating induced emfs, and finds that Faraday's Law tells us that the induced current produces a magnetic flux to counteract increases in flux through loops. Such applications have been used in toroidal coils. Have there been any other tested shapes of materials and technology that might better and more efficiently use the fundamentals of the law? red	7/31/2000 12:00:00 am	0 / 1
	Mici Artgia I did not find any part confusing. I found the concept of inductance to be most interesting because it provides yet another parallel between electrostatics and magnetism.	4/6/2003 4:59:00 pm	0 / 1
	Kroi Susear Underneath equation 33.14 there is a note in parenthasis that says that the induced field in NOT an electrostatic field, and so the quantity calculated above is NOT electrostatic work. I understand that the field is different from a normal electric field since it's not created by discreet point	4/7/2003 2:13:13 pm	0 / 1

Preparing for class

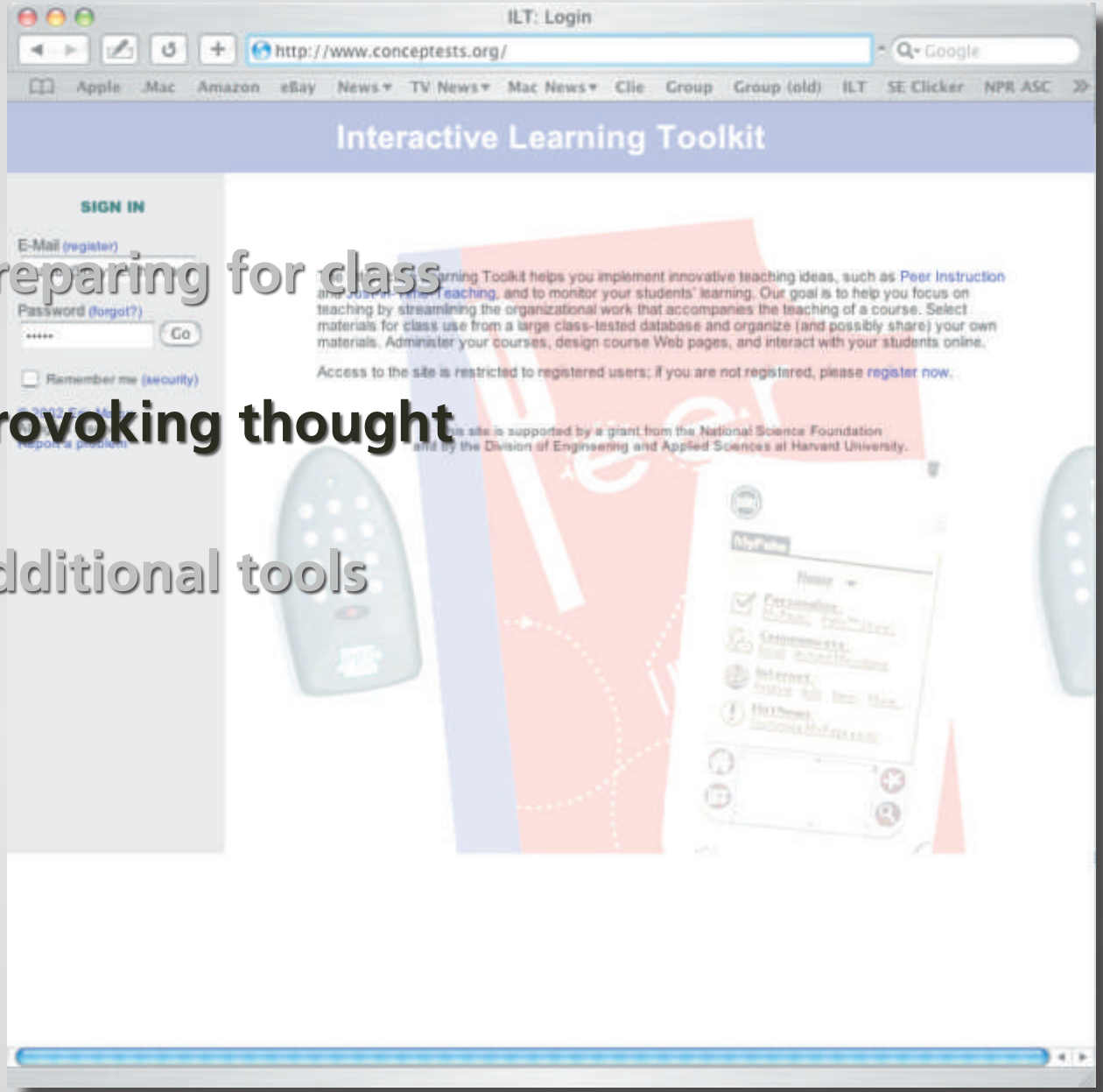
Benefits:

- prepares students for class
- helps instructor address individual student needs
- increases student-faculty interaction
- connects names and faces



Outline

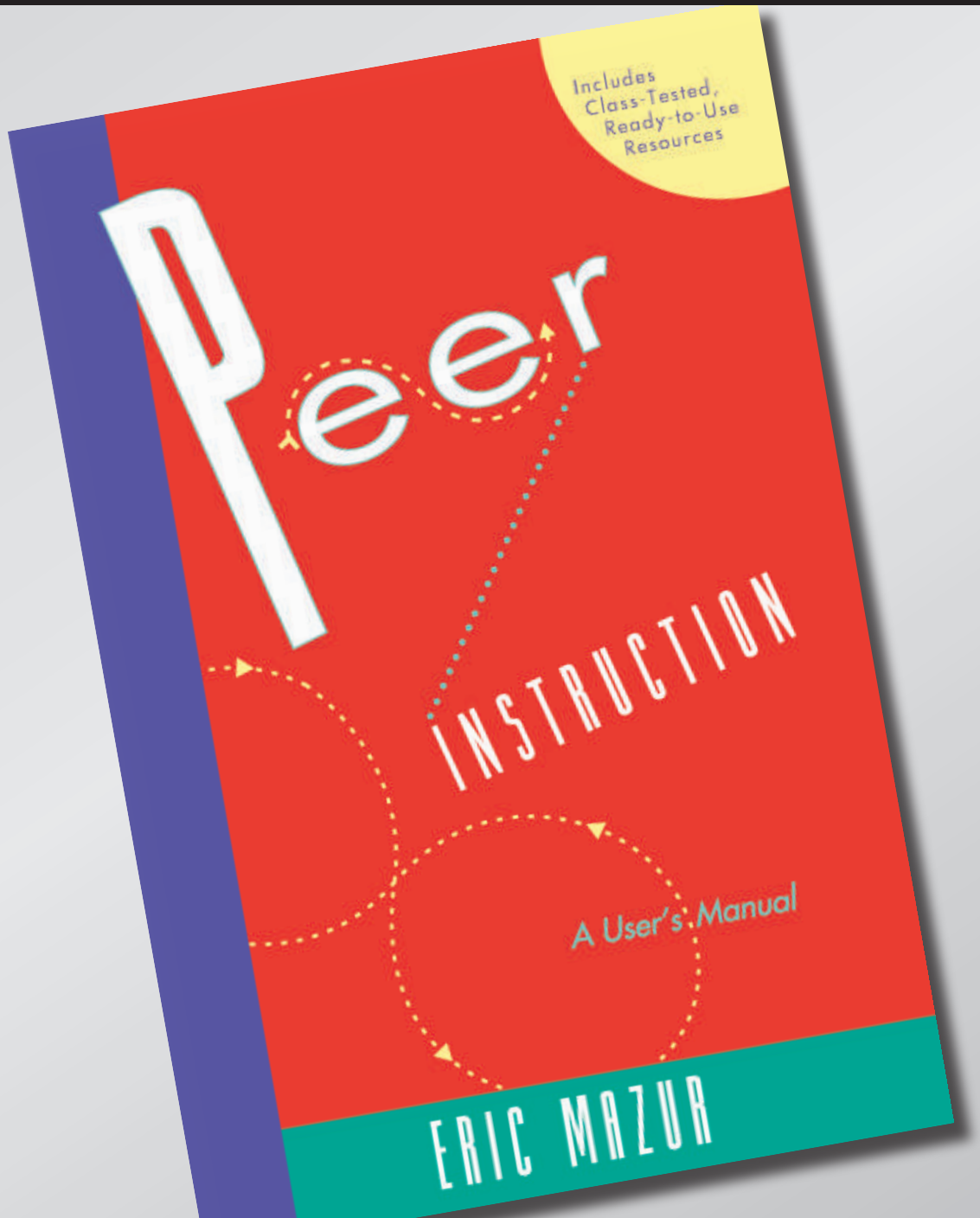
- preparing for class
- **provoking thought**
- additional tools



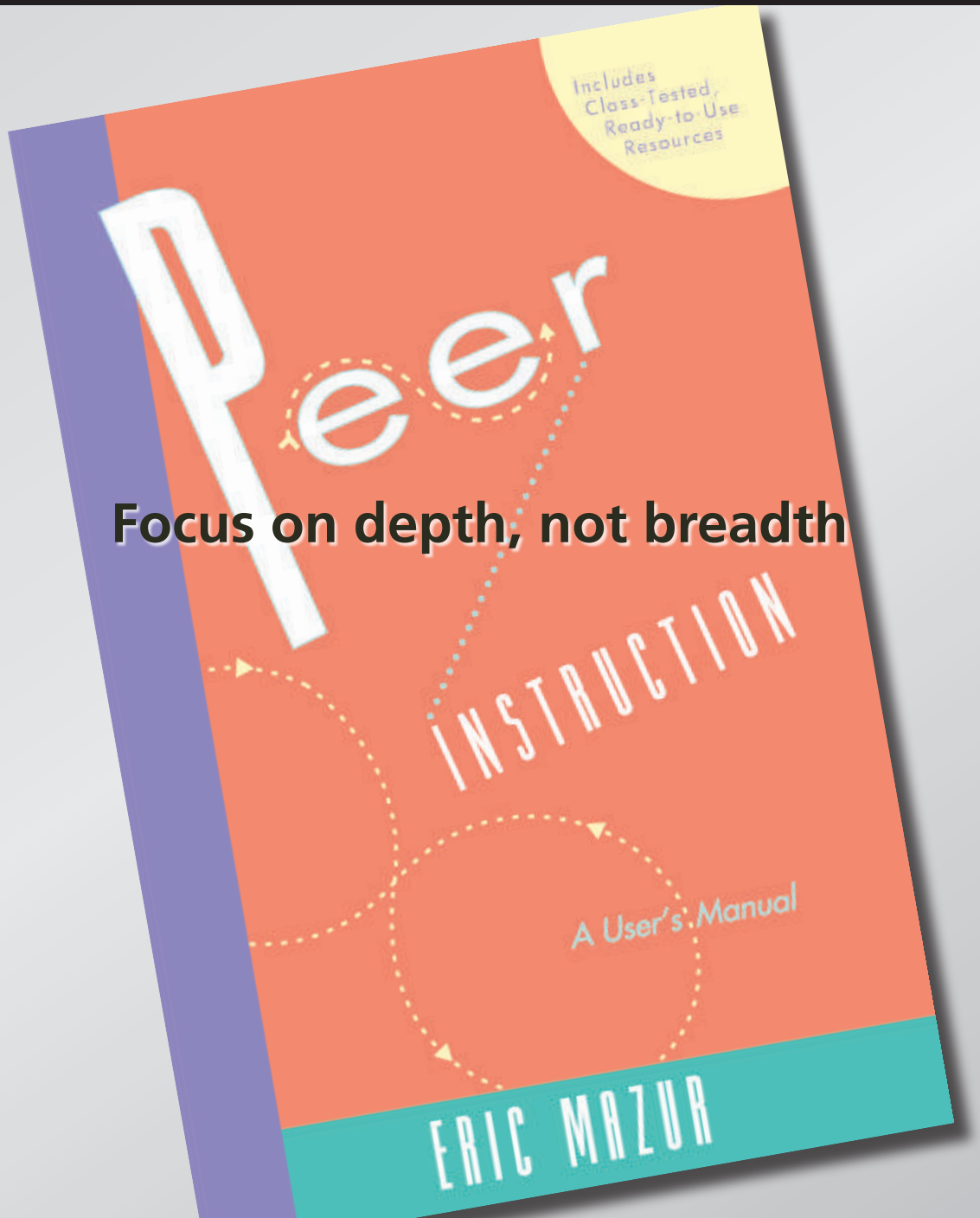
Provoking thought

What to do in class?

Provoking thought



Provoking thought



Focus on depth, not breadth

Provoking thought

Provoking thought

Some hurdles:

- finding materials
- collecting and managing feedback
- providing materials to students

Provoking thought

ILT: Manage

http://www.conceptest.org

ILT: Login local ILT: Lecture ILT: Reading

Physics 1b

HOME READING LECTURES ASSIGNMENTS FORUMS NEWS HANDOUTS ?

Courses > Physics 1b > Lectures > |< < Changing magnetic fields II 4/8 > >|

E-MAIL

Manage email connection

Email (3)

COMING UP

5/2 Assignment 1

TOOLS

Add from database
Add new CT

Remove selected
Move selected
Copy selected
Reorder questions

Edit header
Generate slide set
Upload PRS data
Interactive classroom

Expand all
Collapse all
Export data

Student view

QUICK LINKS

Standardized tests

Students

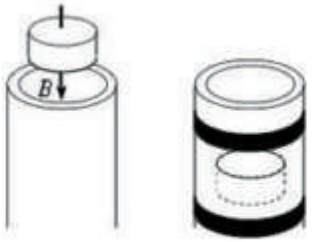
Sections

Select Section

edit clone

Physics > Introductory Electromagnetism > Magnetism > CT: 3691
October 25, 2001 00:55:08 am

1. A permanent magnet is dropped through a long aluminum tube, as shown. As the magnet drops, electric currents are induced around the tube. Compared to a freely-falling magnet, the magnet through the tube drops



1. more slowly.
2. exactly the same way.
3. faster.
4. Need more information.

Hint: consider the effects of induced currents through strips ahead of and behind the dropped magnet.

Answer: 1 . In a loop of the aluminum tube just below the magnet, the flux is increasing as the magnet gets nearer. This induces a counterclockwise current producing an opposing magnetic field which repels the magnet. In a loop above the magnet, the flux is decreasing, so a clockwise current is induced, producing a magnetic field in the same direction as the magnet's field, thus attracting the magnet upward. So the net effect is to slow the magnet down.

edit clone

Physics > Introductory Electromagnetism > Magnetism > CT: 3756
October 12, 2001 05:55:06 pm

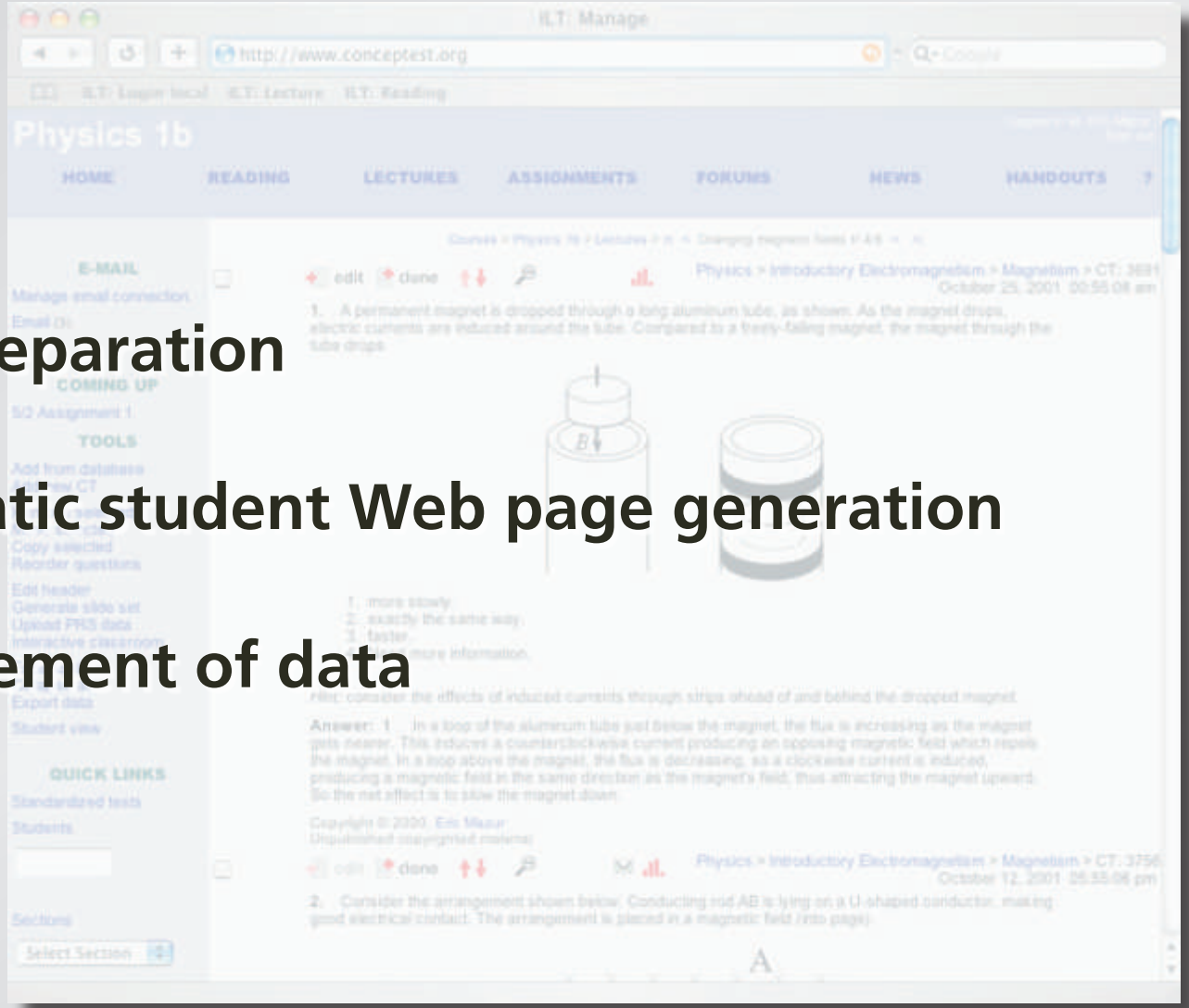
2. Consider the arrangement shown below. Conducting rod AB is lying on a U-shaped conductor, making good electrical contact. The arrangement is placed in a magnetic field (into page).

A

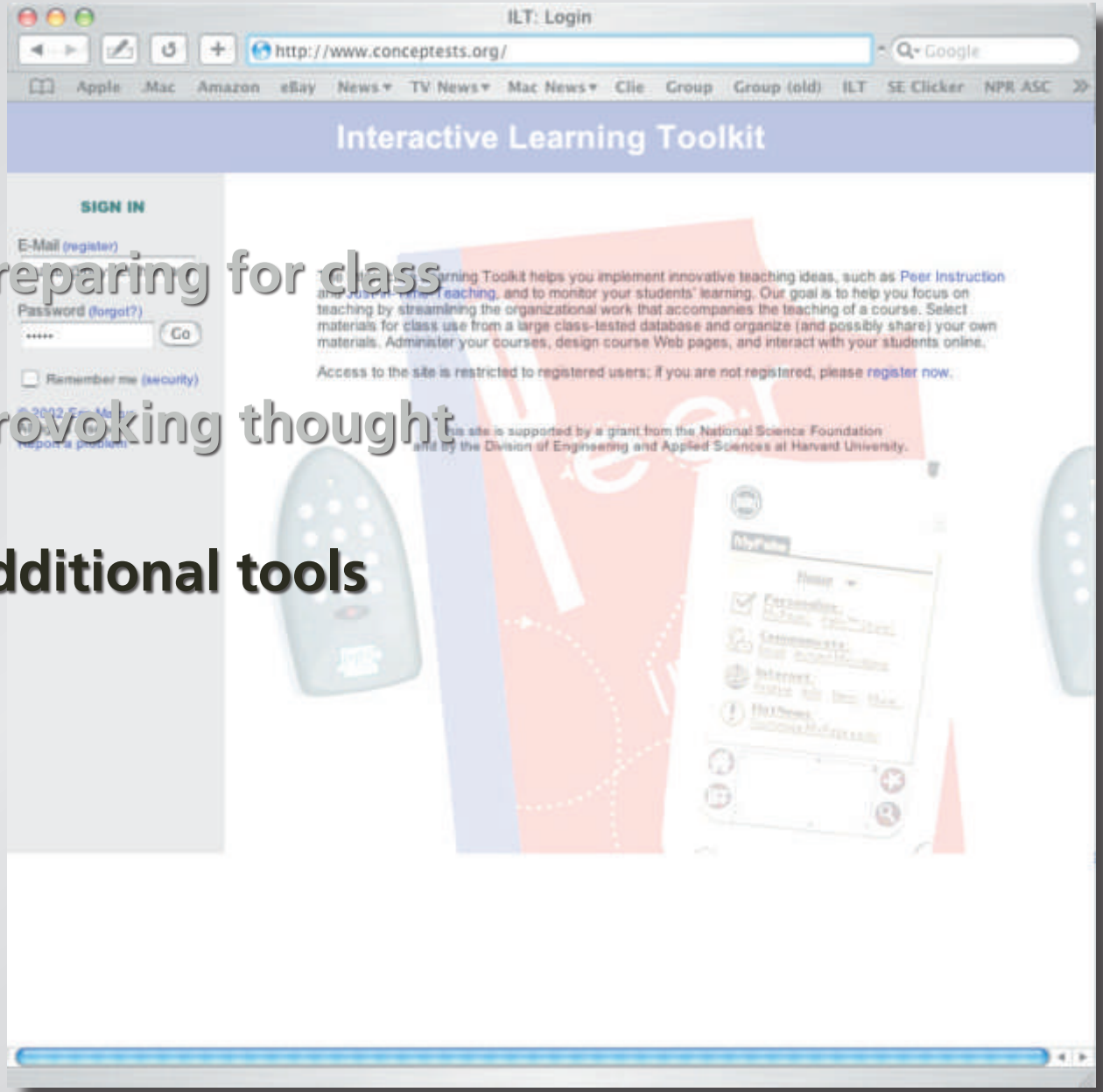
Provoking thought

Benefits:

- easy preparation
- automatic student Web page generation
- management of data



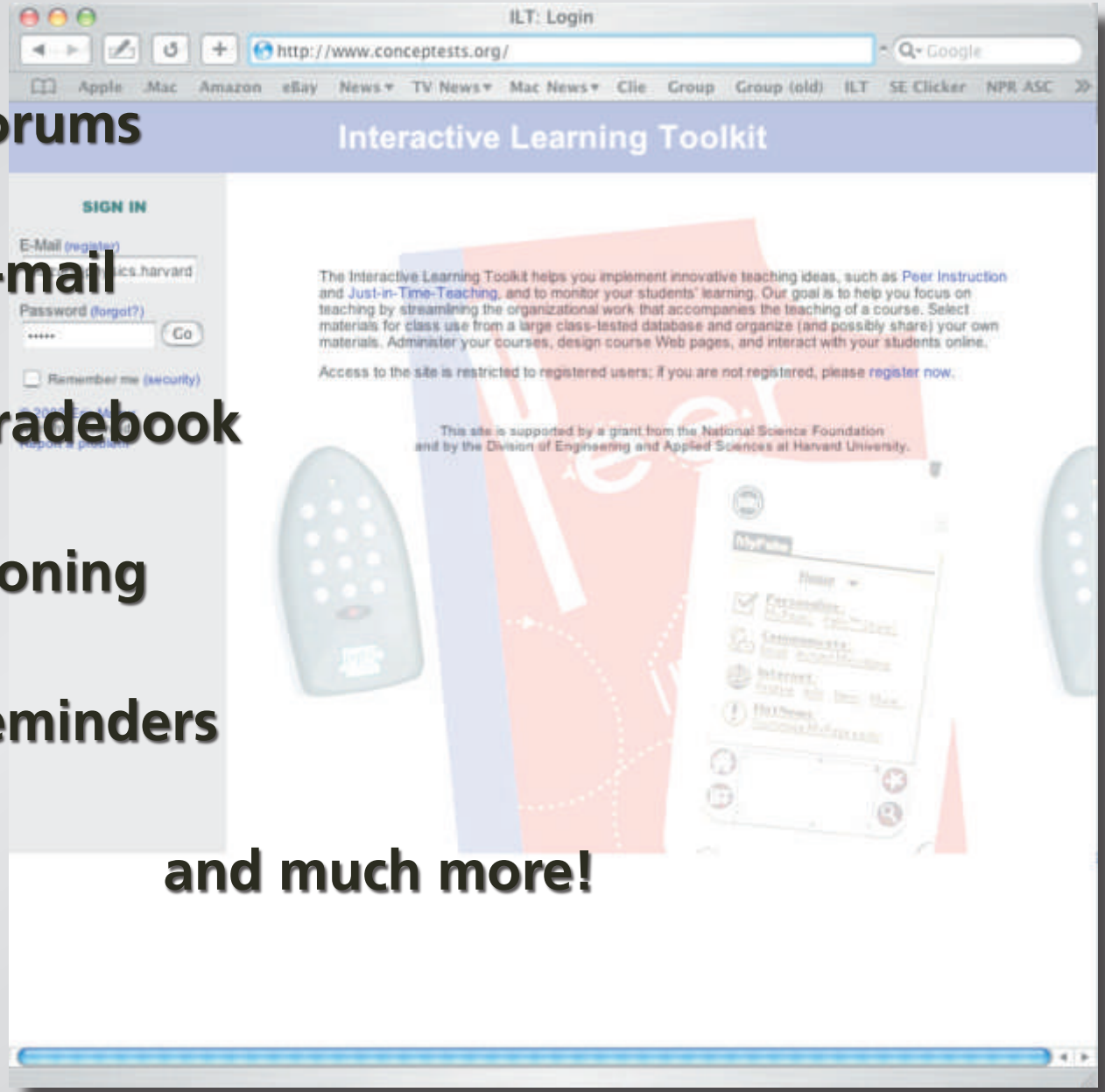
Outline



- preparing for class
- provoking thought
- additional tools

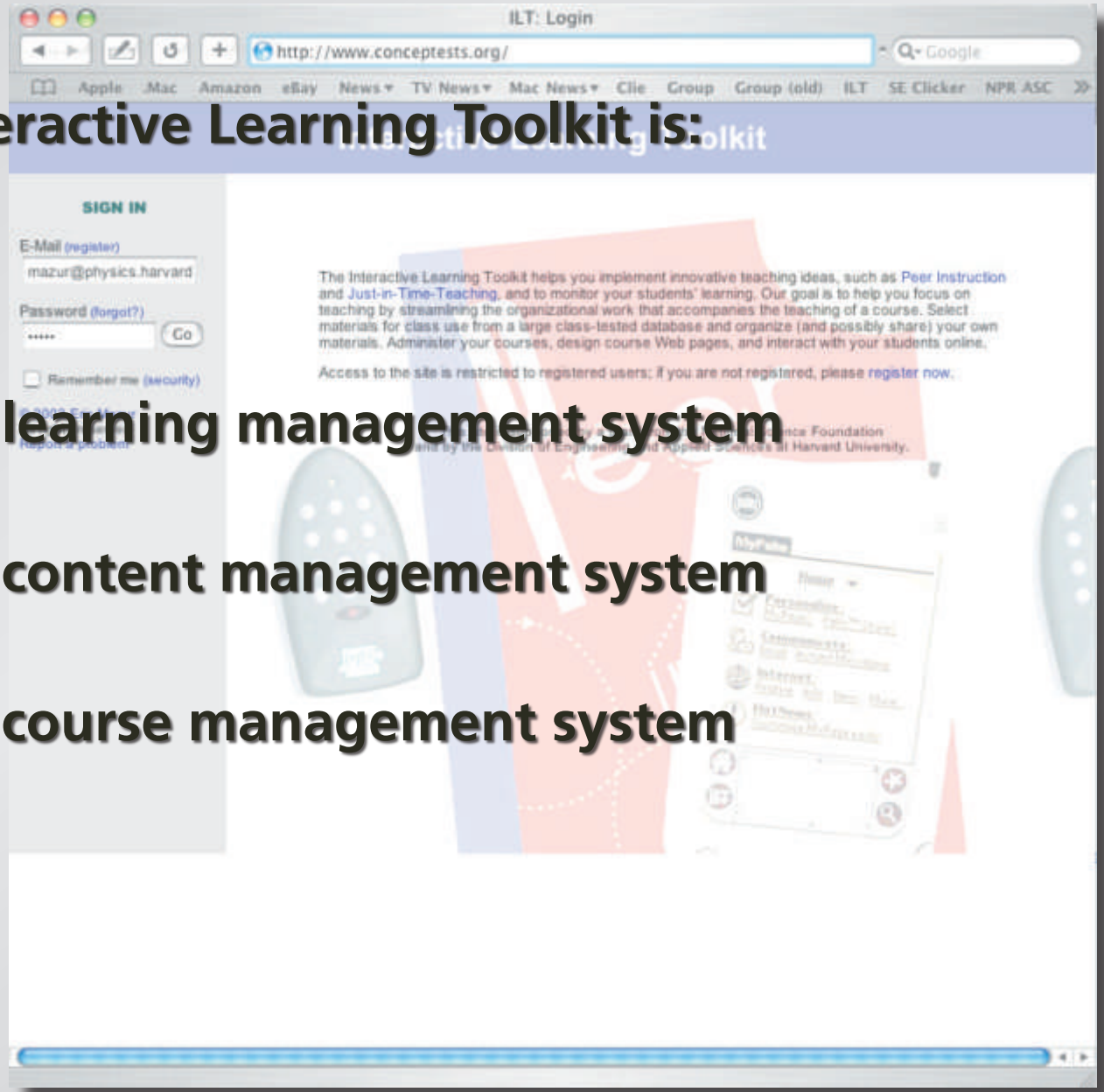
Additional tools

- forums
- e-mail
- gradebook
- cloning
- reminders



and much more!

Additional tools



Interactive Learning Toolkit is:

- a learning management system
- a content management system
- a course management system

Additional tools

Resources:

ILT video (www.ankerpub.com)

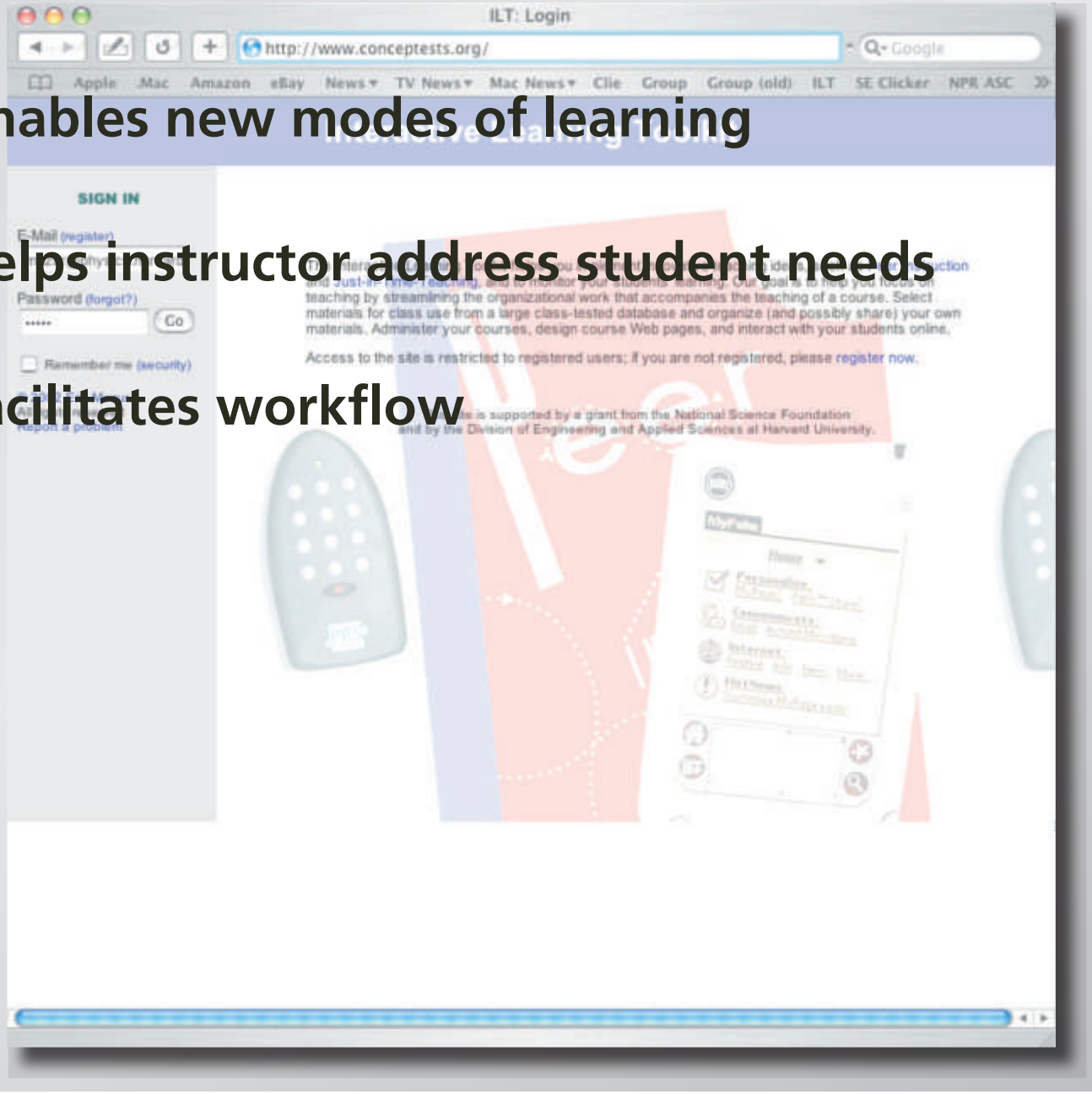
Books on PI and JiTT (Prentice Hall)

ILT site:

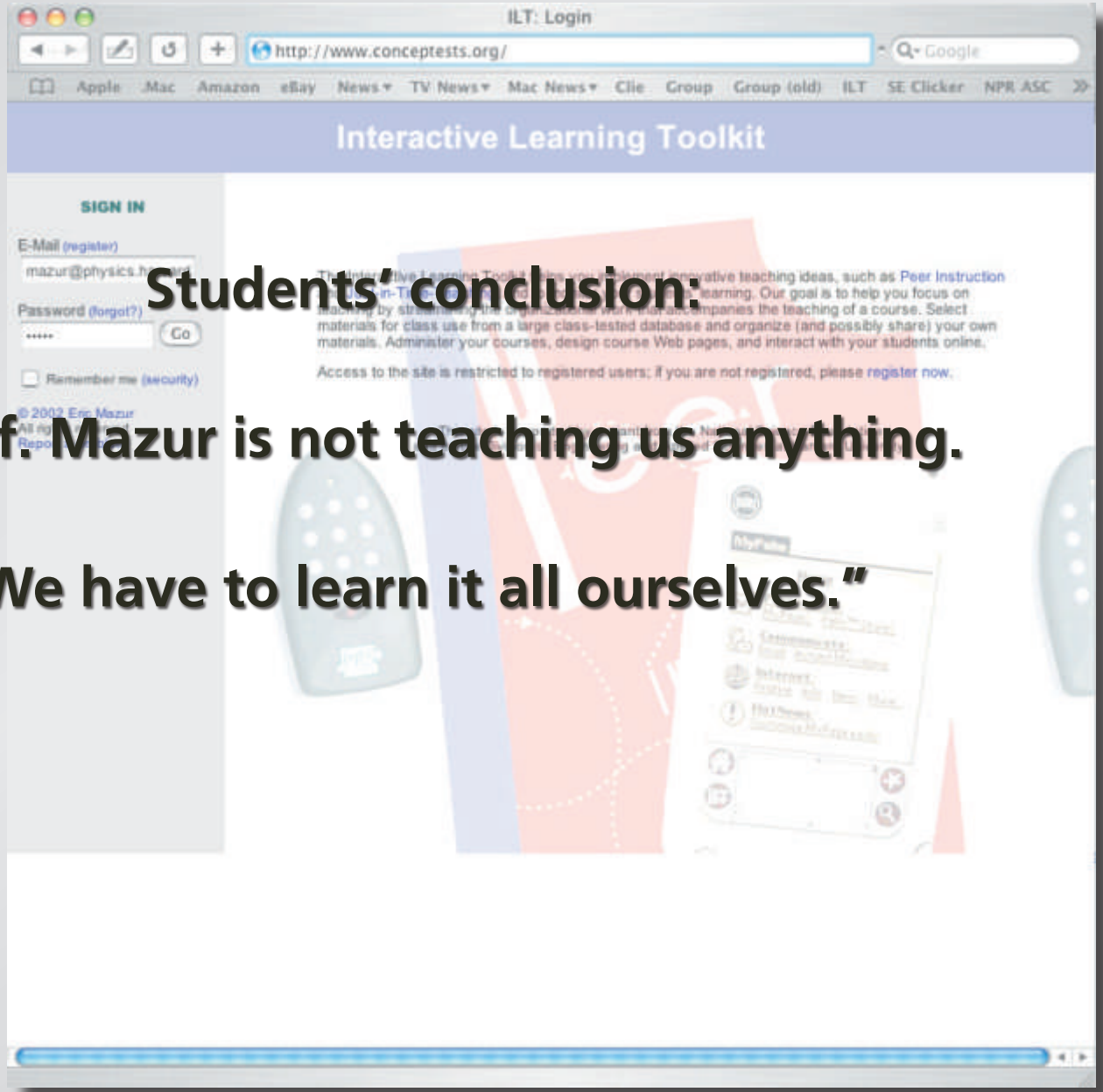
deas.harvard.edu/ilt

Summary

- enables new modes of learning
- helps instructor address student needs
- facilitates workflow



Summary

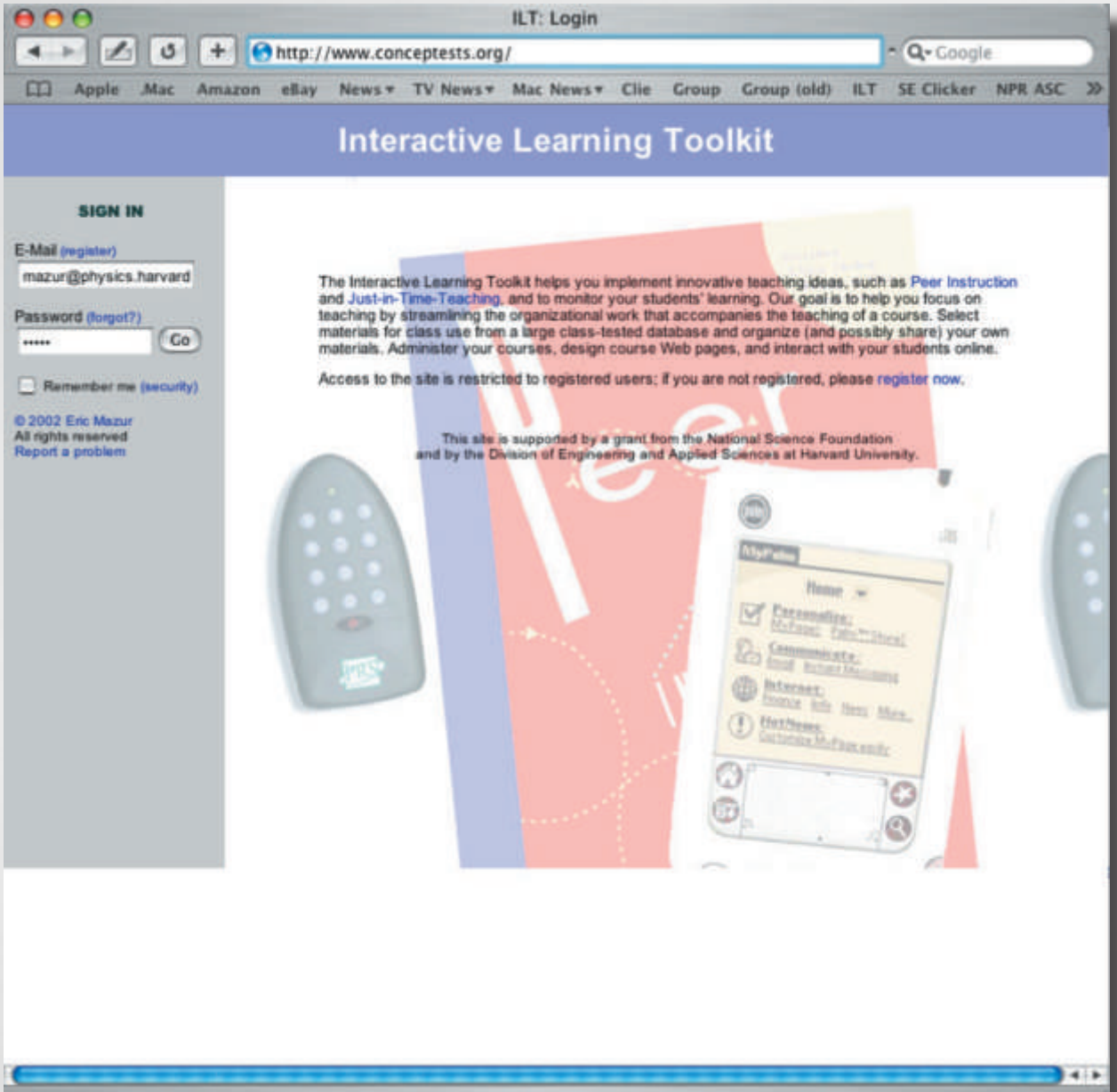


Students' conclusion:

"Prof. Mazur is not teaching us anything.

We have to learn it all ourselves."

Impact and Assessment

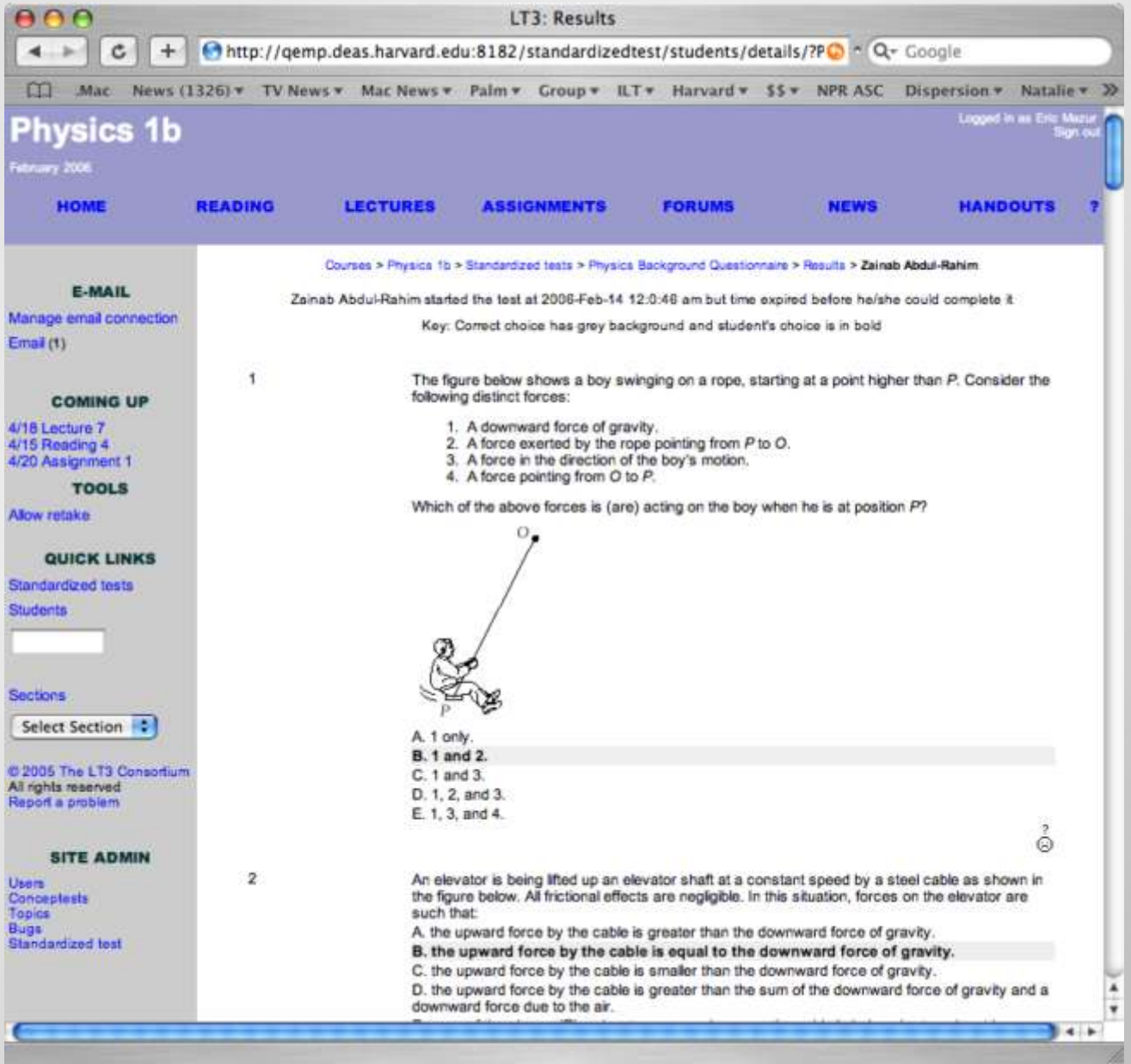


Impact and Assessment

- ILT helps assess performance
- active learning result

Impact and Assessment

- easy to administer
- easy to implement
- easy results!



Impact and Assessment

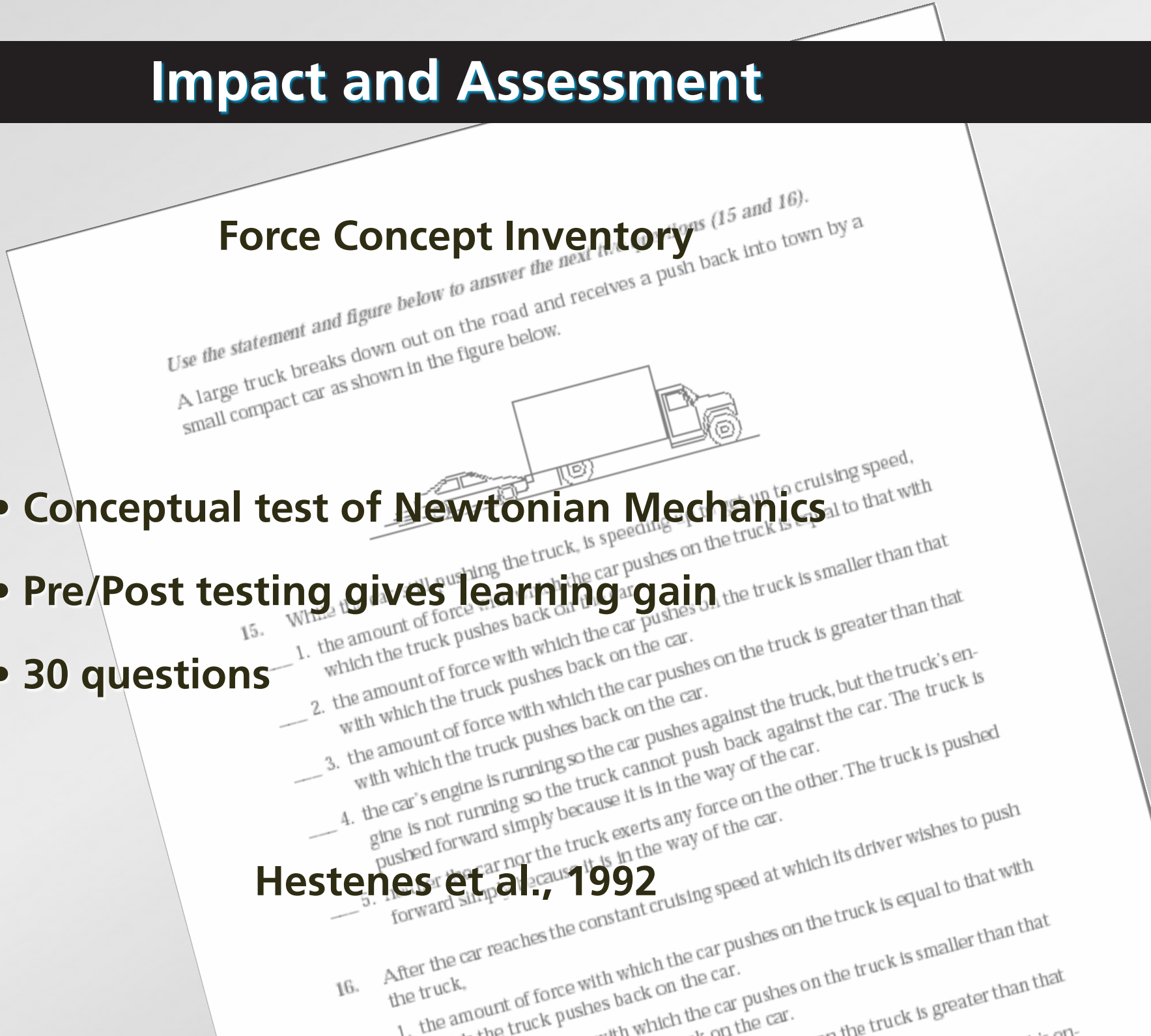
Available assessment instruments

- Force Concept Inventory
- Conceptual Survey on Electricity and Magnetism
- Lawson's test for scientific reasoning
- Astronomy Diagnostic Test
- Maryland Physics Expectation Test

over 15,000 students tested!

Impact and Assessment

Force Concept Inventory

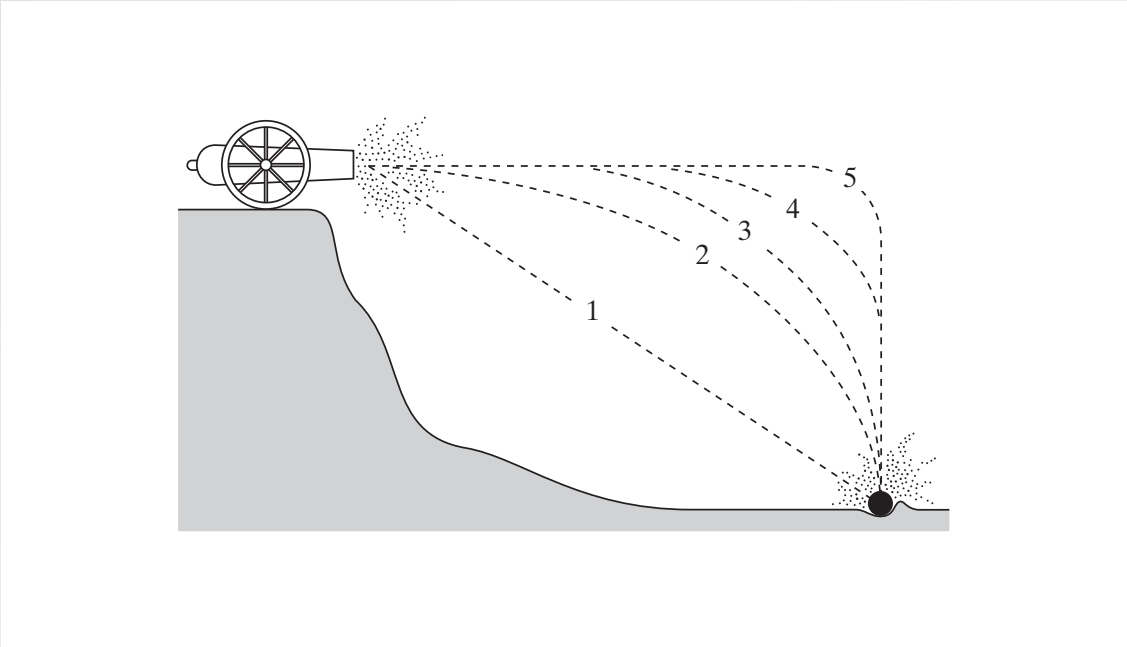


- Conceptual test of Newtonian Mechanics
- Pre/Post testing gives learning gain
- 30 questions

Hestenes et al., 1992

Impact and Assessment

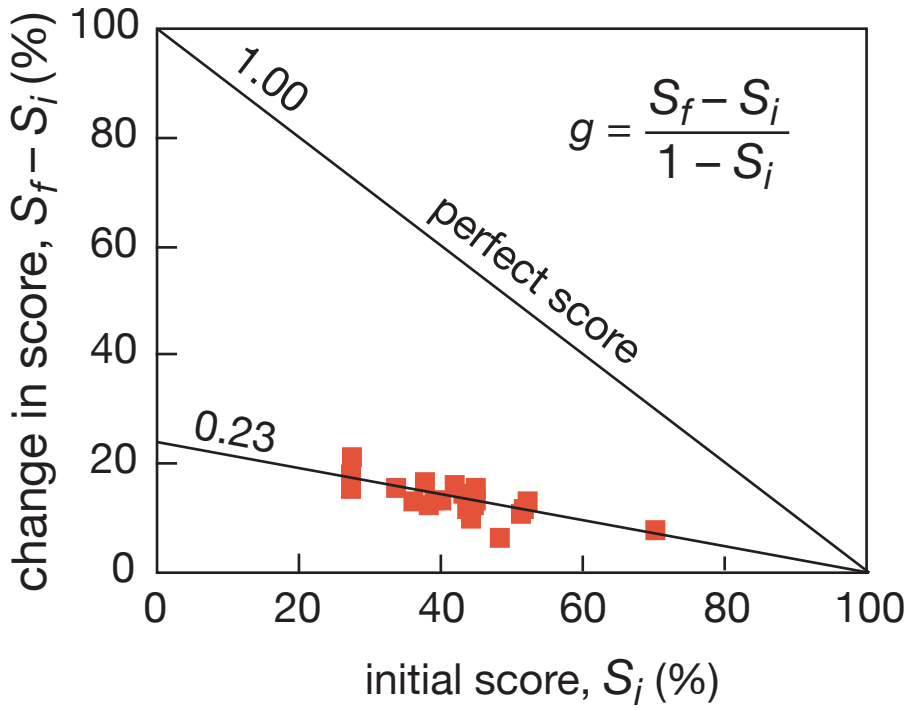
Sample question



A ball is fired by a cannon from the top of a cliff as shown above. Which of the paths would the cannon ball most closely follow?

Impact and Assessment

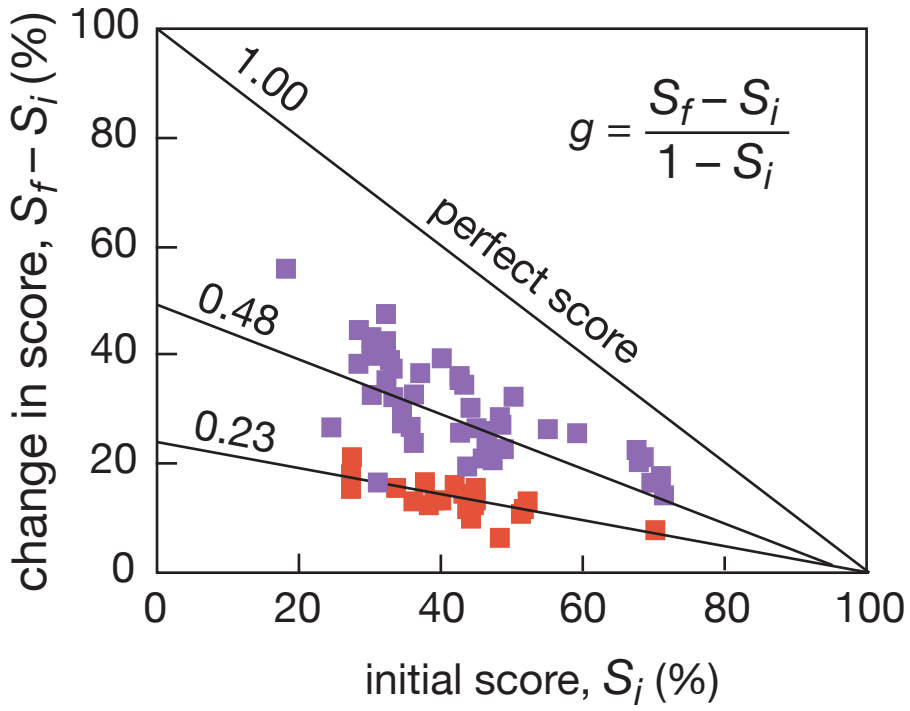
FCI results for standard lecture courses



R.R. Hake, *Am. J. Phys.* 66, 64 (1998)

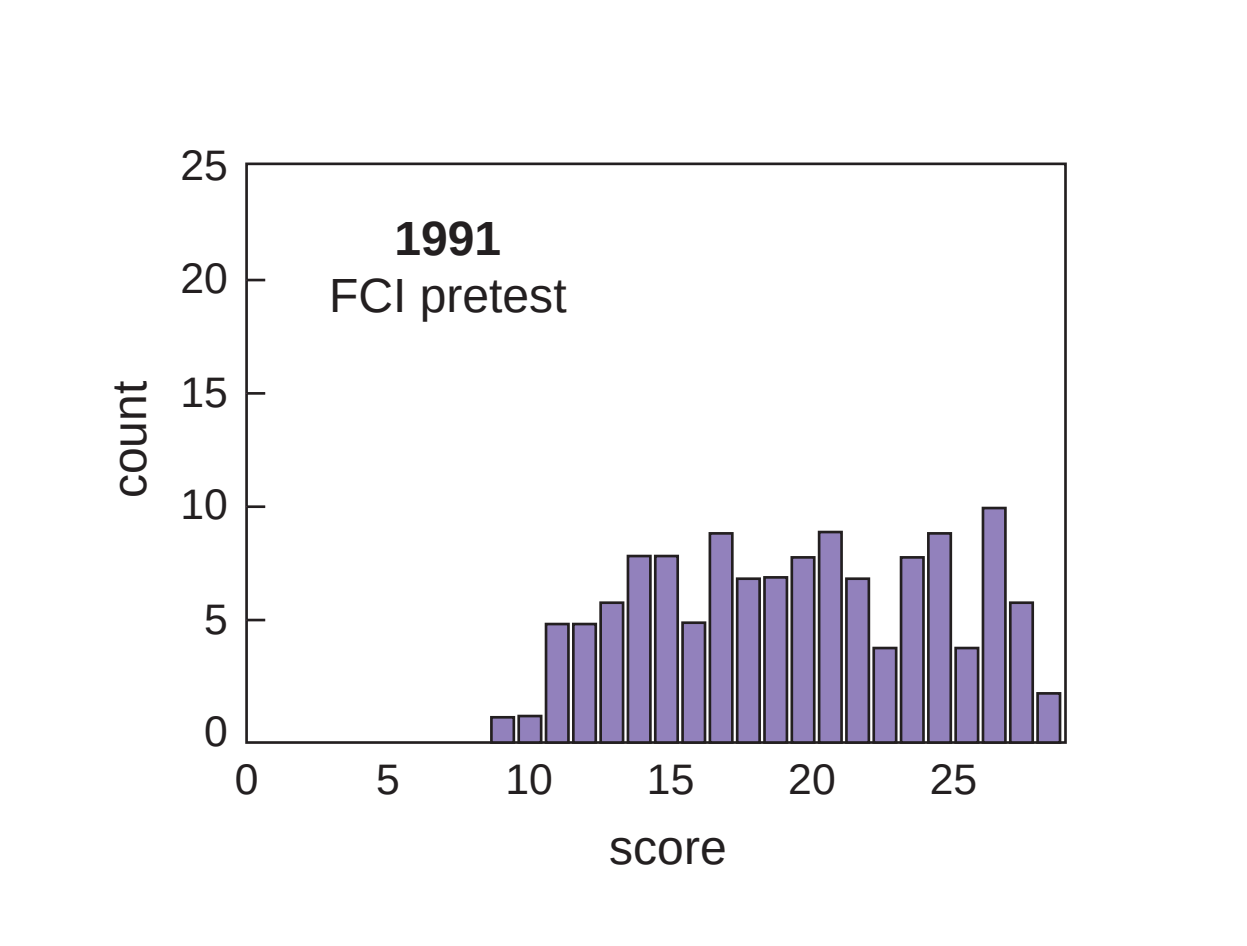
Impact and Assessment

FCI results for 'active learning' courses



Impact and Assessment

Impact on one of our courses



Impact and Assessment

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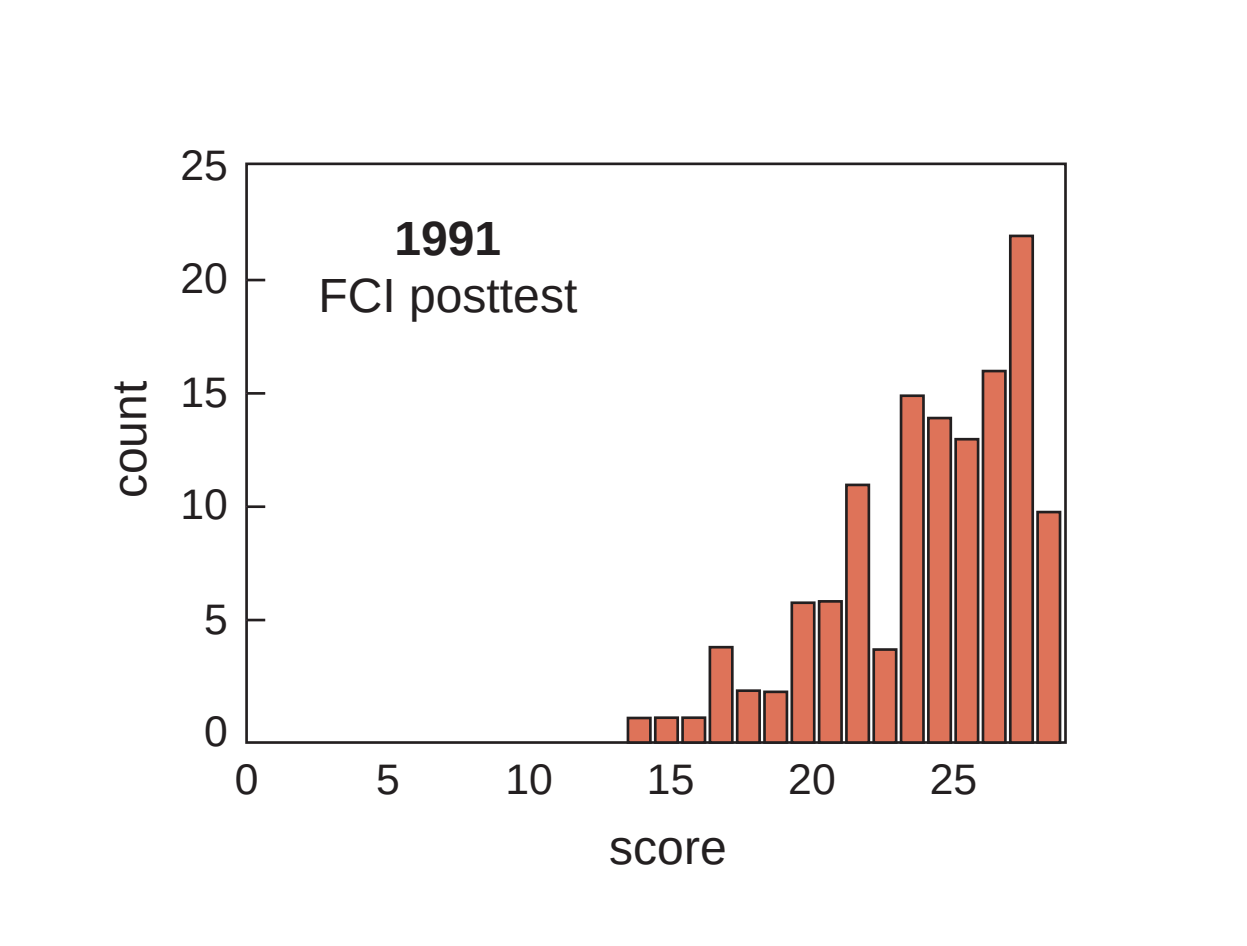
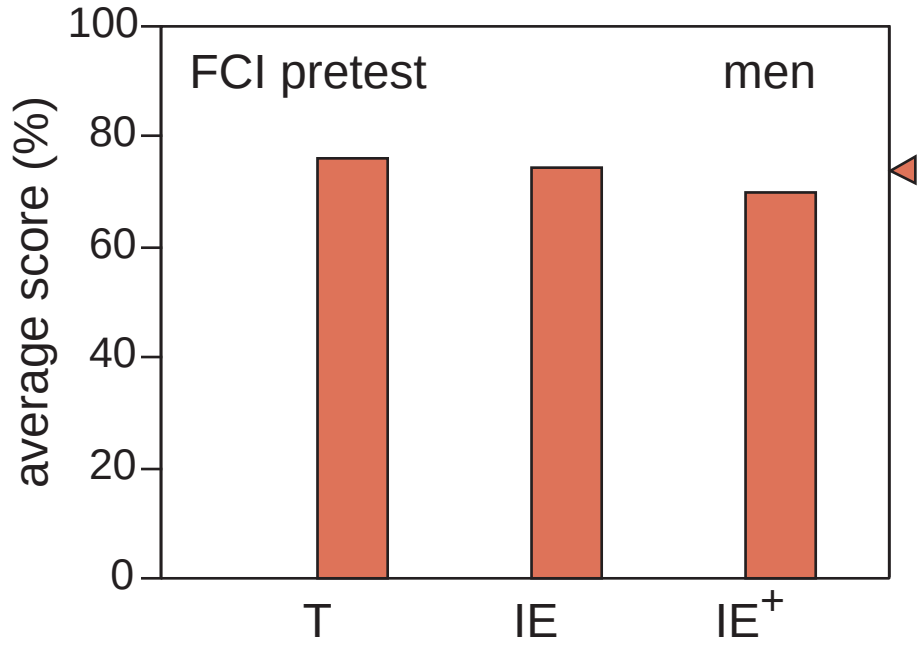


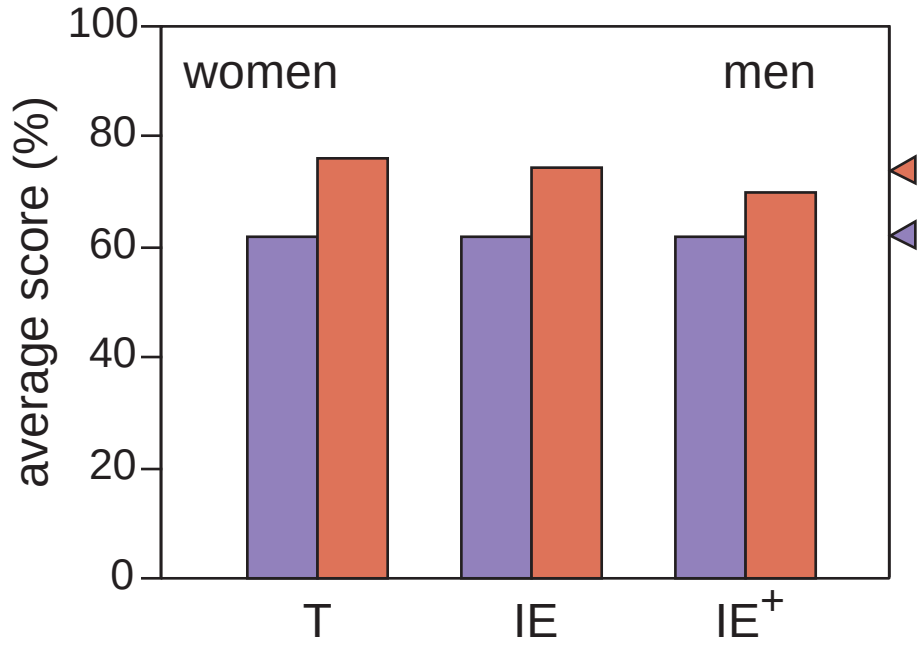
Impact and Assessment

Impact of active learning on gender gap



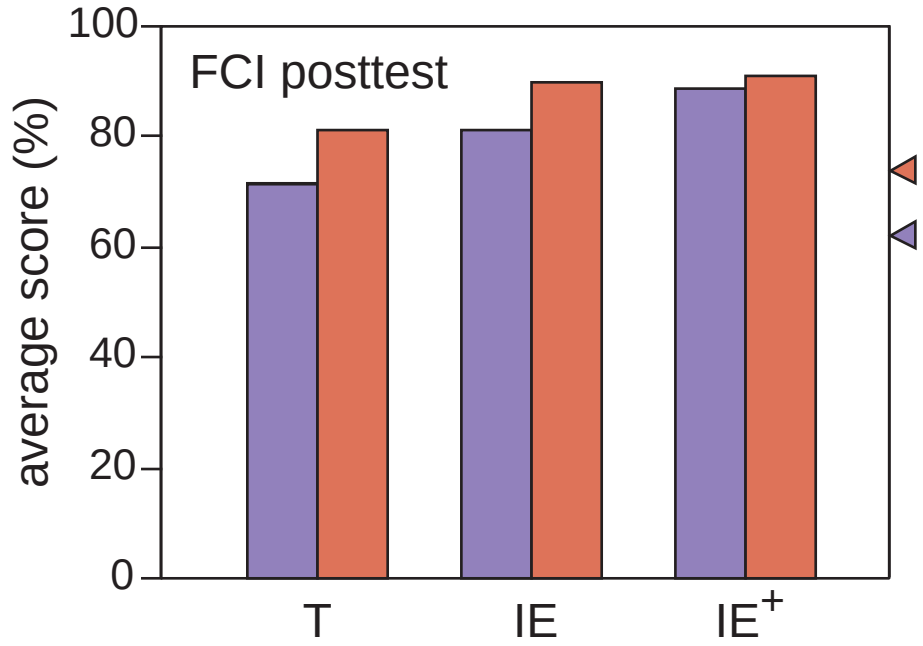
Impact and Assessment

Impact of active learning on gender gap



Impact and Assessment

Impact of active learning on gender gap



Impact and Assessment

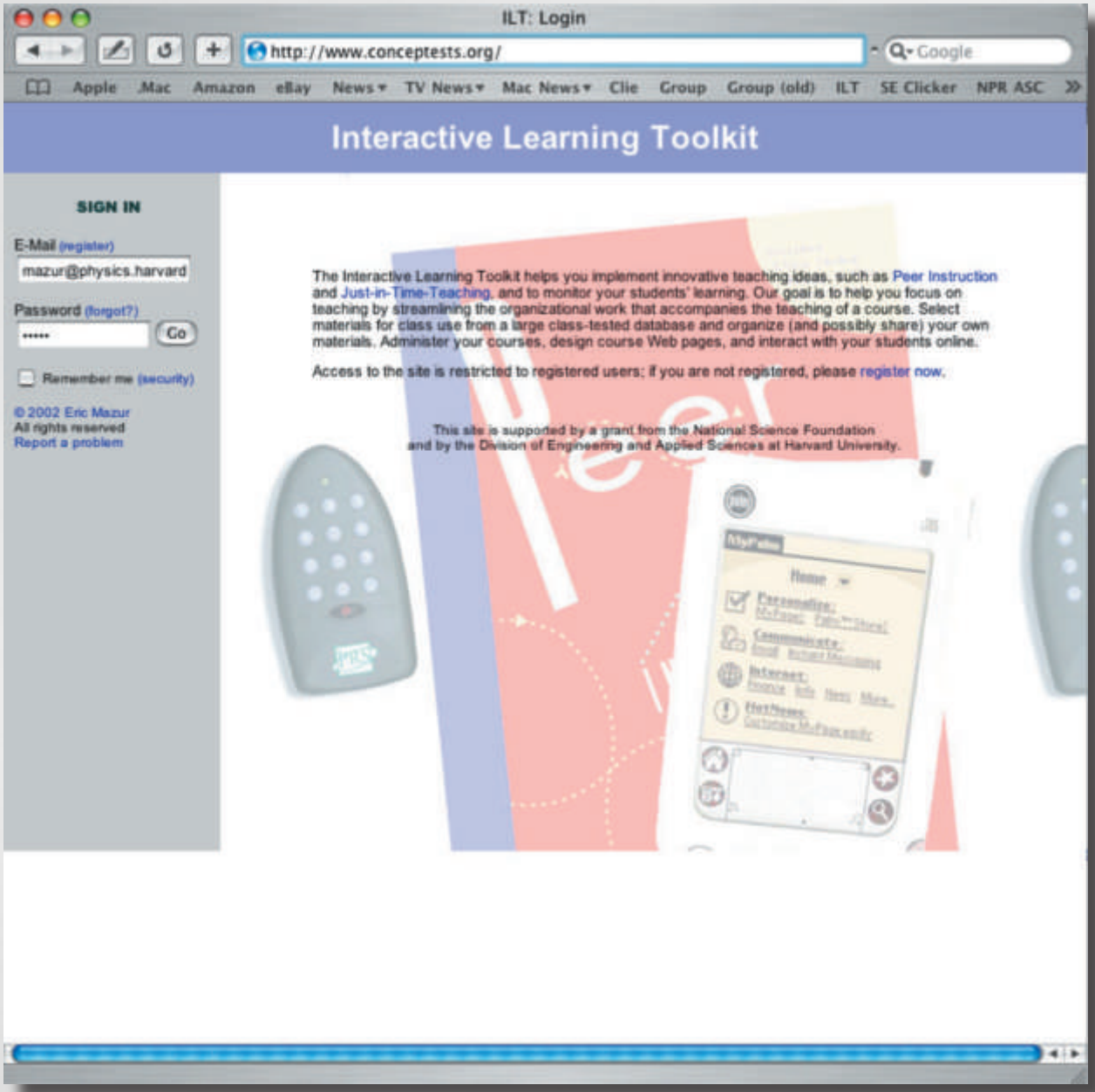
ILT provides:

- access to standardized assessment
- technology to implement active learning

Impact of active engagement on student learning:

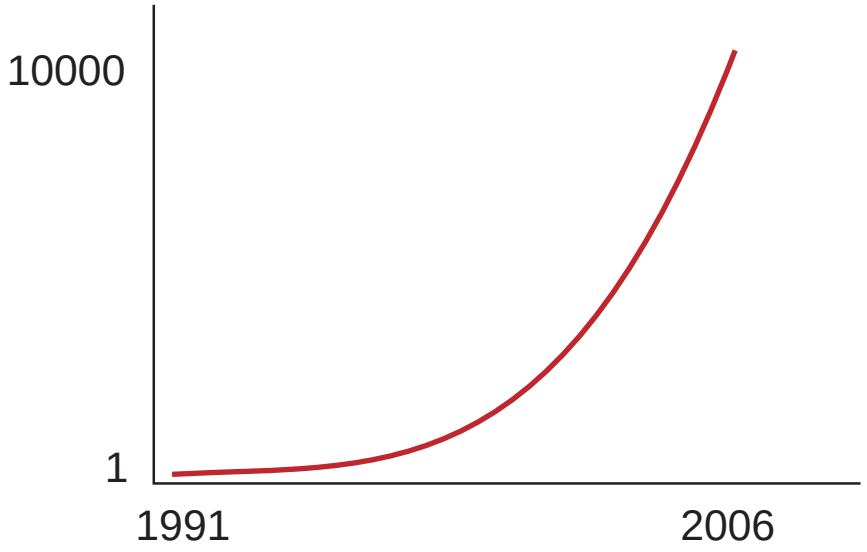
- gains for all students
- eliminates gender gap

Scaling-up


ILT: Login
http://www.conceptests.org/
Google
Apple Mac Amazon eBay News TV News Mac News Clie Group Group (old) ILT SE Clicker NPR ASC
Interactive Learning Toolkit
SIGN IN
E-Mail (register)
mazur@physics.harvard
Password (forgot?)
Go
Remember me (security)
© 2002 Eric Mazur
All rights reserved
Report a problem
The Interactive Learning Toolkit helps you implement innovative teaching ideas, such as Peer Instruction and Just-in-Time-Teaching, and to monitor your students' learning. Our goal is to help you focus on teaching by streamlining the organizational work that accompanies the teaching of a course. Select materials for class use from a large class-tested database and organize (and possibly share) your own materials. Administer your courses, design course Web pages, and interact with your students online.
Access to the site is restricted to registered users; if you are not registered, please register now.
This site is supported by a grant from the National Science Foundation and by the Division of Engineering and Applied Sciences at Harvard University.

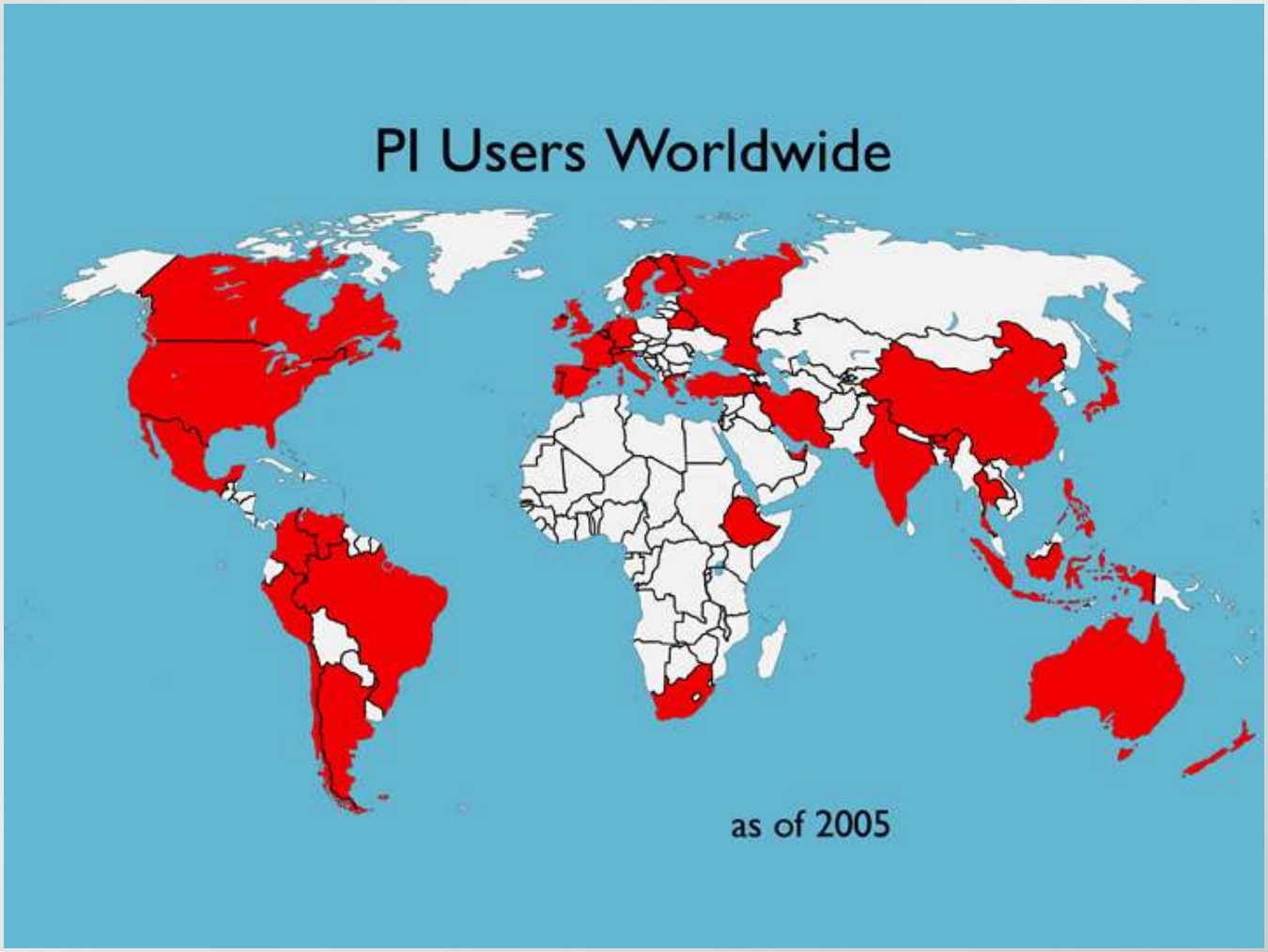
Scaling-up

dramatic growth in PI adoption…



Scaling-up

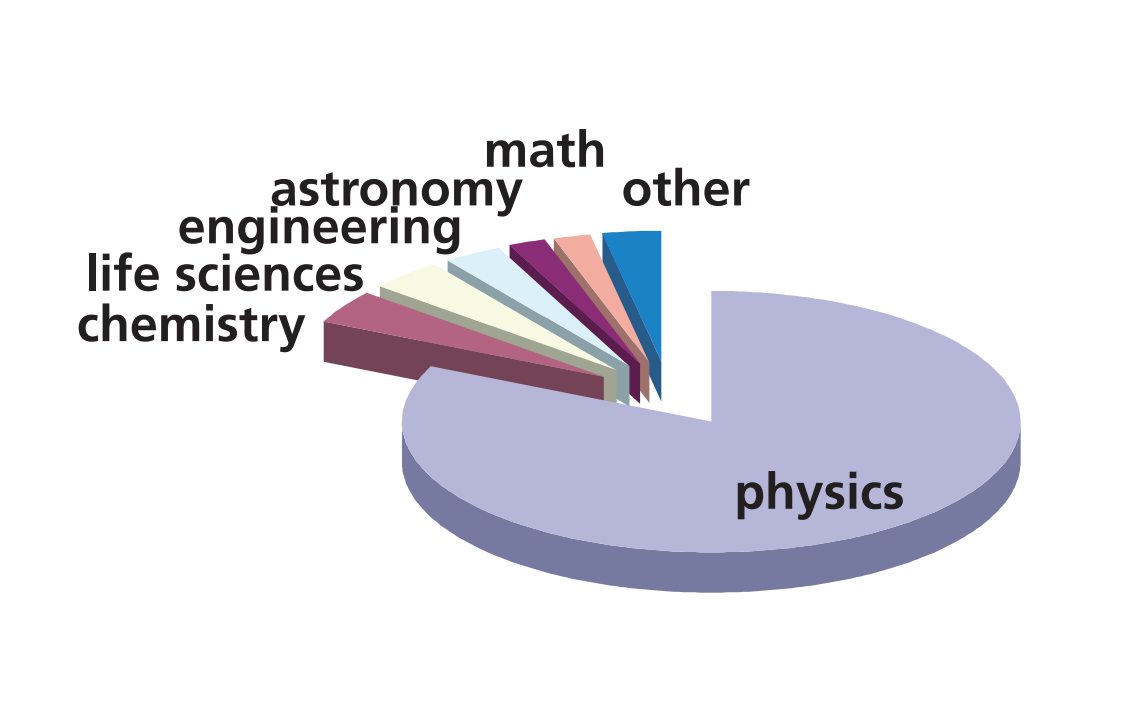
across the world…



Scaling-up

across disciplines…

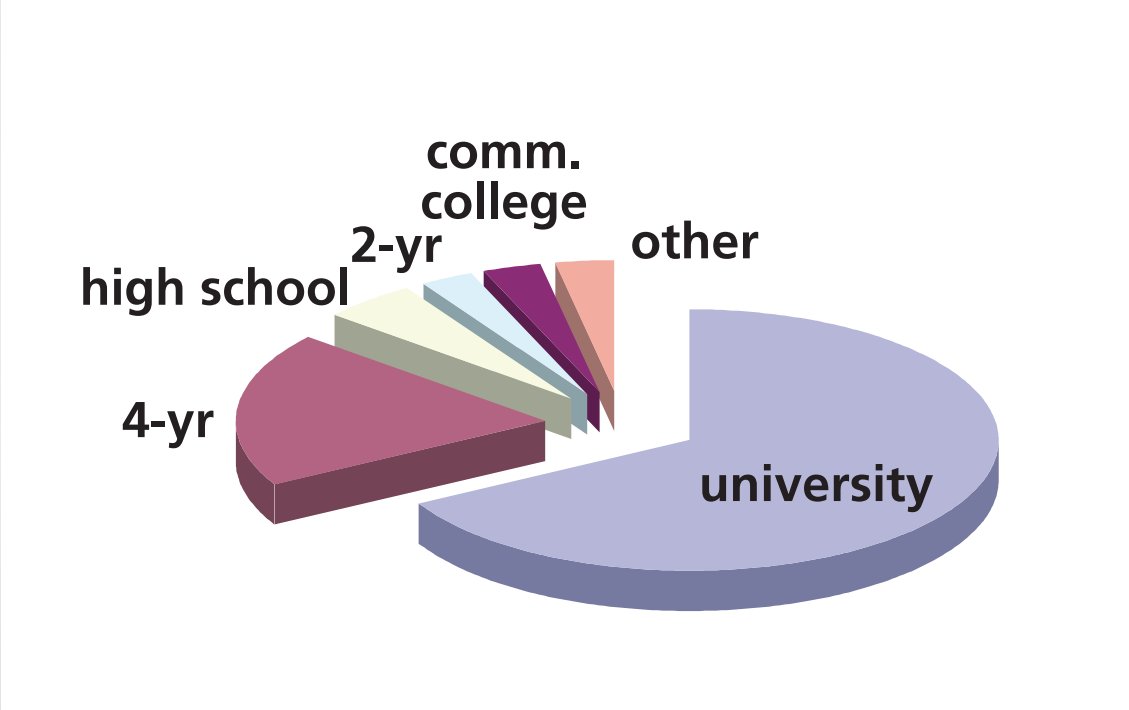
Physics	82%
Chemistry	4%
Life Sciences	4%
Engineering	3%
Astronomy	2%
Mathematics	2%
Other	2%



Scaling-up

and across institution type

University	67%
4-yr college	19%
High school	5%
2-yr college	3%
Comm. college	3%
Other	3%



Scaling-up

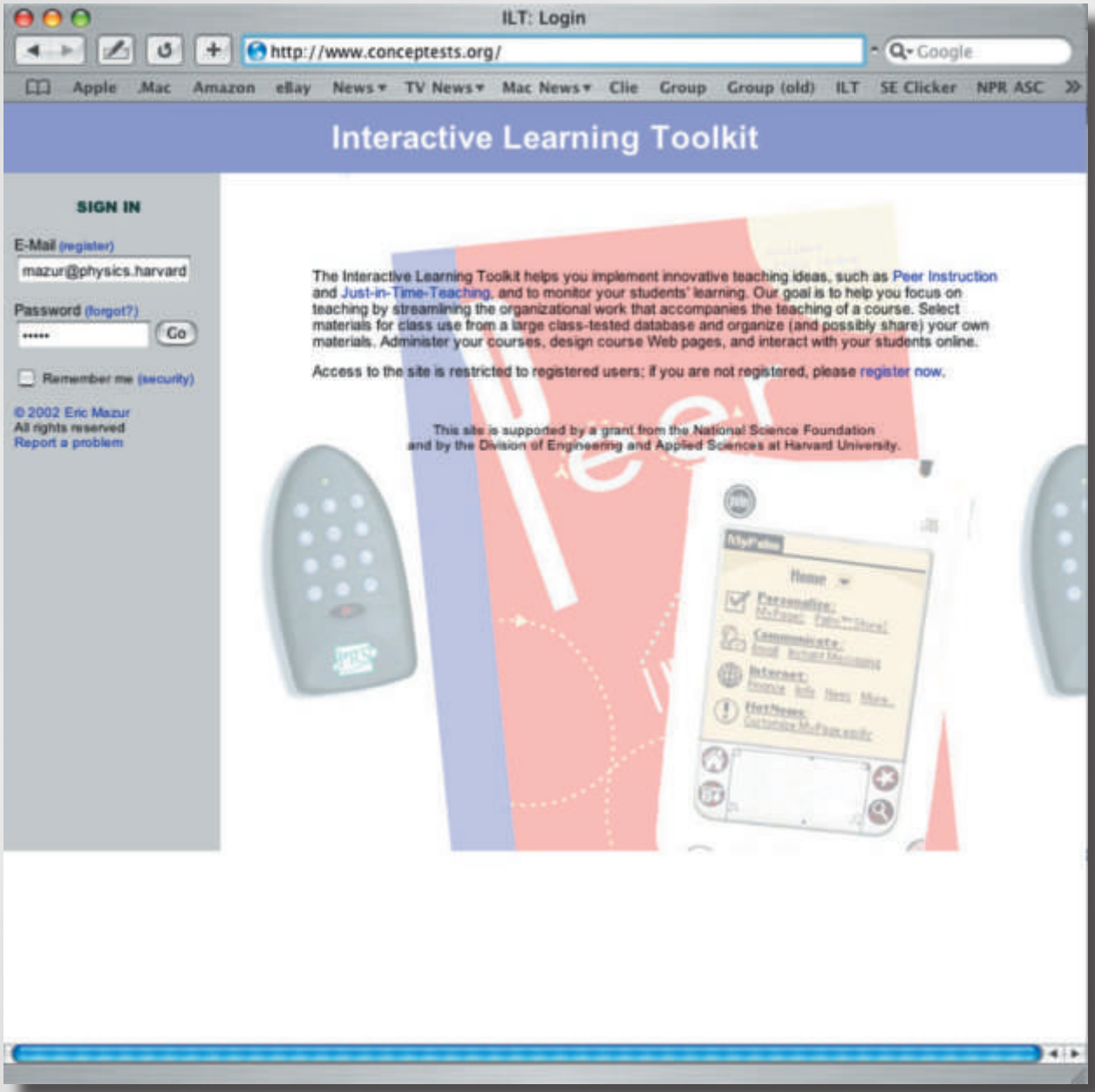
plenty of potential to scale up

Scaling-up

current ILT user base

Faculty (active)	70
Students	7000
Courses (active)	400

Future development



Future development

- let system help manage discussions
- improve content and content-management
- link to existing course management systems