Getting online

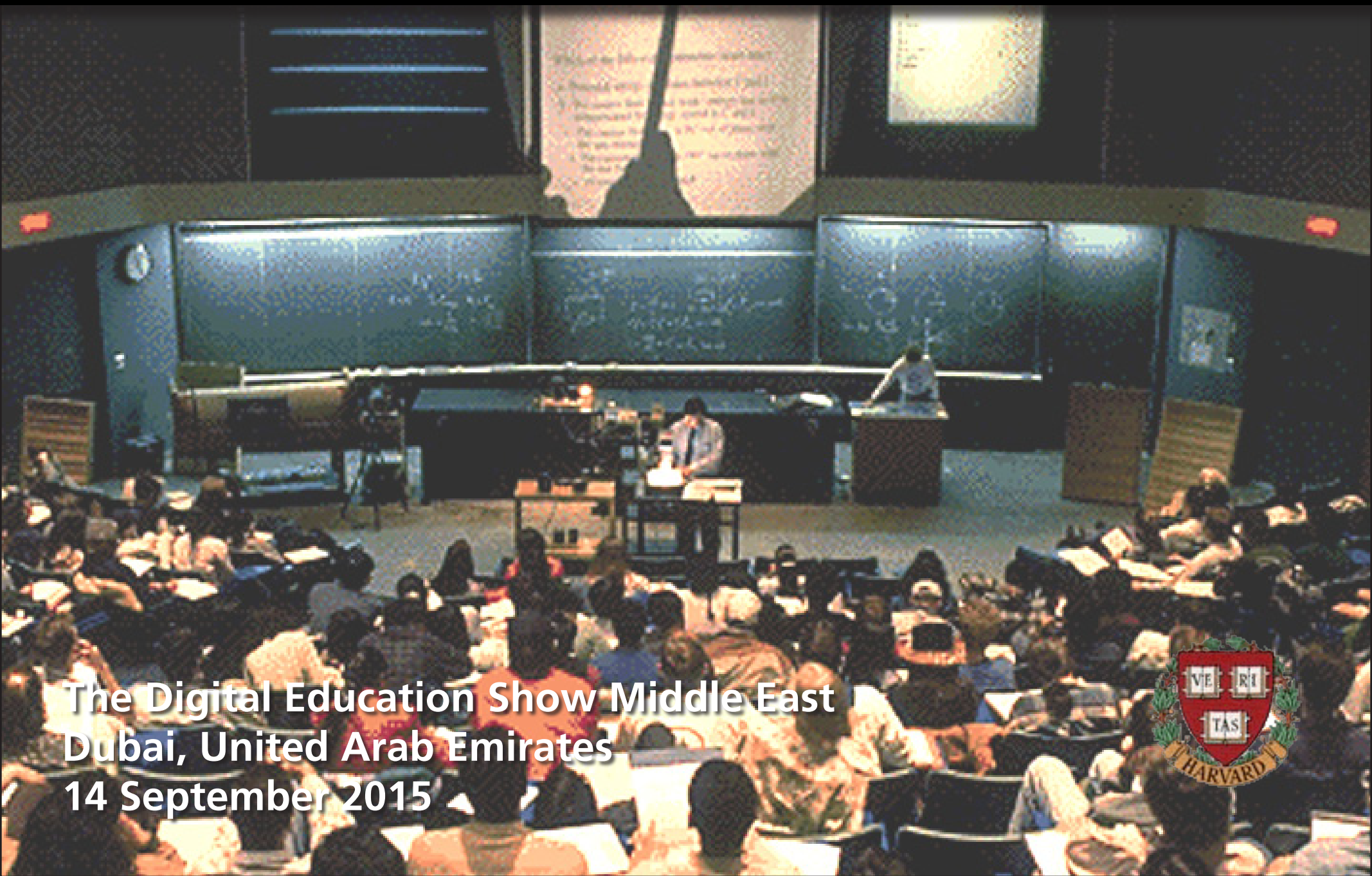
1. Go to: learningcatalytics.com/demo

2. Enter info, click Start

3. Enter Session ID 123456789, click Join

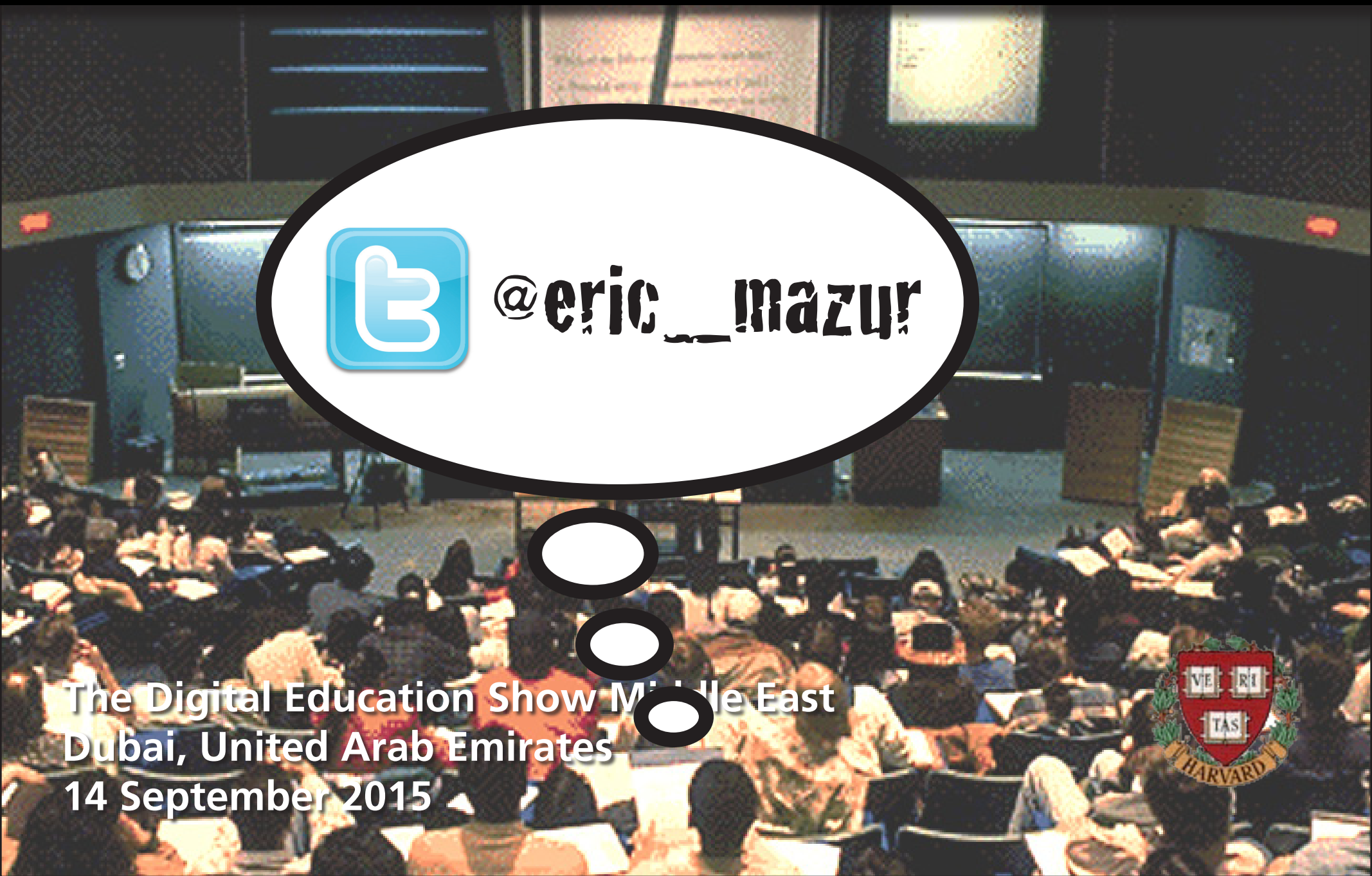
@eric_mazur

Creating the ultimate flipped classroom: A step by step guide for Peer Instruction



The Digital Education Show Middle East
Dubai, United Arab Emirates
14 September 2015

Creating the ultimate flipped classroom:
A step by step guide for Peer Instruction



The Digital Education Show Middle East
Dubai, United Arab Emirates
14 September 2015

Program

10:00	Introduction to Peer Instruction
11:00	Break
11:30	Hands-on with Peer Instruction
12:30	Lunch
13:30	Designing good questions for PI
14:30	Break
15:00	Discussion of the role of technology and wrap-up

@eric_mazur

Quick survey…

Peer Instruction…

1. Never heard of it.
2. Heard of it, but don't really know what it is.
3. Quite familiar with it.
4. I heard you speak about it so often, I could give your talk!

Quick survey…

Peer Instruction…

1. Never heard of it.
2. Don’t use it in my classes, but I’m open to it.
3. Considering using it in my classes.
4. I have used it in my classes a few times.
5. I use it regularly in my classes.

How do we learn?

Think of something you are good at — something that you know you do well.

How do we learn?

Think of something you are good at — something that you know you do well.

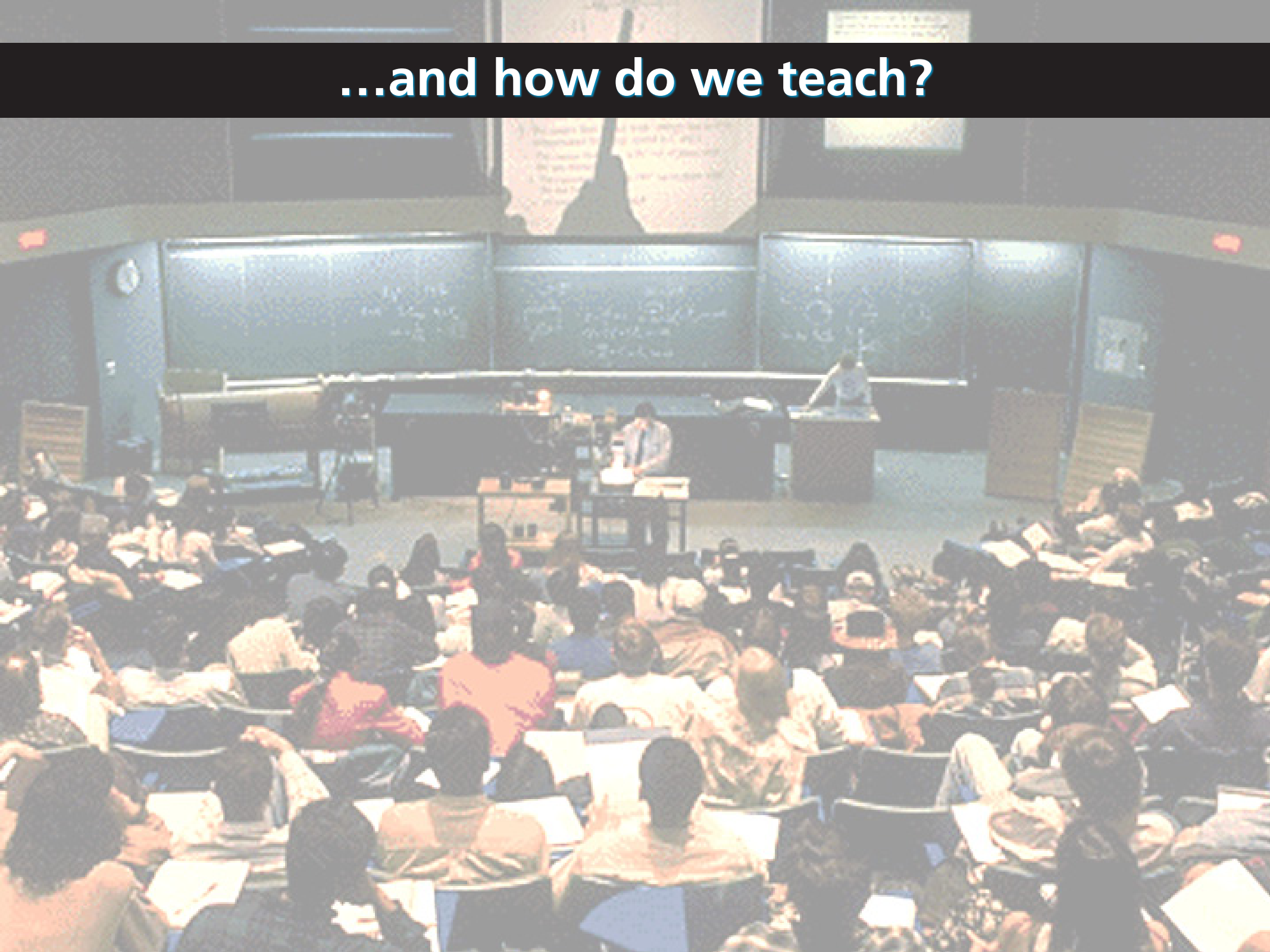
***How* did you become good at this?**

How do we learn?

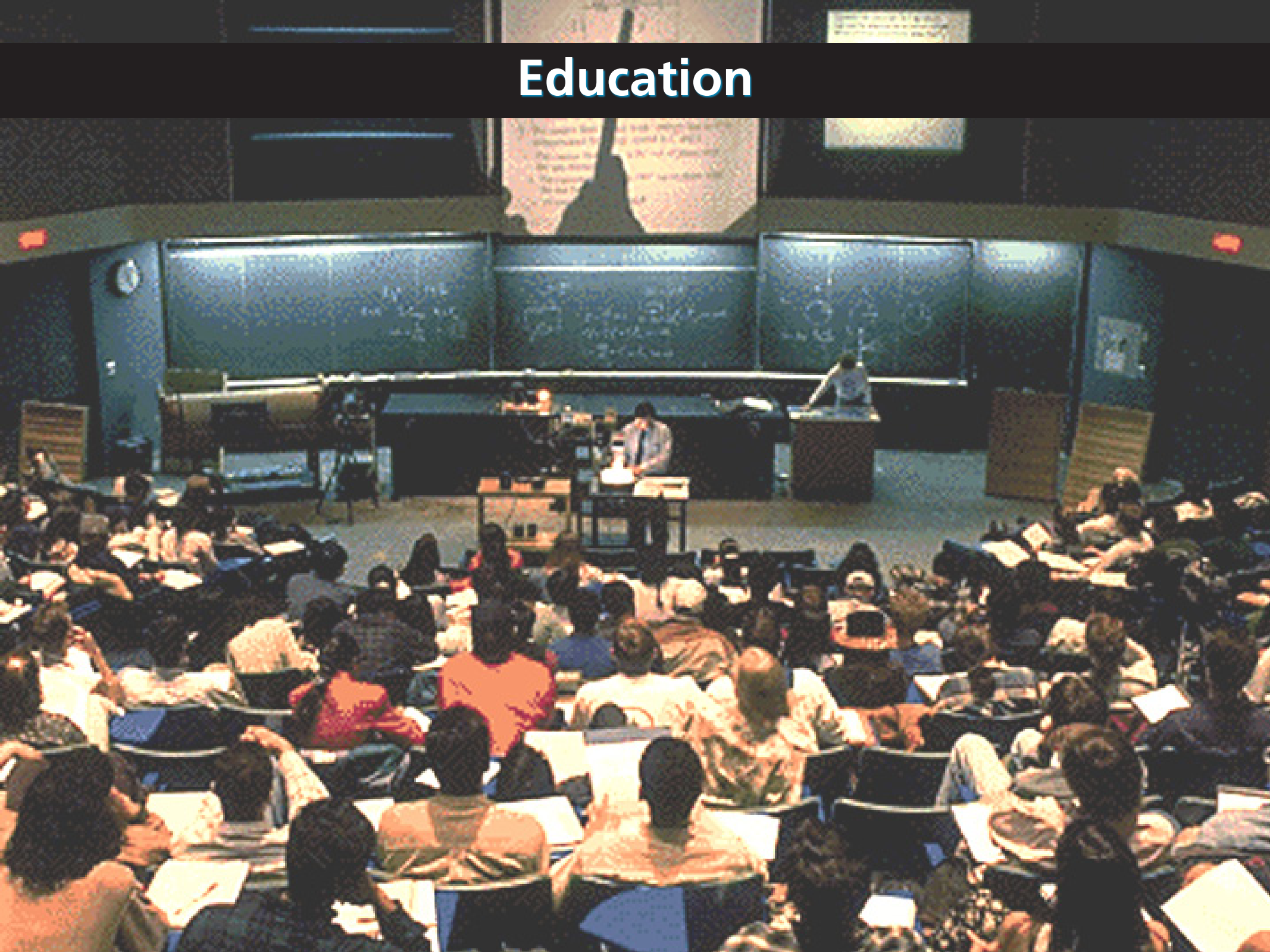
Became good at it by:

1. trial and error
2. lectures
3. practicing
4. apprenticeship
5. other

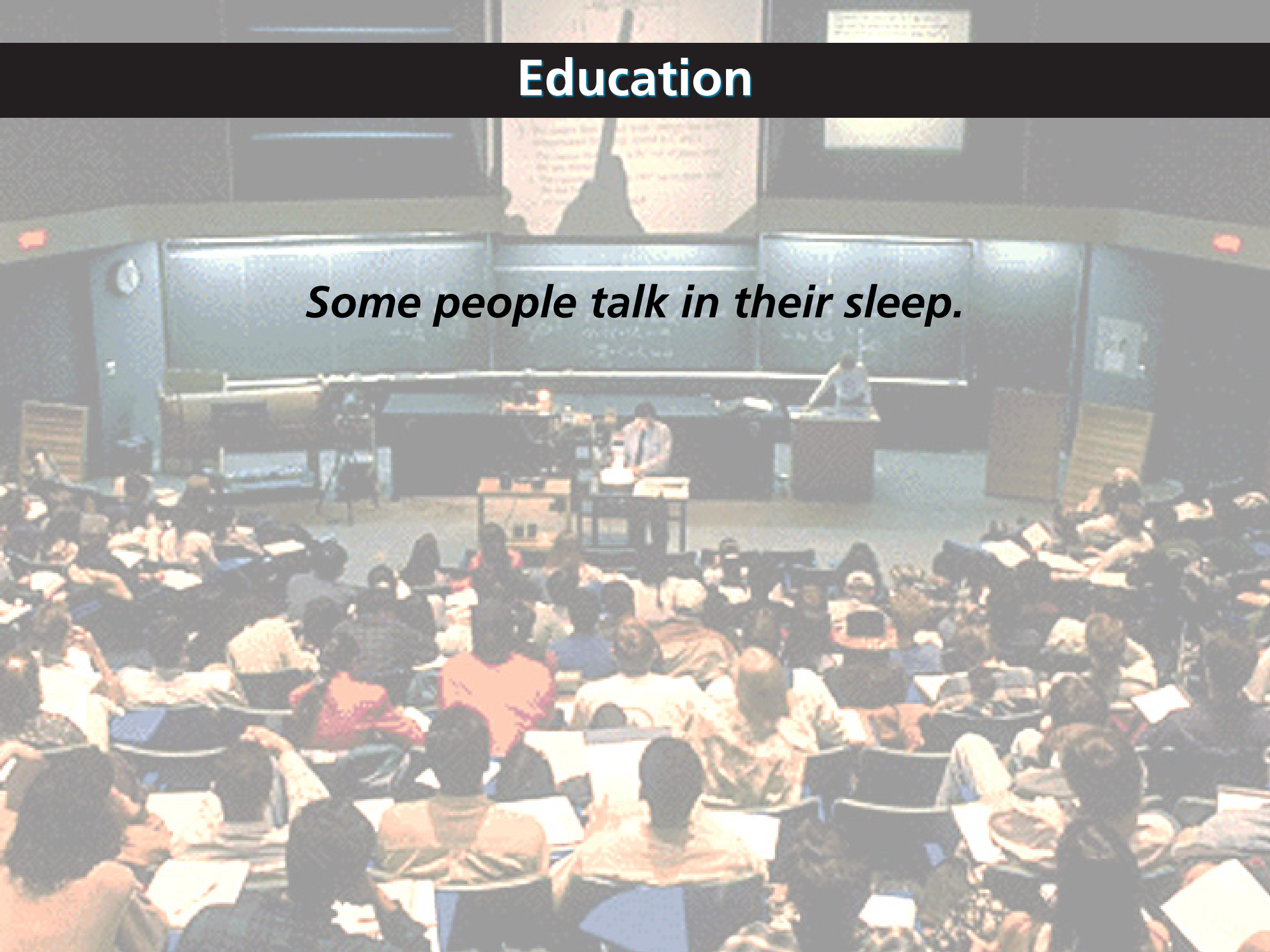
…and how do we teach?



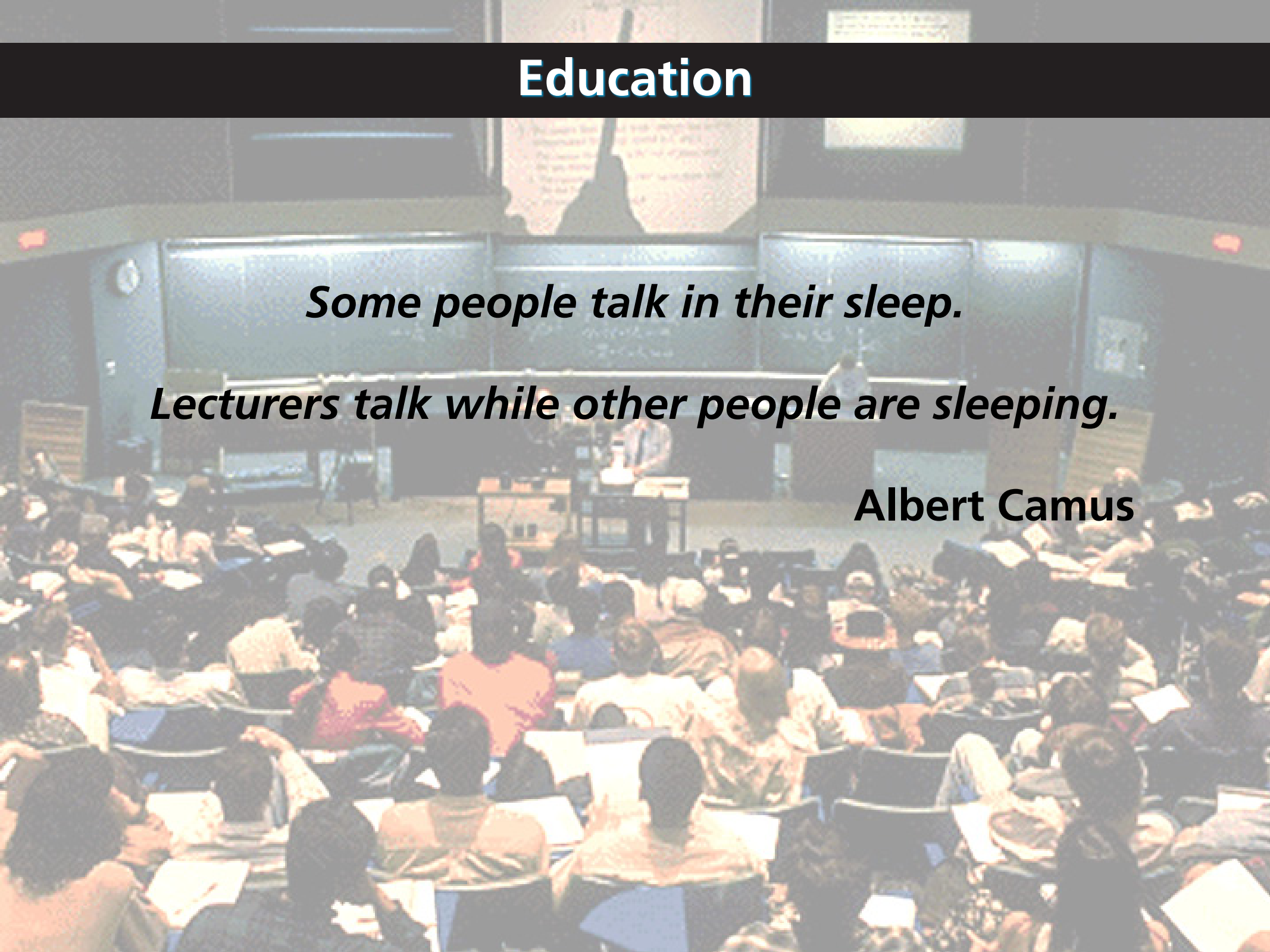
Education



Education



Education

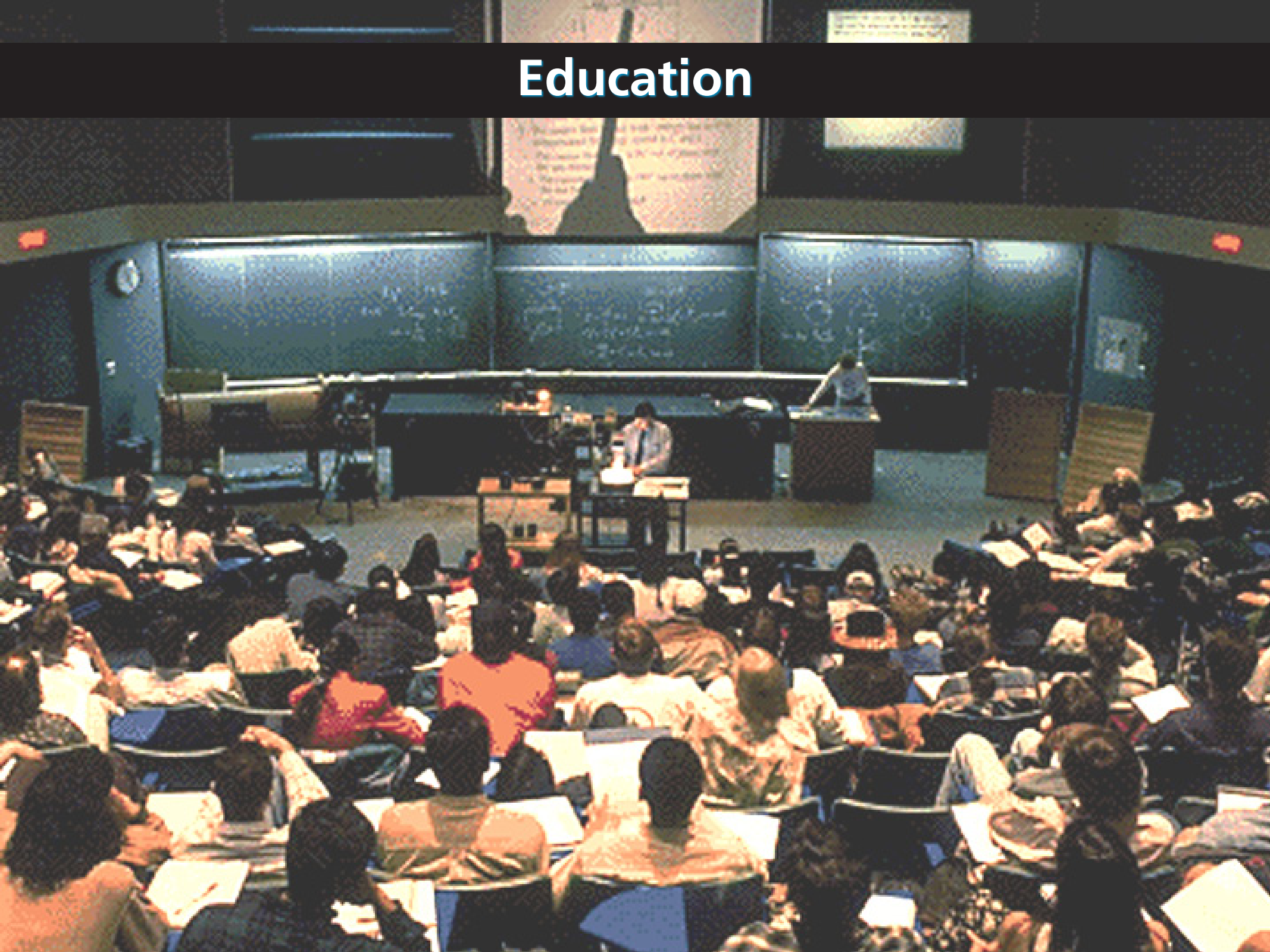


Some people talk in their sleep.

Lecturers talk while other people are sleeping.

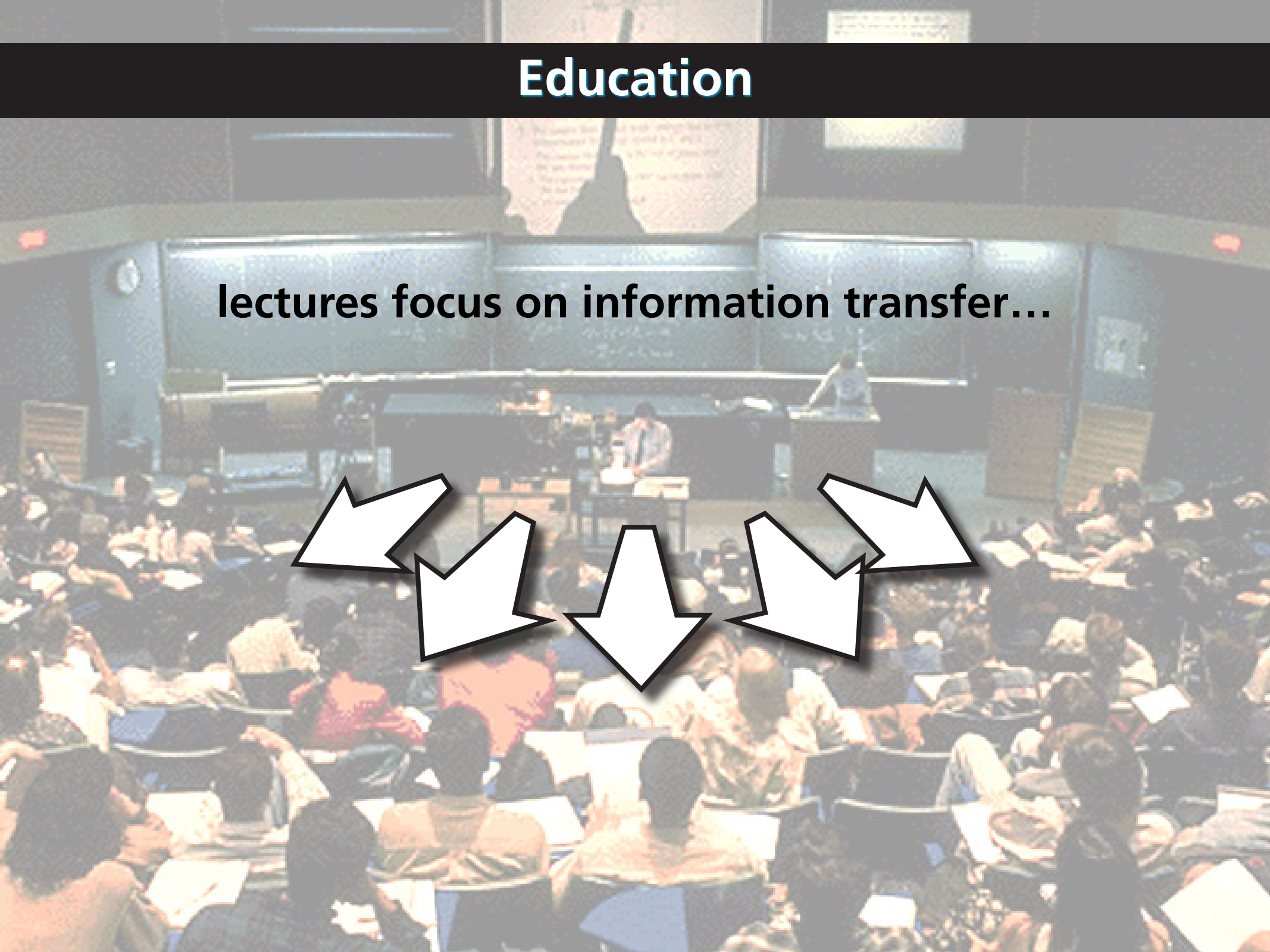
Albert Camus

Education



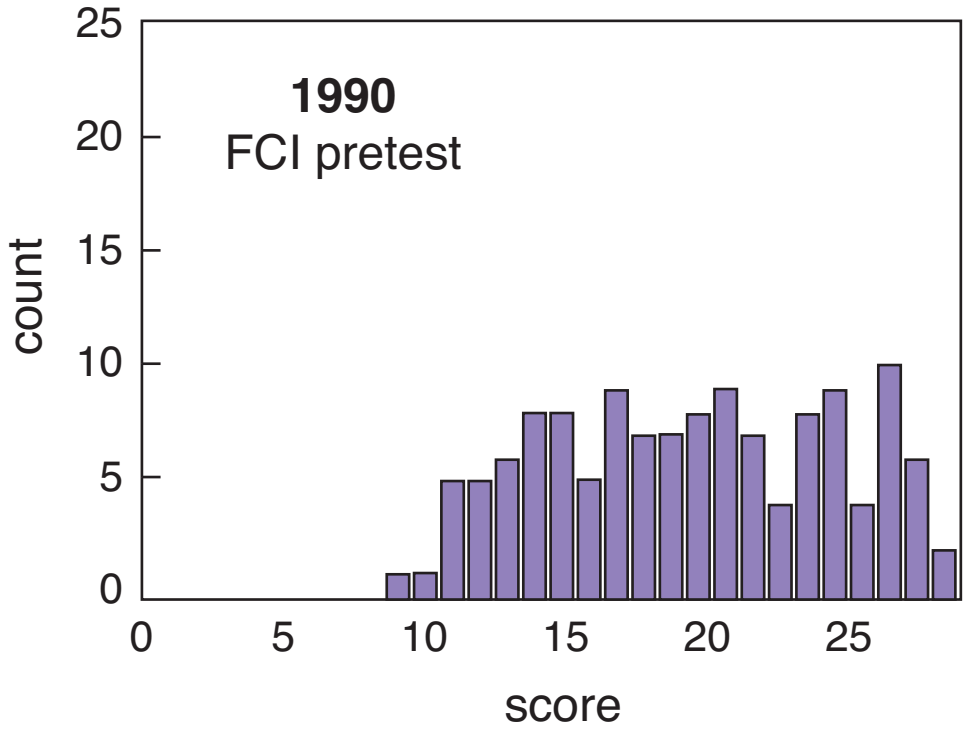
Education

lectures focus on information transfer…



Education

education is not just information transfer



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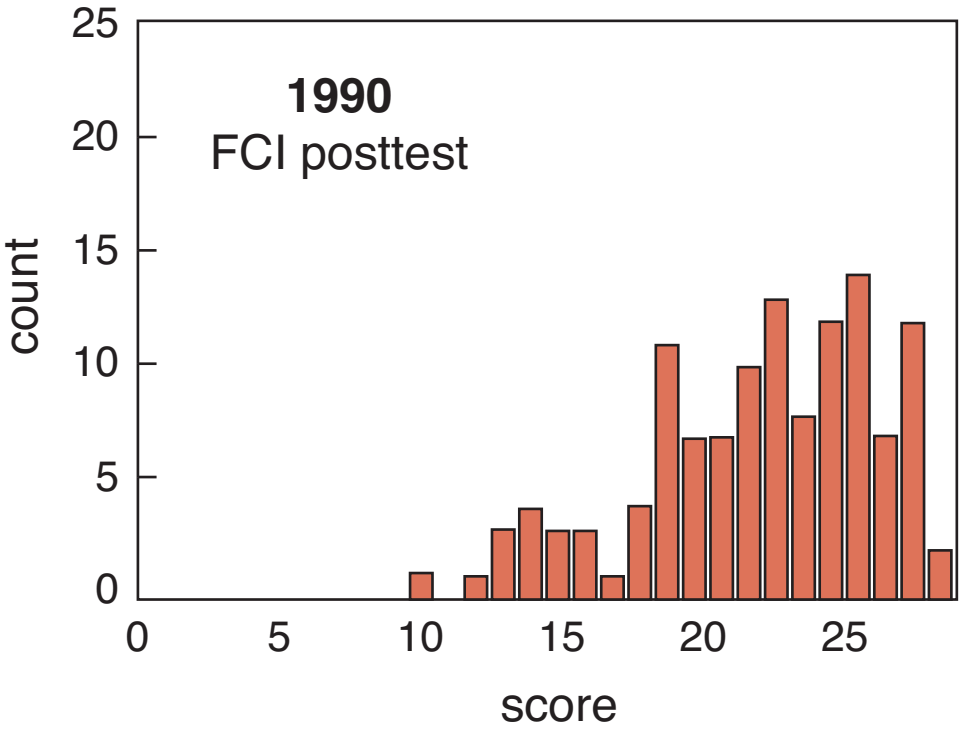

Education

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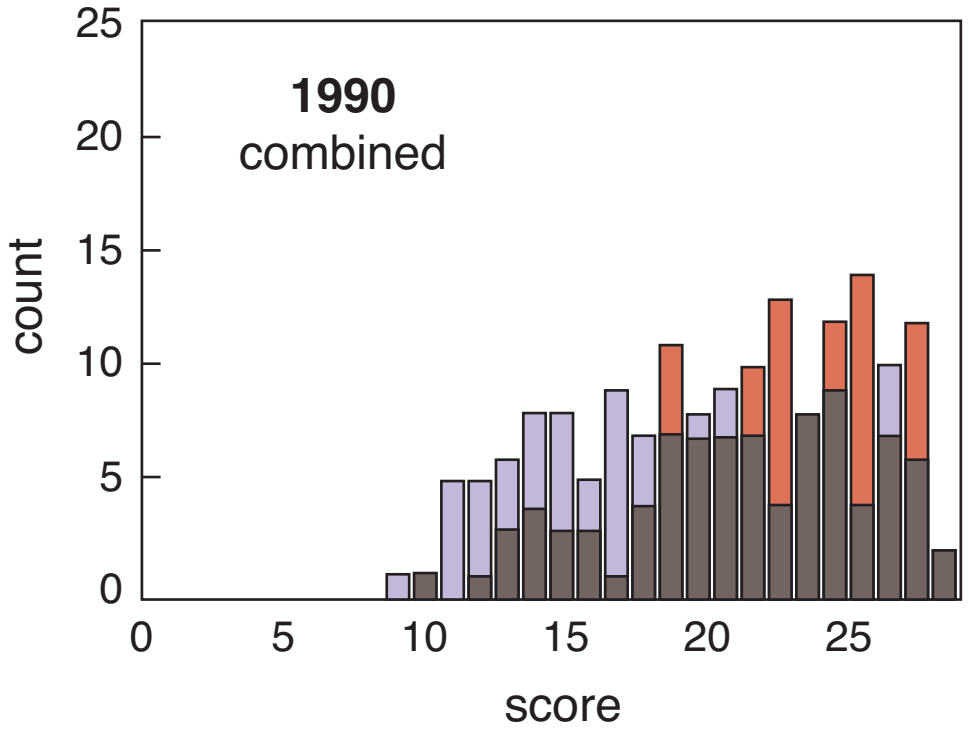
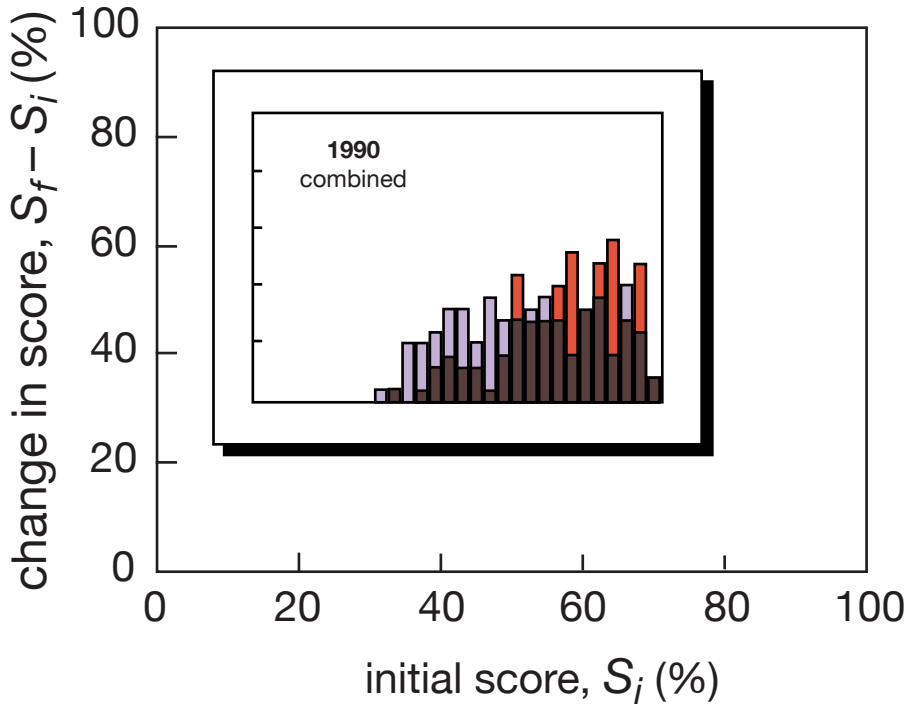
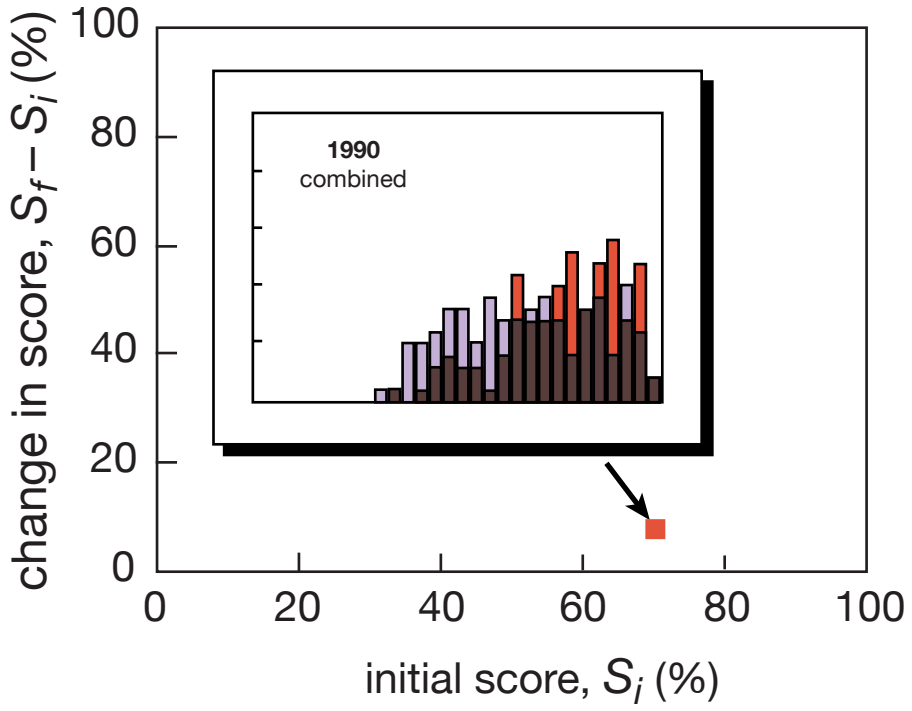


Education


1990
combined
change in score, $S_f - S_i$ (%)
initial score, S_i (%)
0
20
40
60
80
100

Education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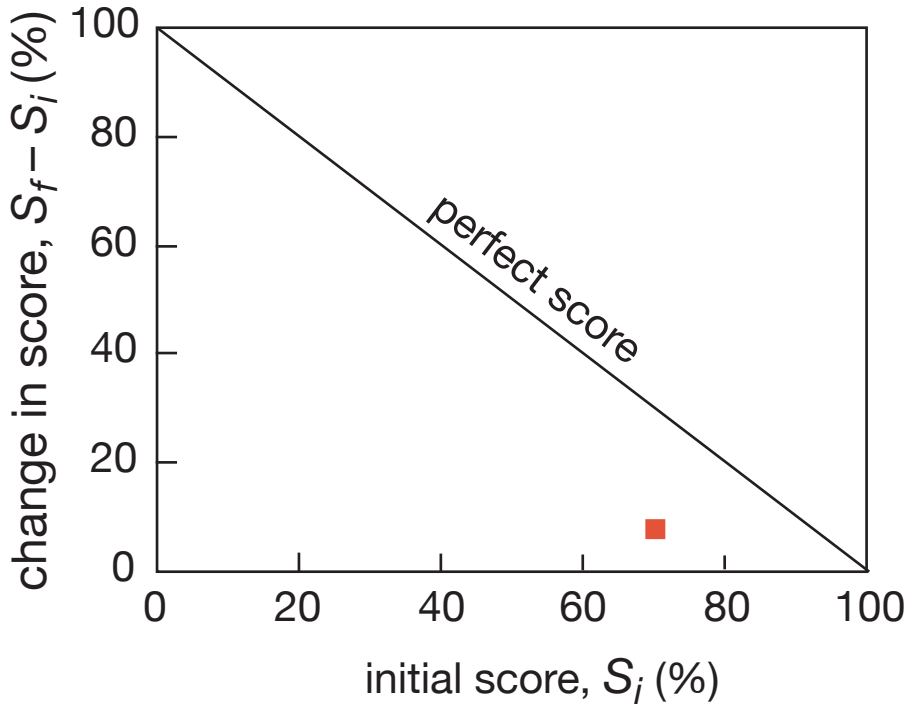
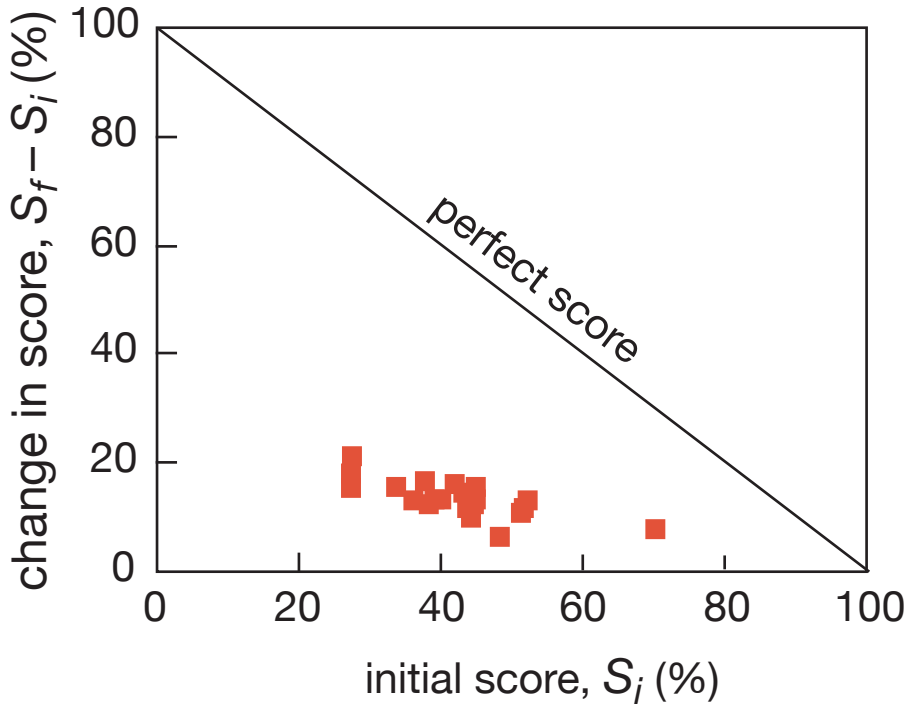
Education


change in score, $S_f - S_i$ (%)
100
80
60
40
20
0
0
20
40
60
80
100
initial score, S_i (%)
perfect score

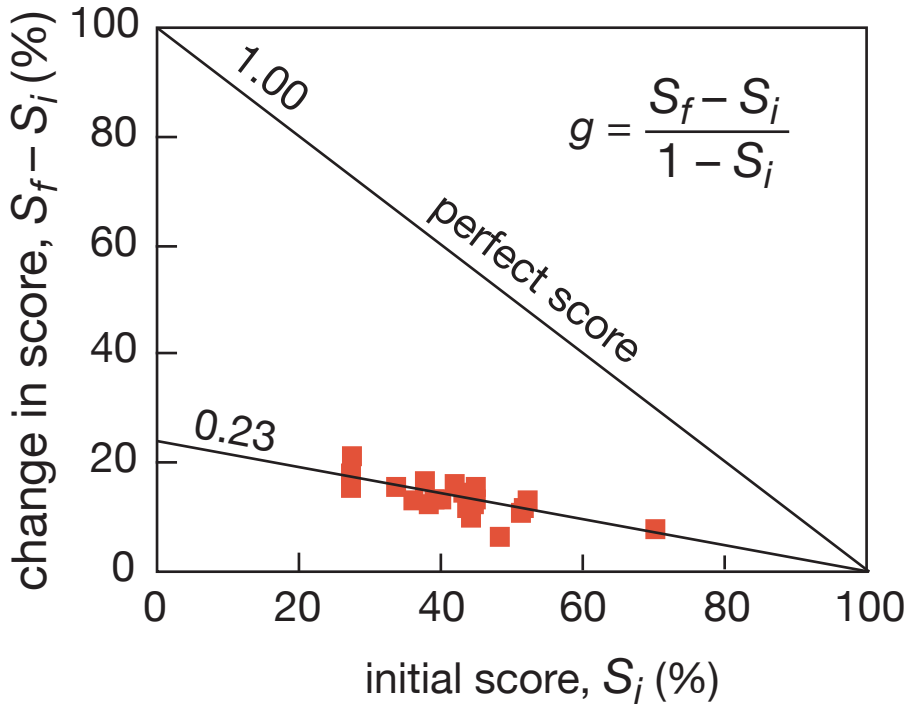
Education



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

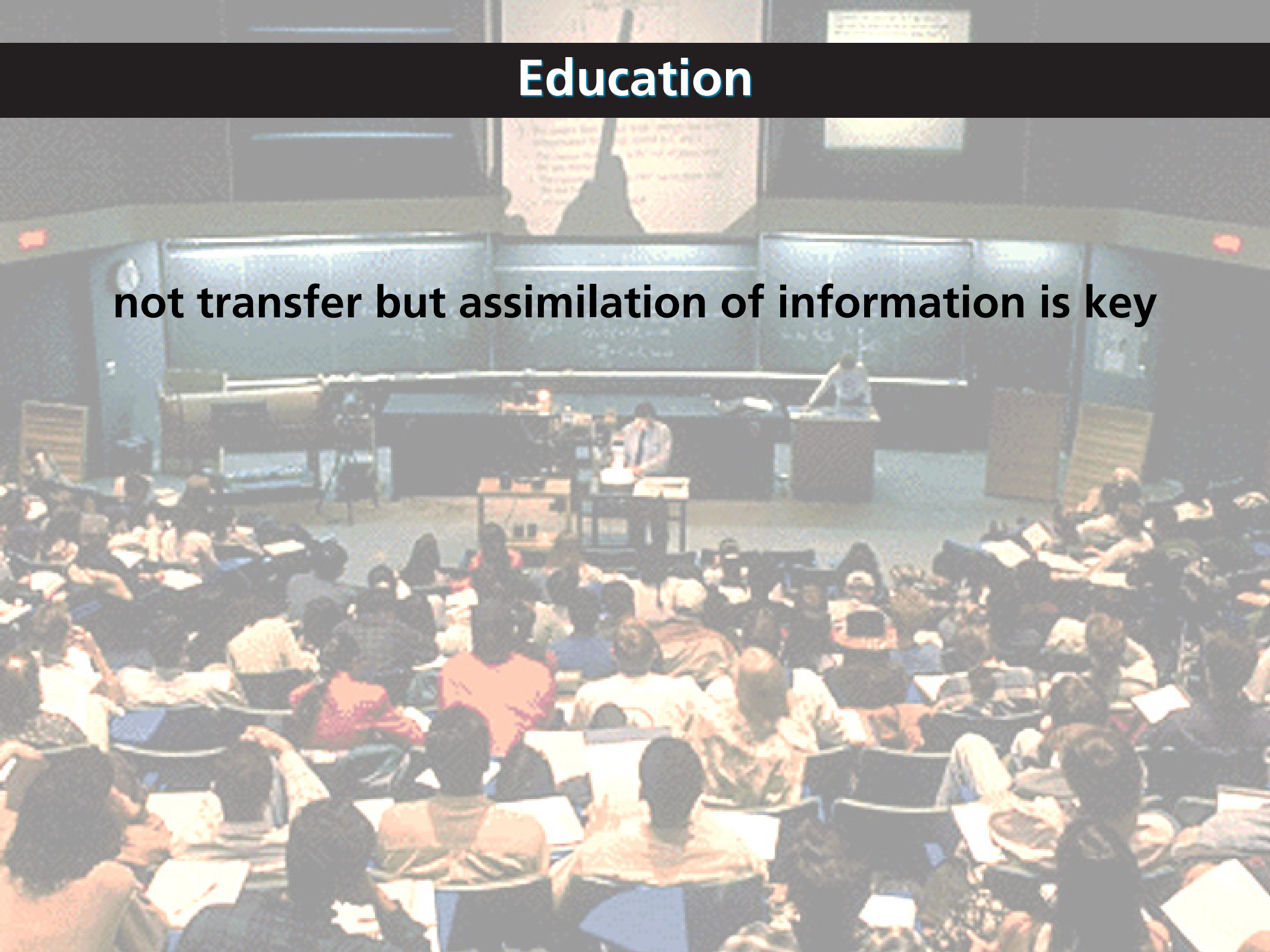
Education

only one quarter of maximum gain realized



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

Education



not transfer but assimilation of information is key


So what should we do?

Peer Instruction

Give students more responsibility for gathering information…

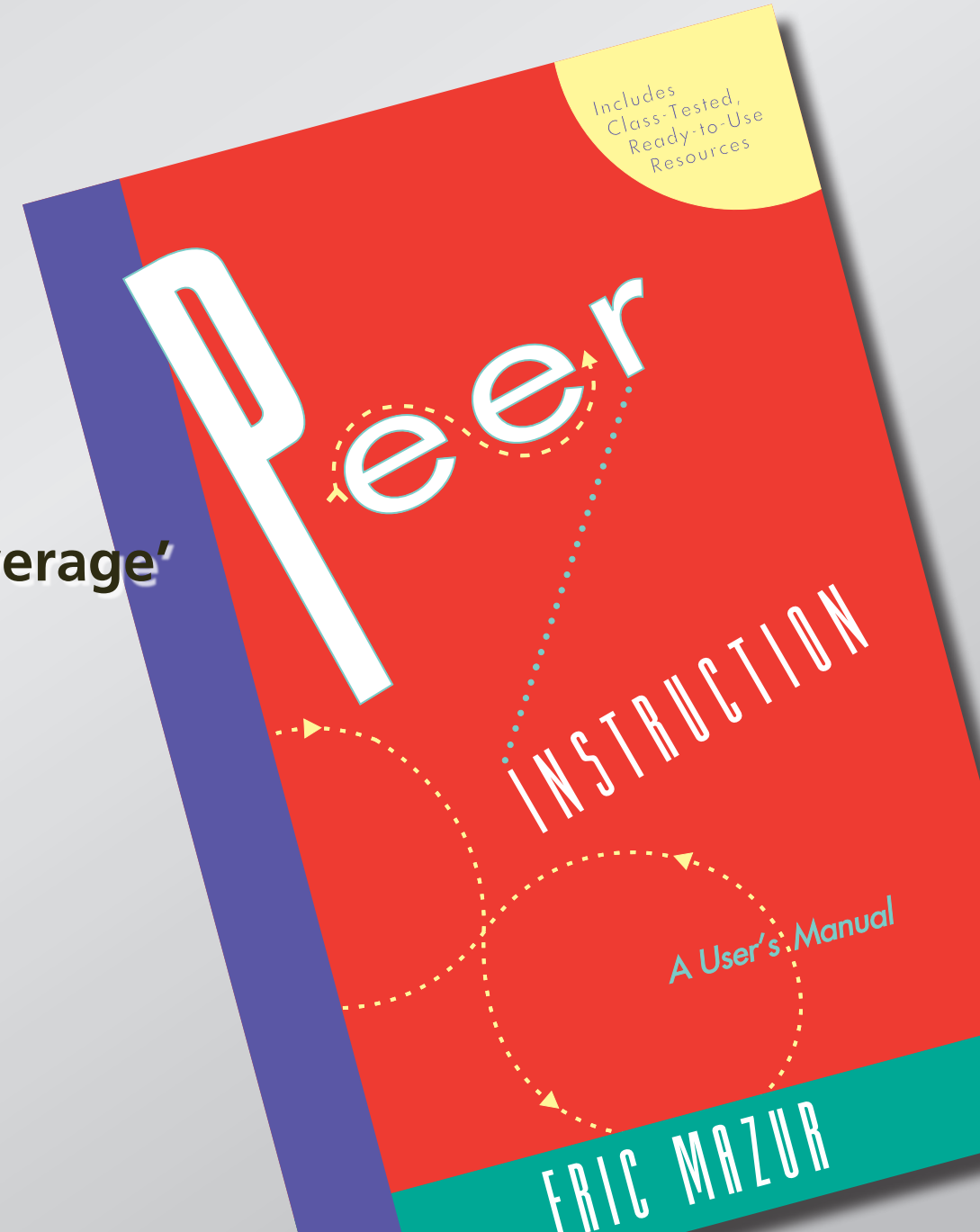
Peer Instruction

Give students more responsibility for gathering information…
so we can better help them assimilate it.

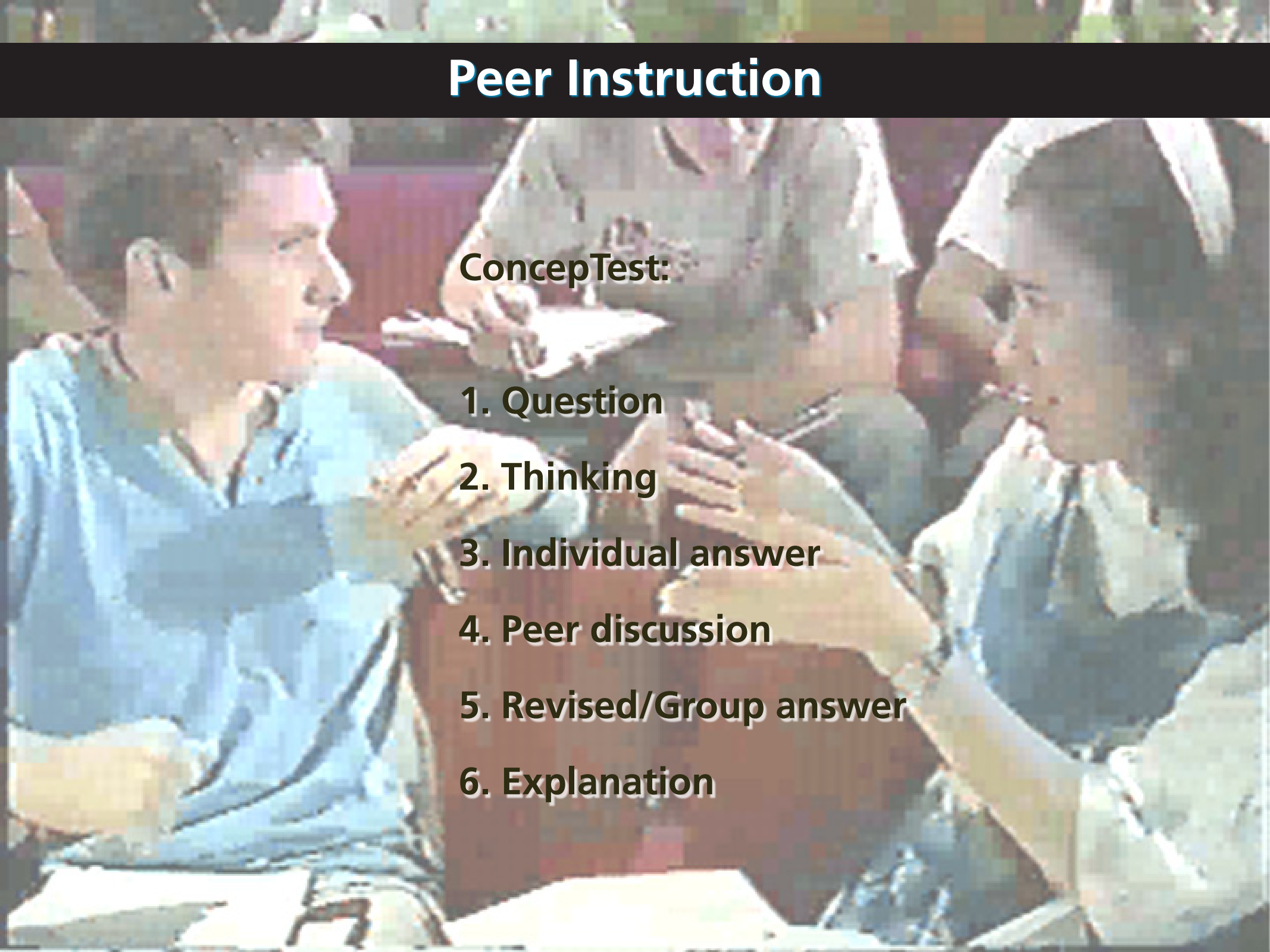
Peer Instruction

Main features:

- **pre-class assignment**
- **in-class: depth, not ‘coverage’**
- **ConcepTests**



Peer Instruction



ConcepTest:

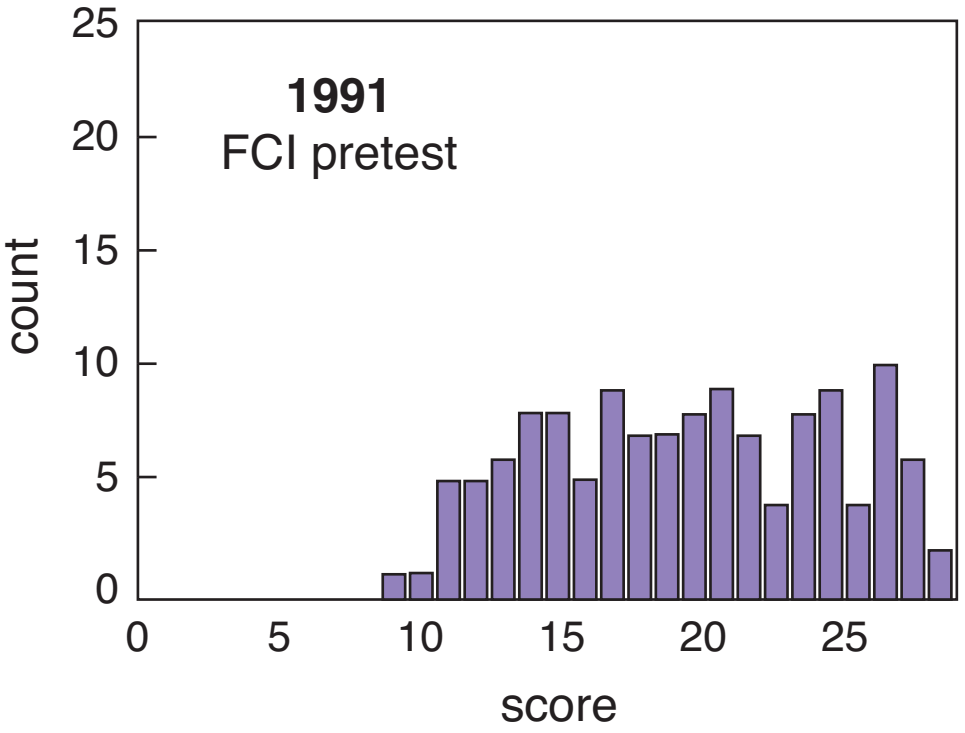
1. Question
2. Thinking
3. Individual answer
4. Peer discussion
5. Revised/Group answer
6. Explanation

Results

is it any good?

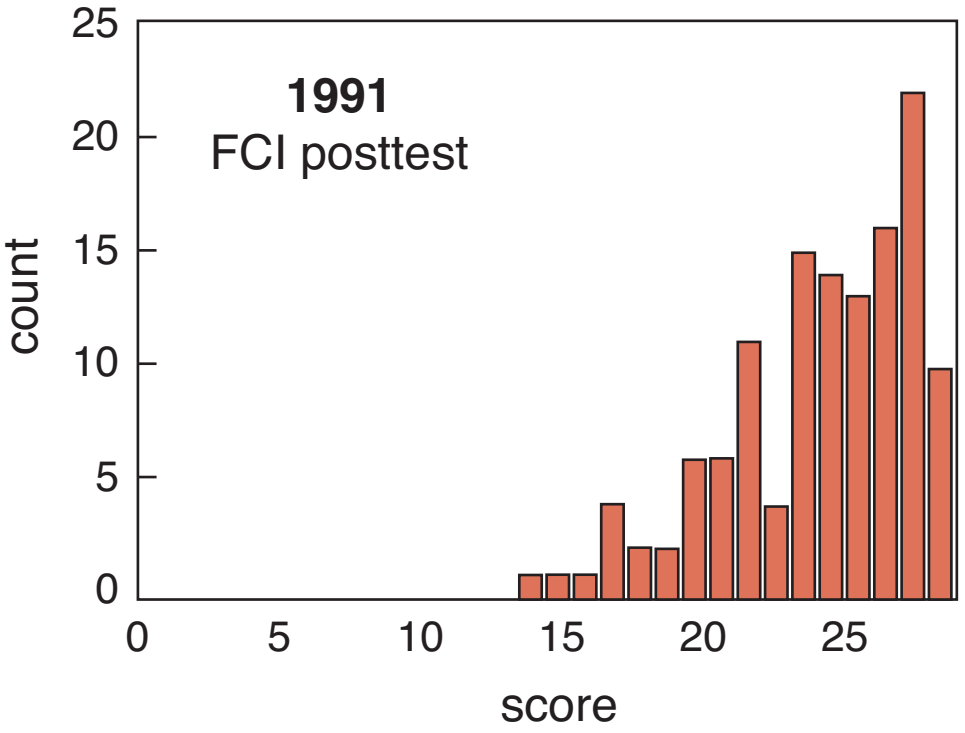
Results

first year of implementing PI



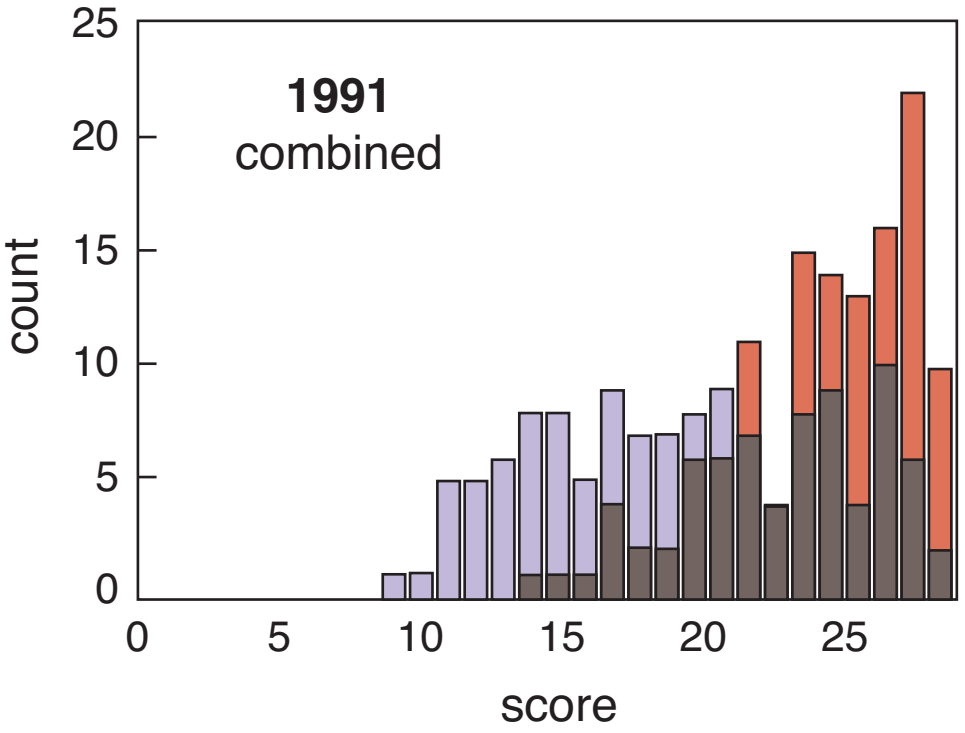
Results

first year of implementing PI

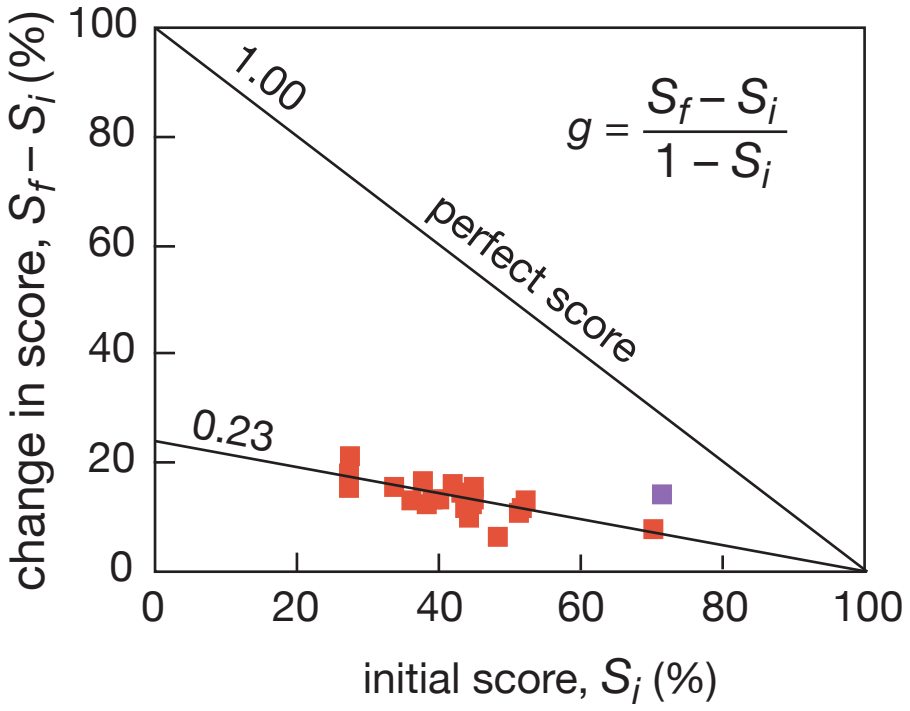


Results

first year of implementing PI



Results


change in score, $S_f - S_i$ (%)
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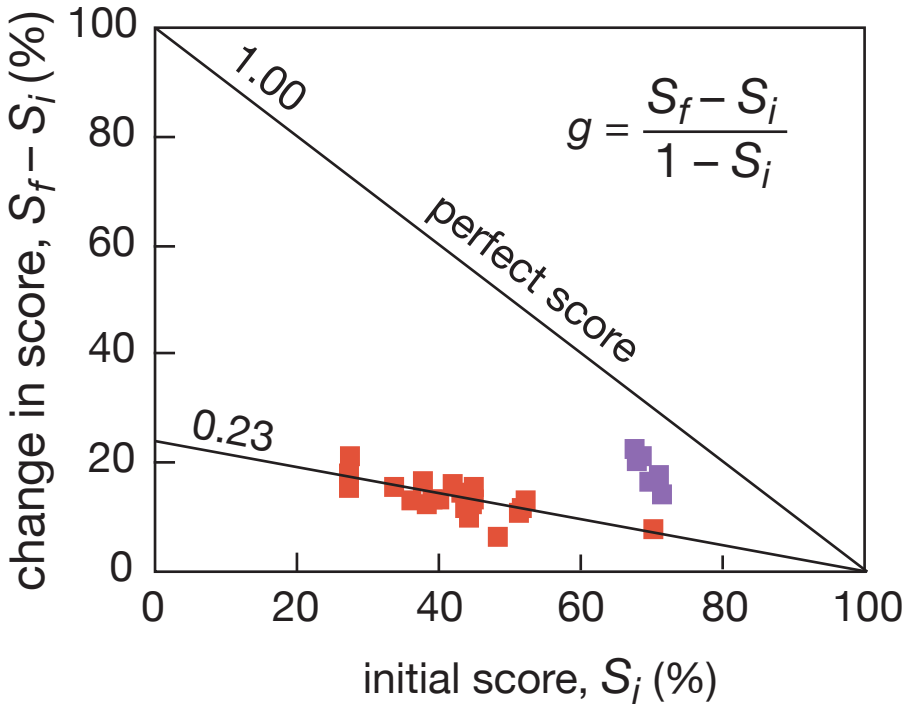
80
60
40
20
0
0
20
40
60
80
100
initial score, S_i (%)
1.00
perfect score
0.23
$g = \frac{S_f - S_i}{1 - S_i}$

Results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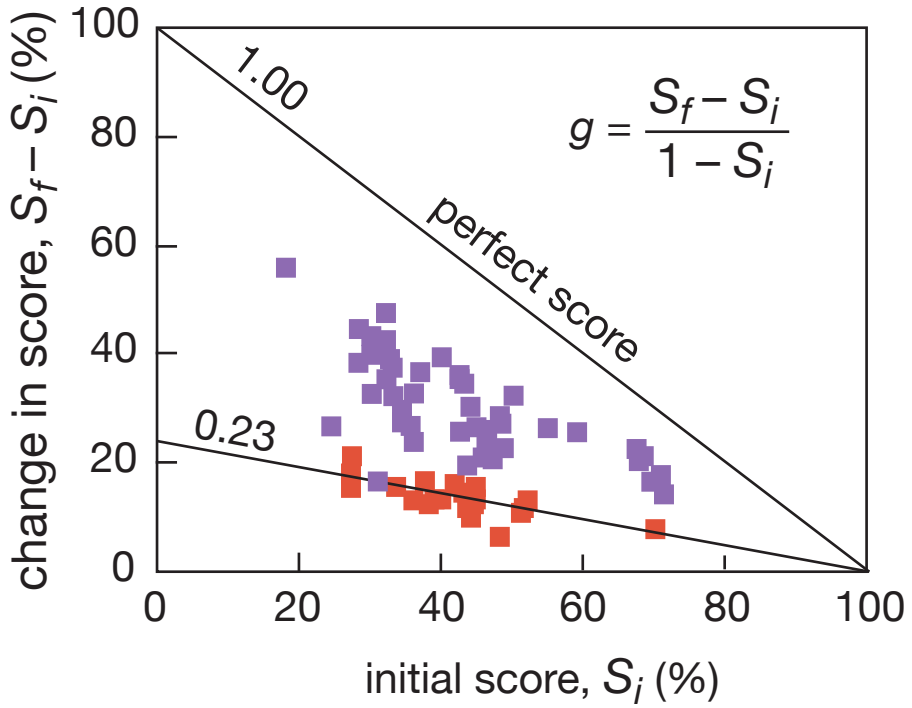
Results



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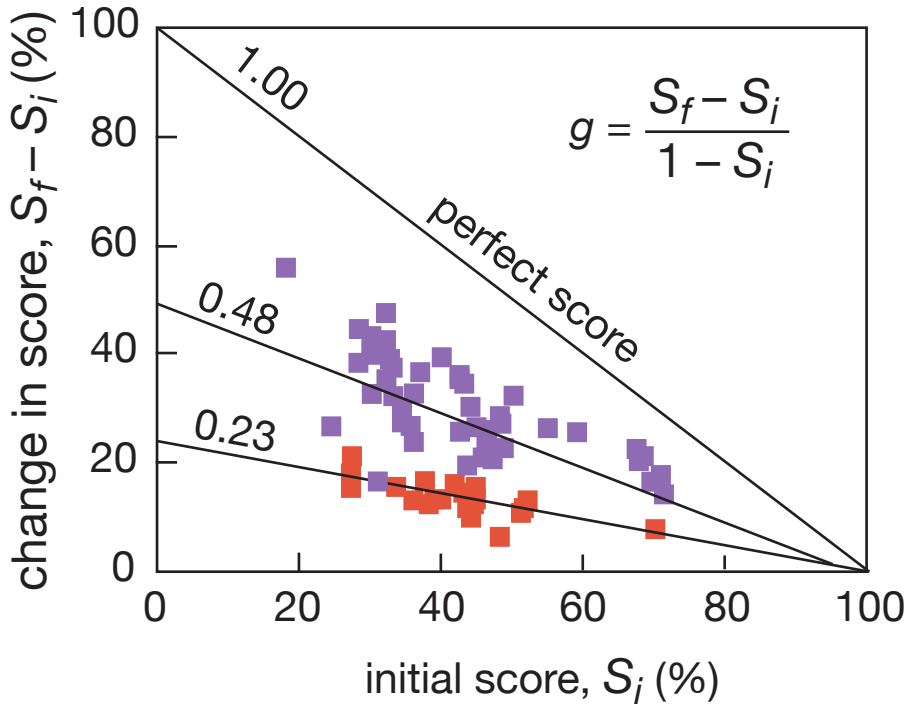
Results

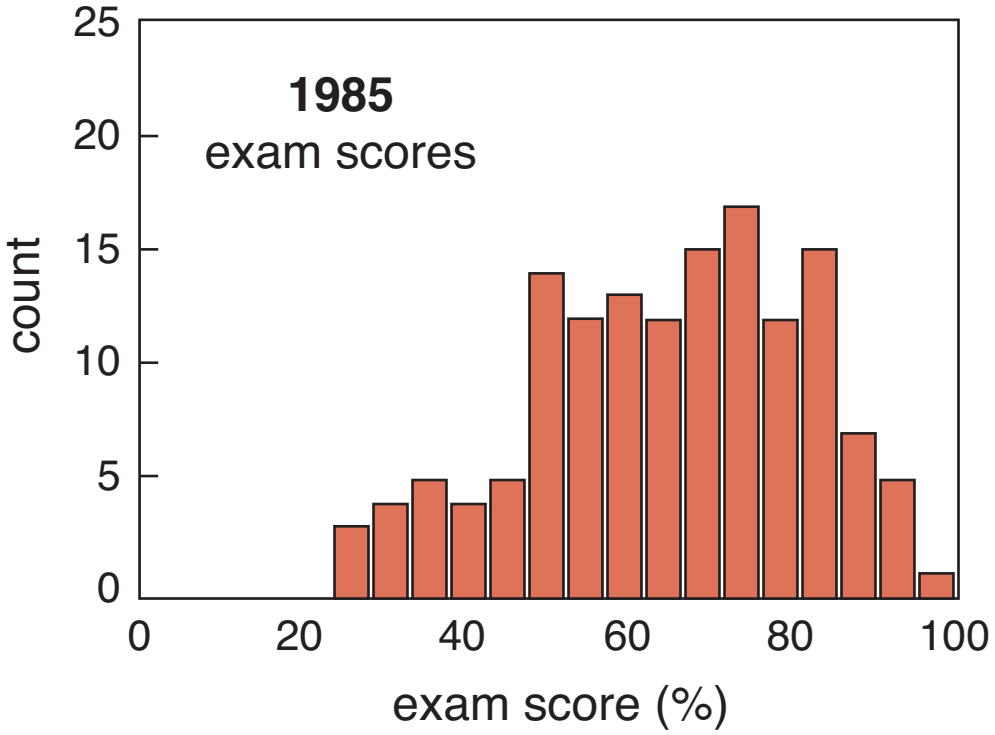


R.R. Hake, *Am. J. Phys.* 66, 64 (1998)

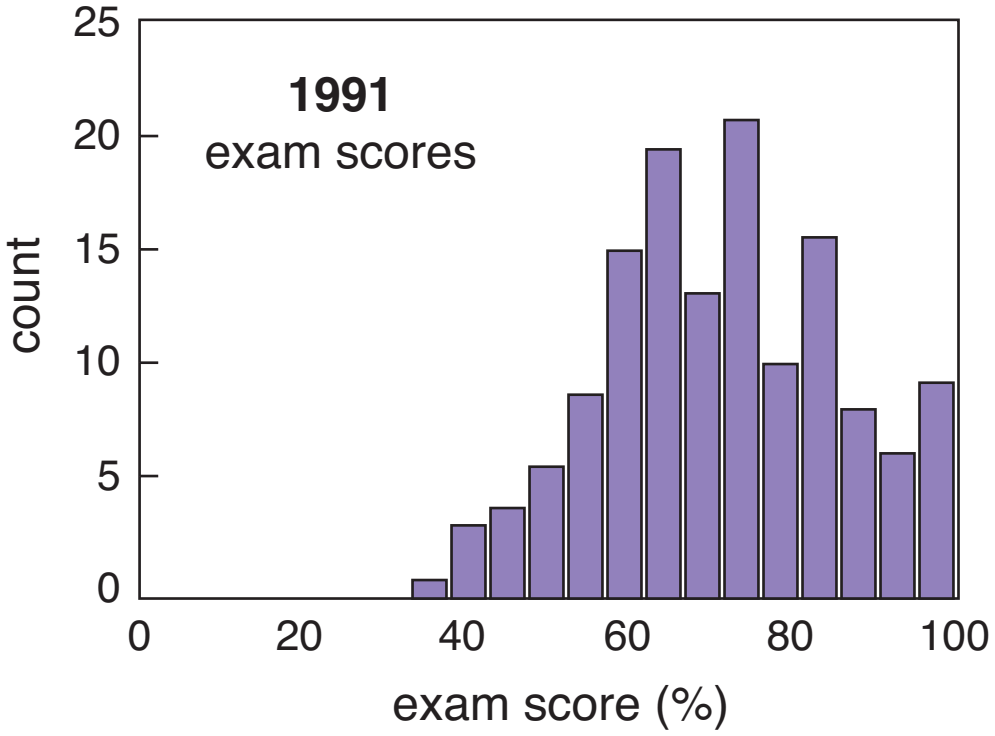
Results

what about problem solving?

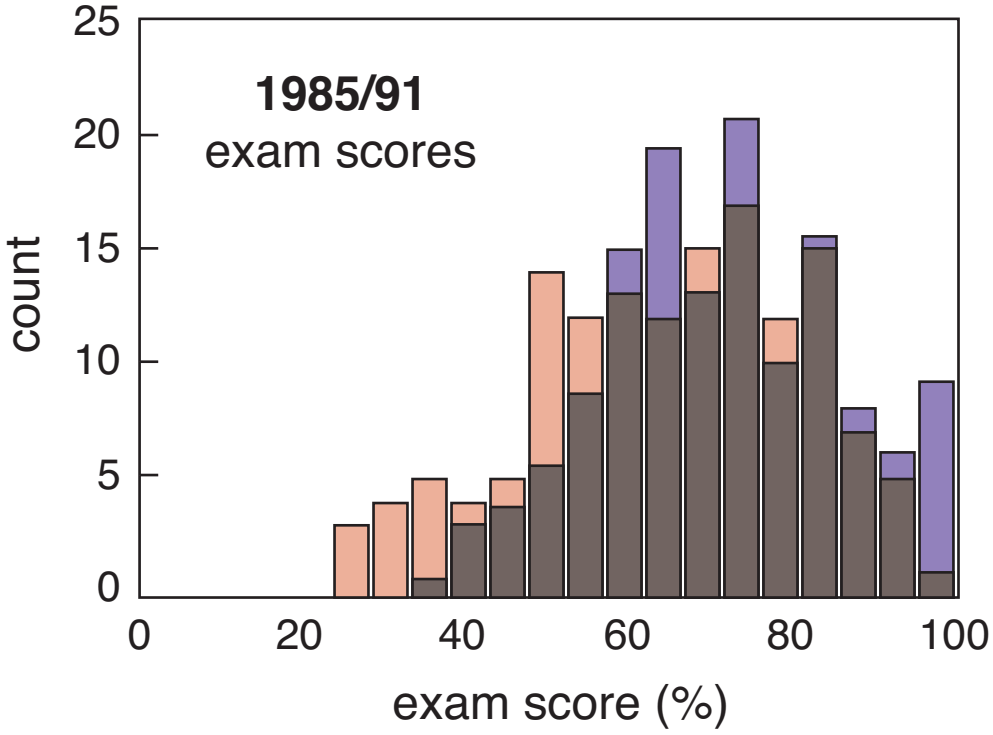
Results


1985
exam scores
count
25
20
15
10
5
0
0
20
40
60
80
100
exam score (%)

Results


1991
exam scores
count
25
20
15
10
5
0
0
20
40
60
80
100
exam score (%)

Results


1985/91
exam scores
count
25
20
15
10
5
0
0
20
40
60
80
100
exam score (%)

Conclusion

So better understanding leads to better problem solving!

Conclusion

So better understanding leads to better problem solving!

(but “good” problem solving doesn’t always indicate understanding!)

Summary

Traditional indicators of success misleading

Summary

Traditional indicators of success misleading

Education is no longer about information

Hands-on with Peer Instruction

The Digital Education Show Middle East
Dubai, United Arab Emirates
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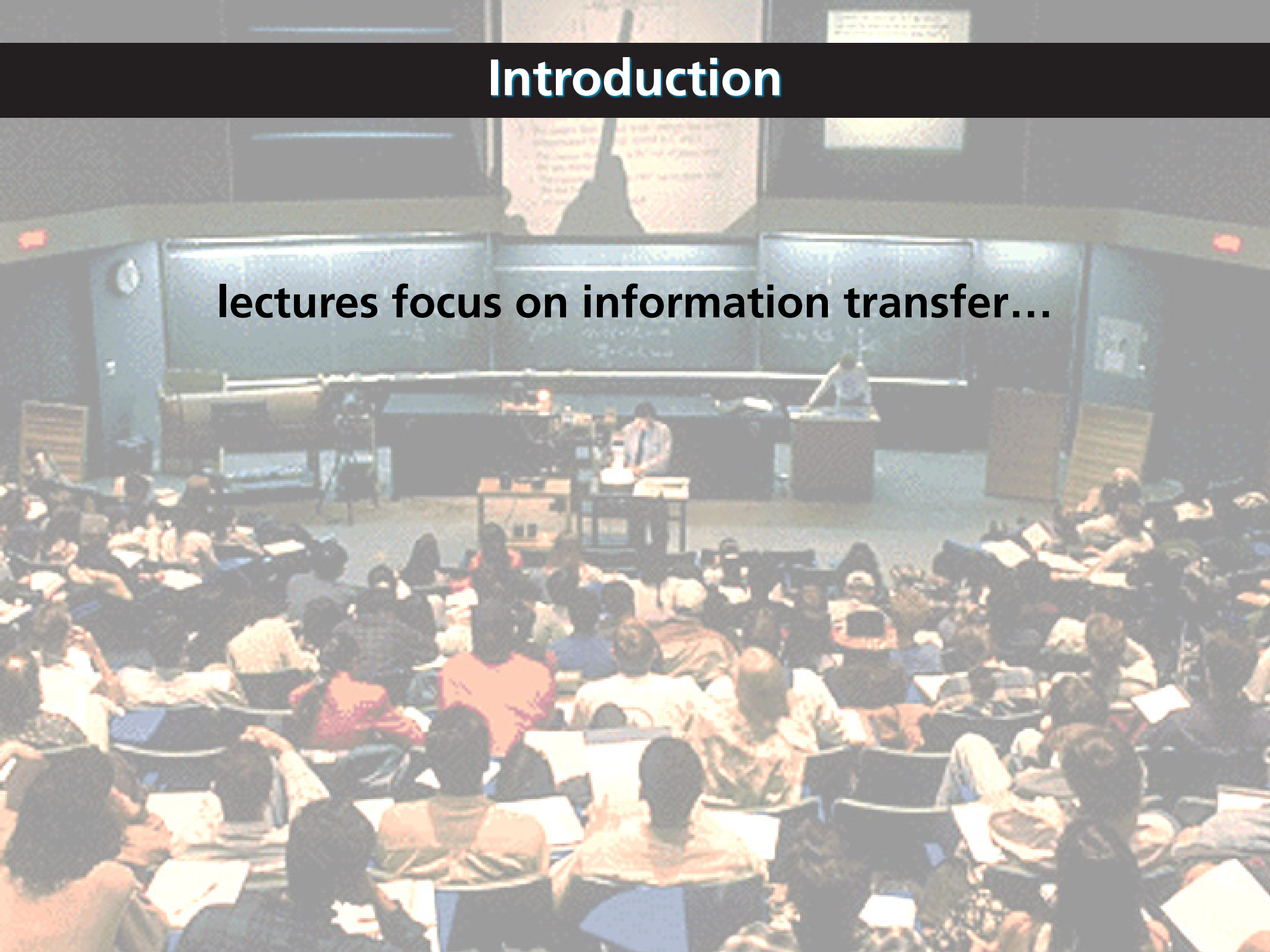
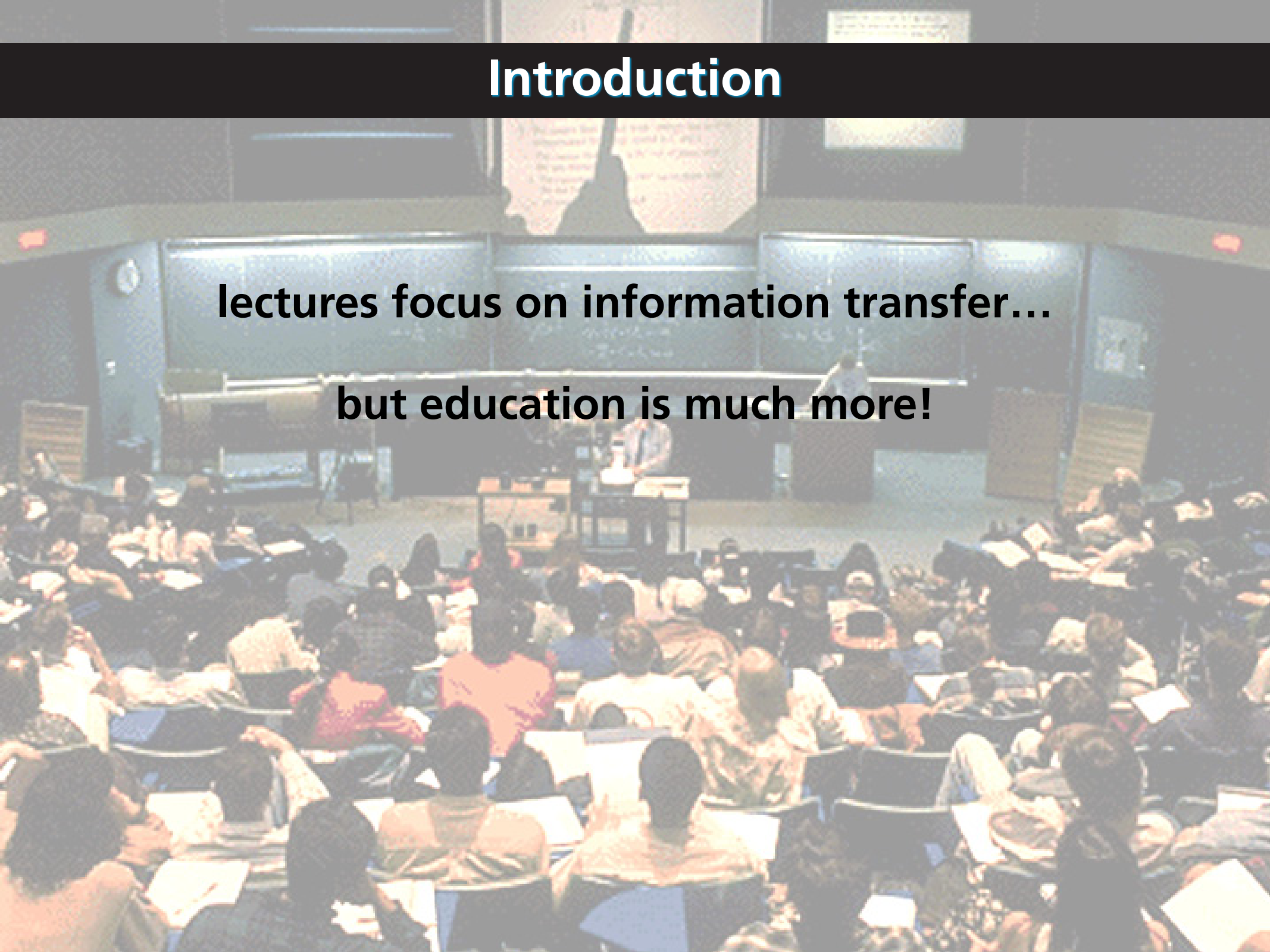
Introduction



lectures focus on information transfer…

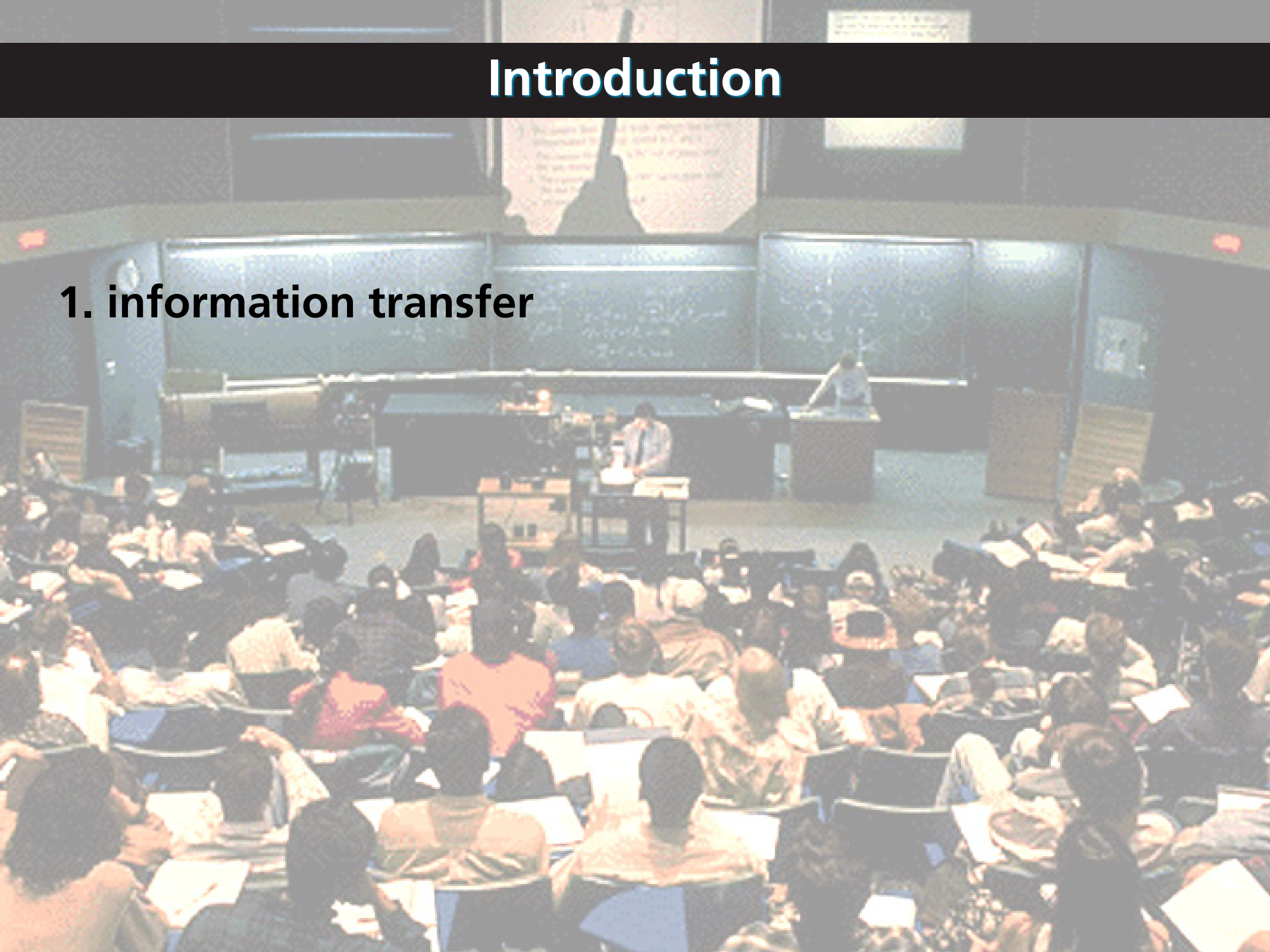
Introduction



lectures focus on information transfer…

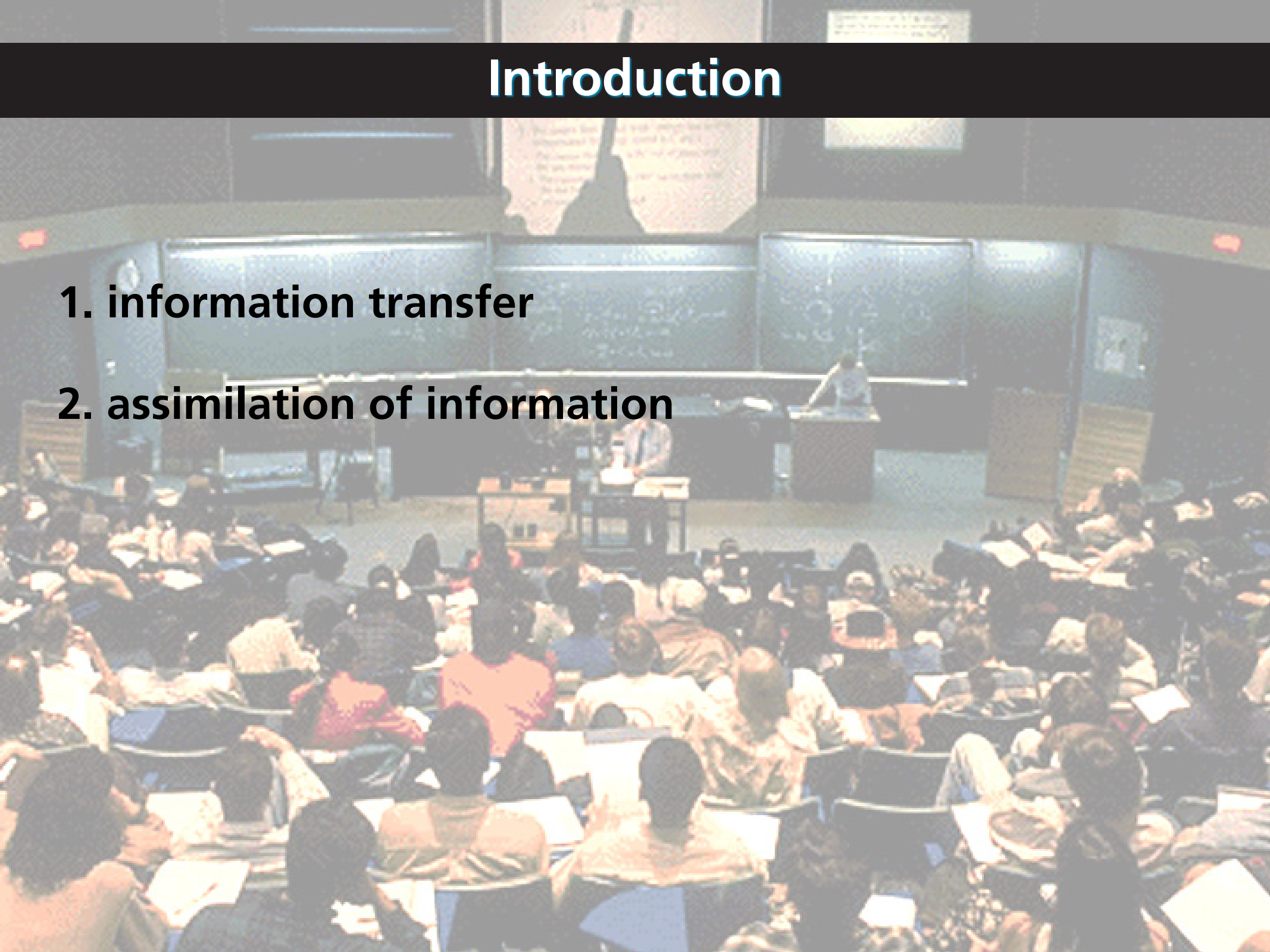
but education is much more!

Introduction



1. information transfer

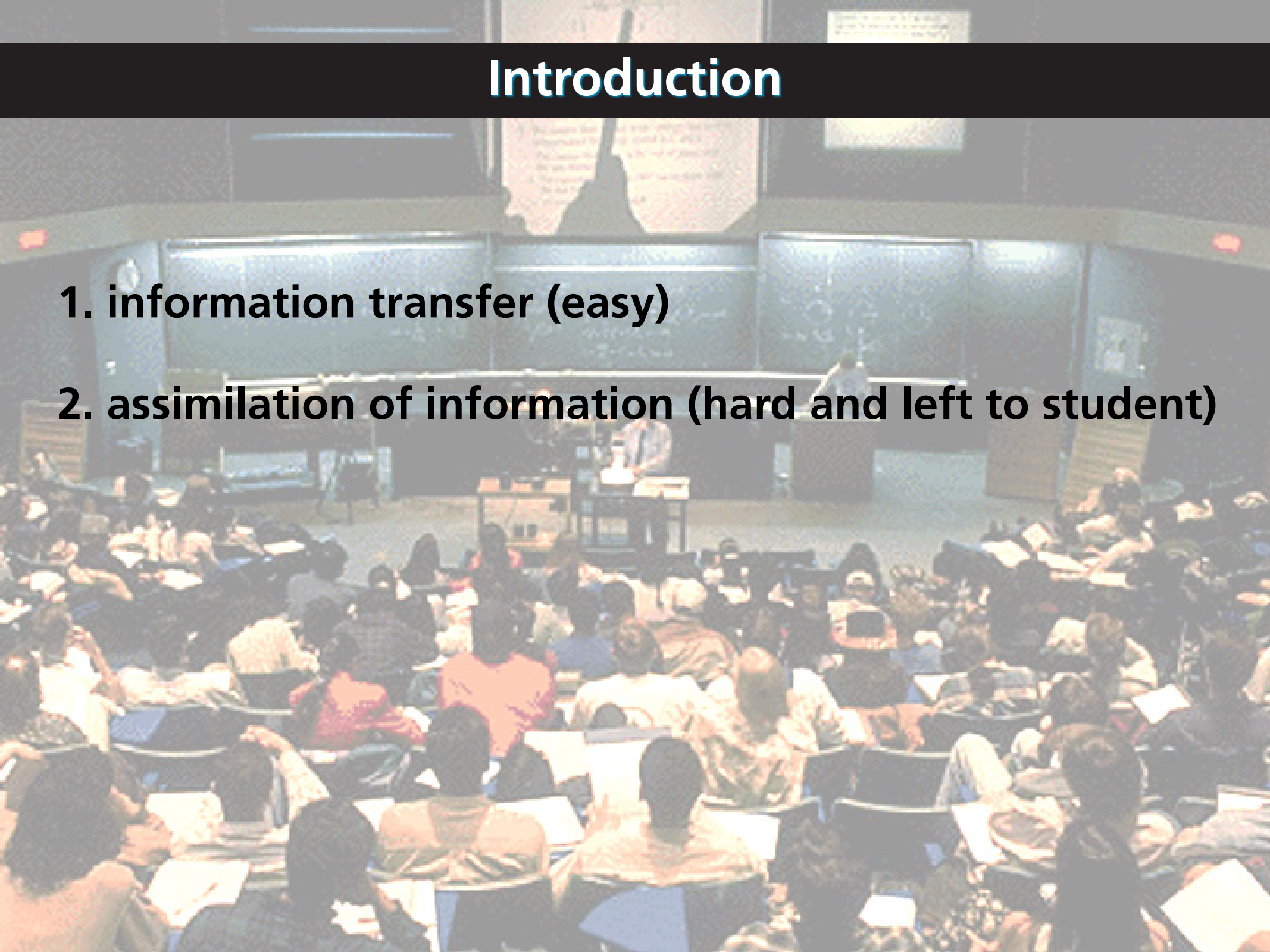
Introduction



1. information transfer

2. assimilation of information

Introduction



1. information transfer (easy)

2. assimilation of information (hard and left to student)

Introduction

Solution: move information transfer out of classroom!

Introduction

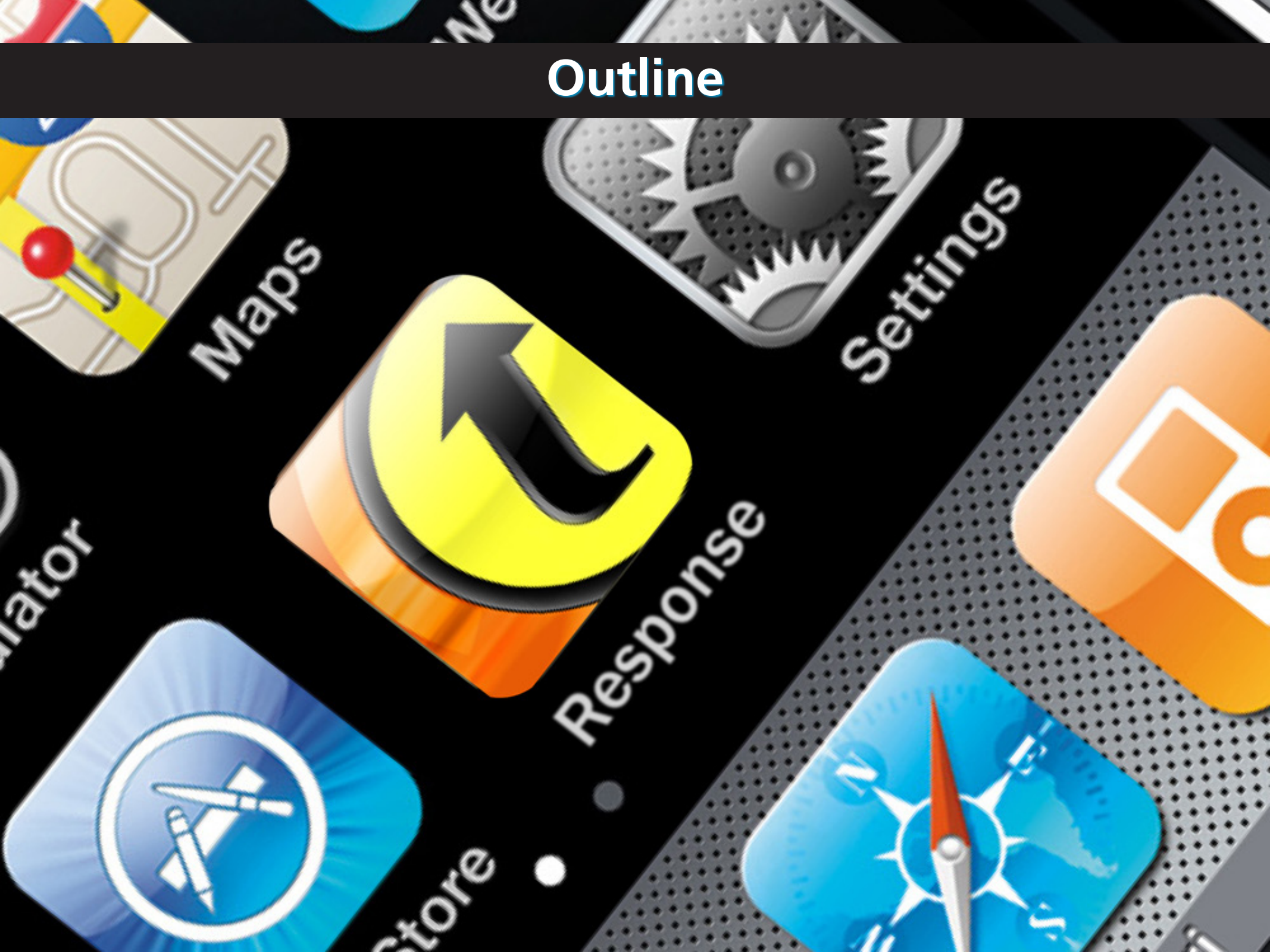
How to move information transfer out of classroom?

Introduction

How to move information transfer out of classroom?

Use JiTT (before class) and PI (in class)!

Outline



Outline

- PI & JiTT Overview
- Implementing PI & JiTT
- ConcepTests

PI & JiTT Overview

"How can I be sure that my students will prepare for class?"

PI & JiTT Overview

Students do not come to class prepared, because...

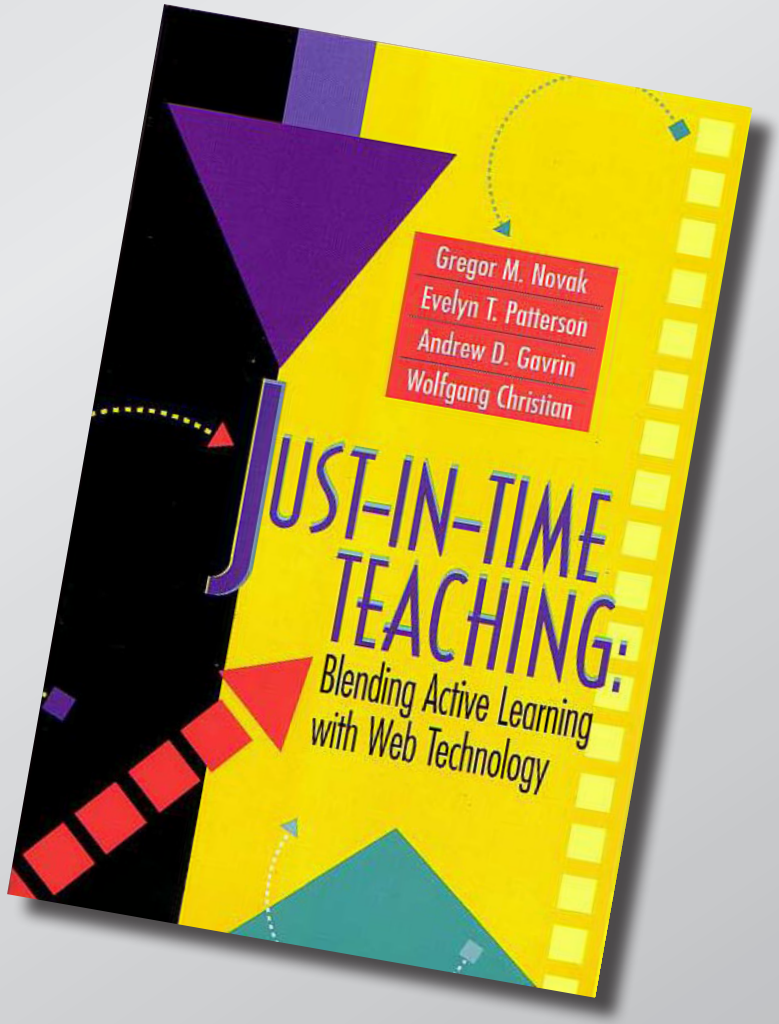
1. they don't have time.
2. they are not motivated to learn.
3. their instructors take away the incentive.
4. they do not have the requisite skills.
5. of some other reason.
6. They do come prepared in my class!

(select what you consider to be the main reason)

PI & JiTT Overview

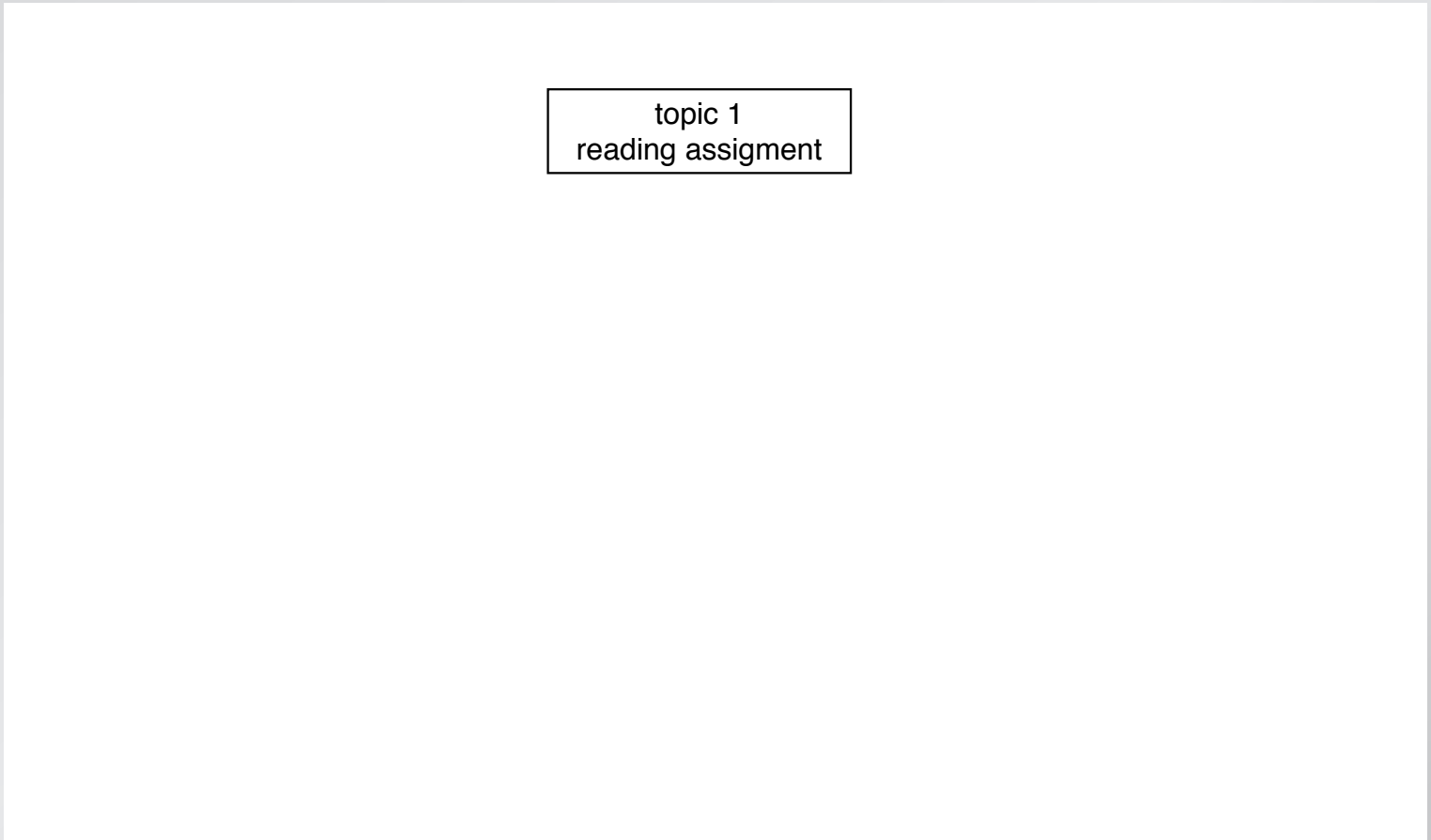
Just-in-time-Teaching (JiTT)

www.jitt.org



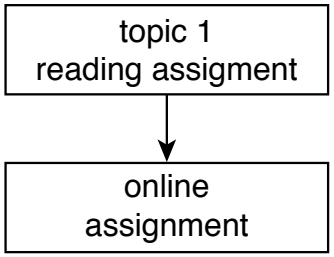
PI & JiTT Overview

JiTT workflow



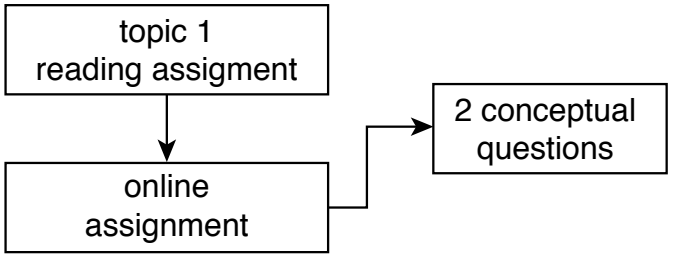
PI & JiTT Overview

JiTT workflow



PI & JiTT Overview

JiTT workflow



PI & JiTT Overview

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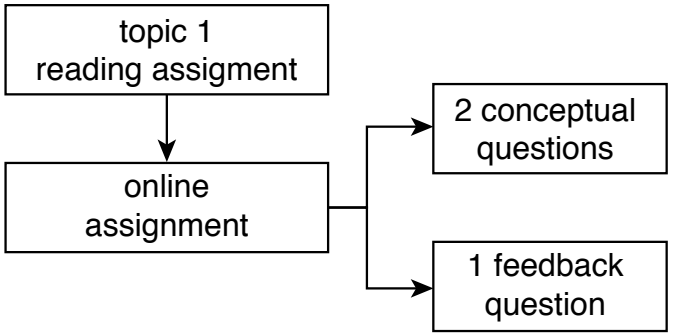
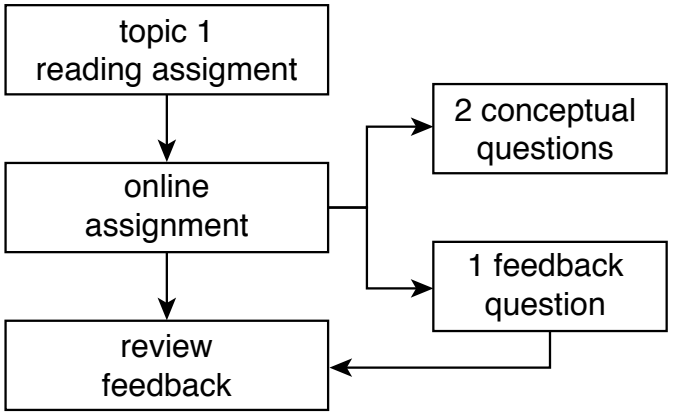


PI & JiTT Overview

JiTT workflow



PI & JiTT Overview

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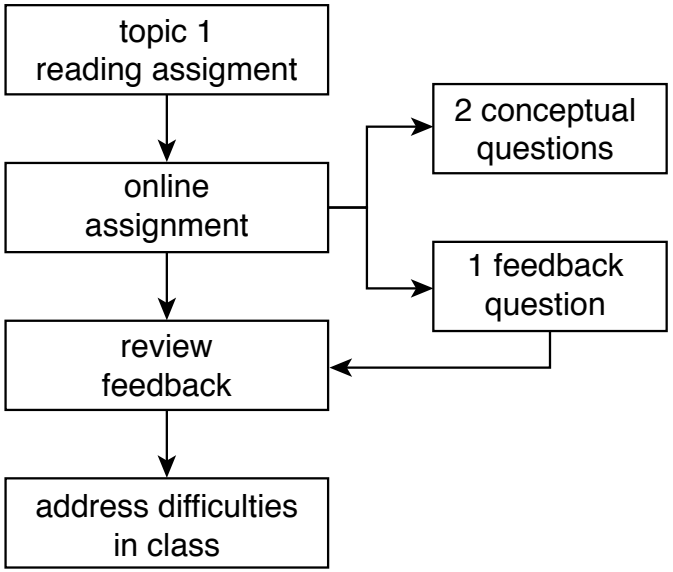
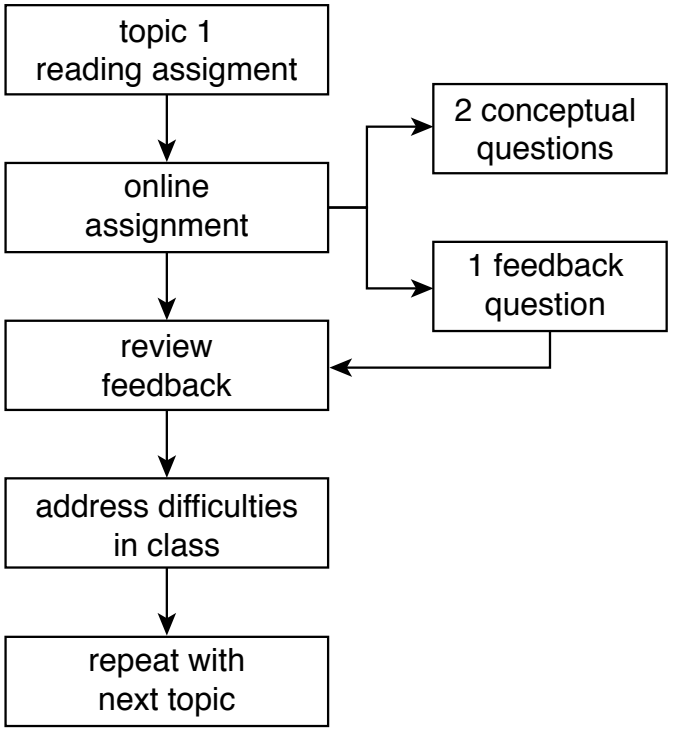


PI & JiTT Overview

JiTT workflow



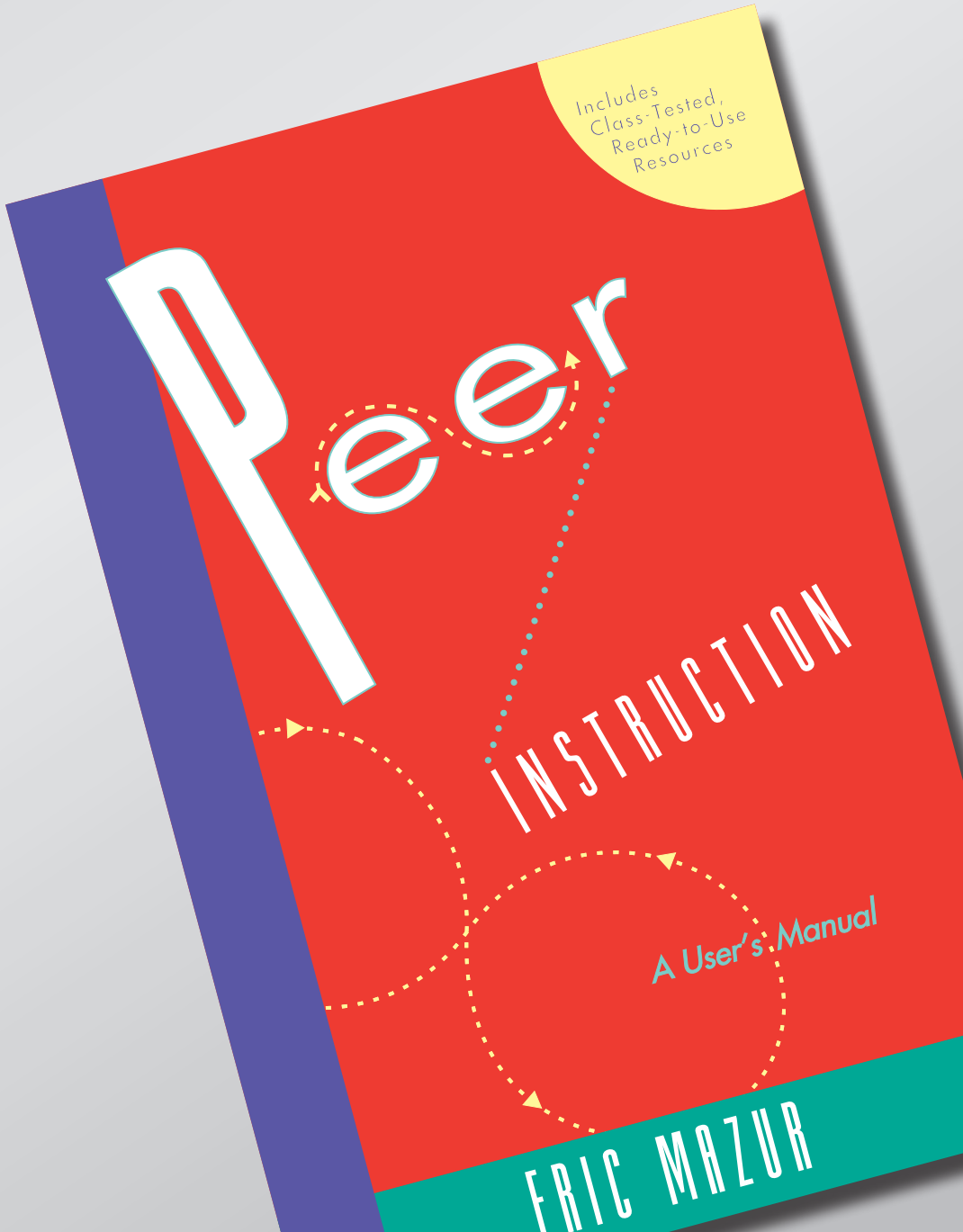
PI & JiTT Overview

JiTT:

- prepares you for class
- prepares students for class
- helps you address student difficulties

PI & JiTT Overview

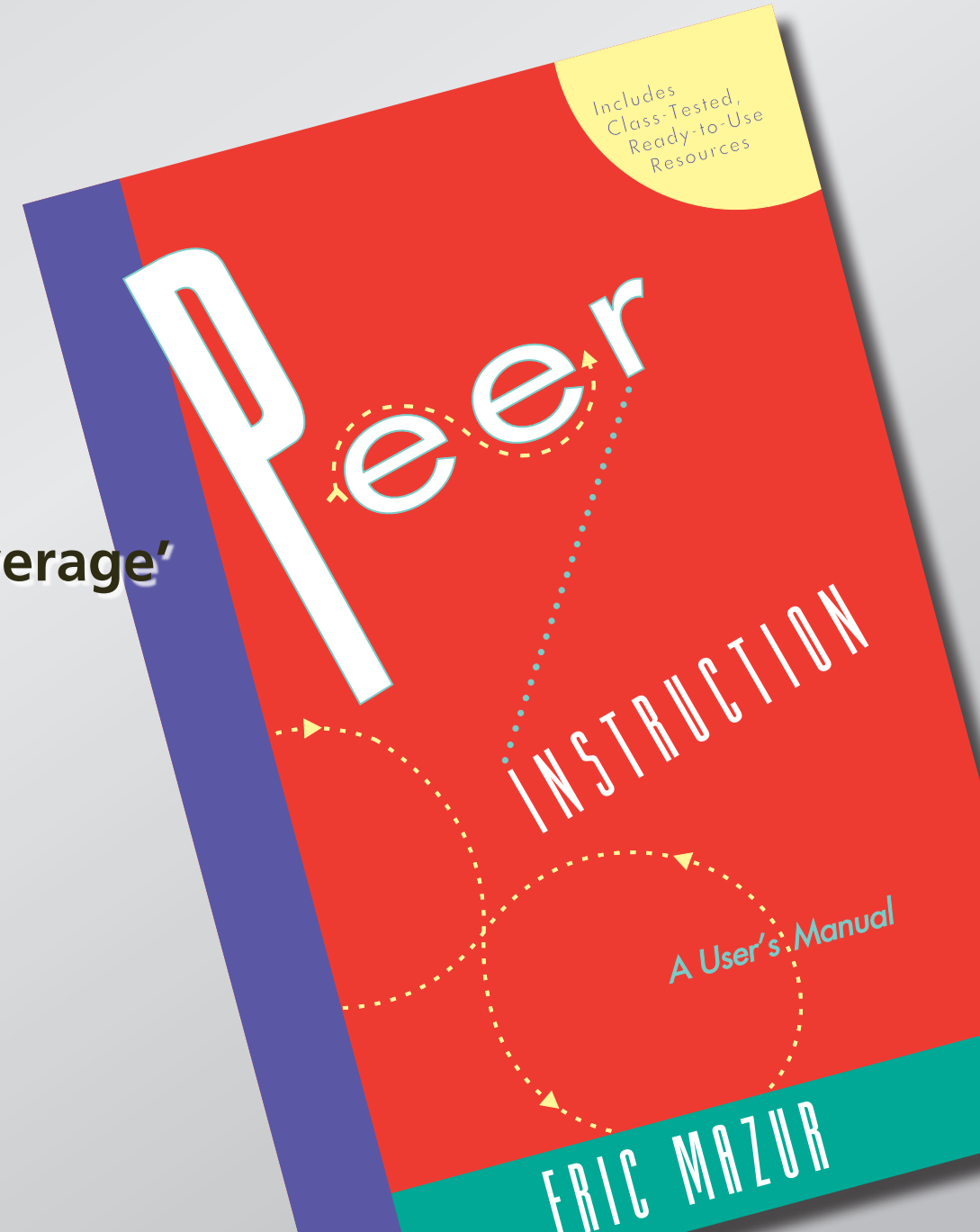
Peer Instruction (PI)



PI & JiTT Overview

Main features:

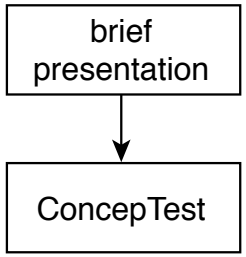
- **pre-class assignment**
- **in-class: depth, not 'coverage'**
- **ConcepTests**



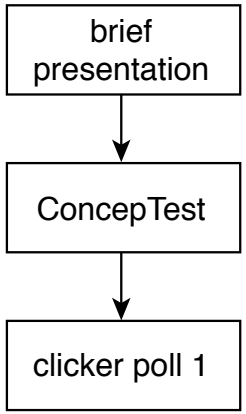
PI & JiTT Overview

brief
presentation

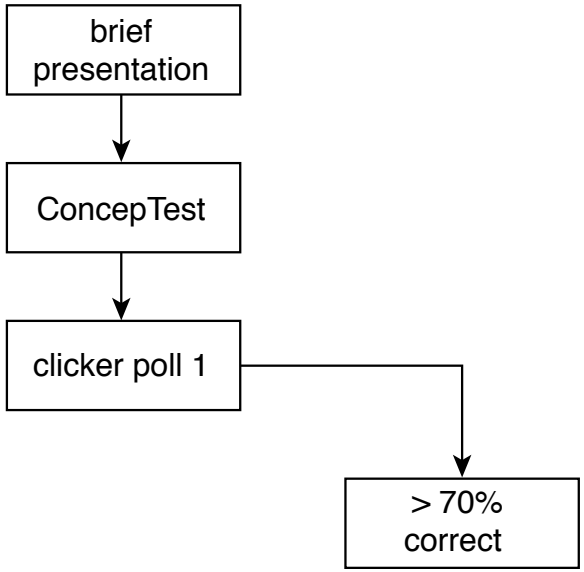
PI & JiTT Overview



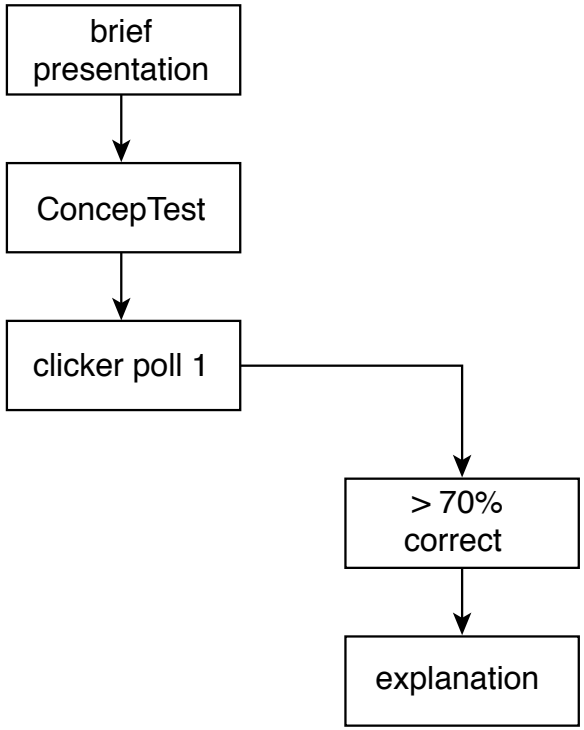
PI & JiTT Overview



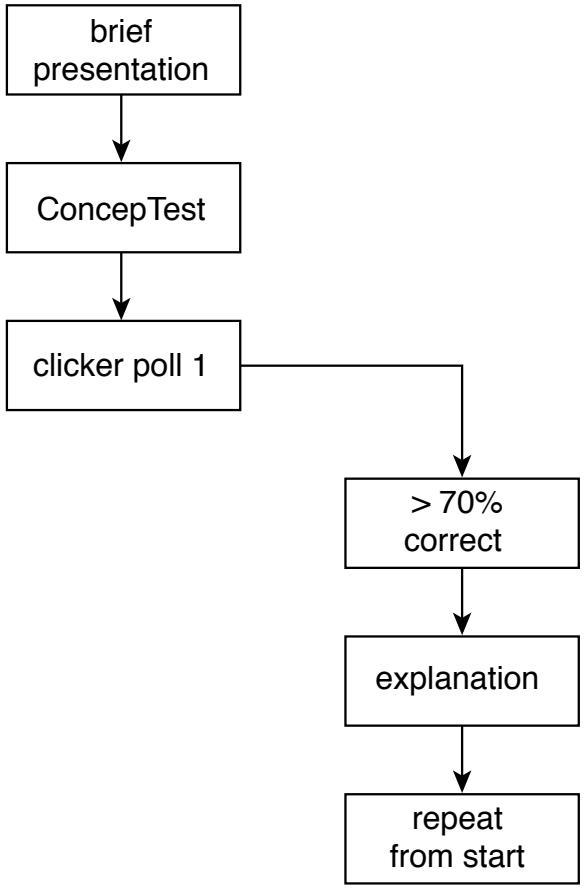
PI & JiTT Overview



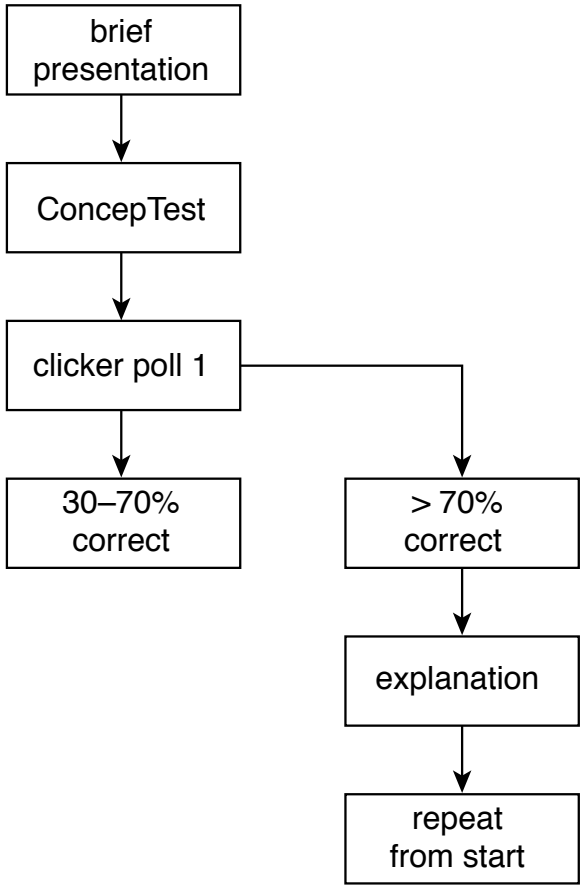
PI & JiTT Overview



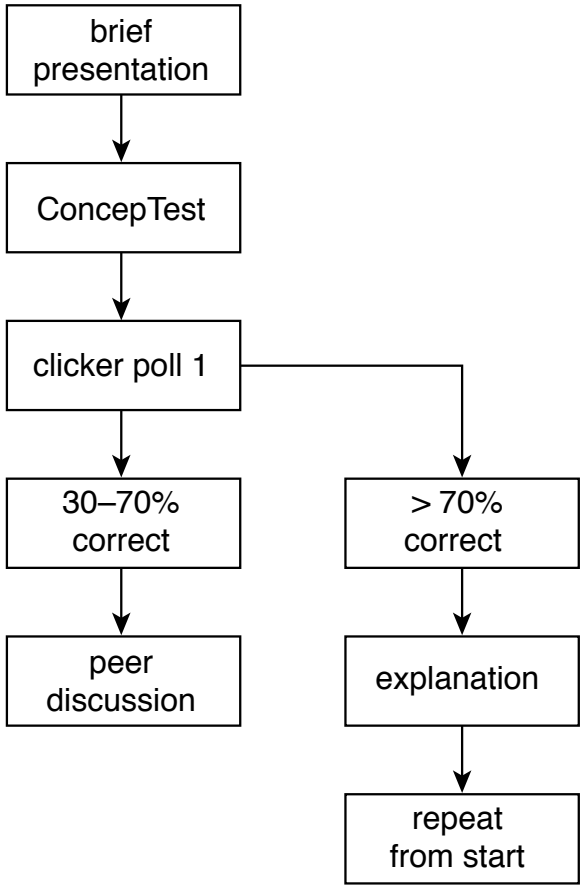
PI & JiTT Overview



PI & JiTT Overview



PI & JiTT Overview



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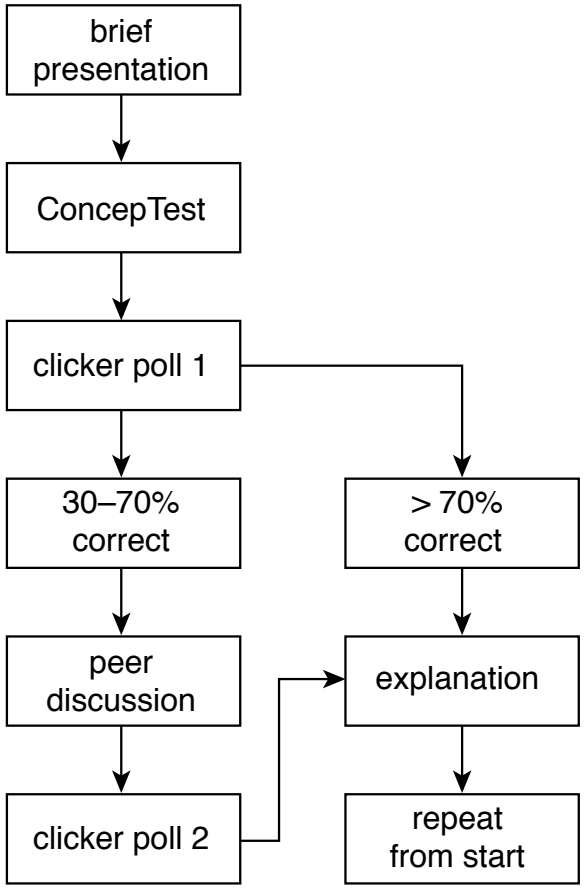

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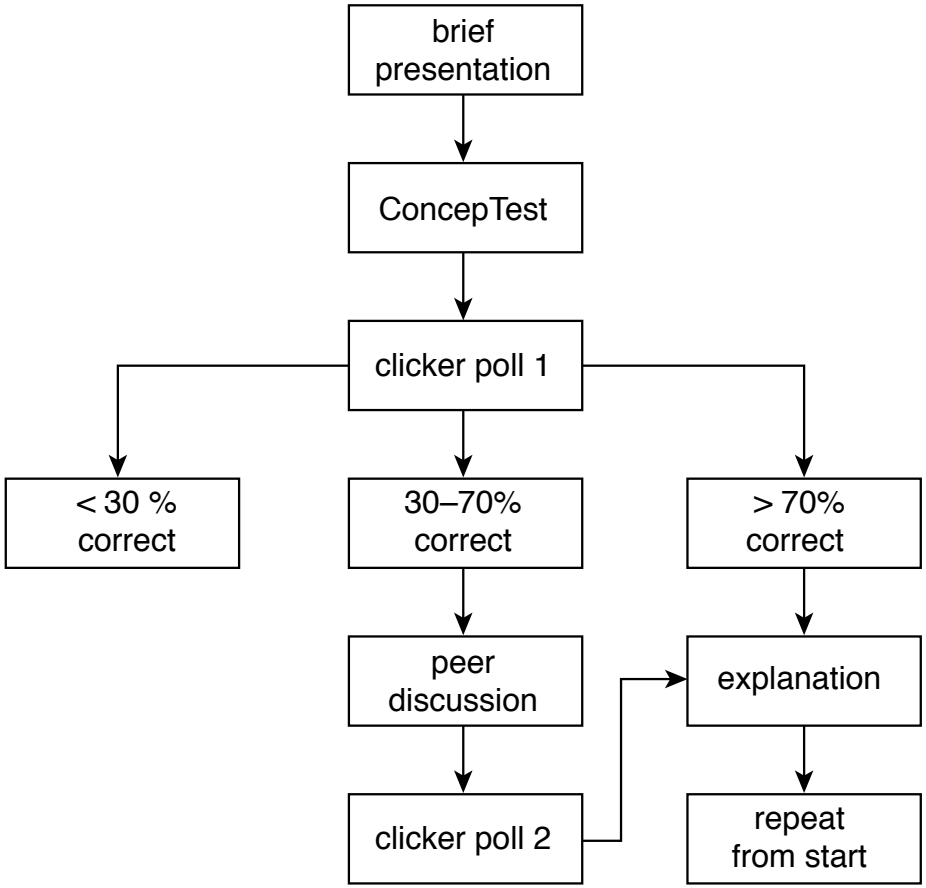

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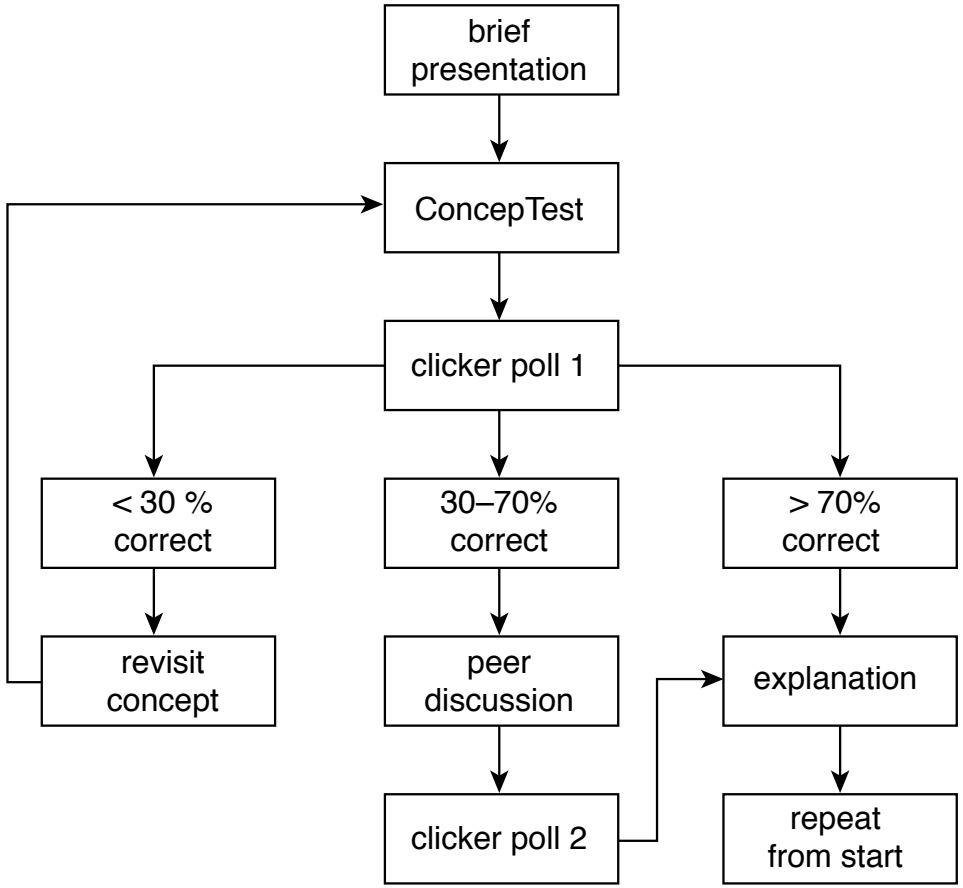
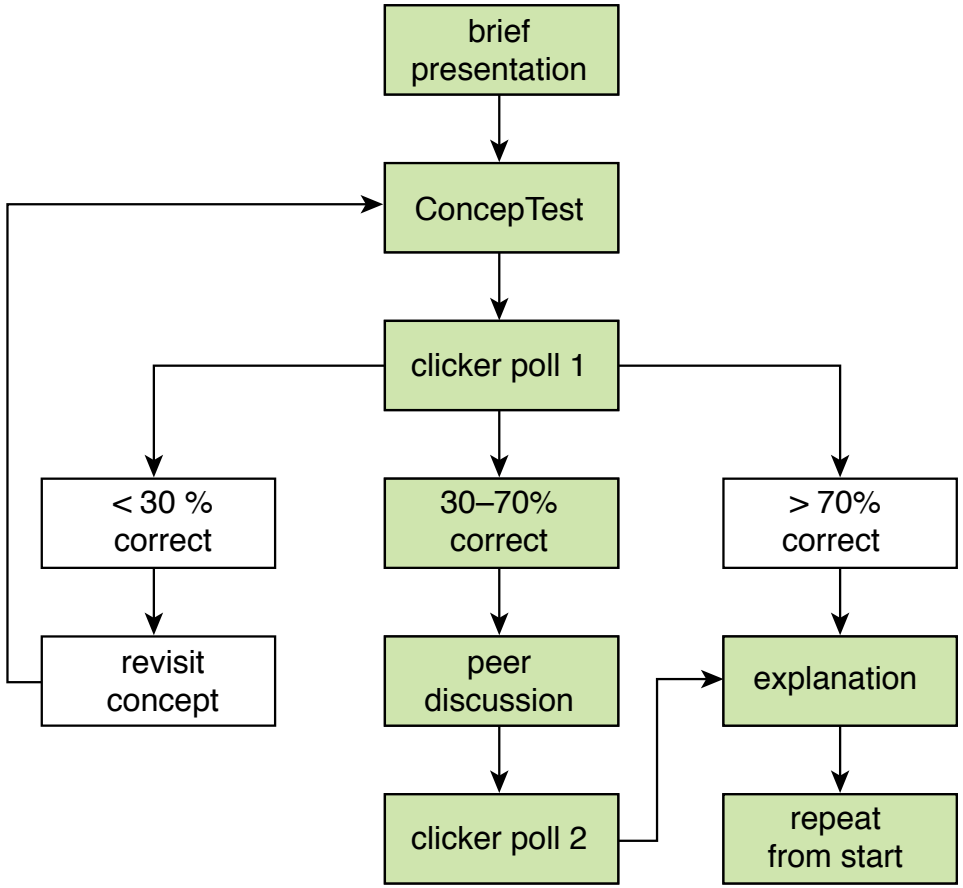


PI & JiTT Overview



PI & JiTT Overview

PI:

- **helps students overcome difficulties**
- **encourages deep learning**
- **provides depth, not “coverage”**
- **helps you become aware of misconceptions**

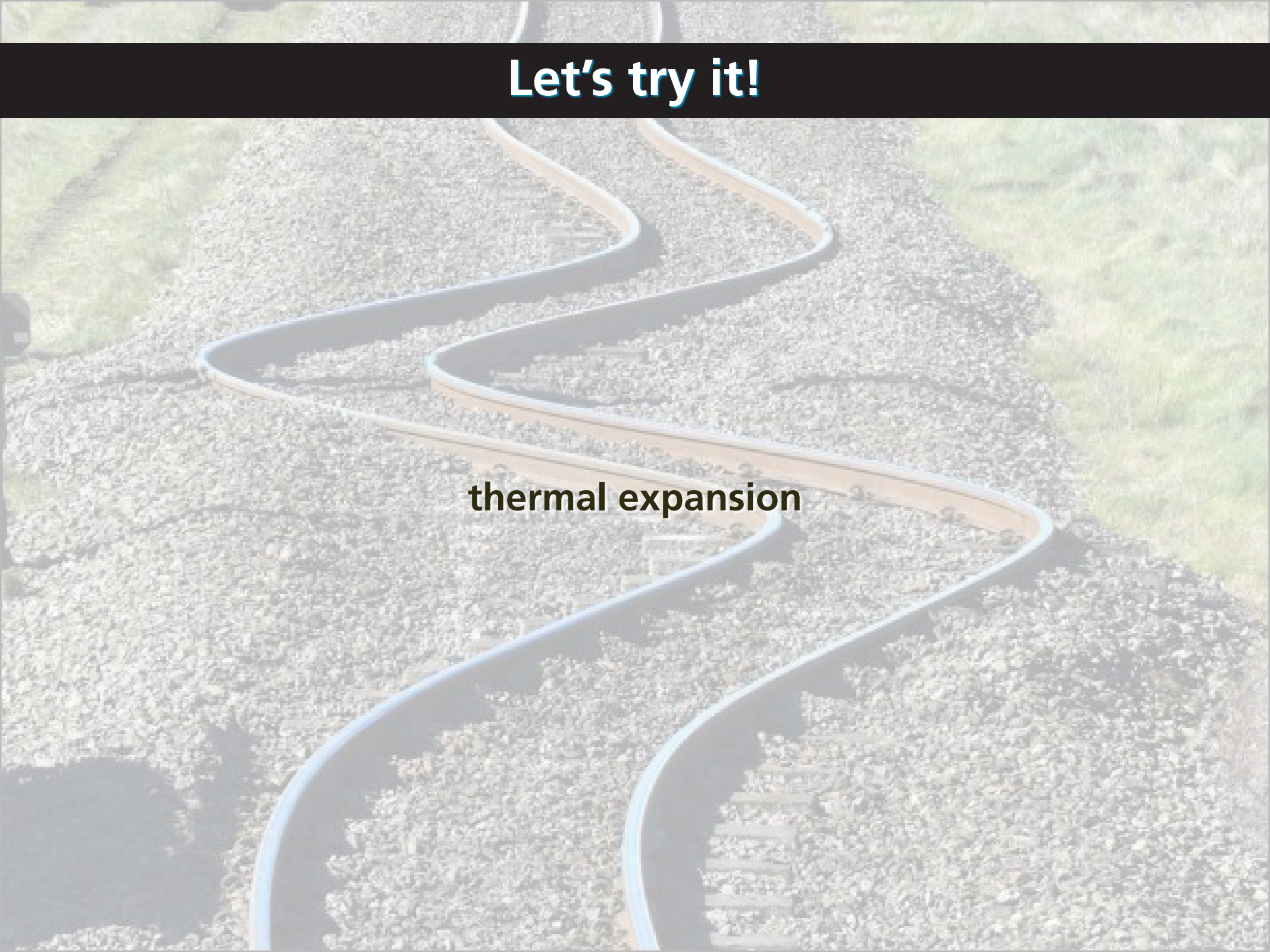
PI & JiTT Overview

“How do I promote fruitful discussion?”

PI & JiTT Overview

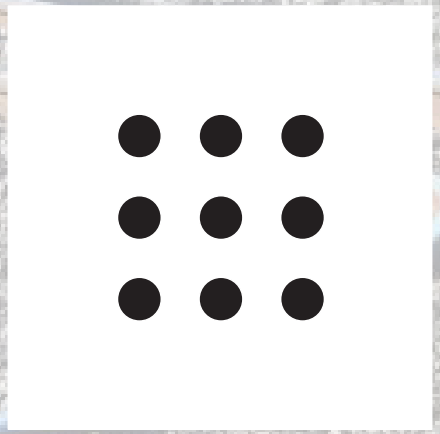
Find someone with a *different* answer

Let's try it!



Let's try it!

When metals heat up, they expand because all atoms get farther away from each other.



Let's try it!

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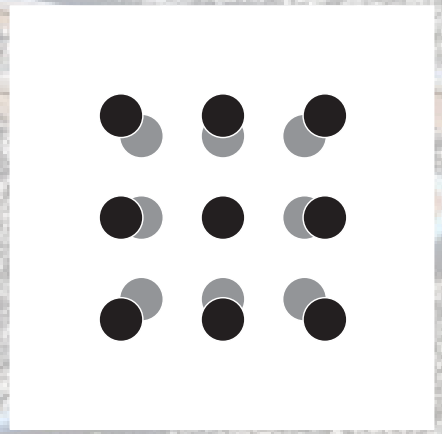
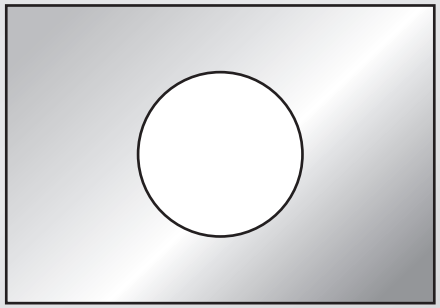


Let's try it!

When metals heat up, they expand because all atoms get farther away from each other.

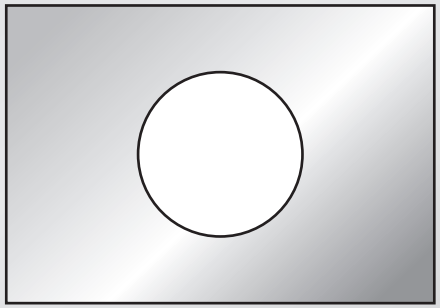
Let's try it!

Consider a rectangular metal plate with a circular hole in it.



Let's try it!

Consider a rectangular metal plate with a circular hole in it.



When the plate is uniformly heated, the diameter of the hole

1. increases.
2. stays the same.
3. decreases.

Let's try it!

Consider a rectangular metal plate with a circular hole in it.

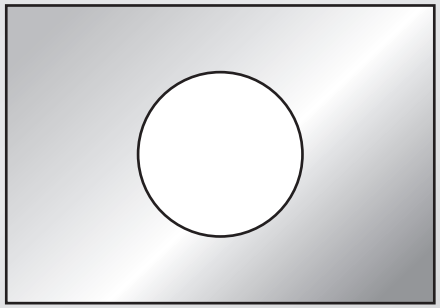
When the plate is uniformly heated, the diameter of the hole

1. increases.
2. stays the same.
3. decreases.

you got all fired up!

Let's try it!

Consider a rectangular metal plate with a circular hole in it.



When the plate is uniformly heated, the diameter of the hole

1. increases.
2. stays the same.
3. decreases.

Let's try it!

Before I tell you the answer…

Let's try it!

Before I tell you the answer, let's analyze what happened.

Let's try it!

Before I tell you the answer, let's analyze what happened.

You…

Let's try it!

Before I tell you the answer, let's analyze what happened.

You…

1. made a commitment

Let's try it!

Before I tell you the answer, let's analyze what happened.

You…

1. made a commitment
2. externalized your answer

Let's try it!

Before I tell you the answer, let's analyze what happened.

You…

1. made a commitment
2. externalized your answer
3. moved from the answer/fact to reasoning

Let's try it!

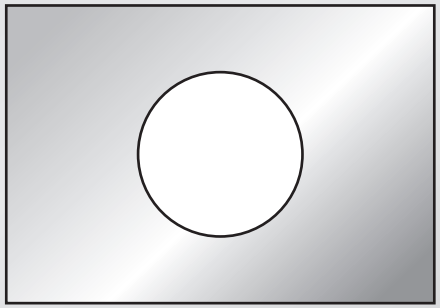
Before I tell you the answer, let's analyze what happened.

You…

1. made a commitment
2. externalized your answer
3. moved from the answer/fact to reasoning
4. became emotionally invested in the learning process

Let's try it!

Consider a rectangular metal plate with a circular hole in it.



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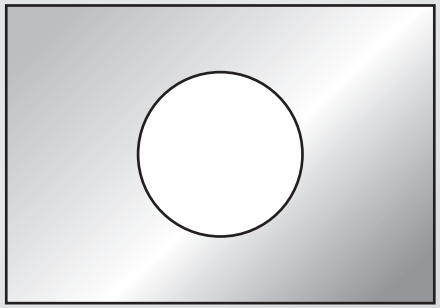
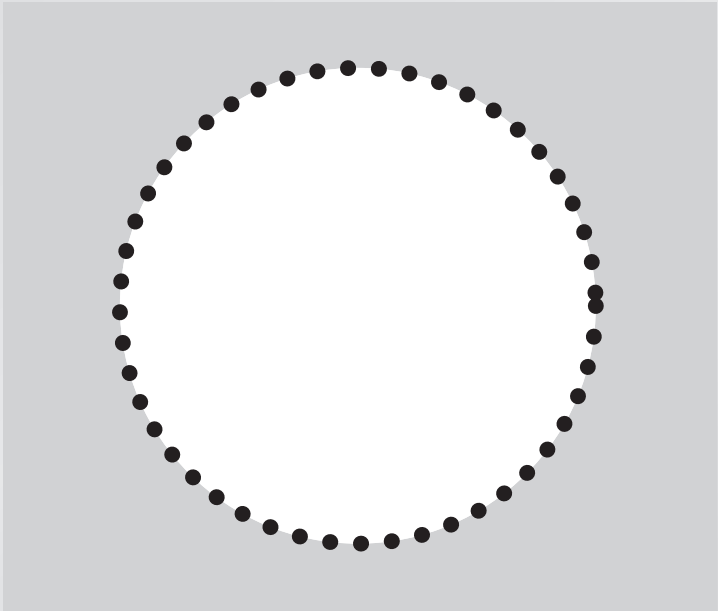


When the plate is uniformly heated, the diameter of the hole

1. increases. ✔
2. stays the same.
3. decreases.

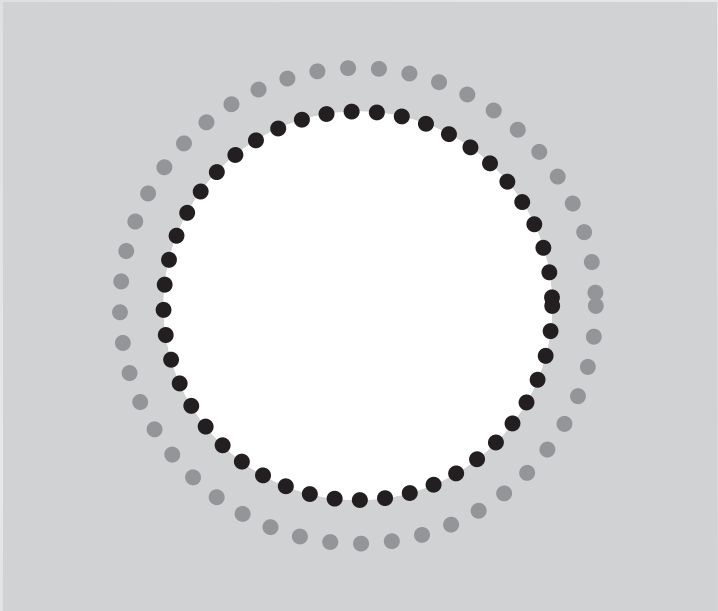
Let's try it!

consider the atoms at the rim of the hole



Let's try it!

consider the atoms at the rim of the hole



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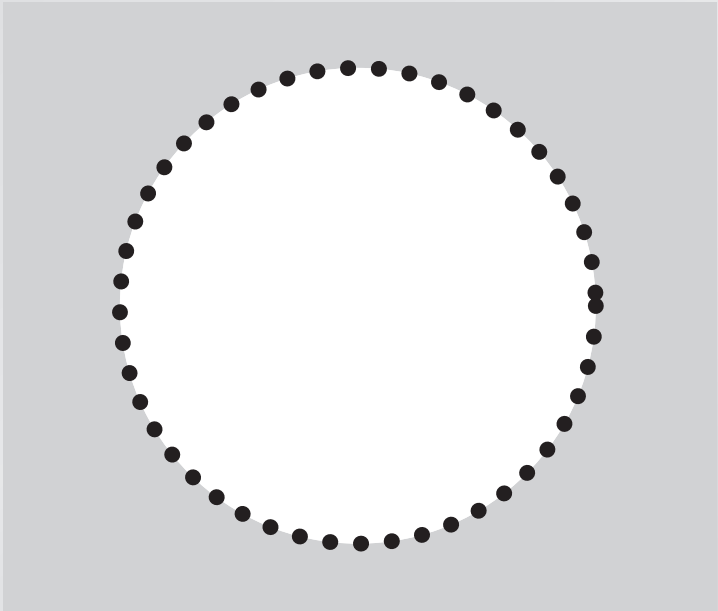

Let's try it!

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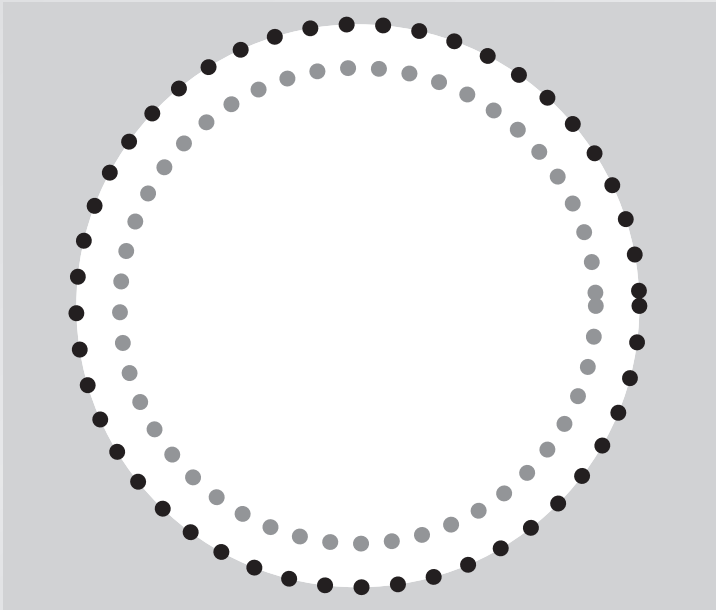


Let's try it!

consider the atoms at the rim of the hole

you won't forget this

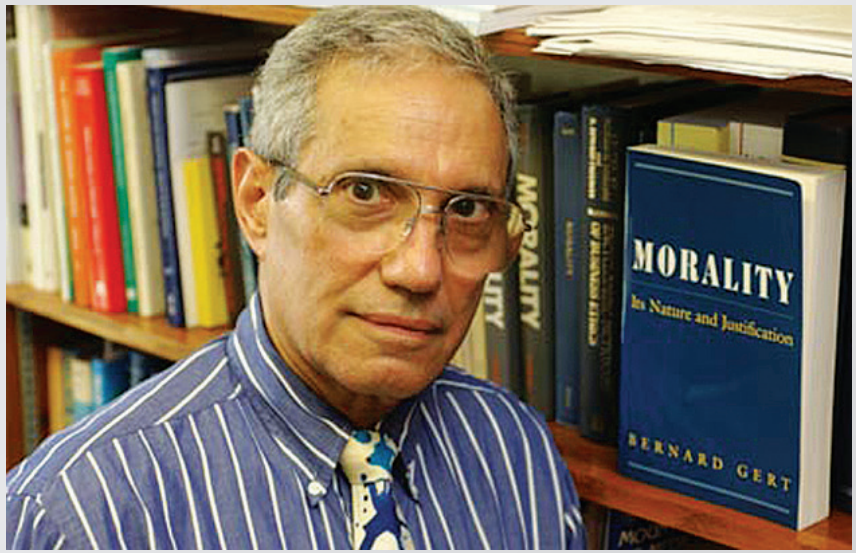
PI & JiTT Overview

“Can this method be used in my class,

where questions don’t necessarily have right answers?”

Let's try it!

Bernard Gert (1934 – 2011)

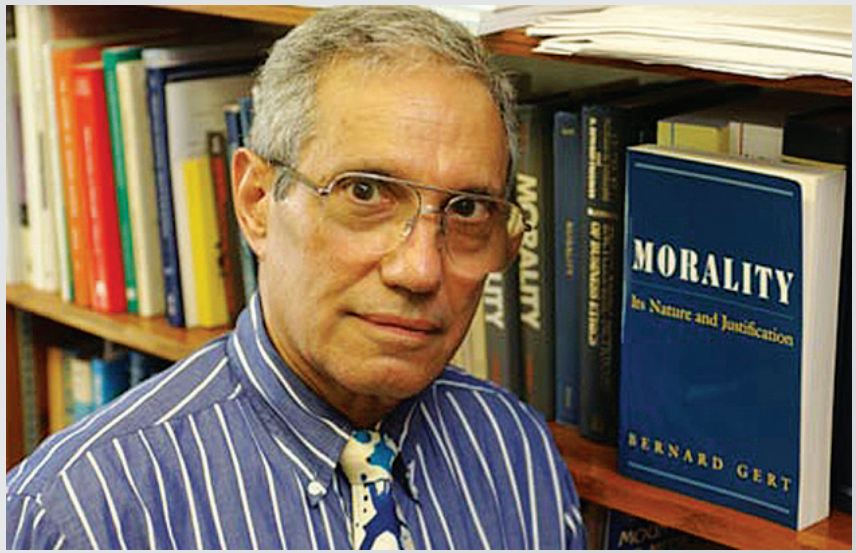


Moral philospher

Professor at Dartmouth

Let's try it!

Bernard Gert (1934 – 2011)



Moral philospher
Professor at Dartmouth

"Morality is an informal public system applying to all rational persons, governing behavior that affects others, and includes what are commonly known as the moral rules, ideals, and virtues and has the lessening of evil or harm as its goal."

Let's try it!

Bernard Gert's moral system created by 10 rules:

1. Do not kill
2. Do not cause pain
3. Do not disable
4. Do not deprive of freedom
5. Do not deprive of pleasure
6. Do not deceive
7. Keep your promises
8. Do not cheat
9. Obey the law
10. Do your duty (as required by job, circumstances).

Let's try it!

Heinz's wife was near death, and her only hope was a drug that had been discovered by a pharmacist who was selling it for an exorbitant price. The drug cost $20,000 to make, and the pharmacist was selling it for $200,000. Heinz could only raise $50,000 and insurance wouldn't make up the difference. He offered what he had to the pharmacist, and when his offer was rejected, Heinz said he would pay the rest later. Still the pharmacist refused. In desperation, Heinz broke into the store and stole the drug.

Let's try it!

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Should Heinz have broken into the store to steal the drug for his wife?

Let's try it!

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Should Heinz have broken into the store to steal the drug for his wife?

1. Yes
2. No

Let's try it!

Bernard Gert's moral system created by 10 rules:

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10. Do your duty (as required by job, circumstances).

Should Heinz have broken into the store to steal the drug for his wife?

1. Yes
2. No

you got all engaged!

PI & JiTT Overview

Don’t need a correct answer!

Outline

- PI & JiTT Overview
- **Implementing PI & JiTT**
- ConcepTests

Implementing PI & JiTT

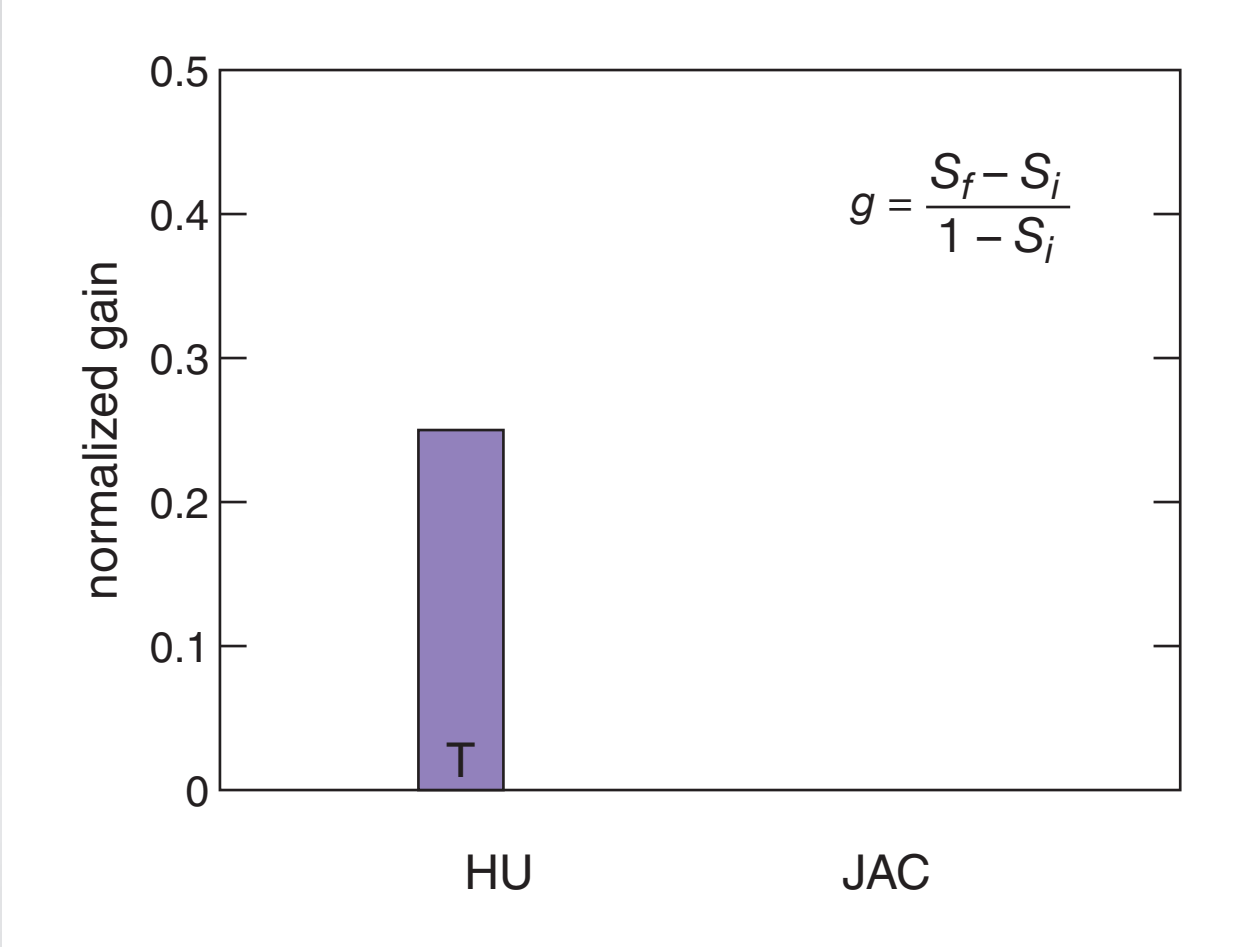
“Will it work at my institution?”

It works here…

…but will it work here?

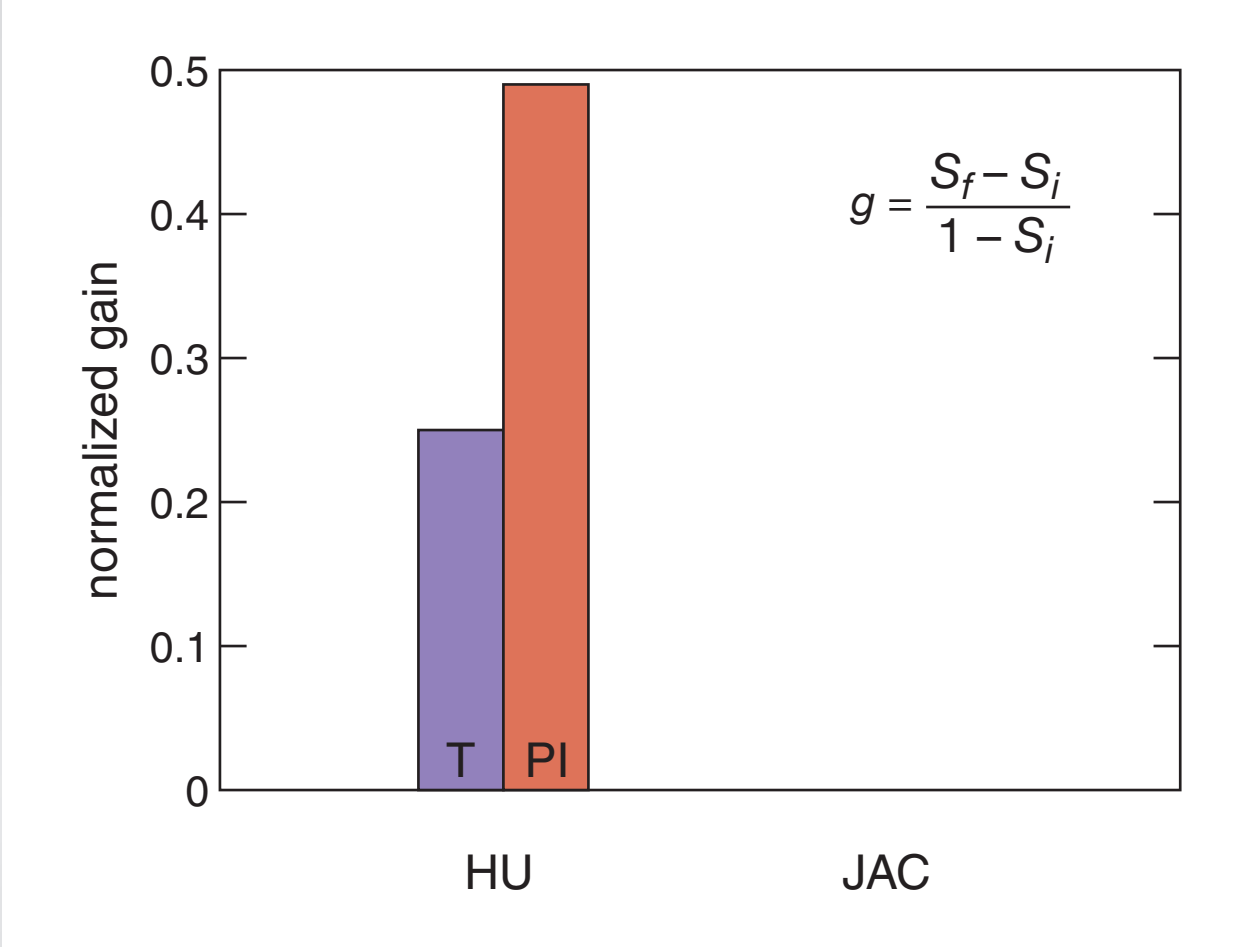
Implementing PI & JiTT

FCI normalized gain



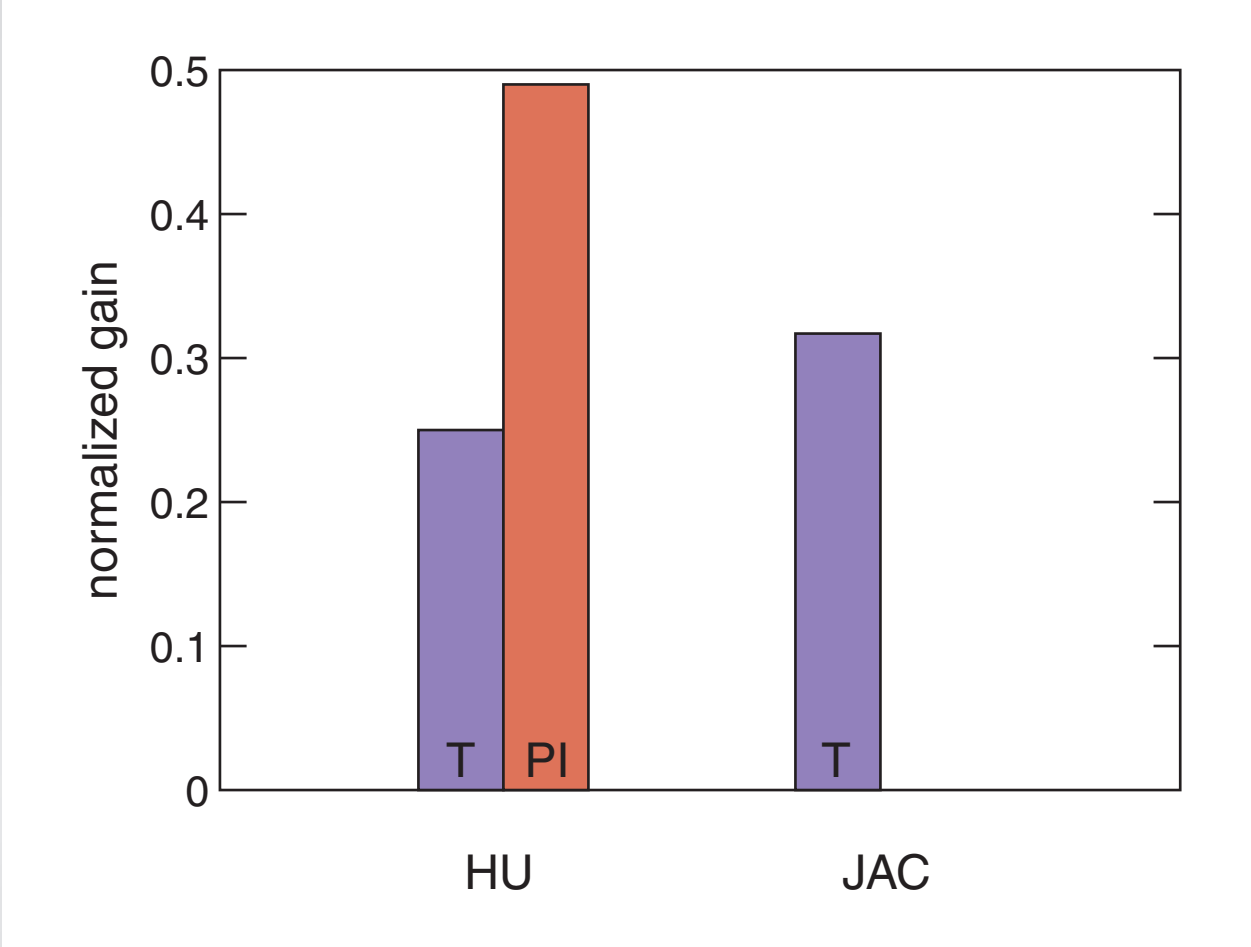
Implementing PI & JiTT

FCI normalized gain



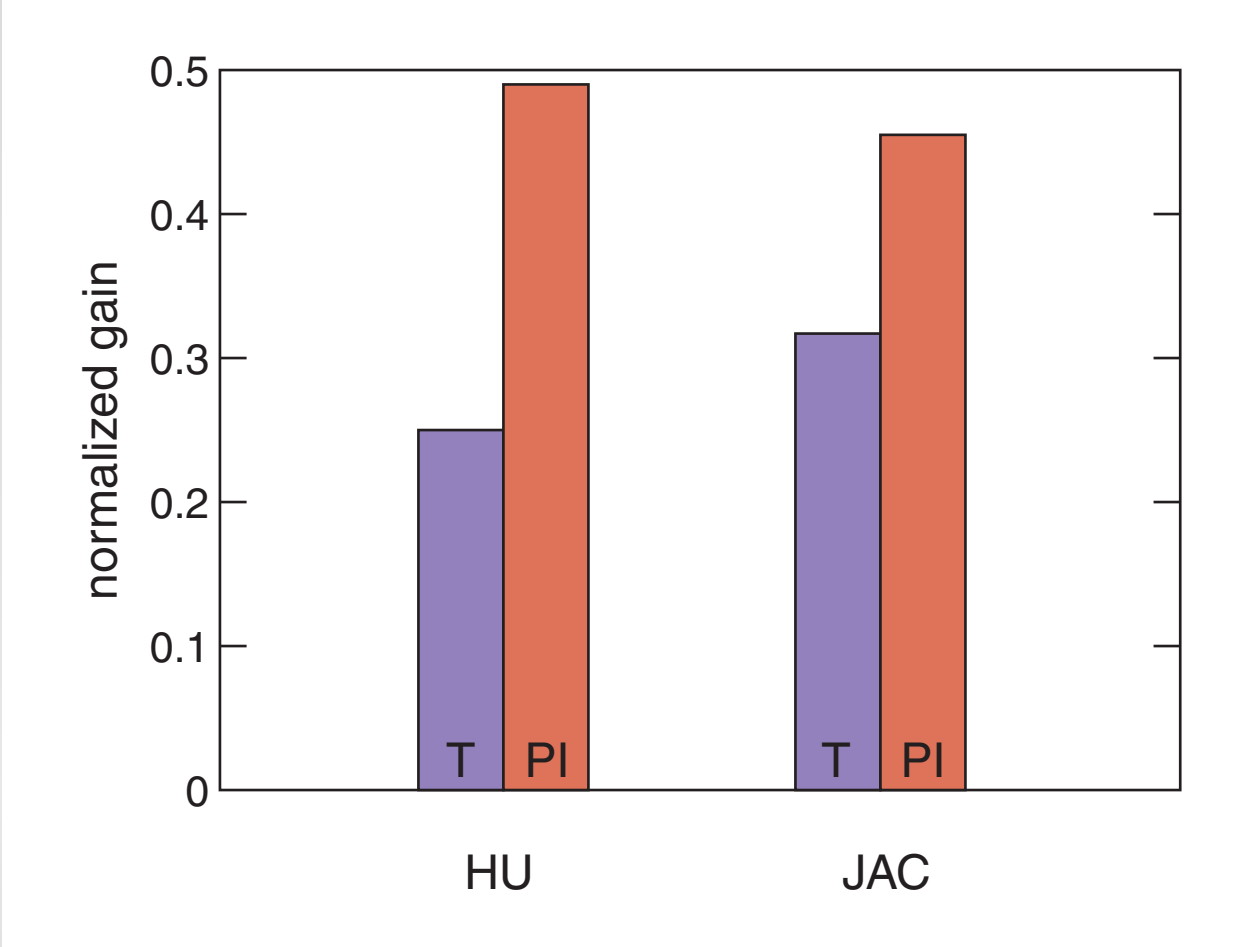
Implementing PI & JiTT

FCI normalized gain



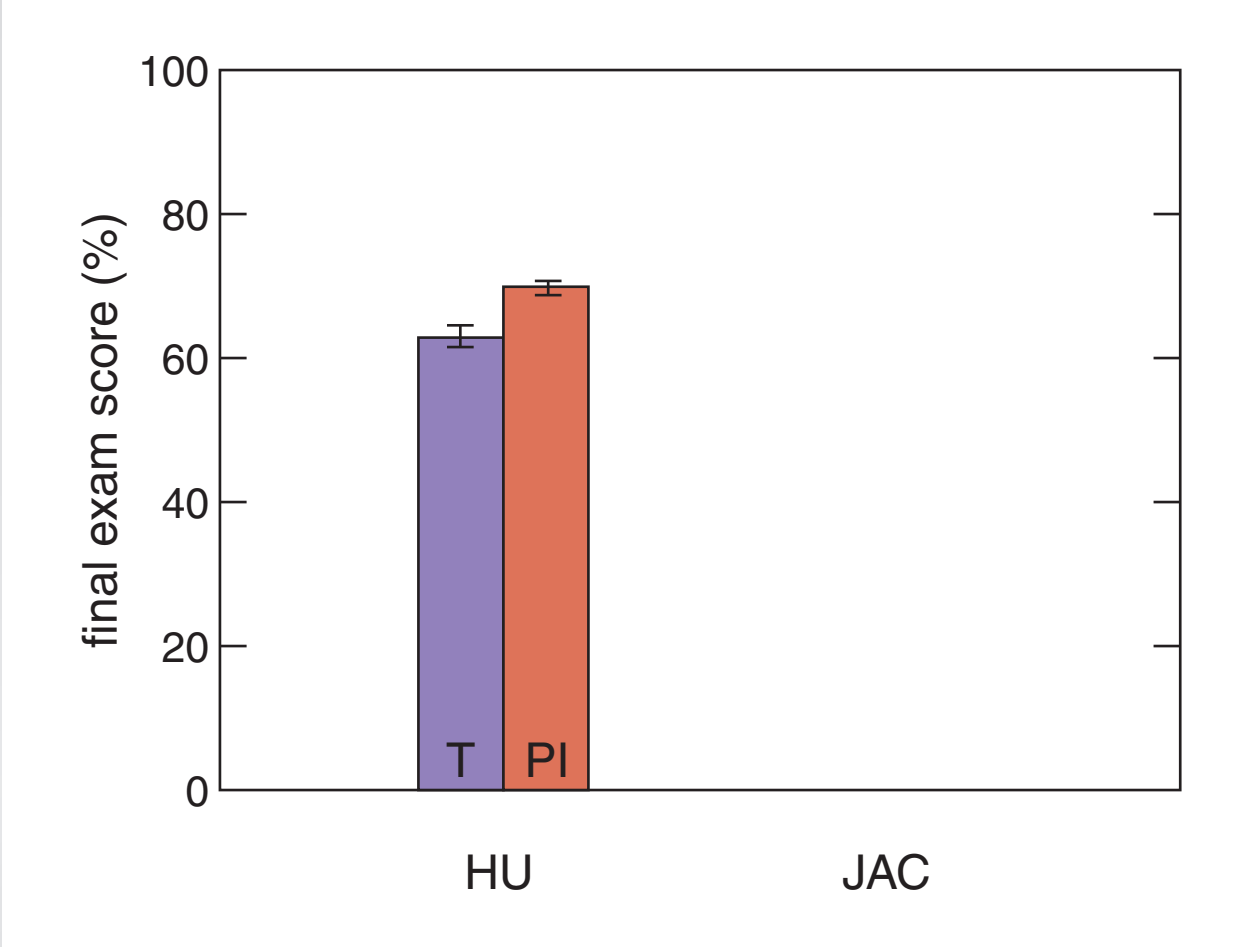
Implementing PI & JiTT

FCI normalized gain



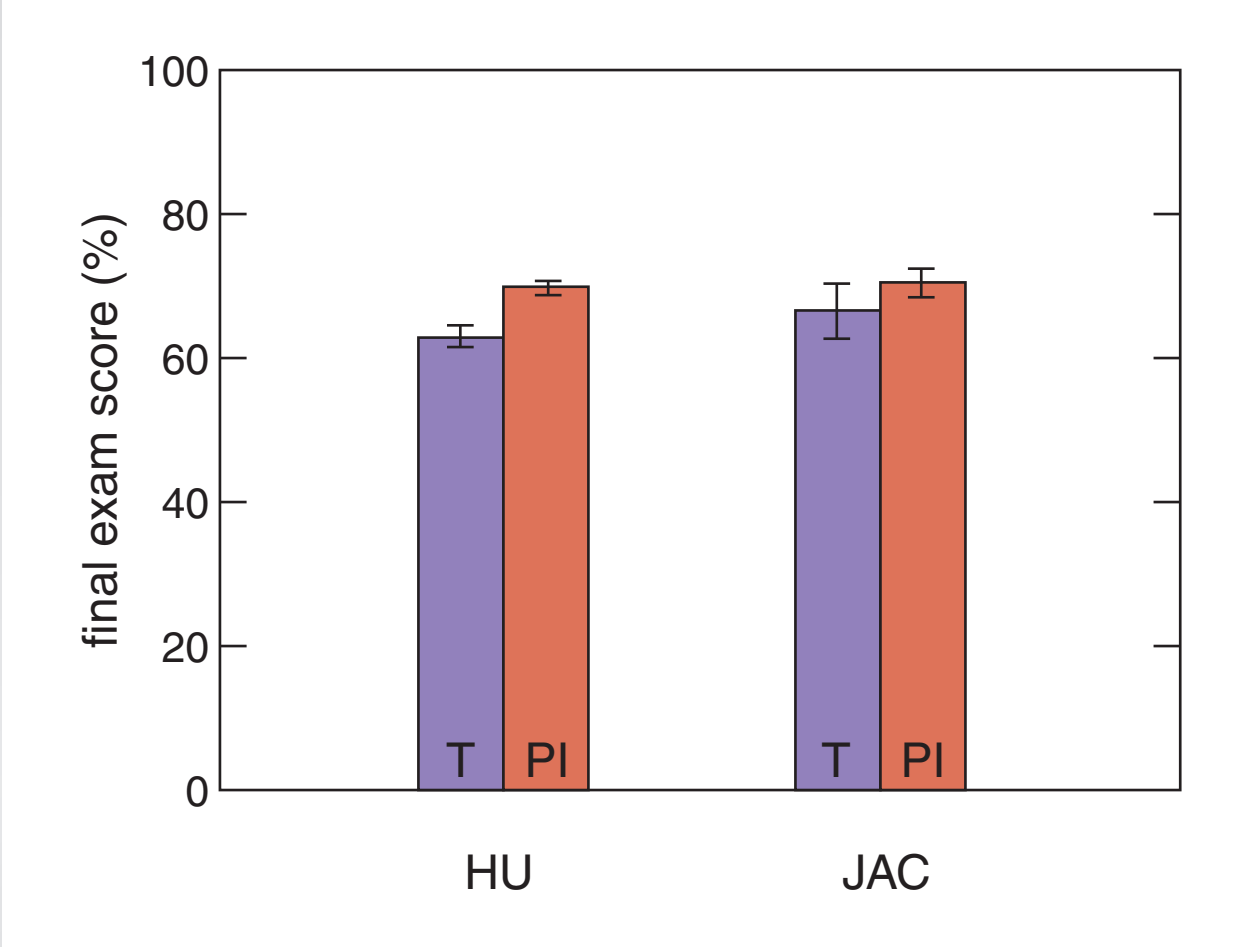
Implementing PI & JiTT

exam performance



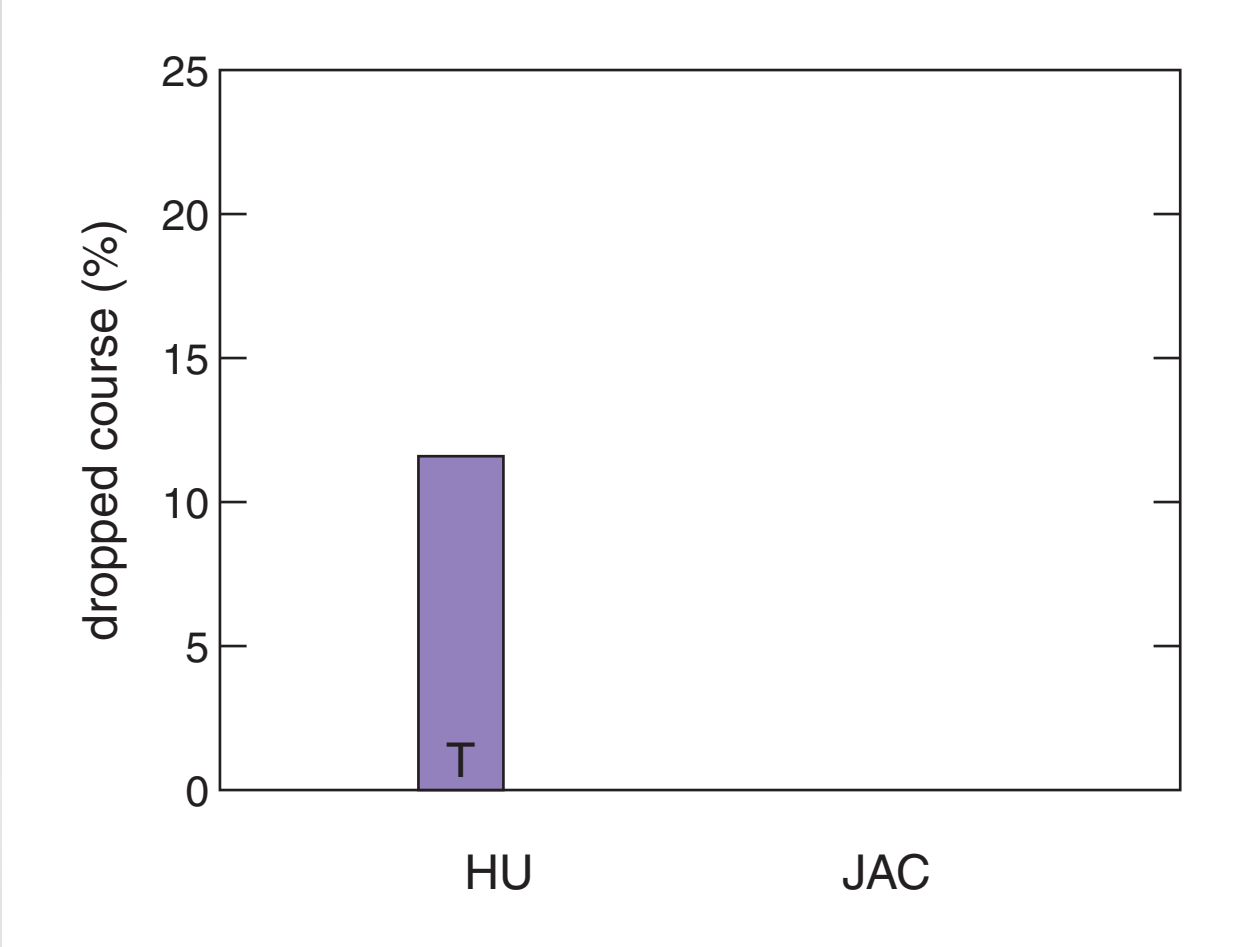
Implementing PI & JiTT

exam performance



Implementing PI & JiTT

student retention



Implementing PI & JiTT

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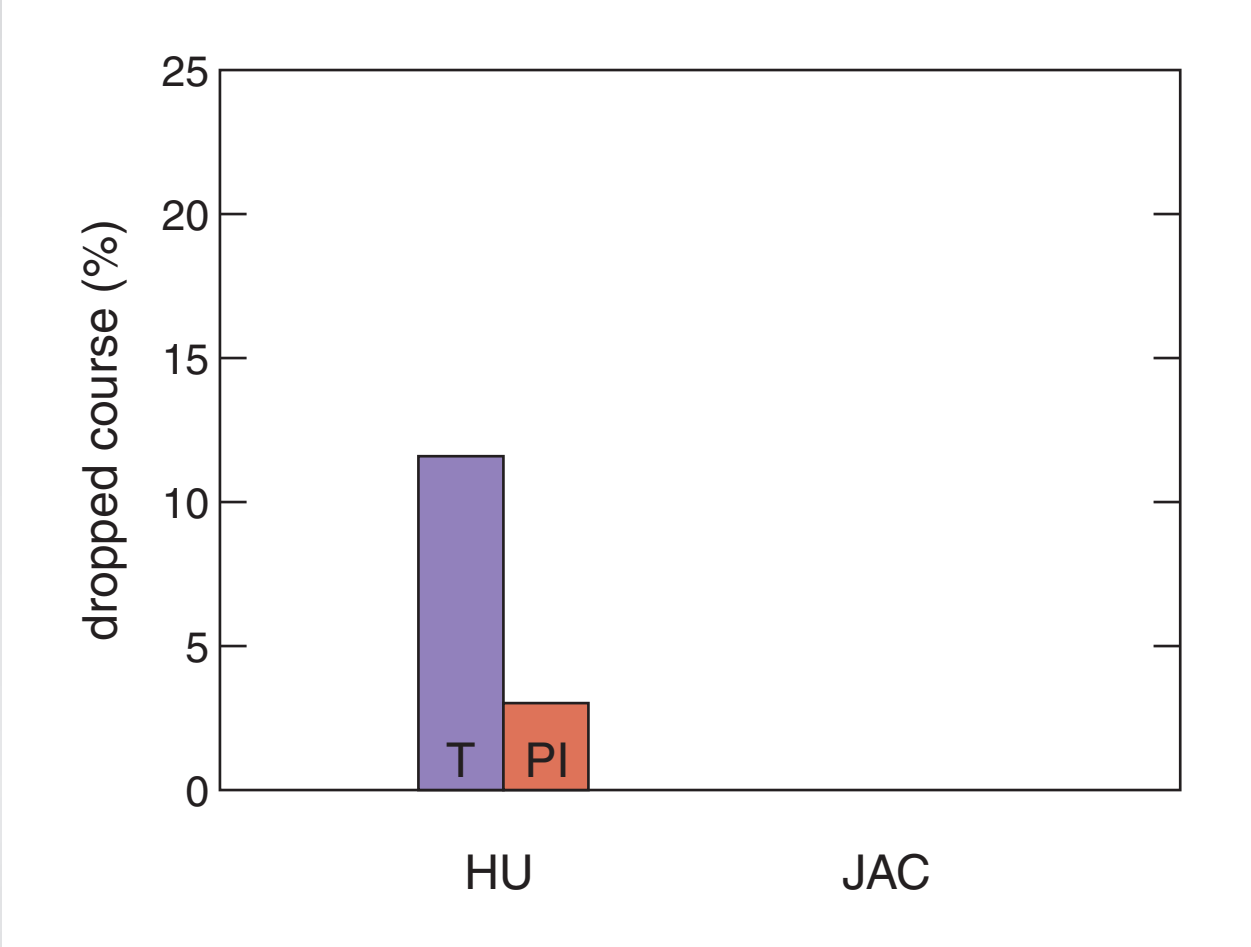
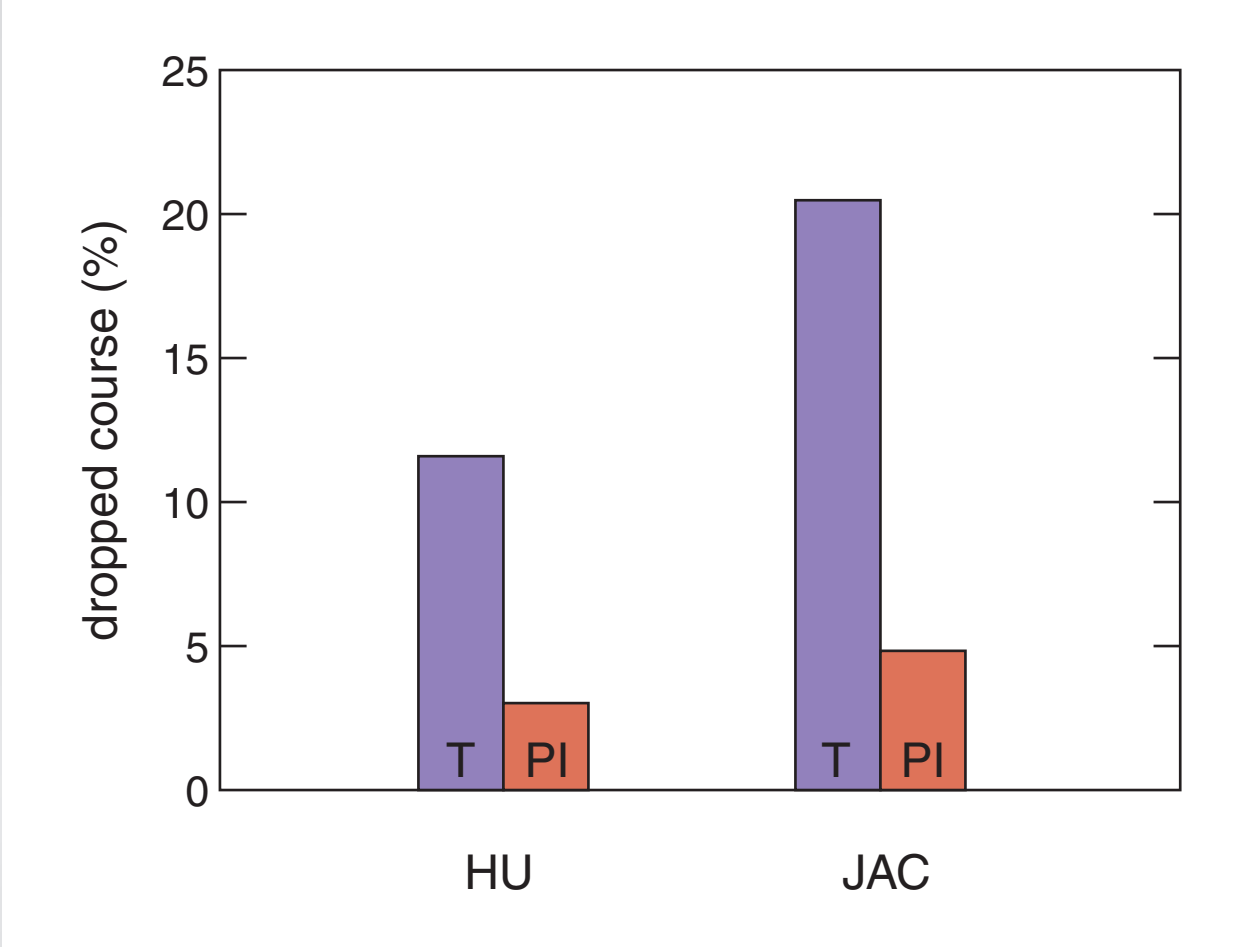


Implementing PI & JiTT

student retention



Implementing PI & JiTT

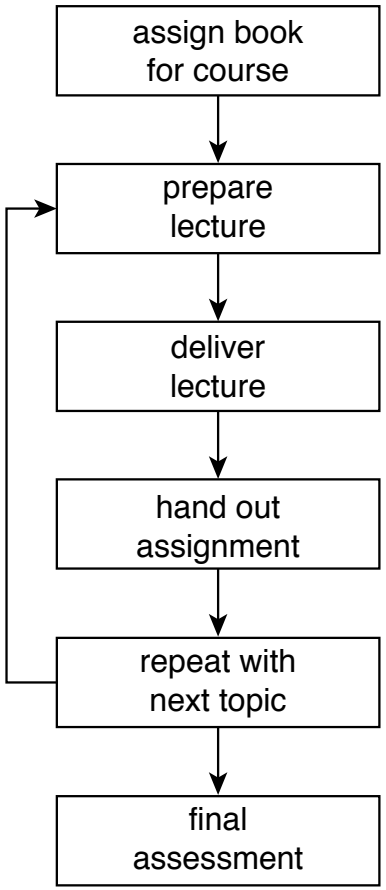
similar learning gains in different environments

Implementing PI & JiTT

"How is preparing a PI class different from preparing a lecture-based class?"

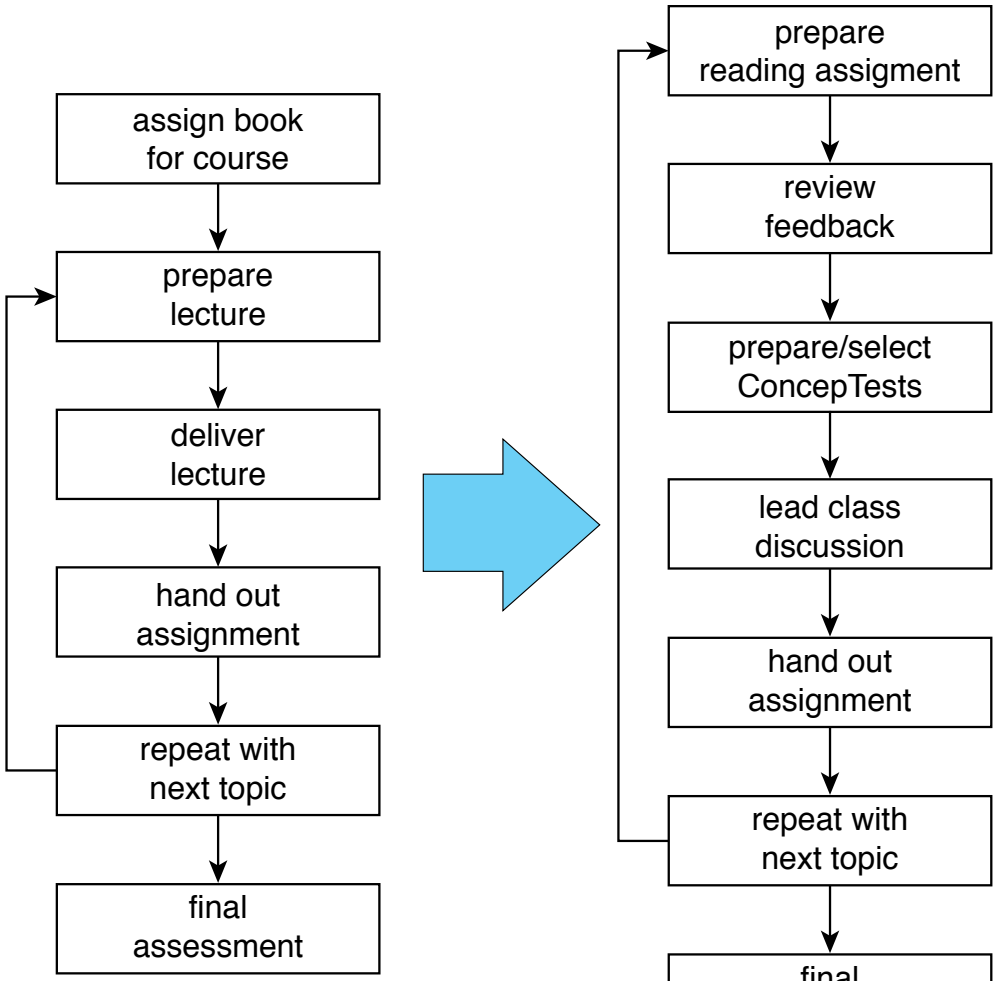
Implementing PI & JiTT

preparing for a lecture-based class



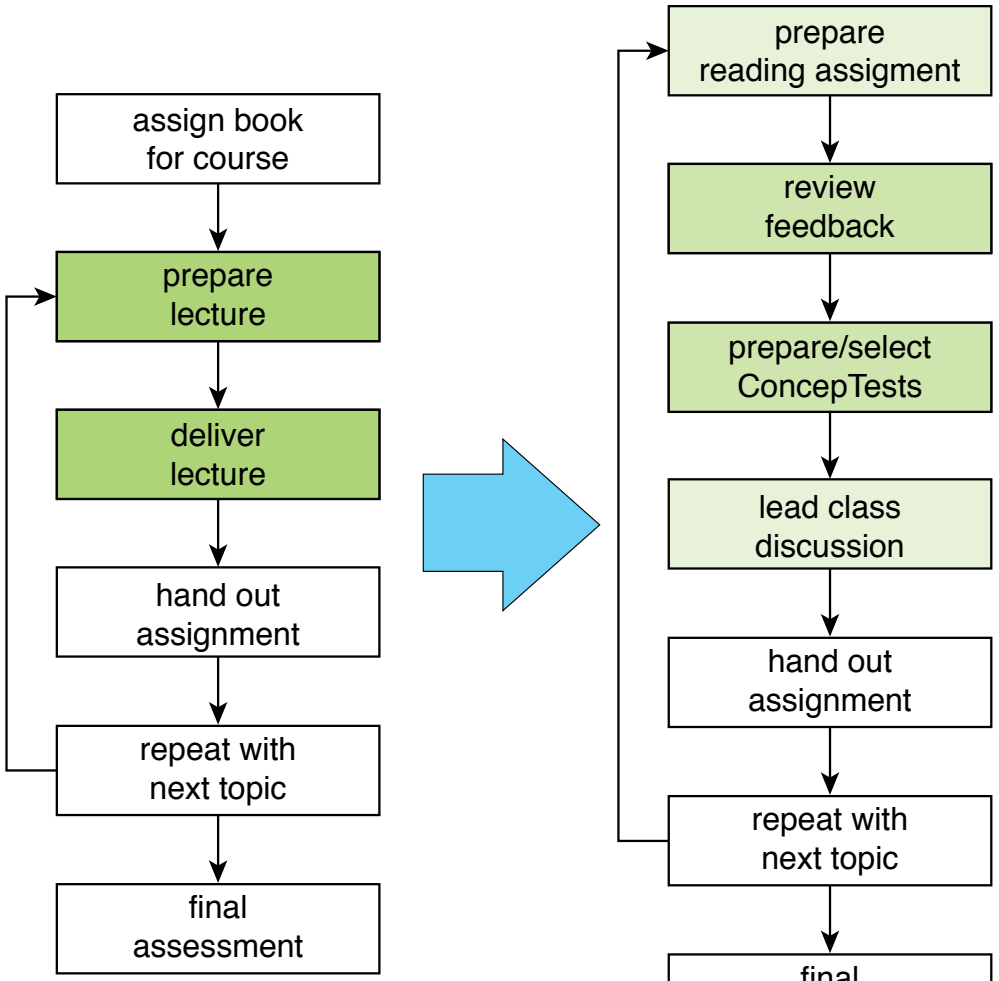
Implementing PI & JiTT

transitioning: where does the effort go?



Implementing PI & JiTT

transitioning: where does the effort go?



Implementing PI & JiTT

New activities:

1. **Reading assignment**
2. **ConcepTests**

Implementing PI & JiTT

“How do I cover everything using this method?”

Implementing PI & JiTT

	traditional	PI
in-class coverage	complete	partial

Implementing PI & JiTT

	traditional	PI
in-class coverage	complete	partial
out-of-class coverage	?	complete

Implementing PI & JiTT

	traditional	PI
in-class coverage	complete	partial
out-of-class coverage	?	complete
material learned	little	substantial

Implementing PI & JiTT

	traditional	PI
in-class coverage	complete	partial
out-of-class coverage	?	complete
material learned	little	substantial

what good is coverage if little is retained?

Outline

- PI & JiTT Overview
- Implementing PI & JiTT
- ConcepTests

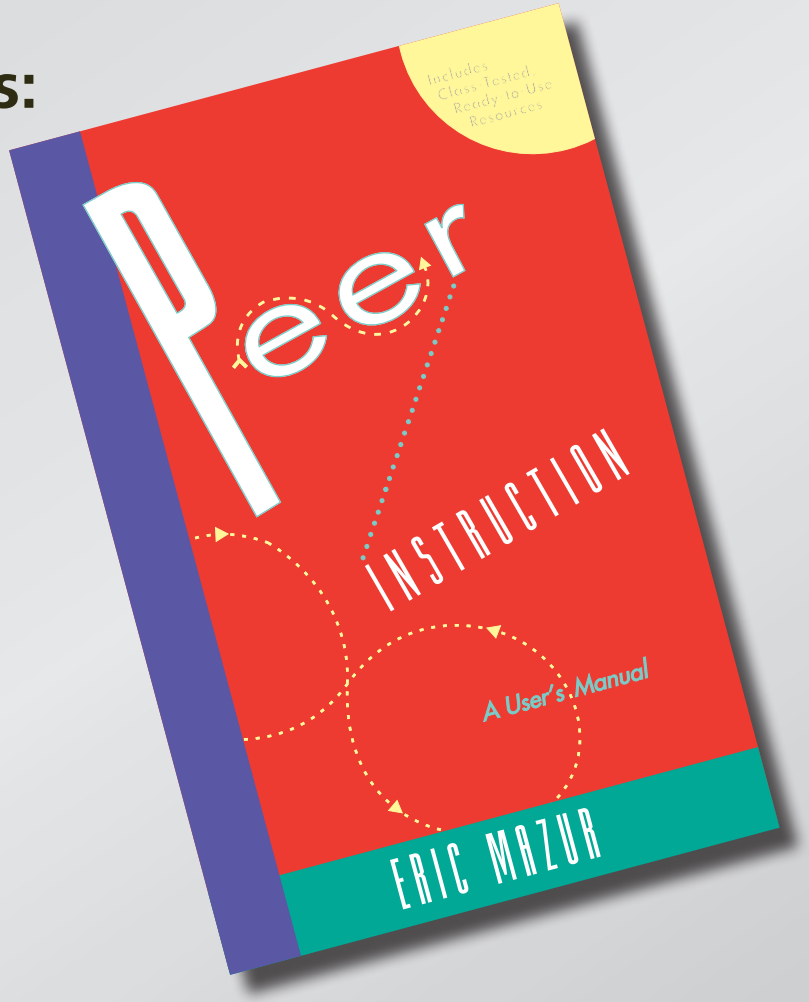
ConcepTests

“Where can I get examples of good questions?”

ConcepTests

Books with ConcepTests:

- **Physics (Prentice Hall)**



ConcepTests

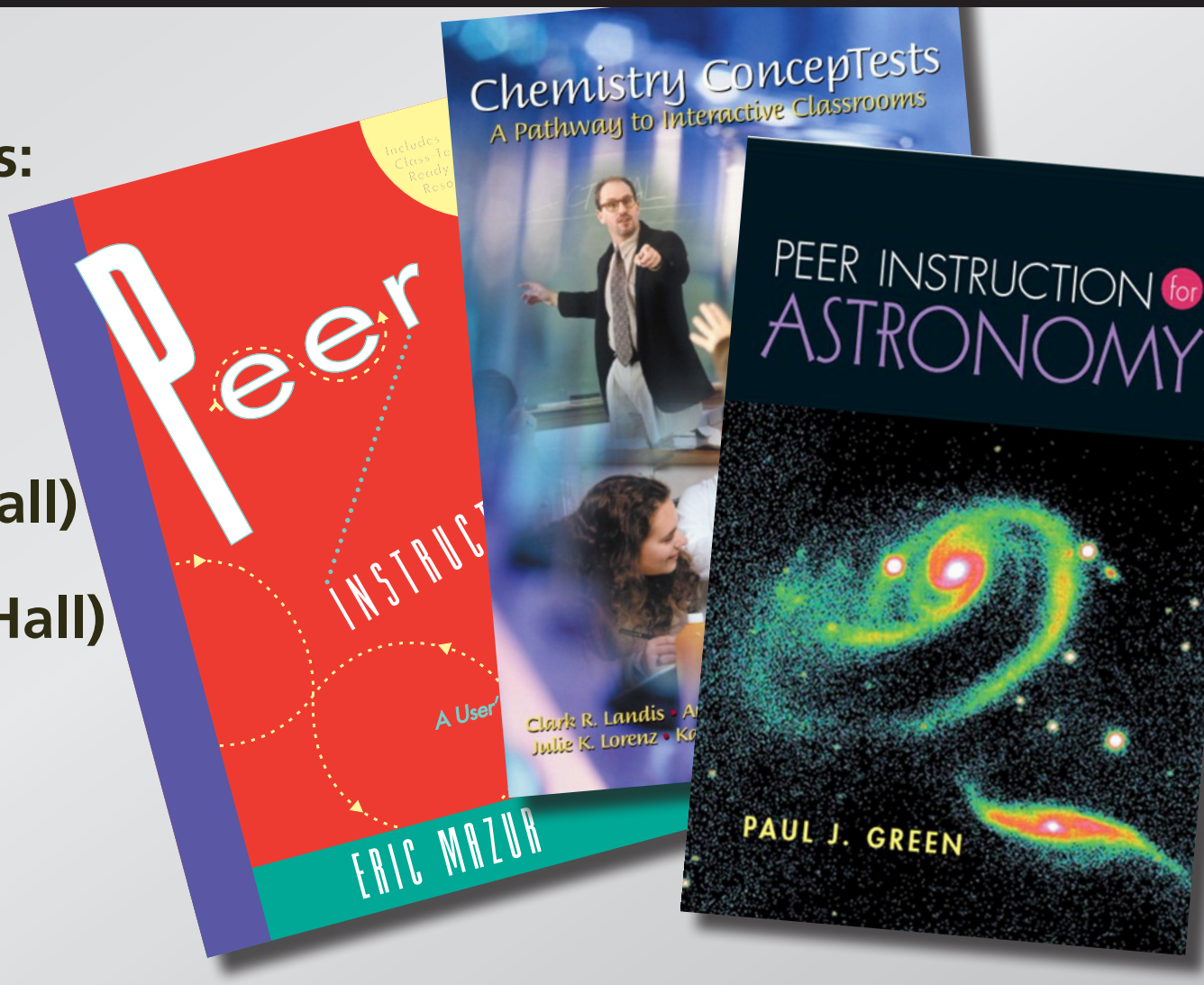
Books with ConcepTests:

- Physics (Prentice Hall)
- Chemistry (Prentice Hall)

ConcepTests

Books with ConcepTests:

- Physics (Prentice Hall)
- Chemistry (Prentice Hall)
- Astronomy (Prentice Hall)



ConcepTests

Books with ConcepTests:

- Physics (Prentice Hall)
- Chemistry (Prentice Hall)
- Astronomy (Prentice Hall)
- Calculus (Wiley)


Join now!
PeerInstruction.net

ConcepTests

… or try searching Google:

<subject> “Peer Instruction”

<subject> ConcepTest

<subject> “Concept Test”

<subject> clickers

ConcepTests

Good conceptual questions (ConcepTests):

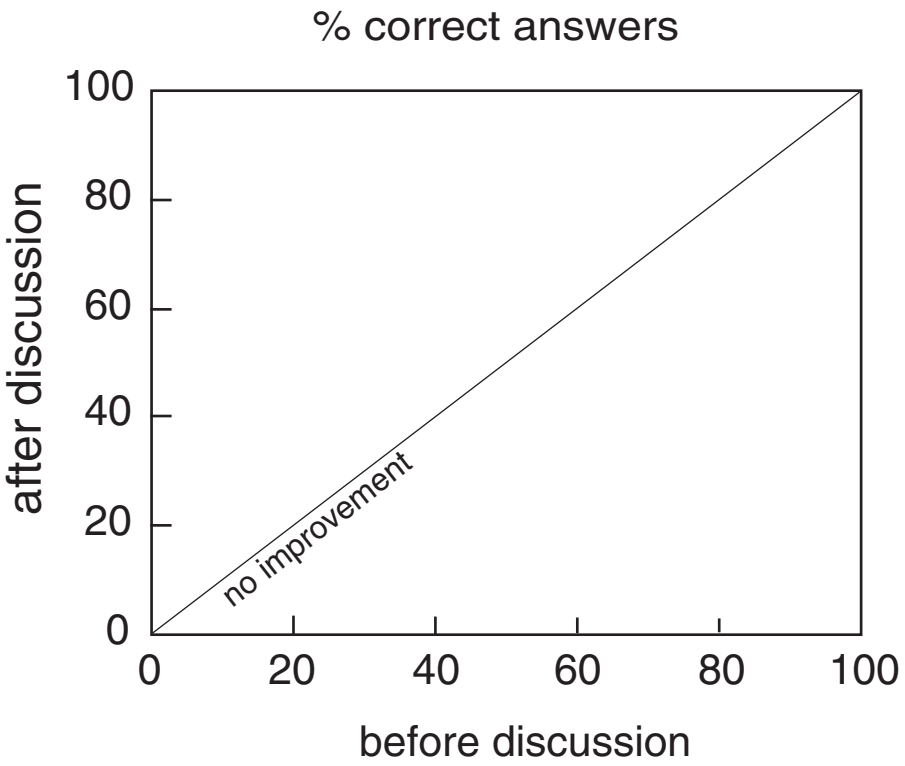
- are based on common student difficulties
- focus on single concept
- require more than “plug and chug” or recall
- are clear and concise
- are of manageable difficulty

ConcepTests

“How can I promote active/fruitful discussions?”

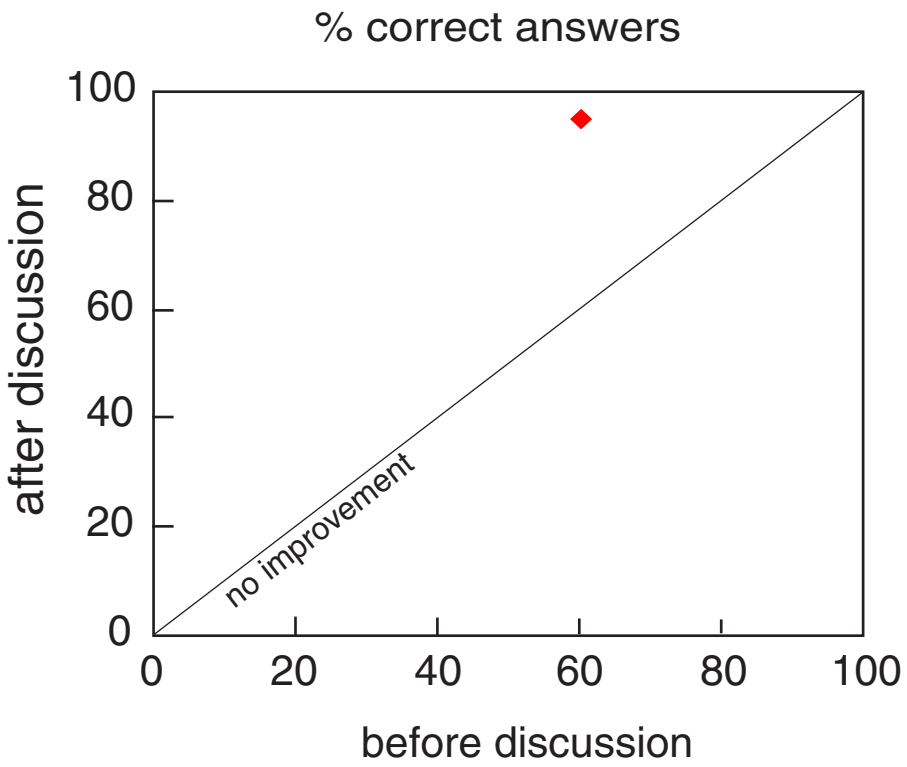
ConcepTests

ConcepTest data



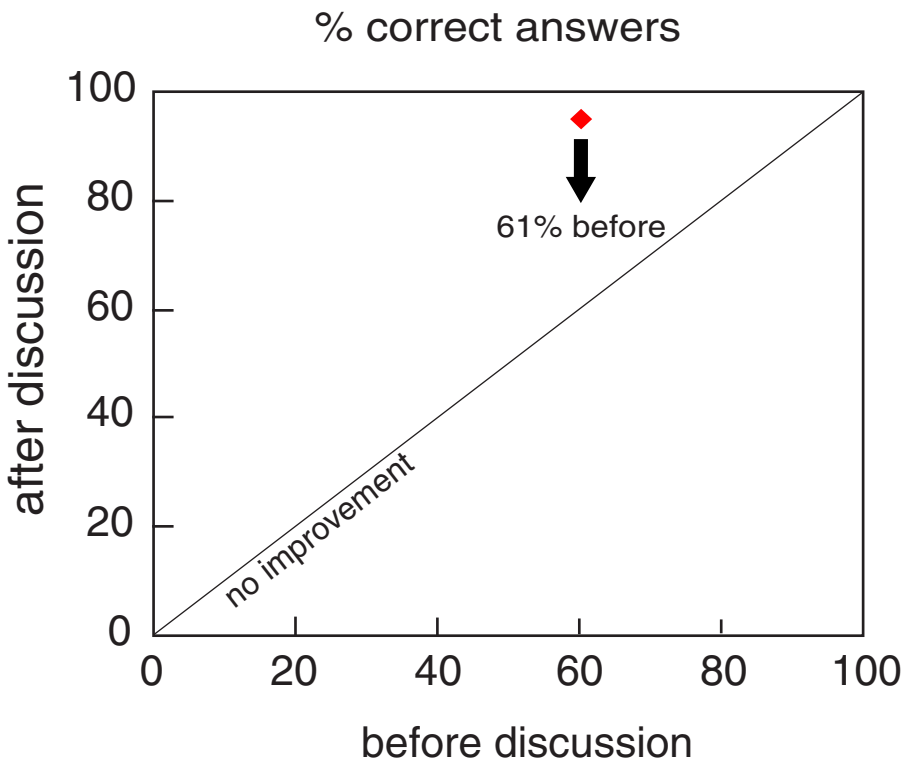
ConcepTests

ConcepTest data



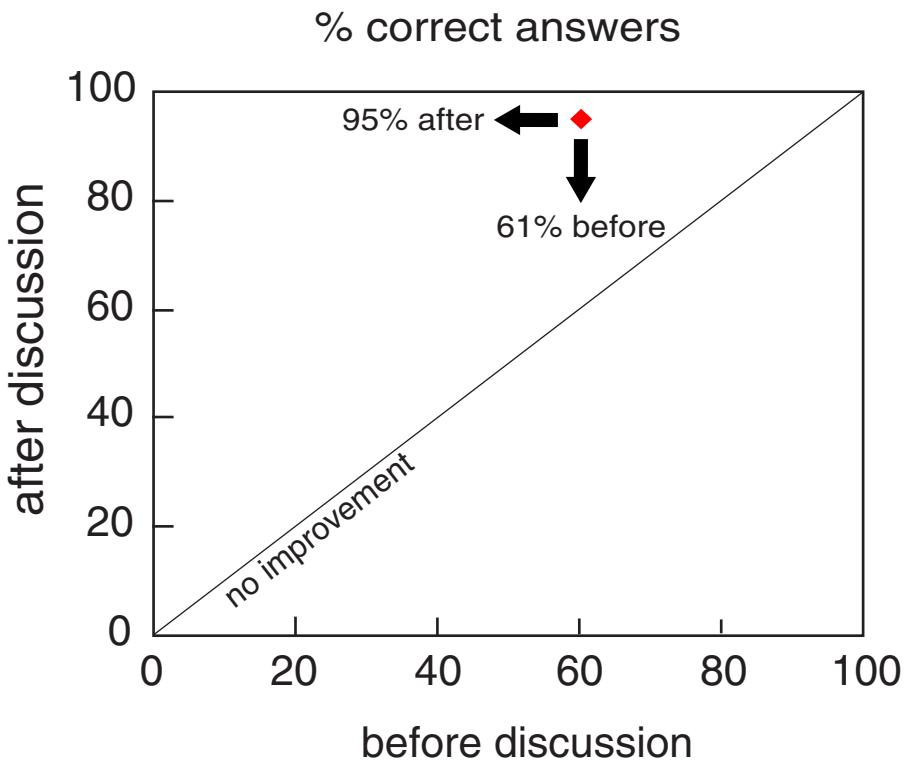
ConcepTests

ConcepTest data



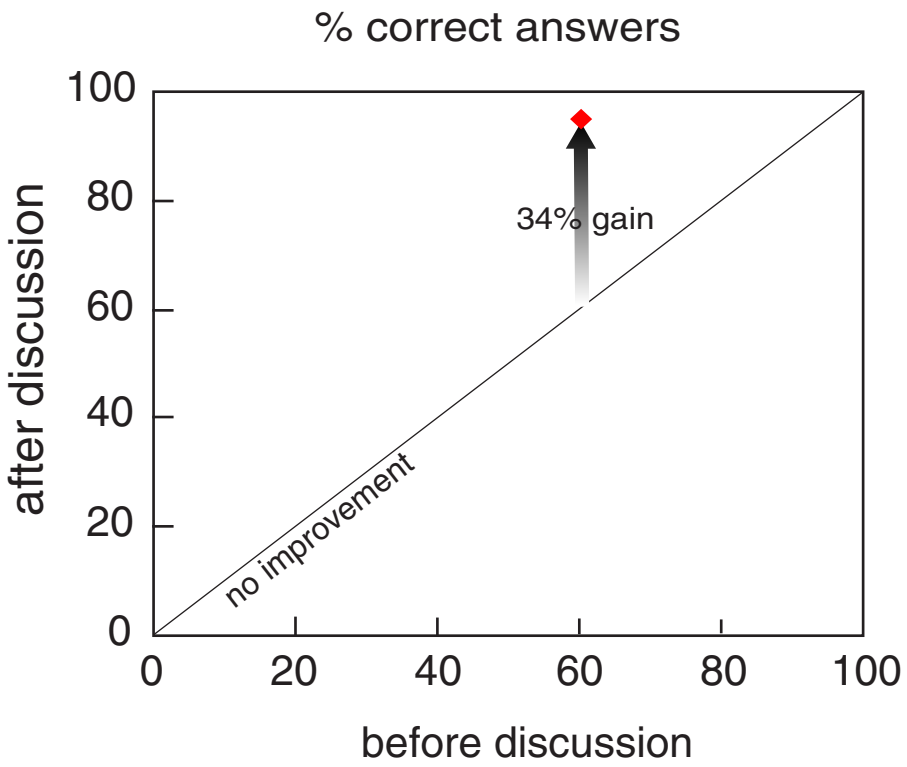
ConcepTests

ConcepTest data



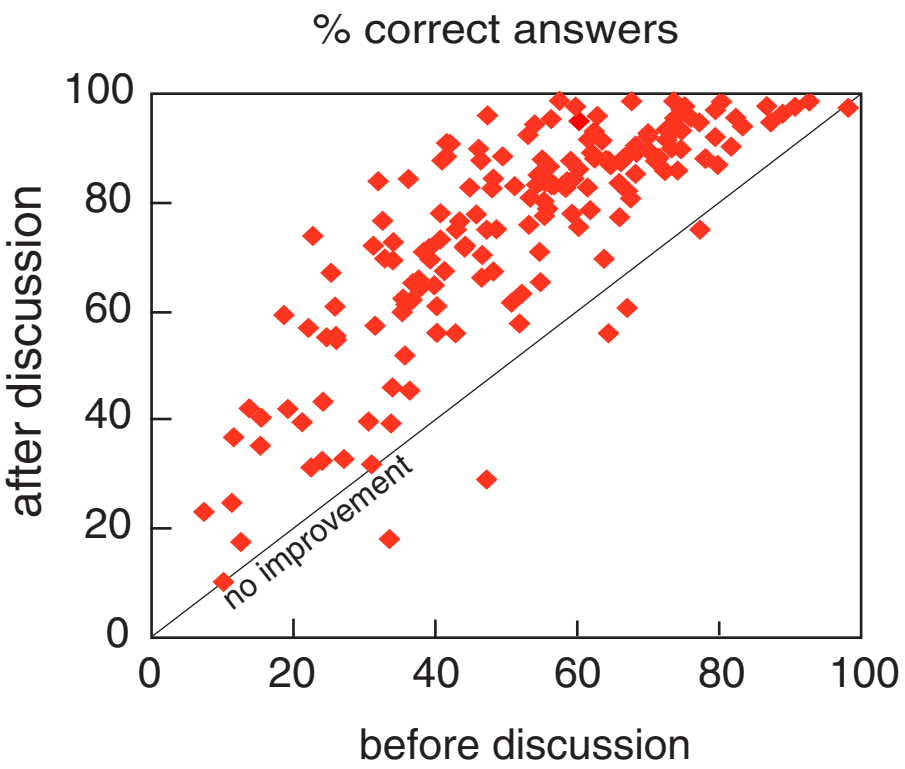
ConcepTests

ConcepTest data



ConcepTests

ConcepTest data



ConcepTests

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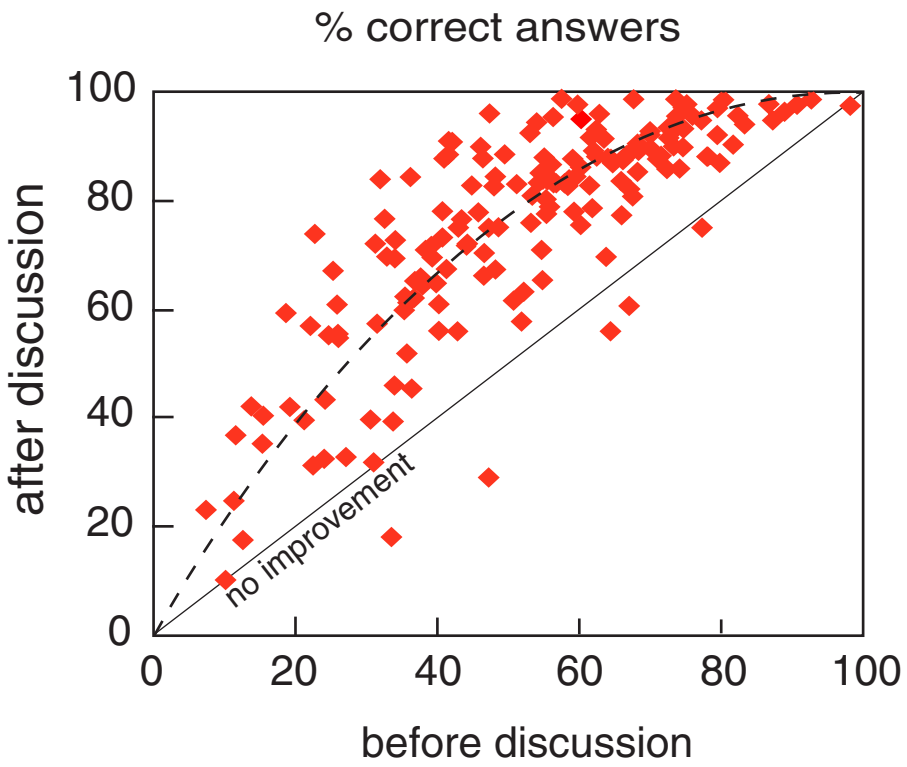
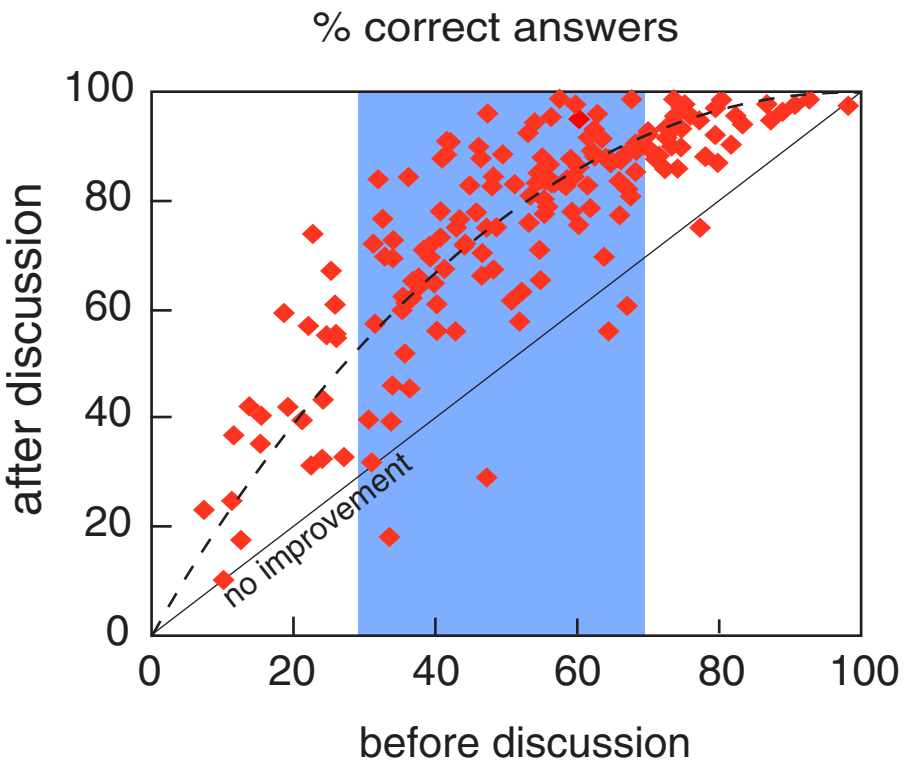
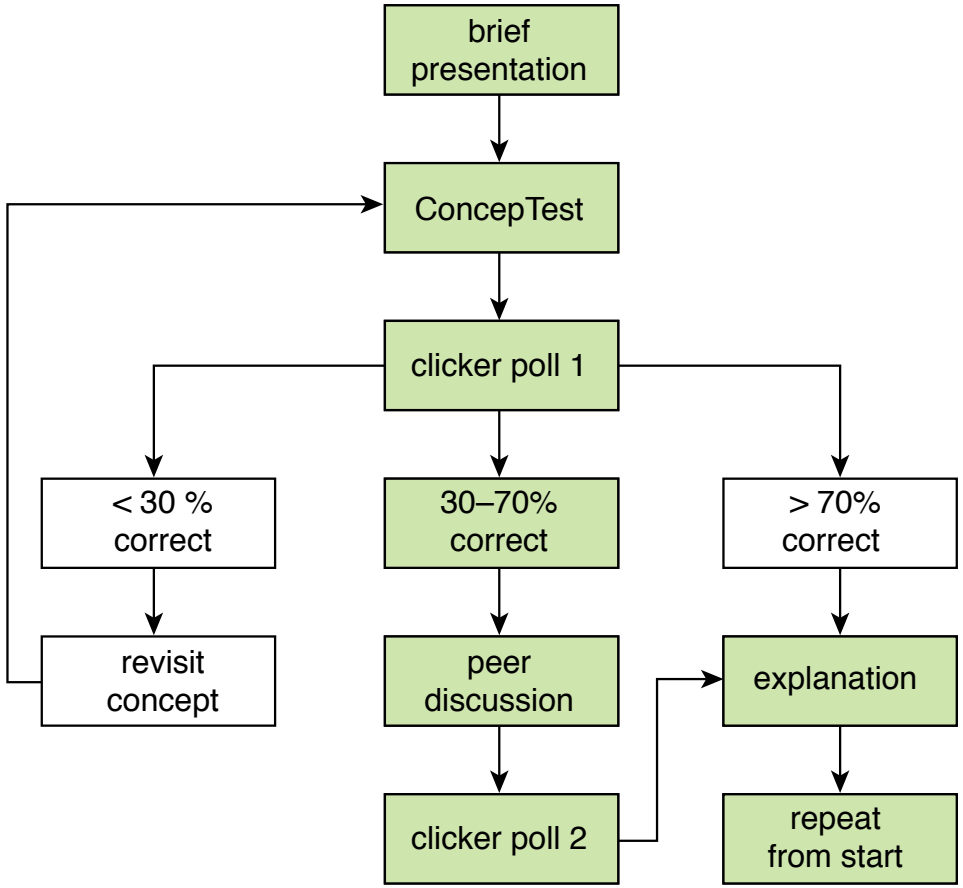


ConcepTests

ConcepTest data



ConcepTests



Designing good questions for Peer Instruction

The Digital Education Show Middle East
Dubai, United Arab Emirates
14 September 2015

Implementing PI & JiTT

“What constitutes a good problem?”

Implementing PI & JiTT

On a Saturday afternoon, you pull into a parking lot with unmetered spaces near a shopping area. You circle around, but there are no empty spots. You decide to wait at one end of the lot, where you can see (and command) about 20 spaces.

Implementing PI & JiTT

On a Saturday afternoon, you pull into a parking lot with unmetered spaces near a shopping area. You circle around, but there are no empty spots. You decide to wait at one end of the lot, where you can see (and command) about 20 spaces.

How long do you have to wait before someone frees up a space?

Implementing PI & JiTT

On a Saturday afternoon, you pull into a parking lot with unmetered spaces near a shopping area. You circle around, but there are no empty spots. You decide to wait at one end of the lot, where you can see (and command) about 20 spaces.

How long do you have to wait before someone frees up a space?

Requires:

Assumptions
Developing a model
Applying that model

Implementing PI & JiTT

On a Saturday afternoon, you pull into a parking lot with unmetered spaces near a shopping area. You circle around, but there are no empty spots. You decide to wait at one end of the lot, where you can see (and command) about 20 spaces. On average people shop for 2 hours.

How long do you have to wait before someone frees up a space?

Implementing PI & JiTT

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How long do you have to wait before someone frees up a space?

Requires:

Developing a model
Applying that model

Implementing PI & JiTT

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Assuming people leave at regularly-spaced intervals, how long do you have to wait before someone frees up a space?

Implementing PI & JiTT

On a Saturday afternoon, you pull into a parking lot with unmetered spaces near a shopping area. You circle around, but there are no empty spots. You decide to wait at one end of the lot, where you can see (and command) about 20 spaces. On average people shop for 2 hours.

Assuming people leave at regularly-spaced intervals, how long do you have to wait before someone frees up a space?

Requires:

Applying a (new) model

Implementing PI & JiTT

On a Saturday afternoon, you pull into a parking lot with unmetered spaces near a shopping area, where people are known to shop, on average, for 2 hours. You circle around, but there are no empty spots. You decide to wait at one end of the lot, where you can see (and command) about 20 spaces.

How long do you have to wait before someone frees up a space?

Implementing PI & JiTT

On a Saturday afternoon, you pull into a parking lot with unmetered spaces near a shopping area, where people are known to shop, on average, for 2 hours. You circle around, but there are no empty spots. You decide to wait at one end of the lot, where you can see (and command) about 20 spaces.

How long do you have to wait before someone frees up a space?

$$t_{wait} = \frac{T_{shop}}{N_{spaces}}$$

Implementing PI & JiTT

On a Saturday afternoon, you pull into a parking lot with unmetered spaces near a shopping area, where people are known to shop, on average, for 2 hours. You circle around, but there are no empty spots. You decide to wait at one end of the lot, where you can see (and command) about 20 spaces.

How long do you have to wait before someone frees up a space?

Requires:

Using a calculator

$$t_{wait} = \frac{T_{shop}}{N_{spaces}}$$

Implementing PI & JiTT

Need to test meaningful skills!

Discussion of technology and wrap-up

The Digital Education Show Middle East
Dubai, United Arab Emirates
14 September 2015

feedback

1 lecture

2 PI

3 PI 2.0


1991
1 lecture
2 PI
3 PI 2.0

1 lecture

2 PI

3 PI 2.0

1 lecture 2 PI 3 PI 2.0

2008

1 lecture

2 PI

3 PI 2.0

1 lecture 2 PI 3 PI 2.0

How do I…

- design good questions?
- optimize the discussions?
- manage time?

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learning | catalytics

1 lecture

2 PI

3 PI 2.0

Use intelligent algorithms and data analytics to…

- improve questioning
- manage discussions
- facilitate time management/flow

a. A 30-year fixed rate
b. A 15-year fixed rate mortgage at
c. A 30-year fixed rate mortgage at 12%
d. A 15-year fixed rate mortgage at 12%

2. The biggest factor that leads American companies to manufacture their products ov
India is:

a. Higher quality of craftsmanship
b. Lower labor costs
c. Decreased transportation costs
d. Effective legal systems

3. Which of the following correctly summarizes the accounting equation for a sole proprietorship?

a. Assets = Liabilities + Owners' equity
b. Liabilities = Assets + Owners' equity
c. Owner's equity = Assets + Liabilities
d. Revenue = Assets – Liabilities

4. In order to present a business plan to a group of potential investors, a businessperson would most likely use which

a. Powerpoint
b. Quickbooks
c. Peoplesoft
d. Excel

5. In order to start an online business, and individual would need all but which of the following:

business model

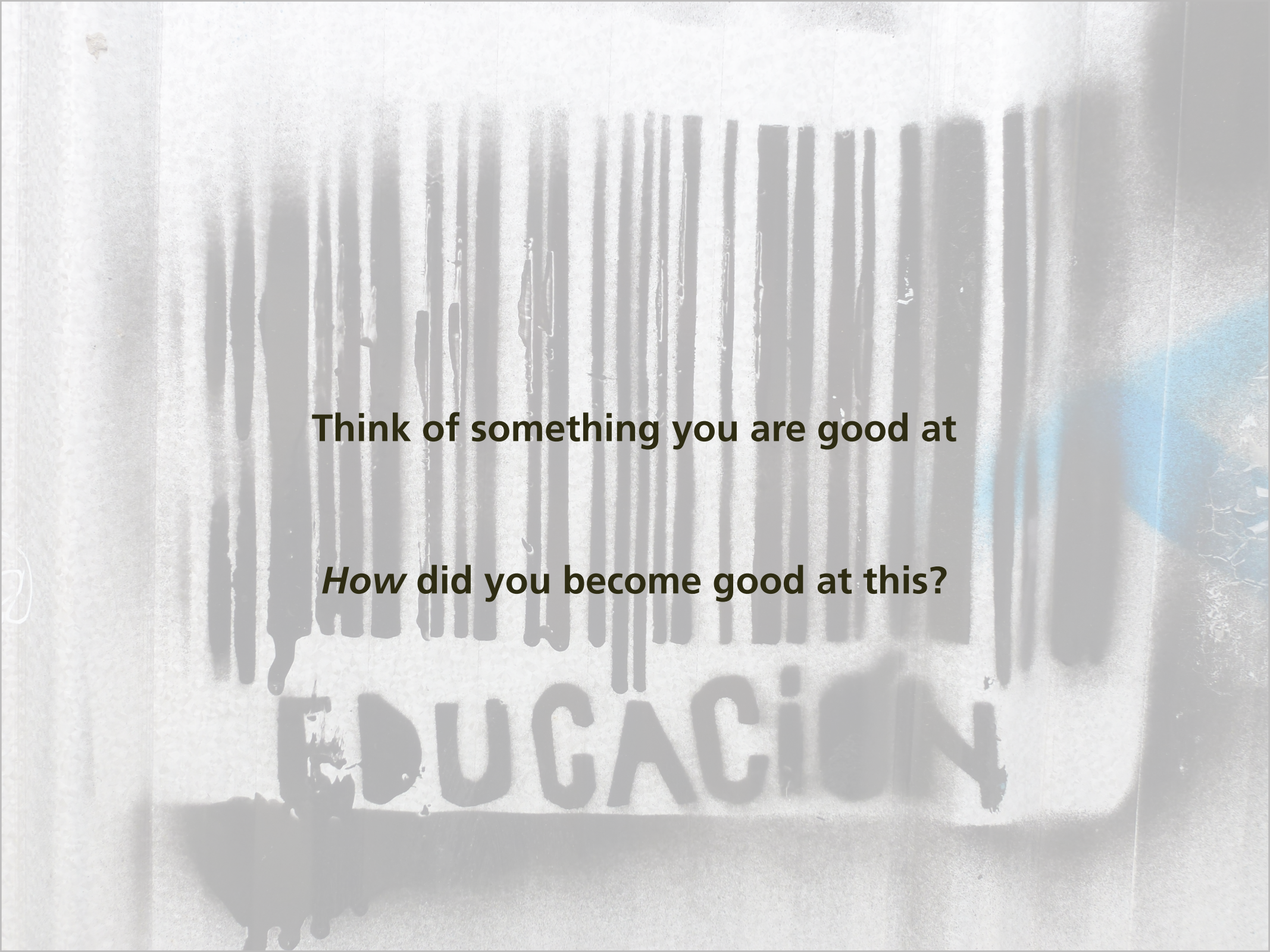
preciation?

extensible plug-in architecture for question types

1 lecture 2 PI 3 PI 2.0

Sample question types:

- direction
- expression
- long answer, short answer, word cloud (fill in text)
- multiple-choice, many-choice
- numerical (enter a number)
- ranking
- region (select point on image)
- sketch



Think of something you are good at

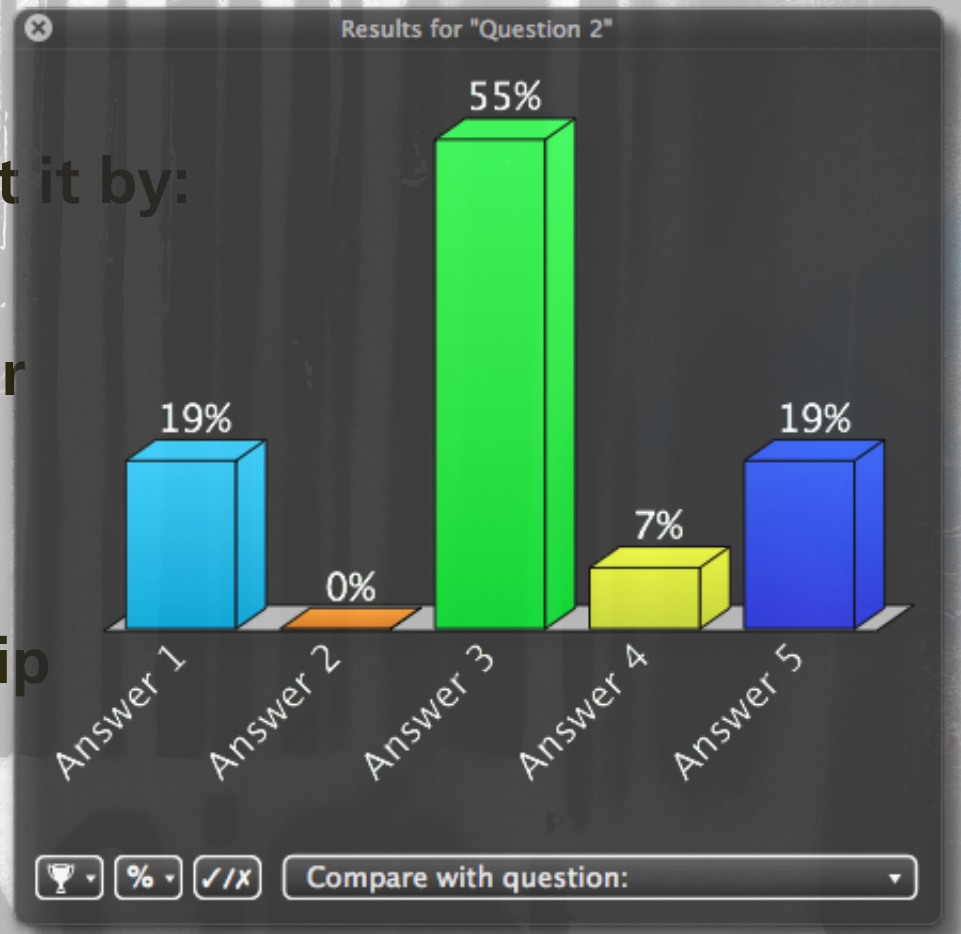
How did you become good at this?

Became good at it by:

1. trial and error
2. lectures
3. practicing
4. apprenticeship
5. other

Became good at it by:

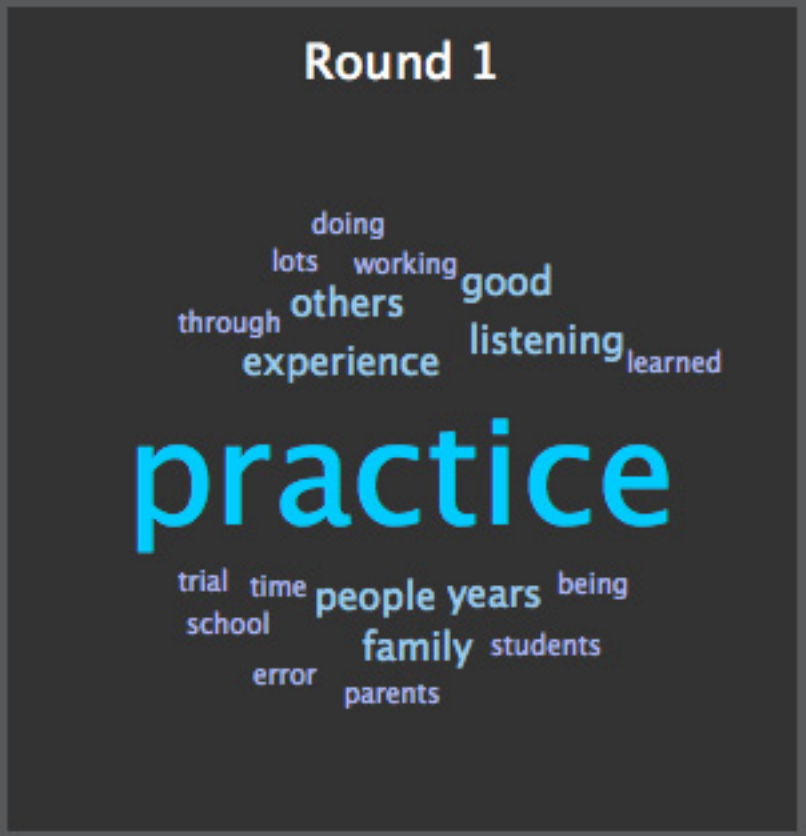
1. trial and error
2. lectures
3. practicing
4. apprenticeship
5. other




Carrier
10:24 PM
Logout
Leave
session 123456
Now describe in a couple of words how you became good at whatever it is you entered in the previous question.
Submit response

Class session: 123456

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



1 learningcatalytics.com/demo 2 enter info 3 ID 123456789

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4. directi… prevailing …tle. The image provides several clues about the direction of …n your screen.

Deliver Show all results

1 educa…

3 PI 2.0

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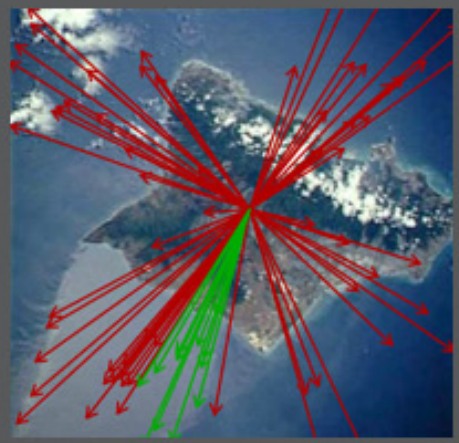
4. directi… prevailing …tle. The image provides several clues about the direction of …n your screen.

Deliver Show all results

Round 1

77 responses, 16% correct



17 get it now

3 still don't get it

1 educa…

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optics i

current session: 766079 | 69 students

Back to all lectures | Stop session | Review results | Seat map | Show floating session ID | Edit | Delete

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

4. direction Light enters horizontally into the combination of two perpendicular mirrors as shown below.

Deliver | Show all results

Indicate the direction of the incident light after it reflects off of both mirrors.

feedback & support

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optics i

current session: 766079 | 69 students

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6 7 8 9 10 11 12 13 14 15

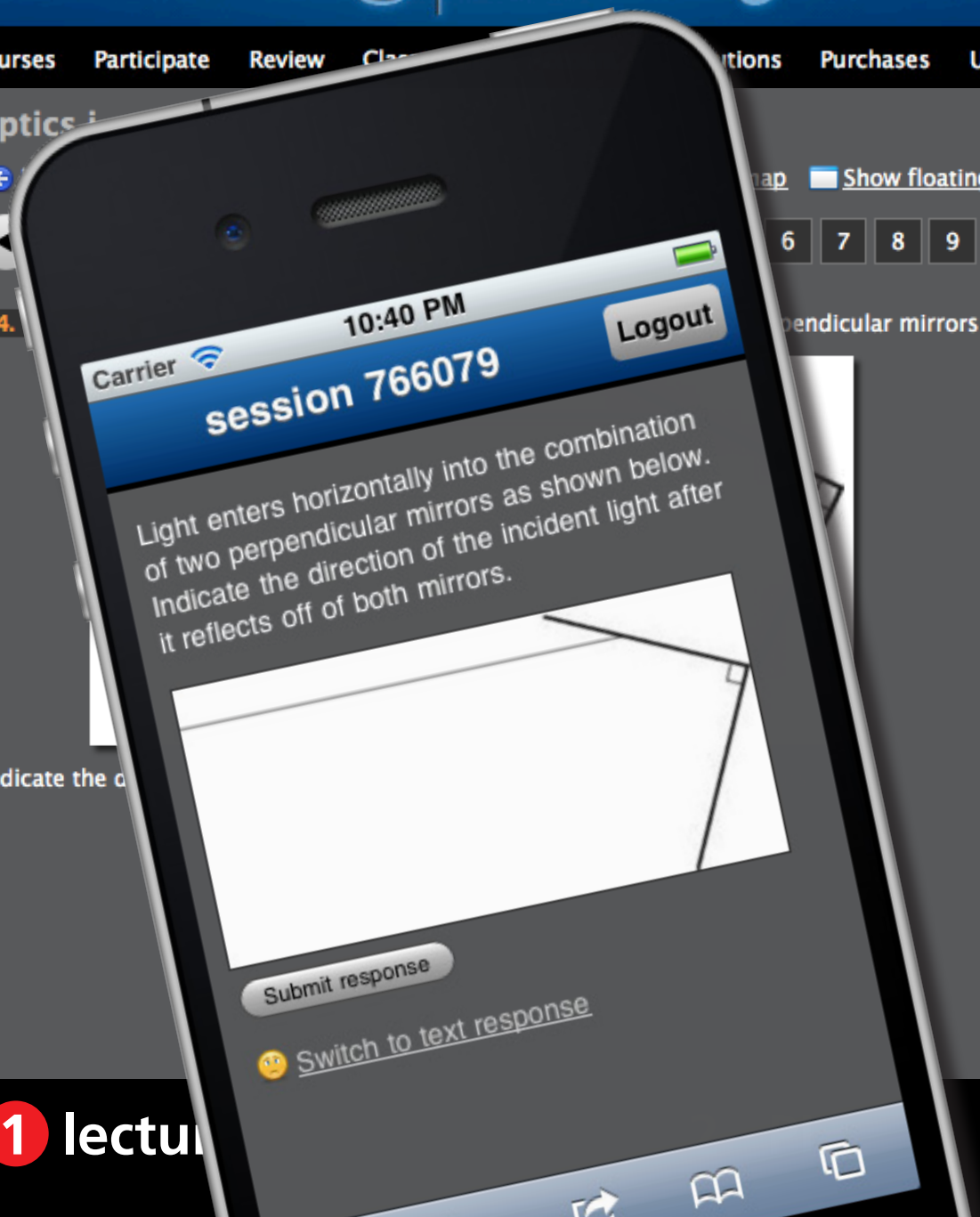
4.

endicular mirrors as shown below.

Deliver Show all results

Indicate the d

feedback & support



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optics i

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6 7 8 9 10 11 12 13 14 15

4.

endicular mirrors as shown below.

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Indicate the d

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optics i

current session: 766079 | 69 students

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6 7 8 9 10 11 12 13 14 15

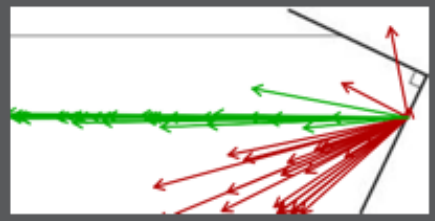
4.

endicular mirrors as shown below.

Deliver Show all results

Round 1

57 responses, 58% correct



Indicate the d

feedback & support

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3 PI 2.0

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optics i

current session: 766079 | 69 students

ap Show floating session ID Edit Delete

6 7 8 9 10 11 12 13 14 15

4.

endicular mirrors as shown below.

Deliver Show all results

Round 1

57 responses, 58% correct

Round 2

51 responses, 73% correct

8 get it now

0 still don't get it

Indicate the d

feedback & support

1 lectu

3 PI 2.0

If $2x - y = 4$, then $x =$

1 lecture 2 PI 3 PI 2.0

transformations of parabolas

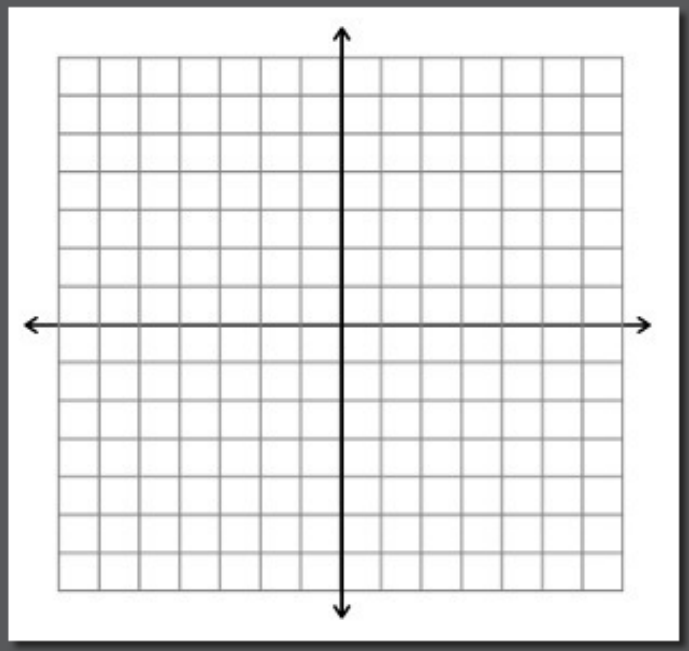
current session: 773885 | 9 students

Back to all lectures | Stop session | Review results | Show floating session ID | Edit | PDF | Delete

Jump to ▼ 1 2 3 4

4. sketch Sketch a graph of the function $f(x) = (x-3)^2 + 2$.

Stop delivery | Deliver again | Assign groups | Show all results



1 education 2 PI 3 PI 2.0

transformations of parabolas

current session: 773885 | 9 students

Back to all lectures | Stop session | Review results | Show floating session ID | Edit | PDF | Delete

Jump to ▼ 1 2 3 4

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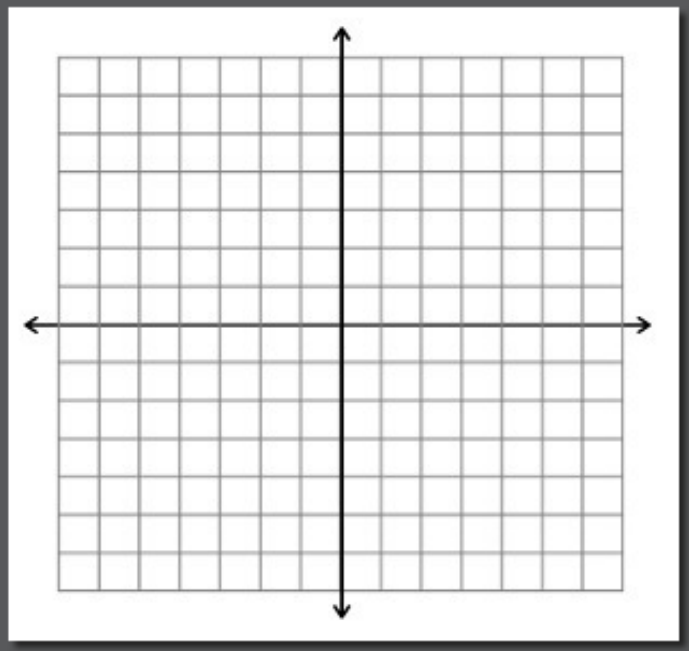
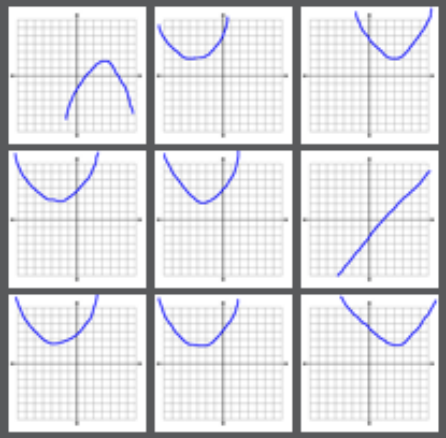
Stop delivery | Deliver again | Assign groups | Show all results

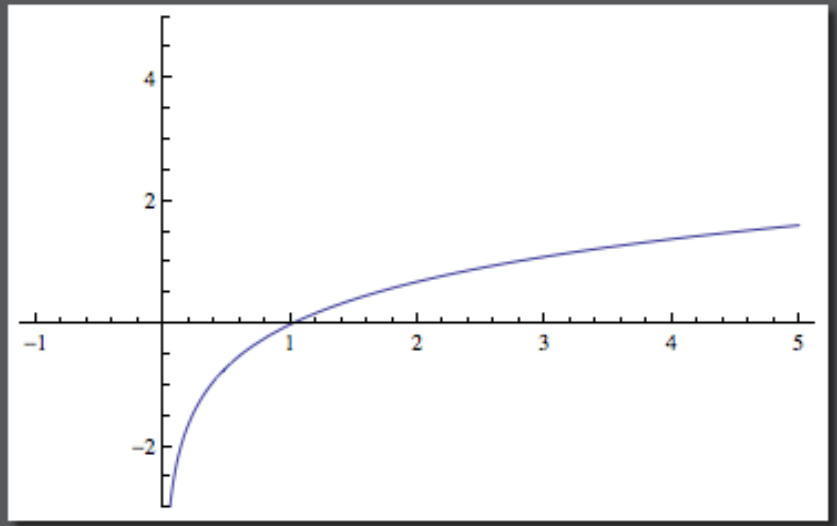


Round 1

9 responses



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



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This is a graph of $f(x)$ =

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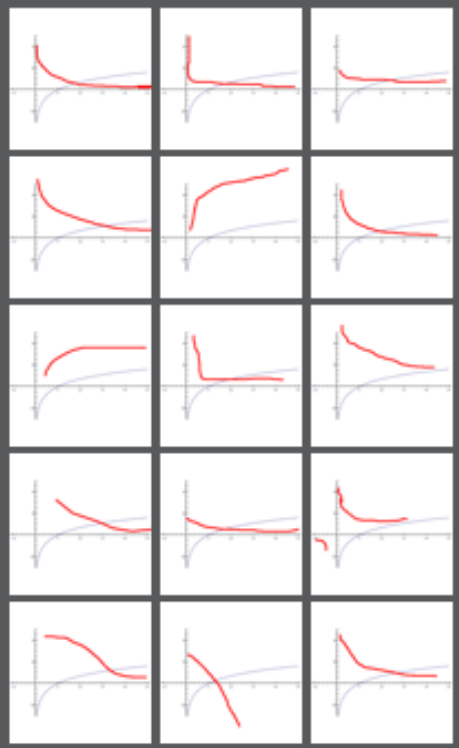
This is a graph of $f(x)$ =

Round 1

15 responses



6 get it now

0 still don't get it

1 education

3 PI 2.0

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1. highlighting What do you see as the most important part of this Shakespeare sonnet?

Stop delivery Deliver again Assign groups Show all results

For shame! deny that thou bear'st love to any,
Who for thyself art so unprovident.
Grant, if thou wilt, thou art beloved of many,
But that thou none lovest is most evident;
For thou art so possess'd with murderous hate
That 'gainst thyself thou stick'st not to conspire.
Seeking that beauteous roof to ruinate
Which to repair should be thy chief desire.
O, change thy thought, that I may change my mind!
Shall hate be fairer lodged than gentle love?
Be, as thy presence is, gracious and kind,
Or to thyself at least kind-hearted prove:
Make thee another self, for love of me,
That beauty still may live in thine or thee.

1 education 2 PI 3 PI 2.0

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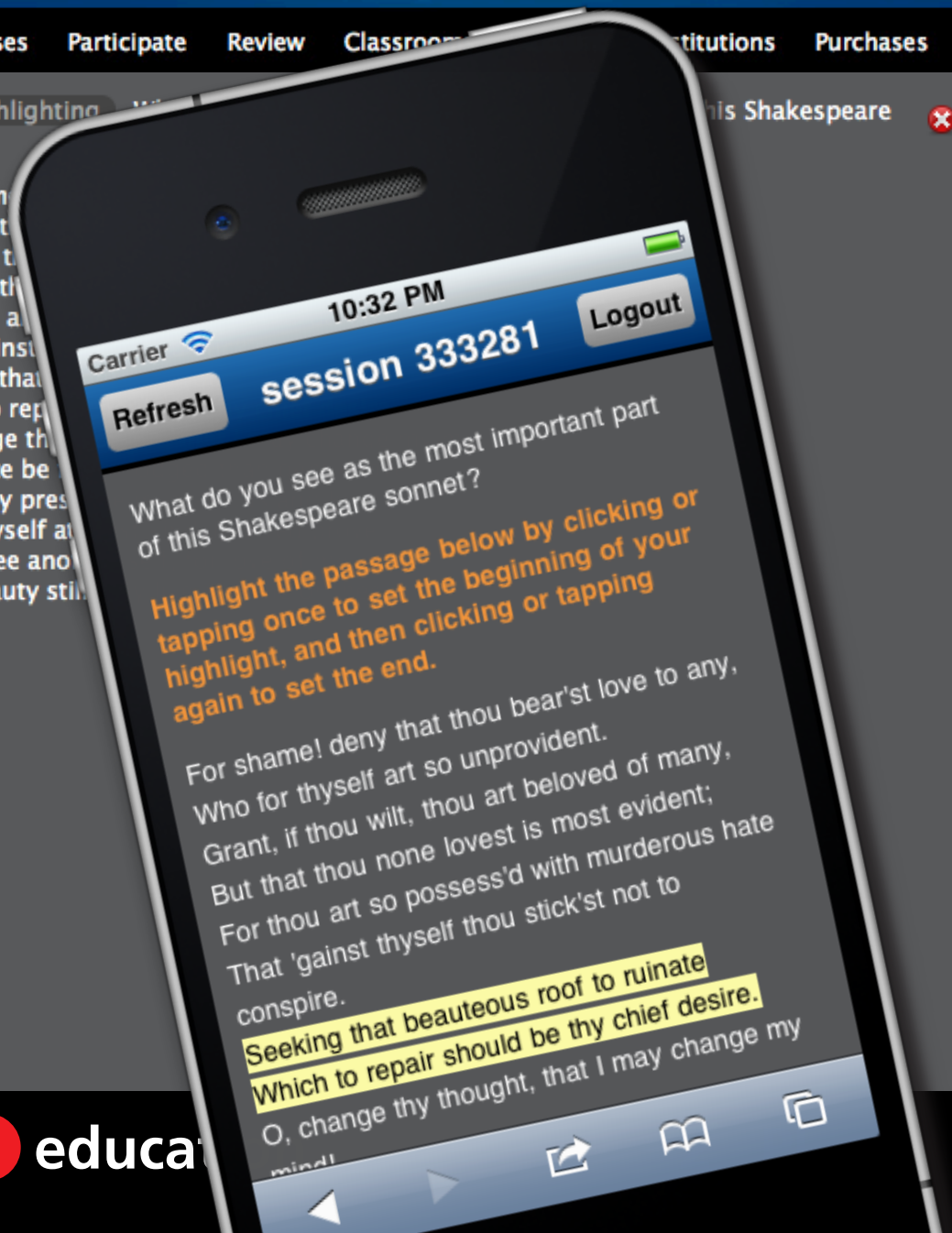
1. highlighting … …is Shakespeare sonnet?

Stop delivery Deliver again Assign groups Show all results

For sham…
Who for t…
Grant, if t…
But that th…
For thou a…
That 'gainst…
Seeking tha…
Which to rep…
O, change th…
Shall hate be…
Be, as thy pres…
Or to thyself a…
Make thee ano…
That beauty sti…



1 educa…

3 PI 2.0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Tour
Help
Stop delivery
Deliver again
Assign groups
Show all results
Round 1
3 responses
10:32 PM
Carrier
Logout
Refresh
session 333281
What do you see as the most important part of this Shakespeare sonnet?
Highlight the passage below by clicking or tapping once to set the beginning of your highlight, and then clicking or tapping again to set the end.
For shame! deny that thou bear'st love to any,
Who for thyself art so unprovident.
Grant, if thou wilt, thou art beloved of many,
But that thou none lovest is most evident;
For thou art so possess'd with murderous hate
That 'gainst thyself thou stick'st not to conspire.
Seeking that beauteous roof to ruinate
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O, change thy thought, that I may change my
1 educa
3 PI 2.0

Sample question types:

- direction
- expression
- long answer, short answer, word cloud (fill in text)
- multiple choice, multiple choice
- numerical (enter a number)
- ranking
- region (select point on image)
- sketch

data analytics

1 lecture 2 PI 3 PI 2.0

human interaction

1 lecture

2 PI

3 PI 2.0

Carrier 9:31 PM 100%

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review results for session 399757 in electrostatic work and energy ii

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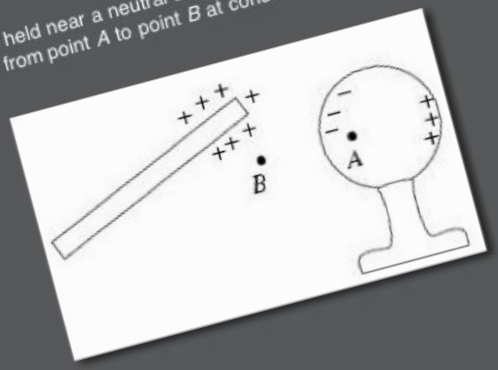
Jump to ▼ 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

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



A. positive
B. zero
C. negative
D. depends on the path taken from *A* to *B*
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%

Search:

1 lecture 2 PI 3 PI 2.0

Carrier 9:31 PM 100%

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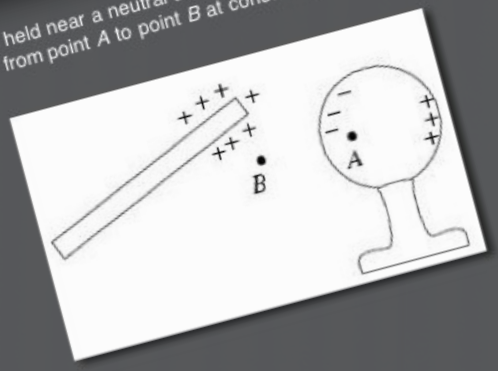

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A. 61%
B. 4%
C. 35%
D. 0%
E. 0%

Round 2
75 responses, 83% correct

A. 83%
B. 0%
C. 17%
D. 0%
E. 0%

Search:

1 lecture **2 PI** **3 PI 2.0**

Carrier 9:31 PM 100%

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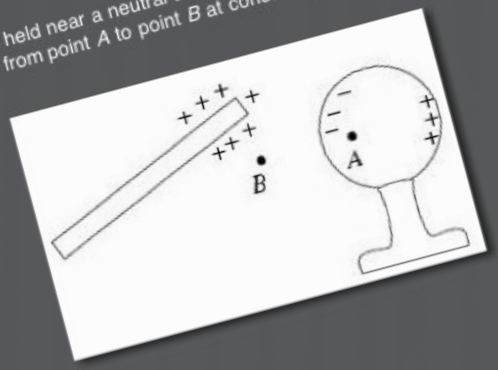

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E. 0%

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A. 83%
B. 0%
C. 17%
D. 0%
E. 0%

Search:

1 lecture 2 PI 3 PI 2.0

Carrier 9:31 PM 100%

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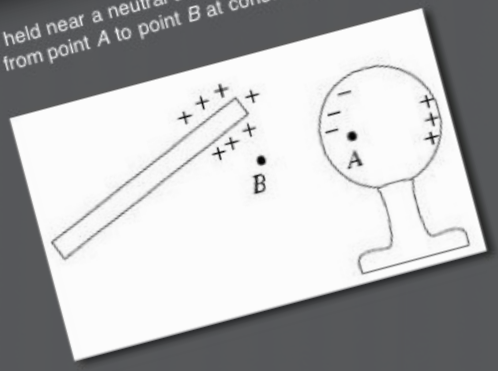

A. positive
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A. 61%
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C. 35%
D. 0%
E. 0%

Round 2
75 responses, 83% correct

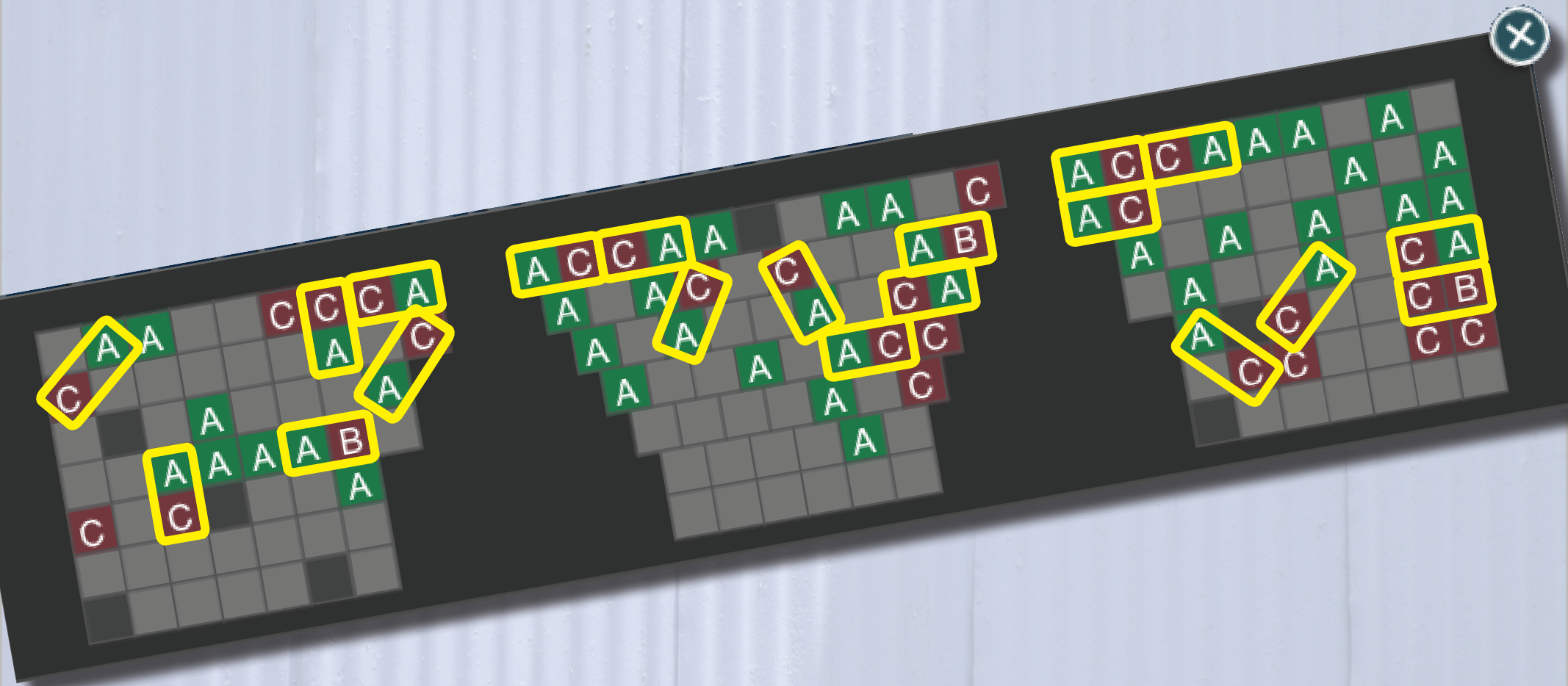
A. 83%
B. 0%
C. 17%
D. 0%
E. 0%

Search:

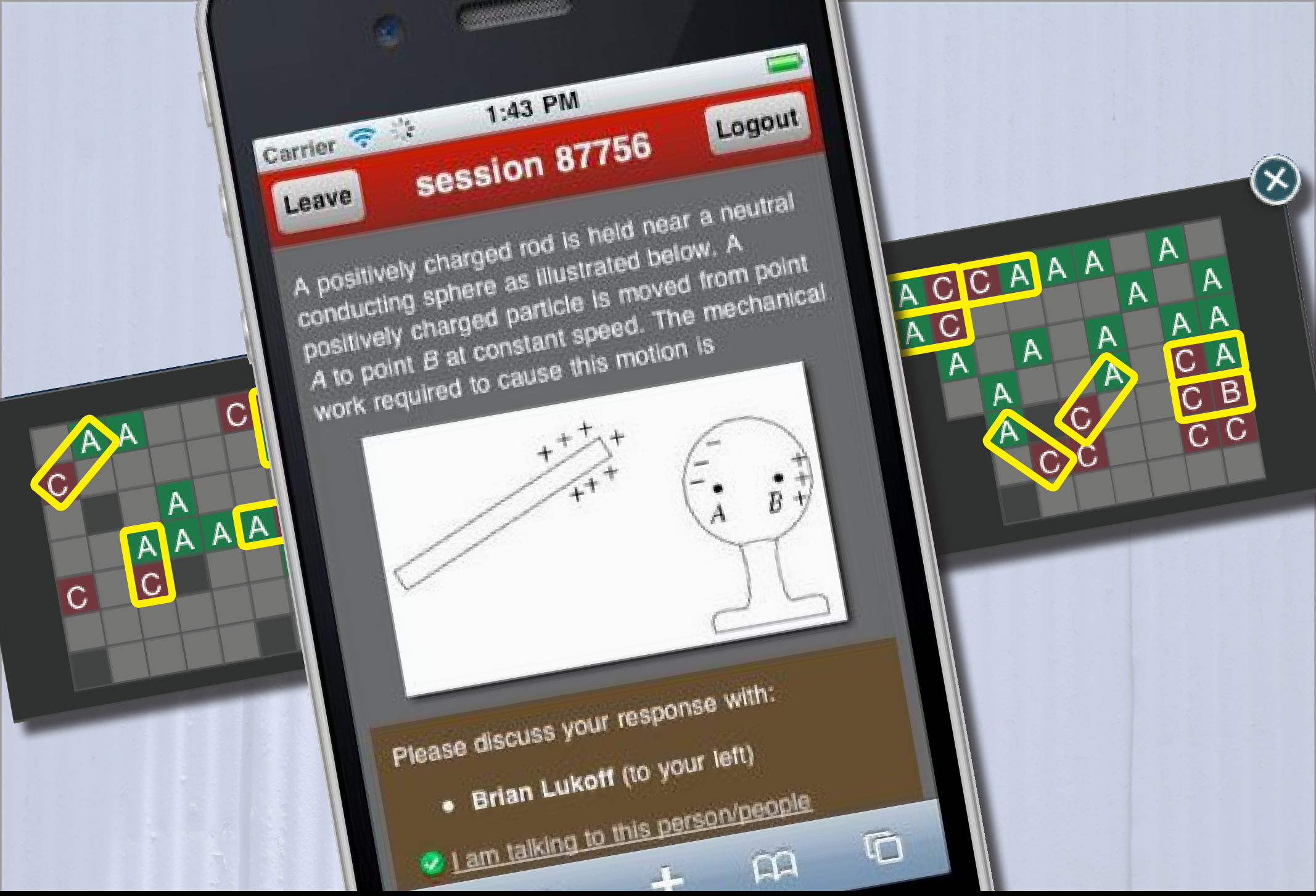
1 lecture **2 PI** **3 PI 2.0**

let system manage pairing

1 lecture 2 PI 3 PI 2.0



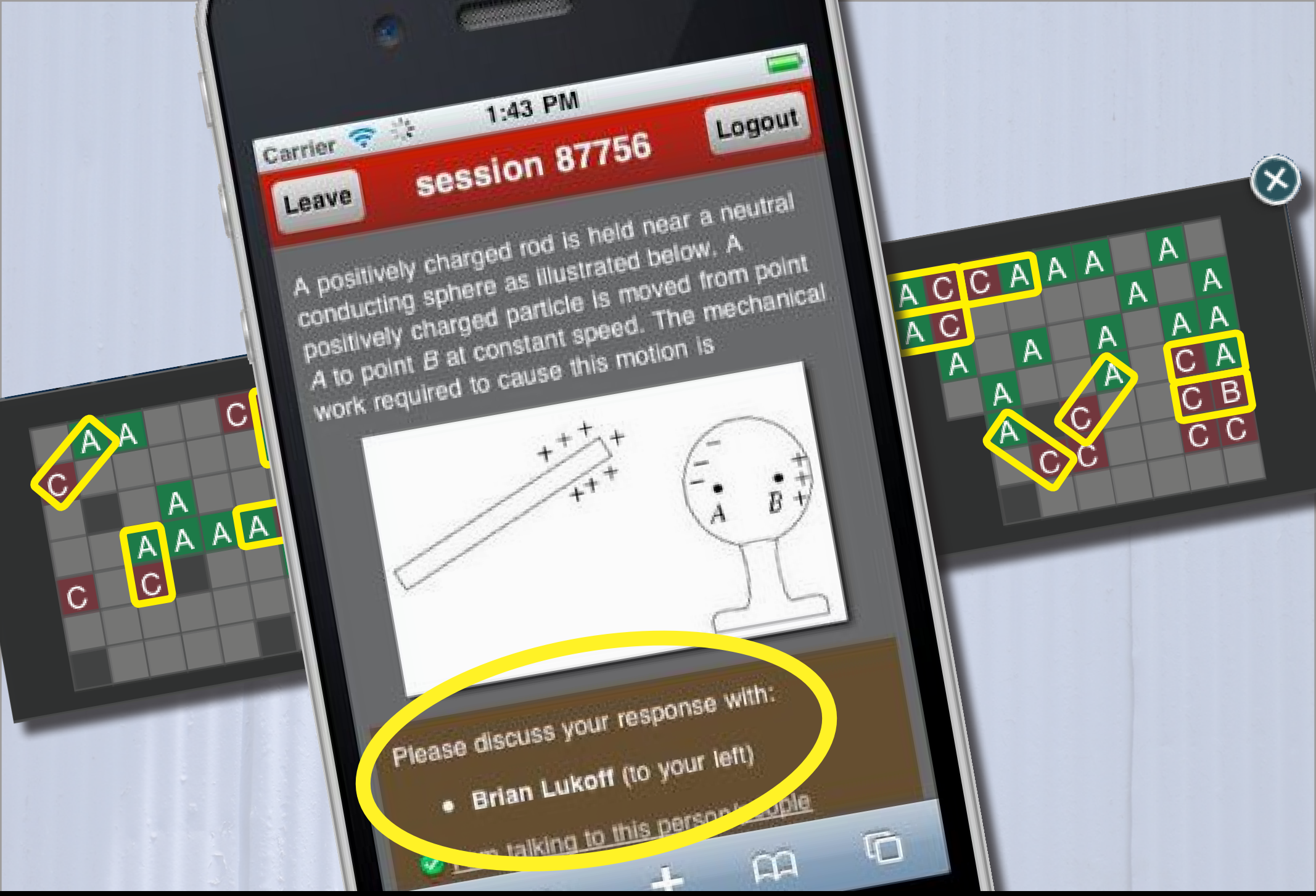
1 lecture 2 PI 3 PI 2.0



1 lecture

2 PI

3 PI 2.0



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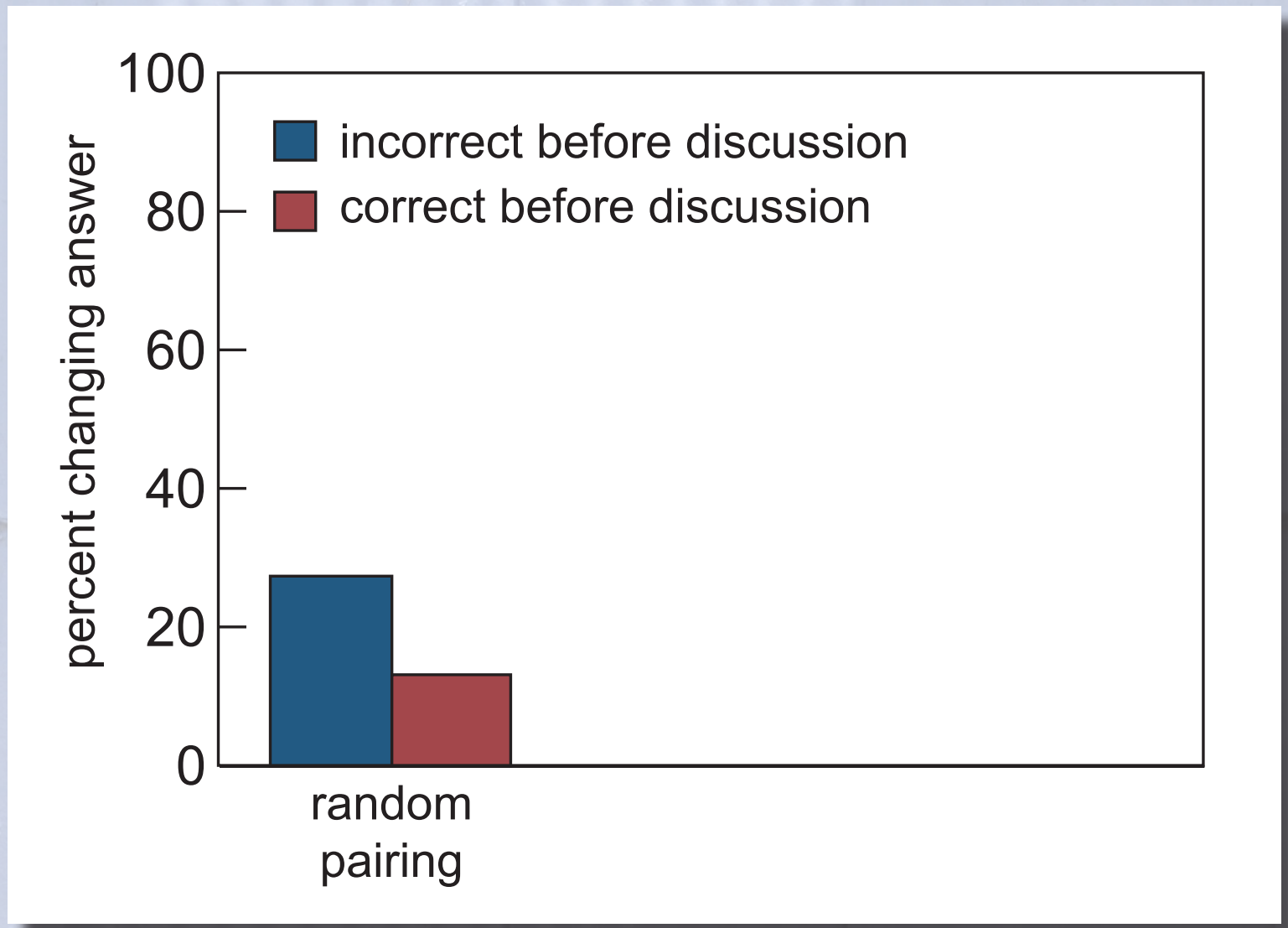
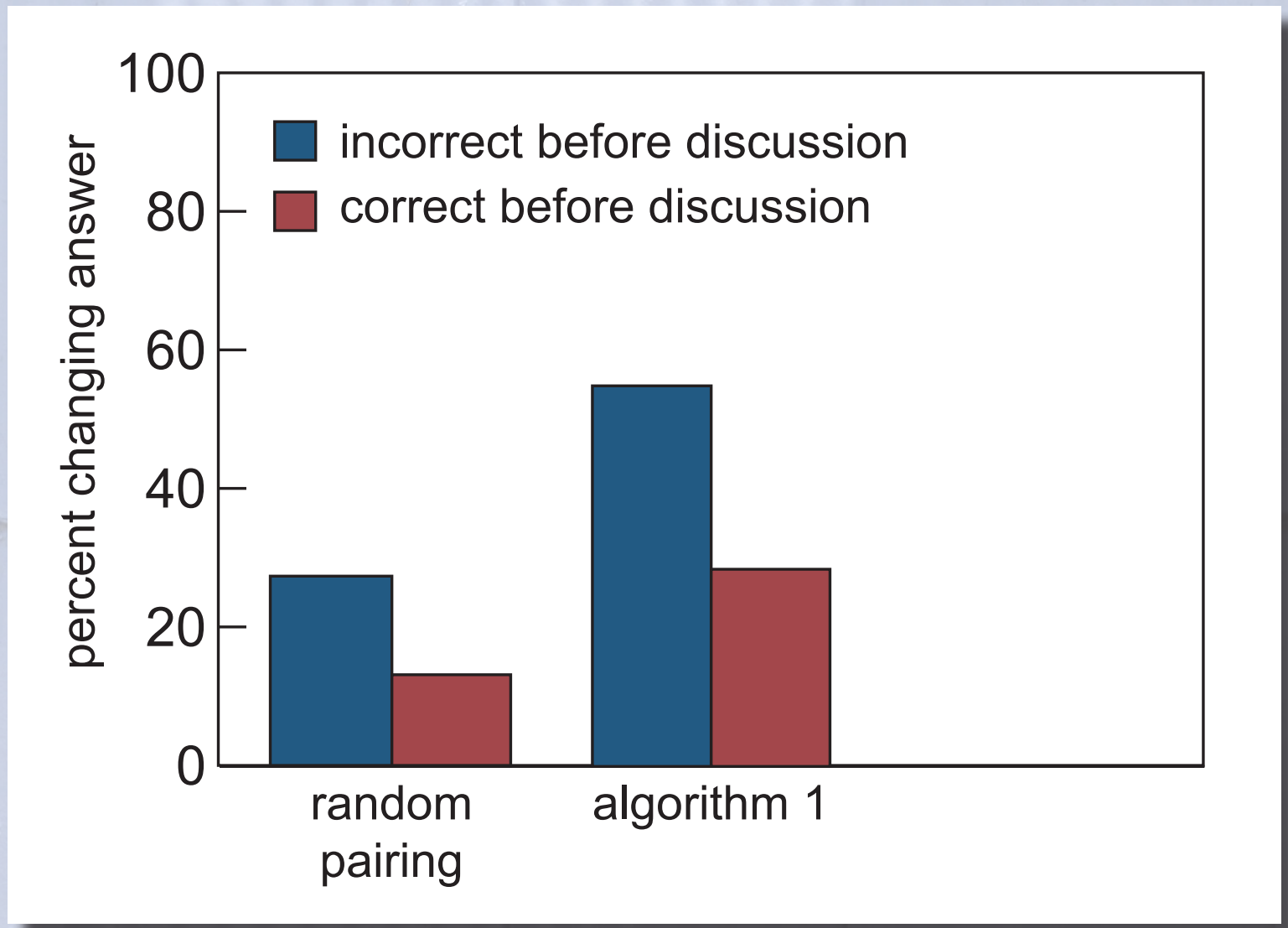
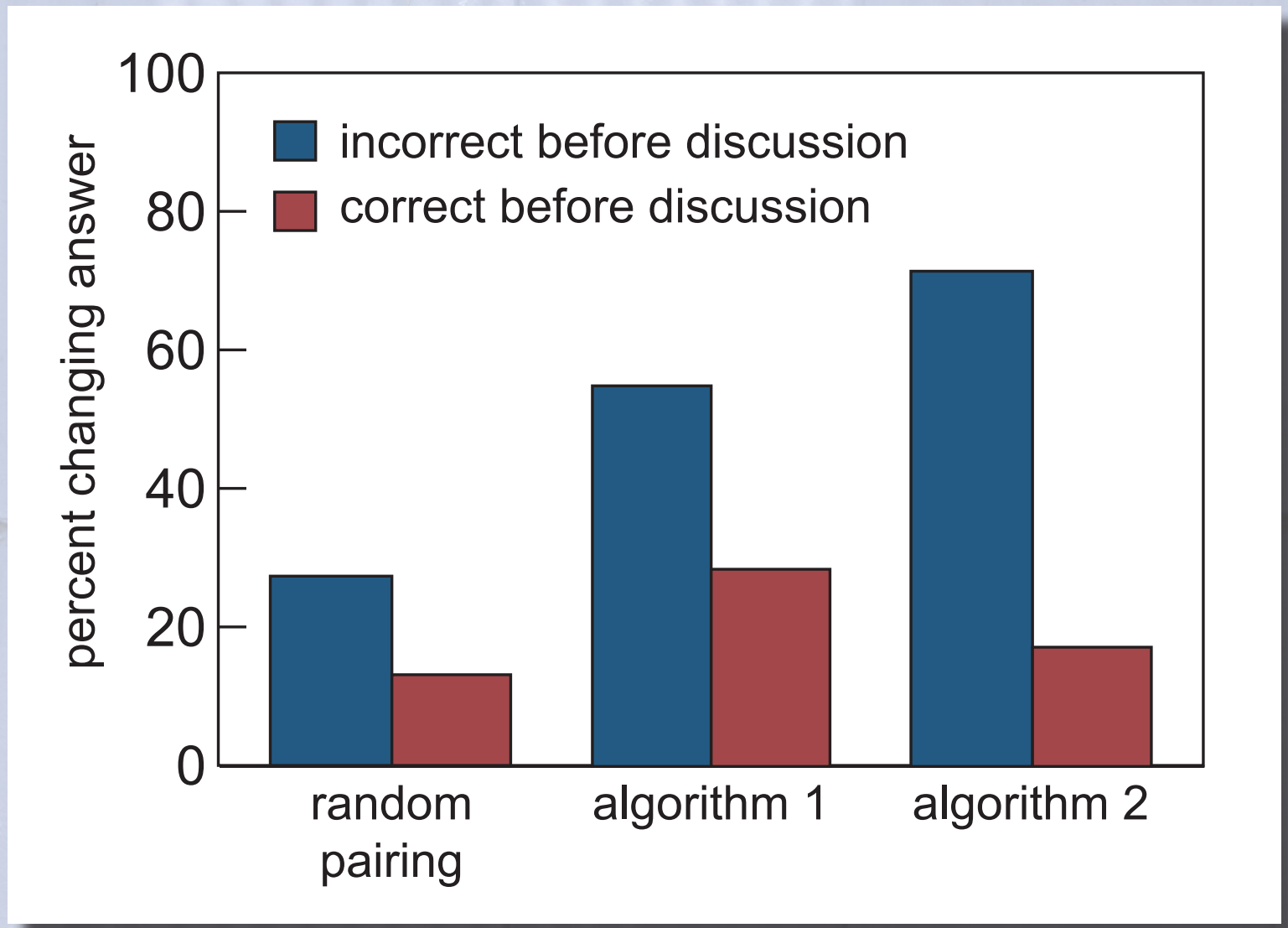


1 lecture 2 PI 3 PI 2.0

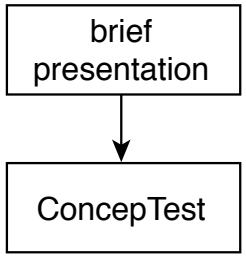


1 lecture 2 PI 3 PI 2.0



1 lecture 2 PI 3 PI 2.0

brief
presentation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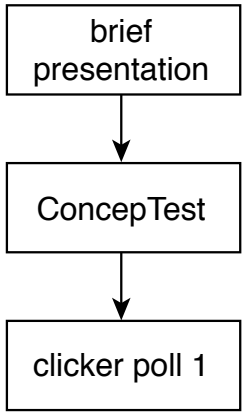
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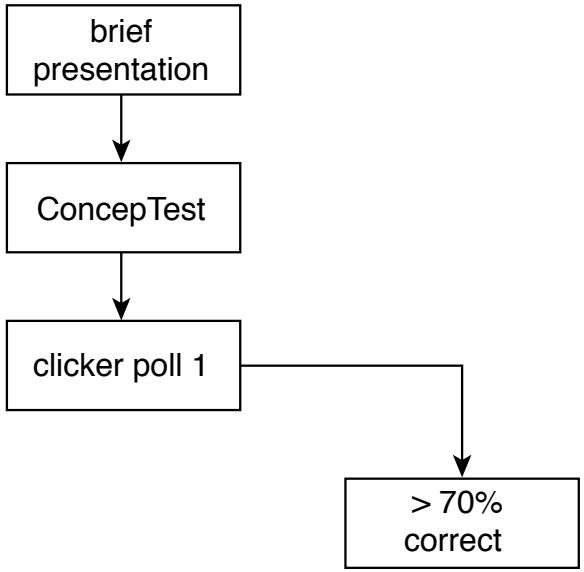
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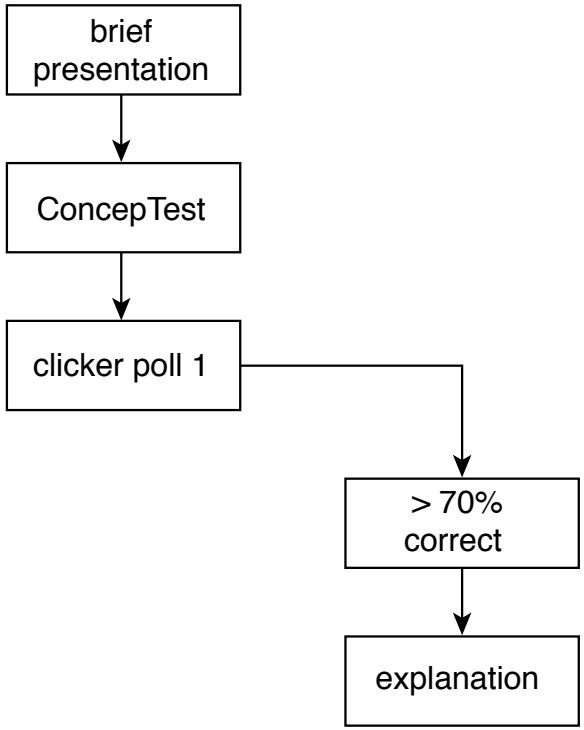
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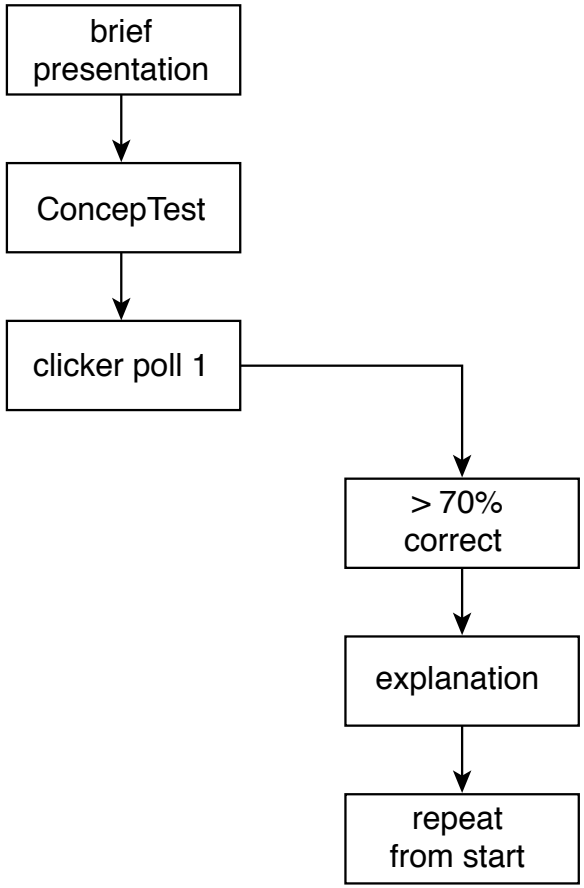
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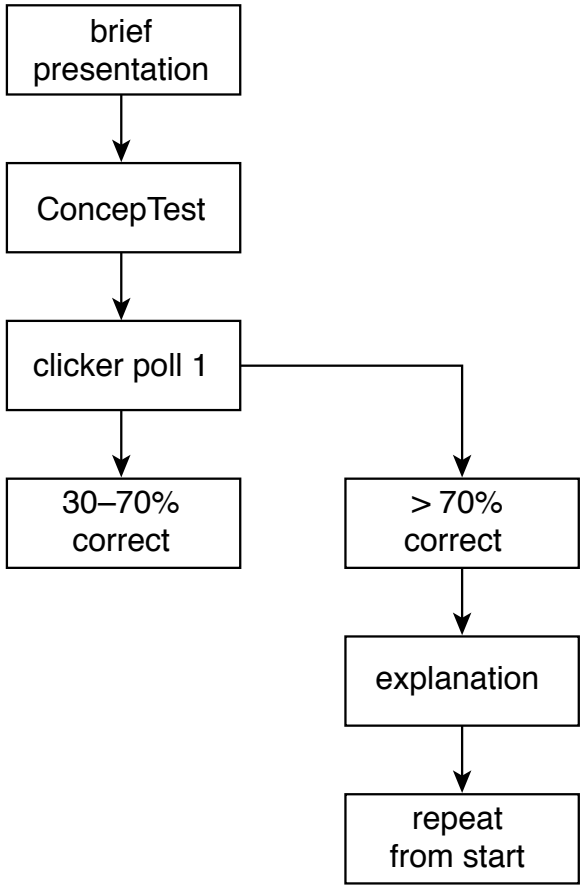
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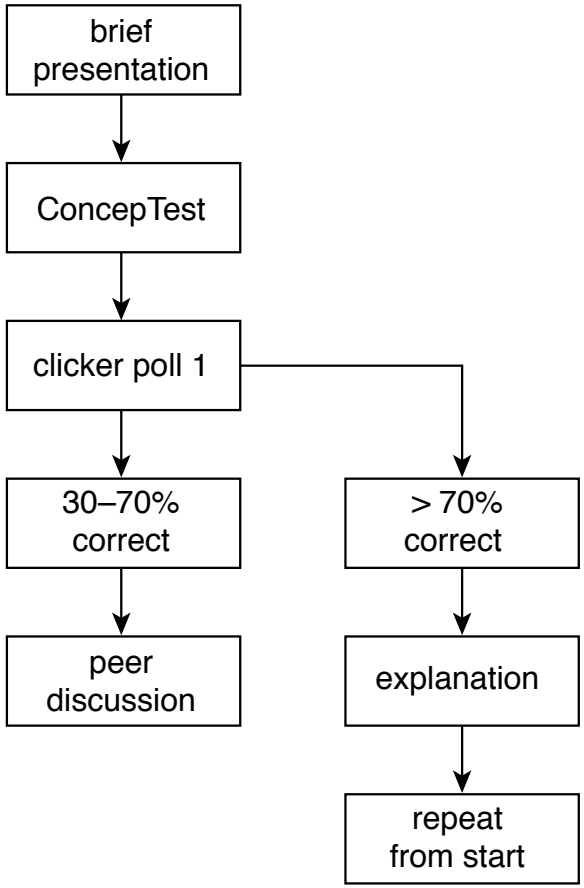
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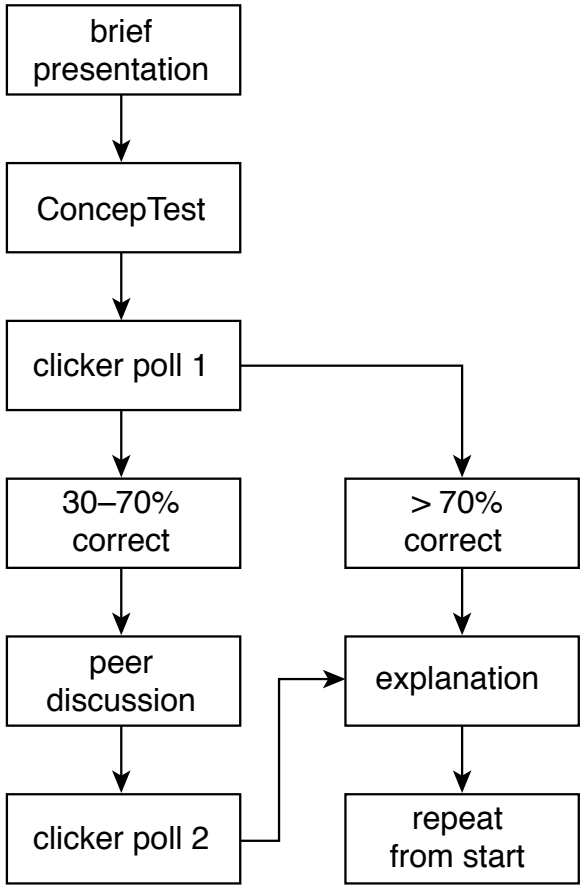
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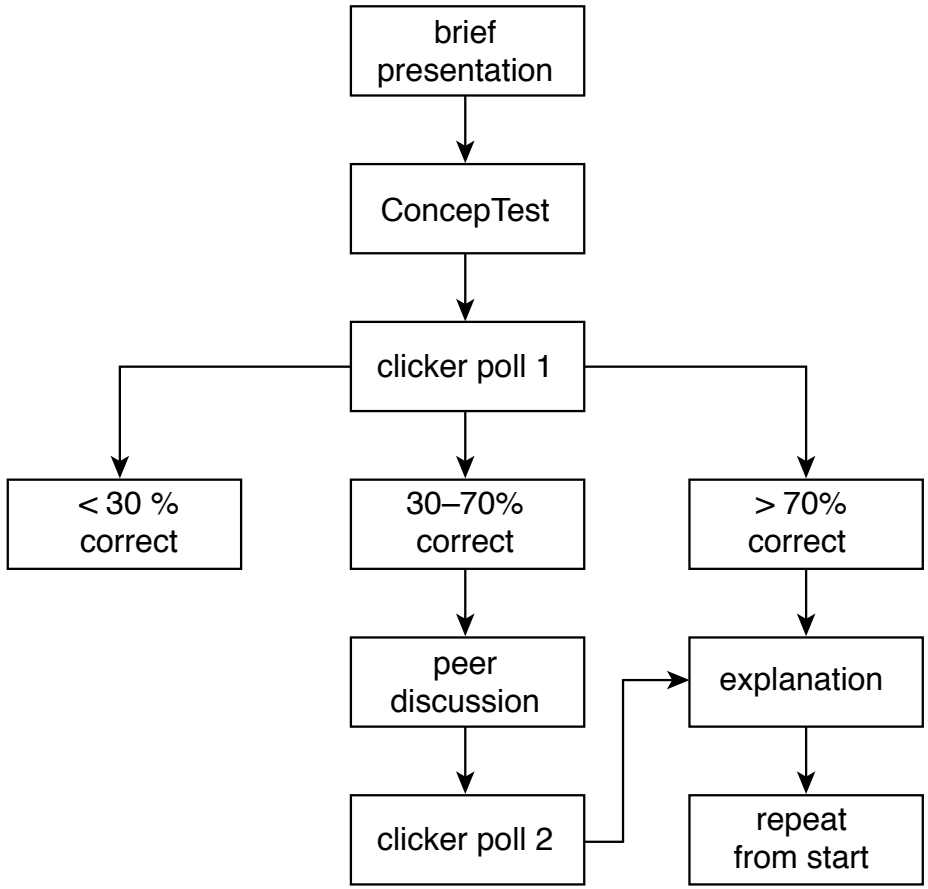
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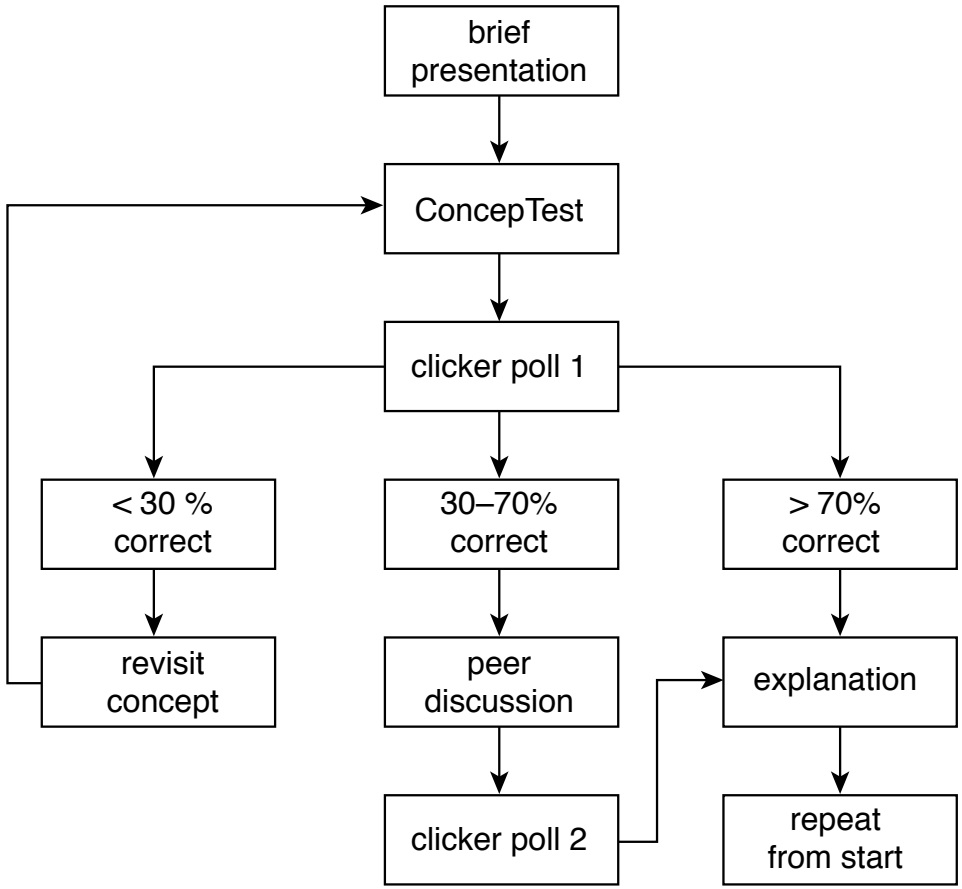
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peer discussion
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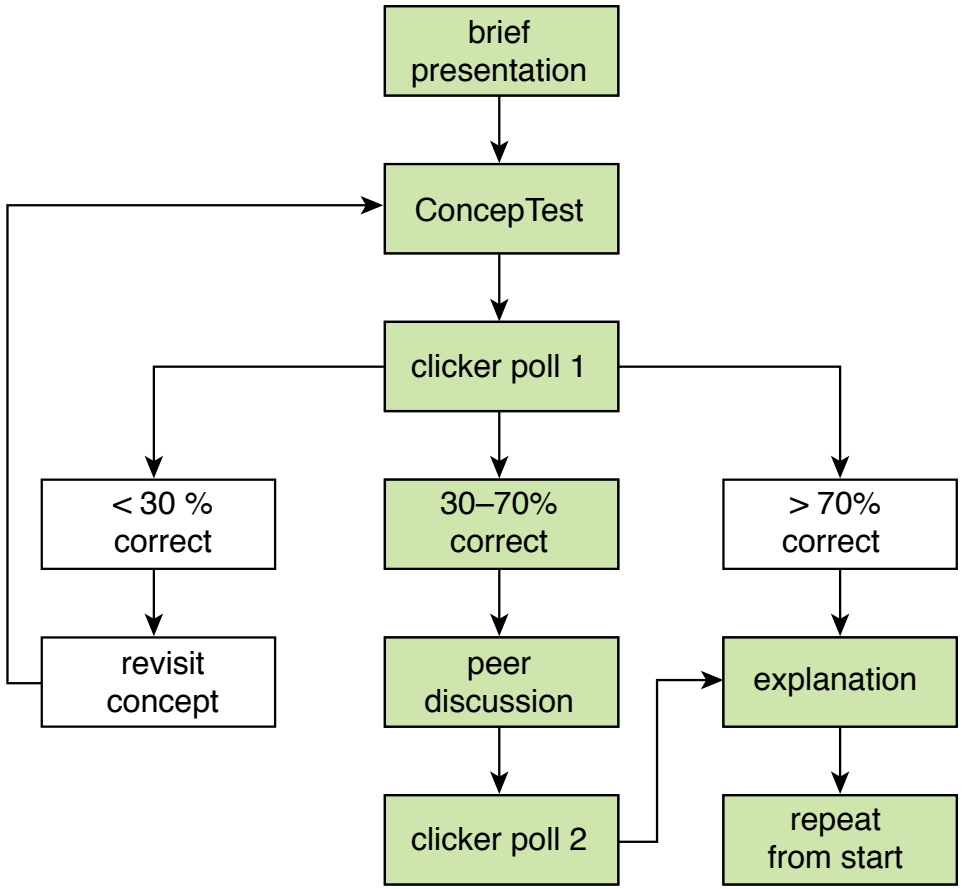
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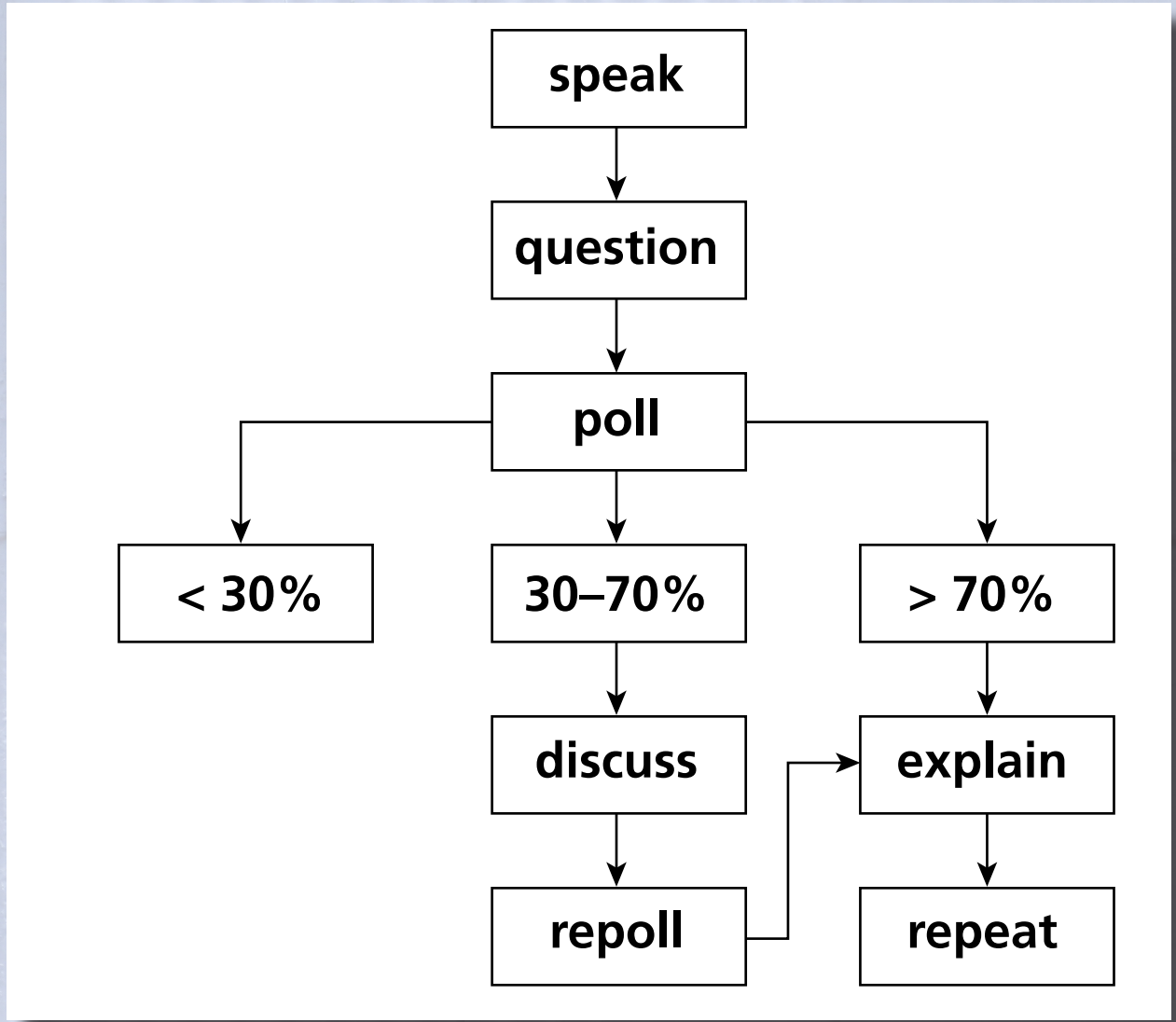
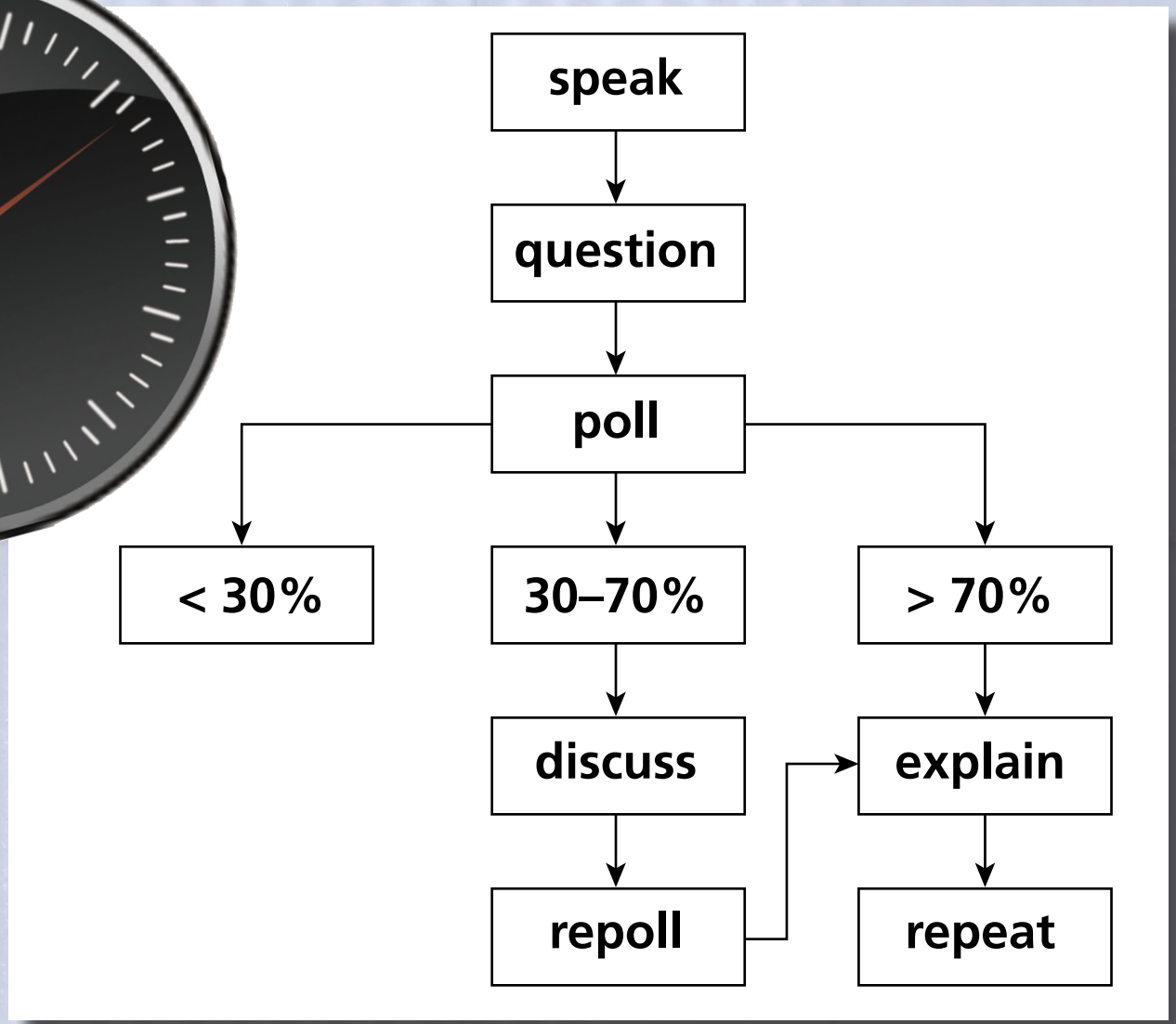


1 lecture 2 PI 3 PI 2.0



1 lecture 2 PI 3 PI 2.0

1 lecture

2 PI

3 PI 2.0

1 education 2 PI 3 PI 2.0

Learning Catalytics:

- implement proven, researched pedagogy

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- use consumer devices

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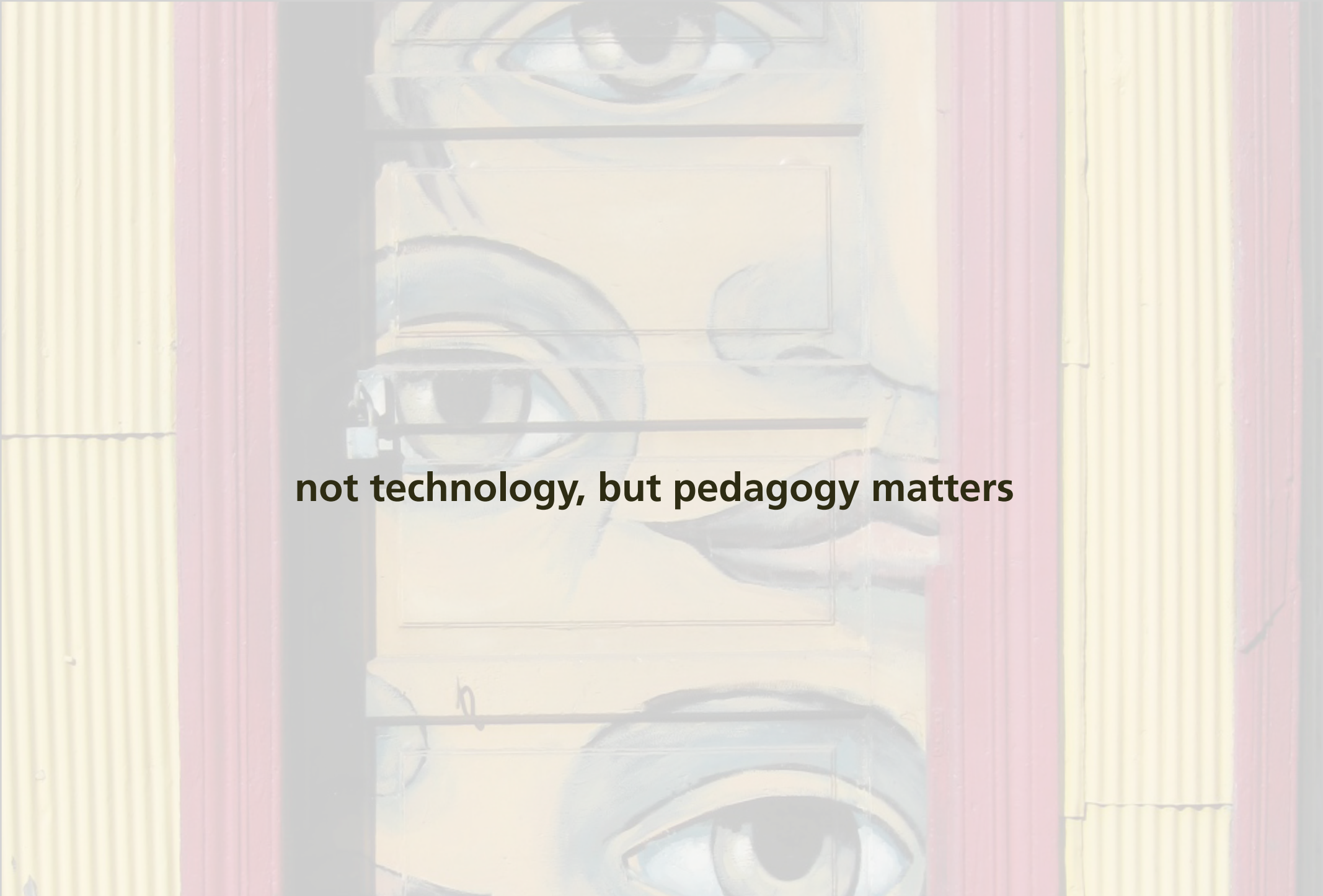
- avoid pitfalls of MC assessment

Learning Catalytics:

- implement proven, researched pedagogy
- use consumer devices
- avoid pitfalls of MC assessment
- create a smart classroom *anywhere*



not technology, but pedagogy matters

Funding:

National Science Foundation

for a copy of this presentation:

http://ericmazur.com

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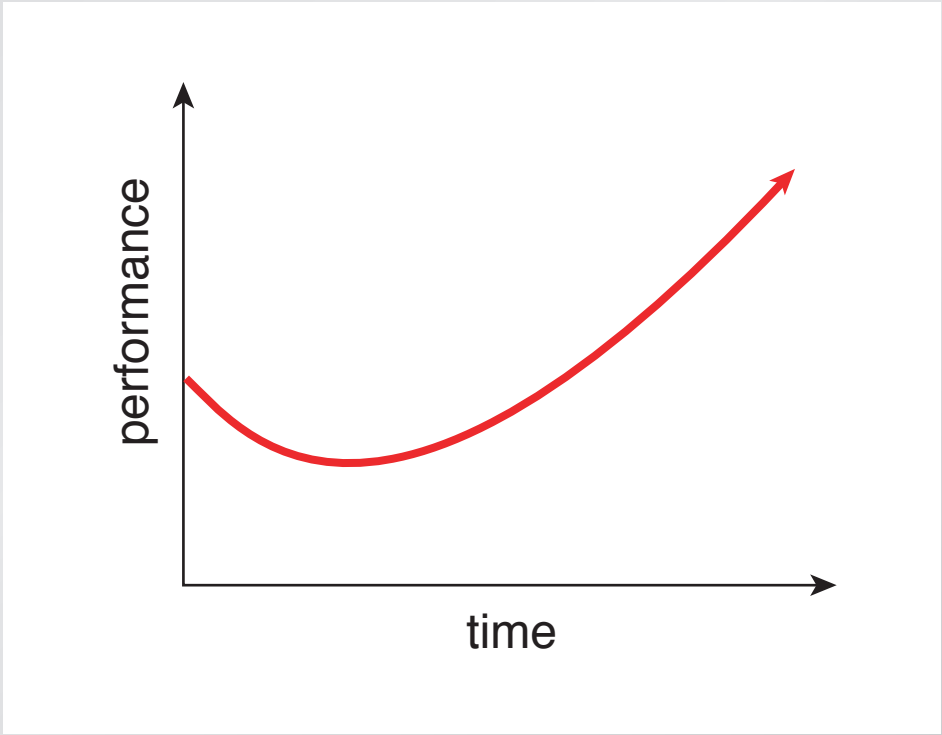
Implementing PI & JiTT

"How do I deal with students who resist this new approach to studying?"

Implementing PI & JiTT

After changing, things might get *worse* before they get better!



Implementing PI & JiTT

Written on Wednesday Feb 16, two weeks into the course:

> Subject: concerns
>
> Professor Mazur,
>
> Here are a few concerns. I speak for many of my classmates.
>
> 1) You are giving us WAY to much work. After spending multiple hours on the problem set, and not being able to figure out many of the questions, I now see that we have an additional 6 or 7 pages or homework in the workbook. I just spent 4 hours on the lab, and I am not confident on almost half of the questions. This is more work than I have had all semester in all of my other classes combined.
>
> 2) If you are going to give us this much work, I would suggest re-structuring the lectures. I find the readings very difficult to understand. I am not a bad student (I got a solid A in physics 1a), but it is very difficult to internalize the readings. You should spend most of the lecture going over, point by point, the readings in their entirety. While the PRS clickers are fun, they do not help me understand the complex material.
>
> I am extremely flustered by the incredibly large amount of work, and my inability to understand it, and I am strongly considering dropping the course.

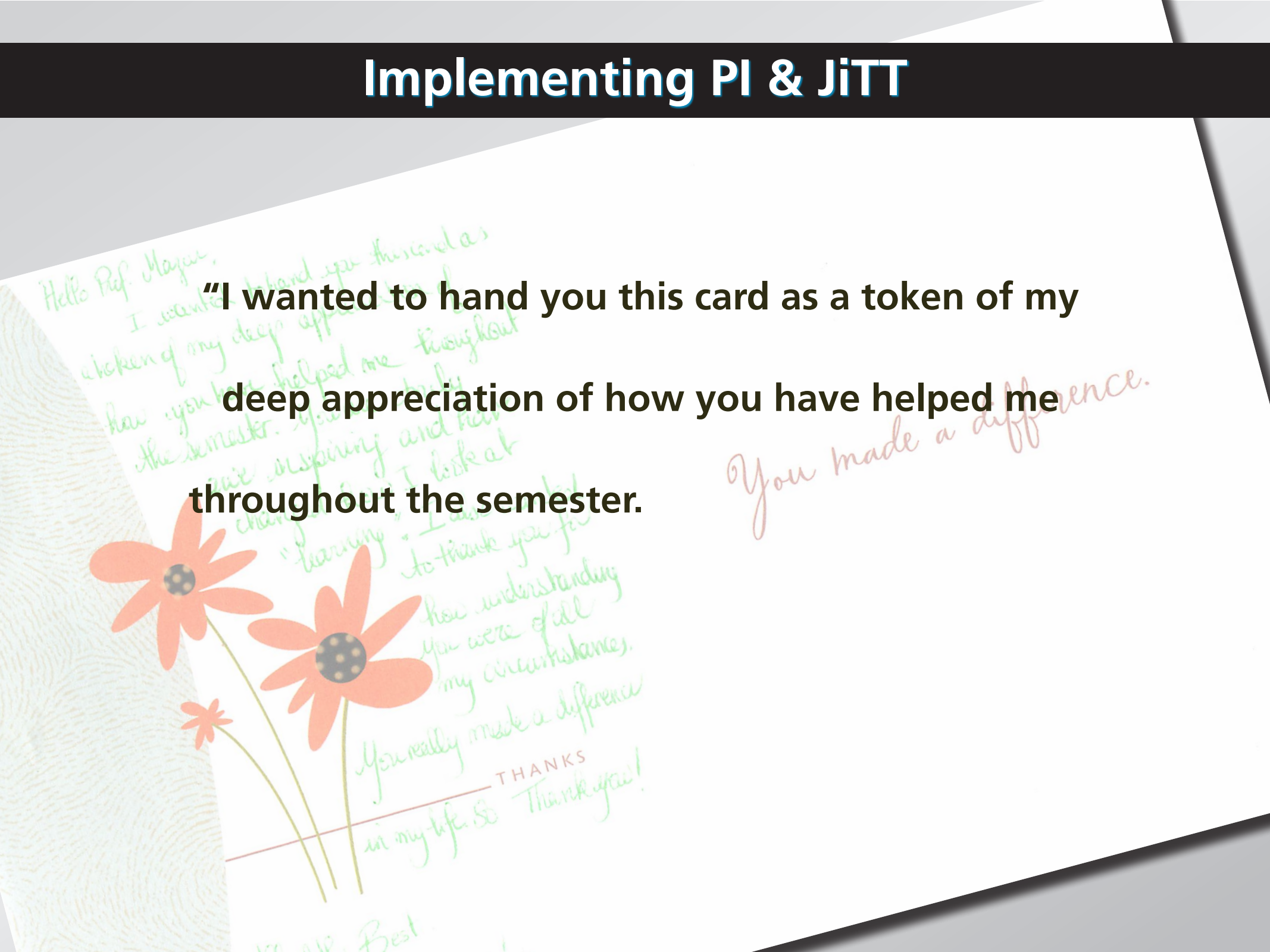
Implementing PI & JiTT

Written on Monday May 23, just after the final exam:

> Subject: Thanks!
>
> Professor Mazur,
>
> First of all I want to thank you for a great semester. You are an excellent professor, and it is clear that you truly care about each and every student.
>
> The exam went well today. I'm not sure to what extent you will curve the final grades (if at all), but it looks like I may be right around the cutoff point between an A and an A-. I studied as hard as I could and I'm keeping my fingers crossed about the A, but no matter what happens with my grade you should know that you are one of the best professors that I have ever had at Harvard.
>
> Thanks again!

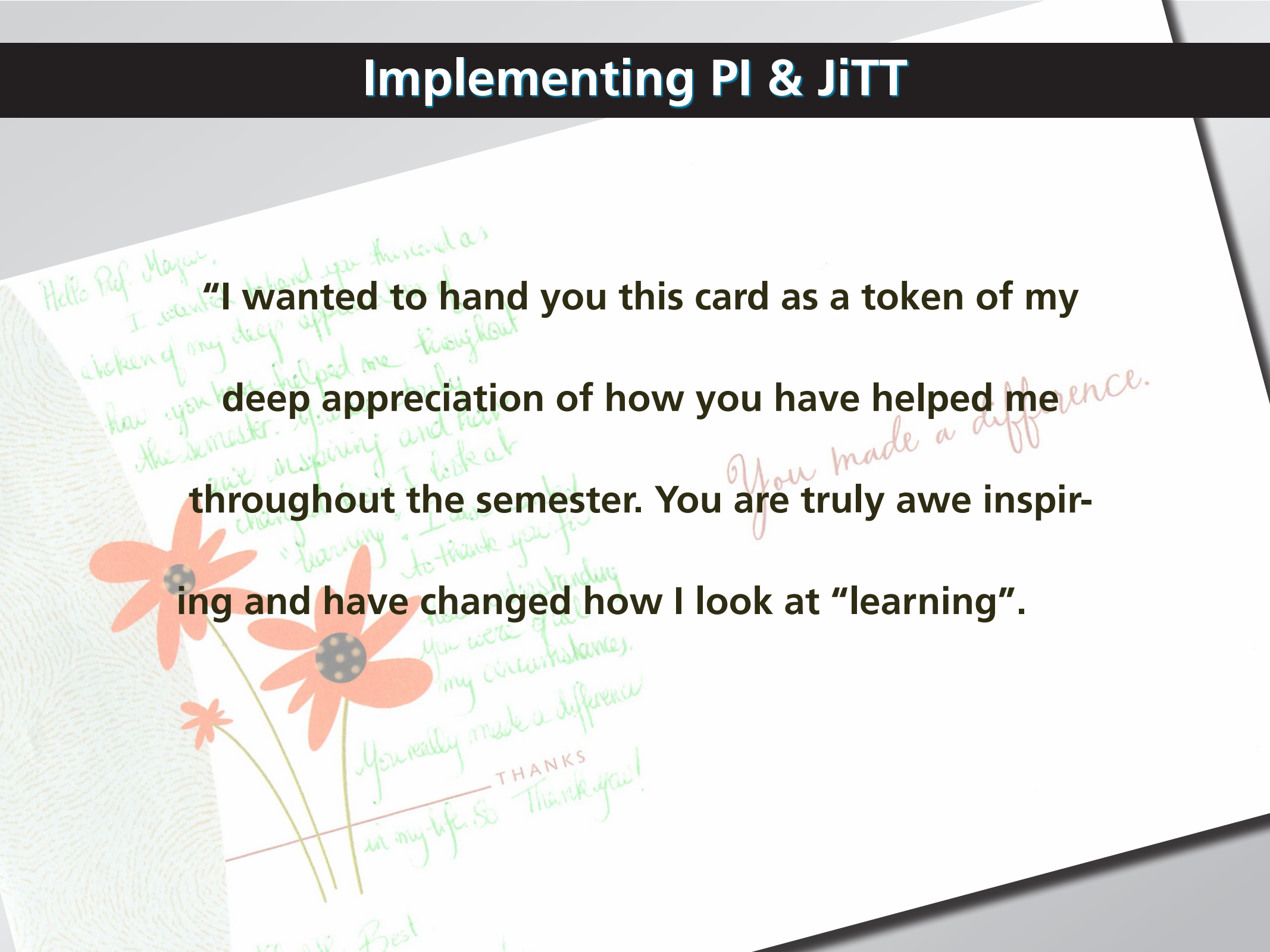
Implementing PI & JiTT

Implementing PI & JiTT

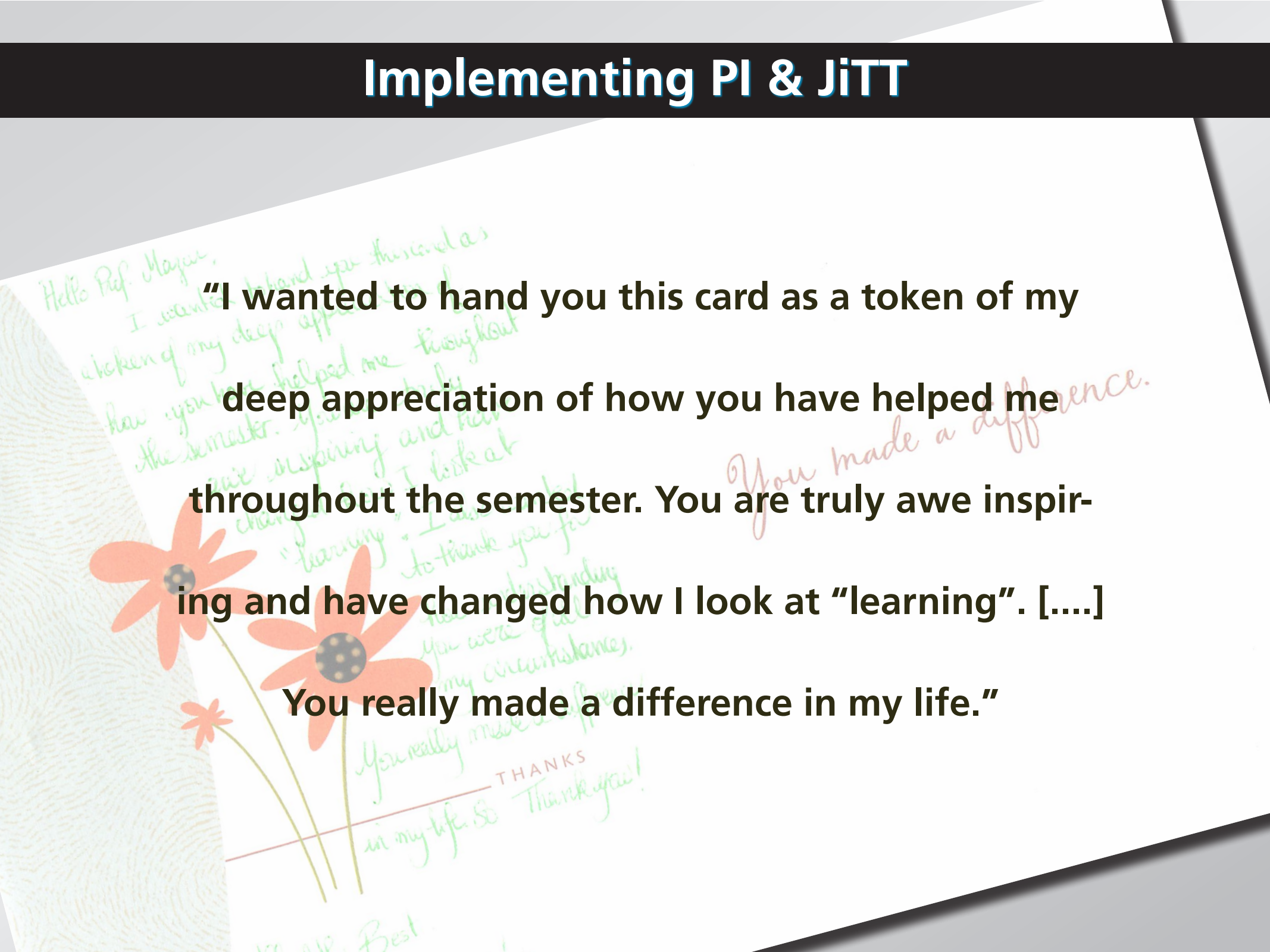


"I wanted to hand you this card as a token of my deep appreciation of how you have helped me throughout the semester.

Implementing PI & JiTT



Implementing PI & JiTT



"I wanted to hand you this card as a token of my deep appreciation of how you have helped me throughout the semester. You are truly awe inspiring and have changed how I look at "learning". [....] You really made a difference in my life."

Implementing PI & JiTT

and don’t forget…

Implementing PI & JiTT

and don’t forget…

PI leads to better learning and retention!