

Engaging Students One-on-One, All At Once Session 1



Peer Instruction Online Course
Taibah University
10 September 2014

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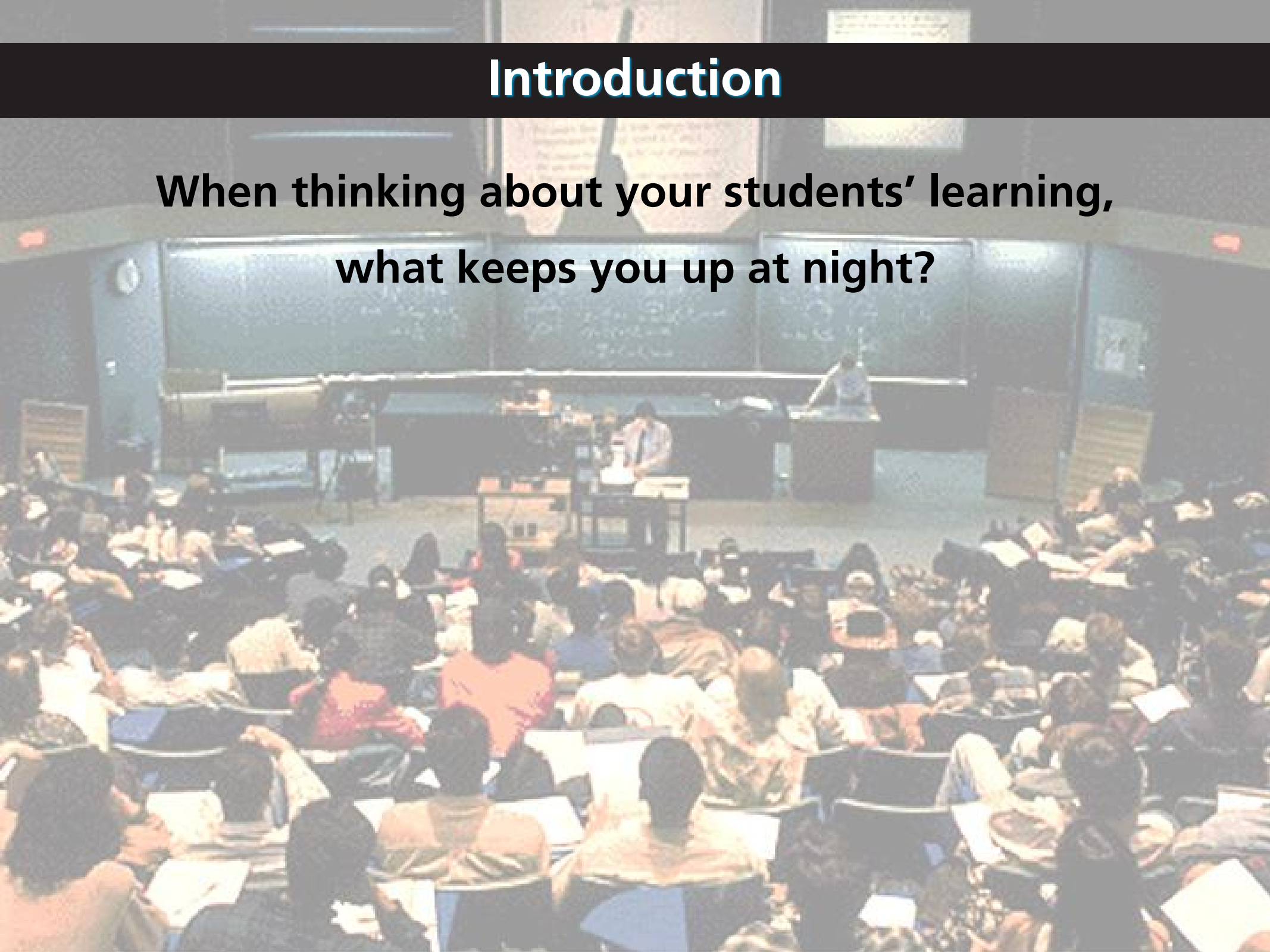
@eric_mazur

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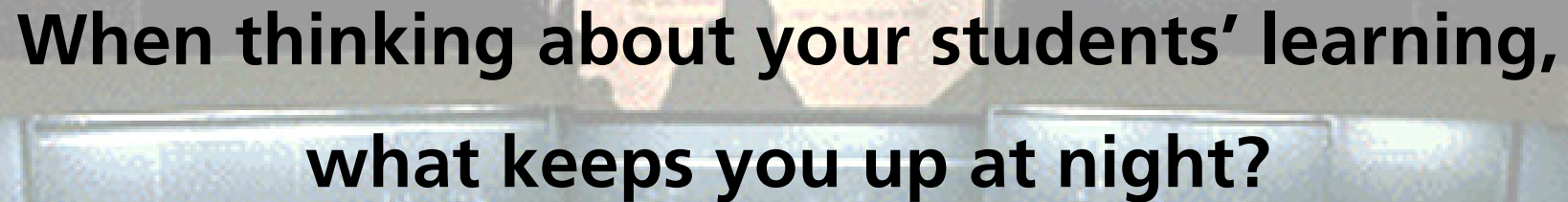


Introduction

**When thinking about your students' learning,
what keeps you up at night?**



Introduction

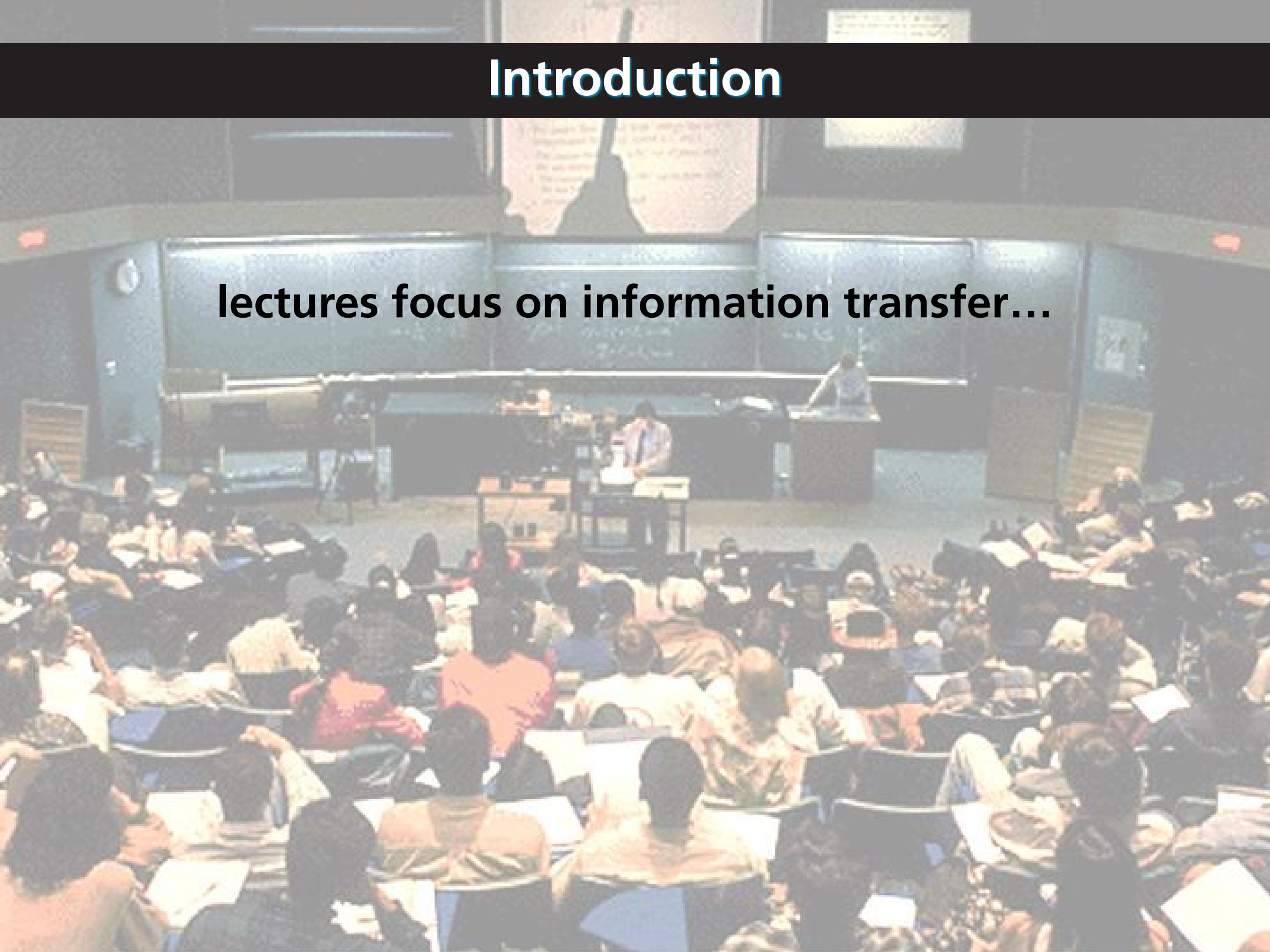


**When thinking about your students' learning,
what keeps you up at night?**



Introduction

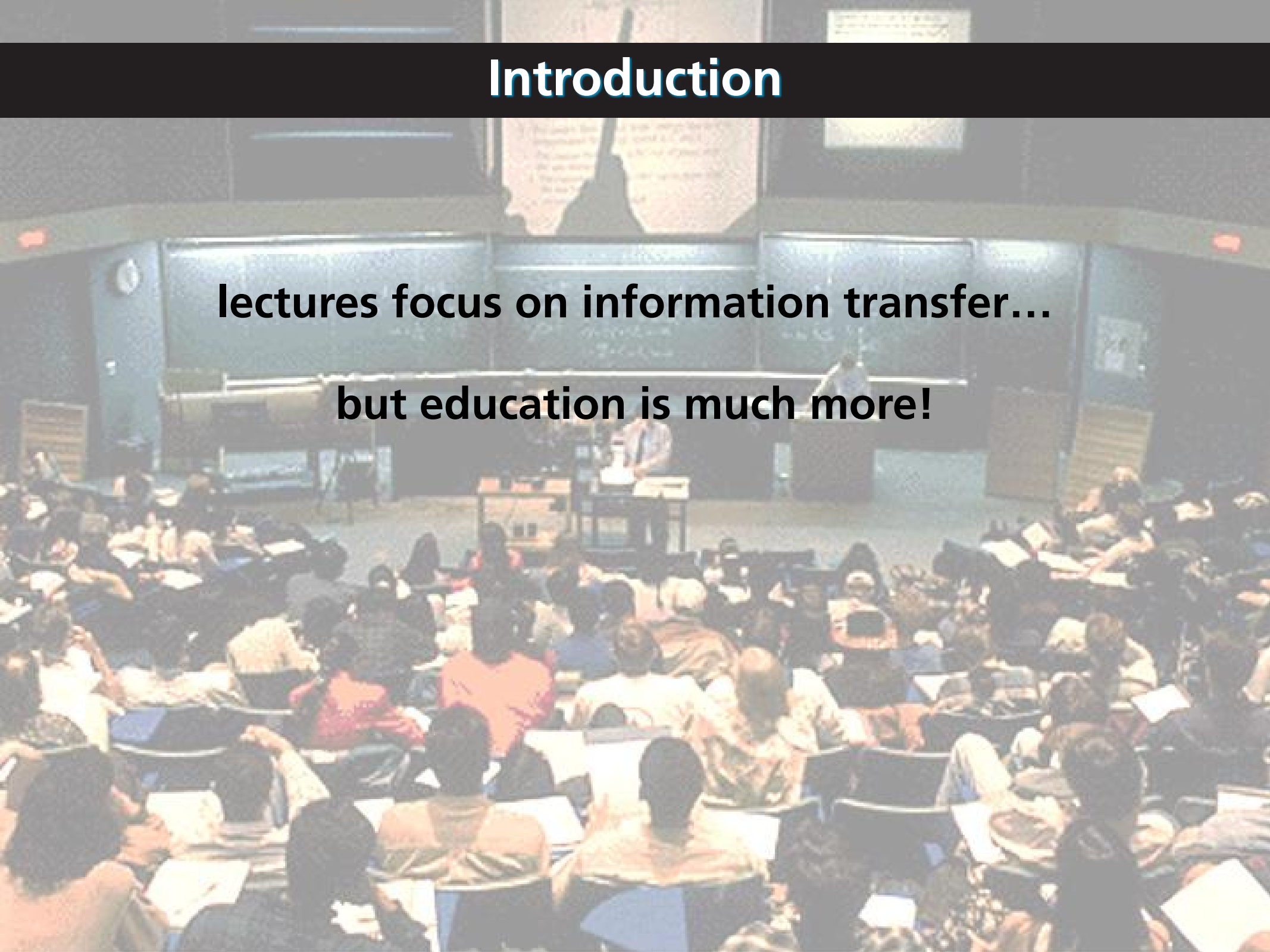
lectures focus on information transfer...



Introduction

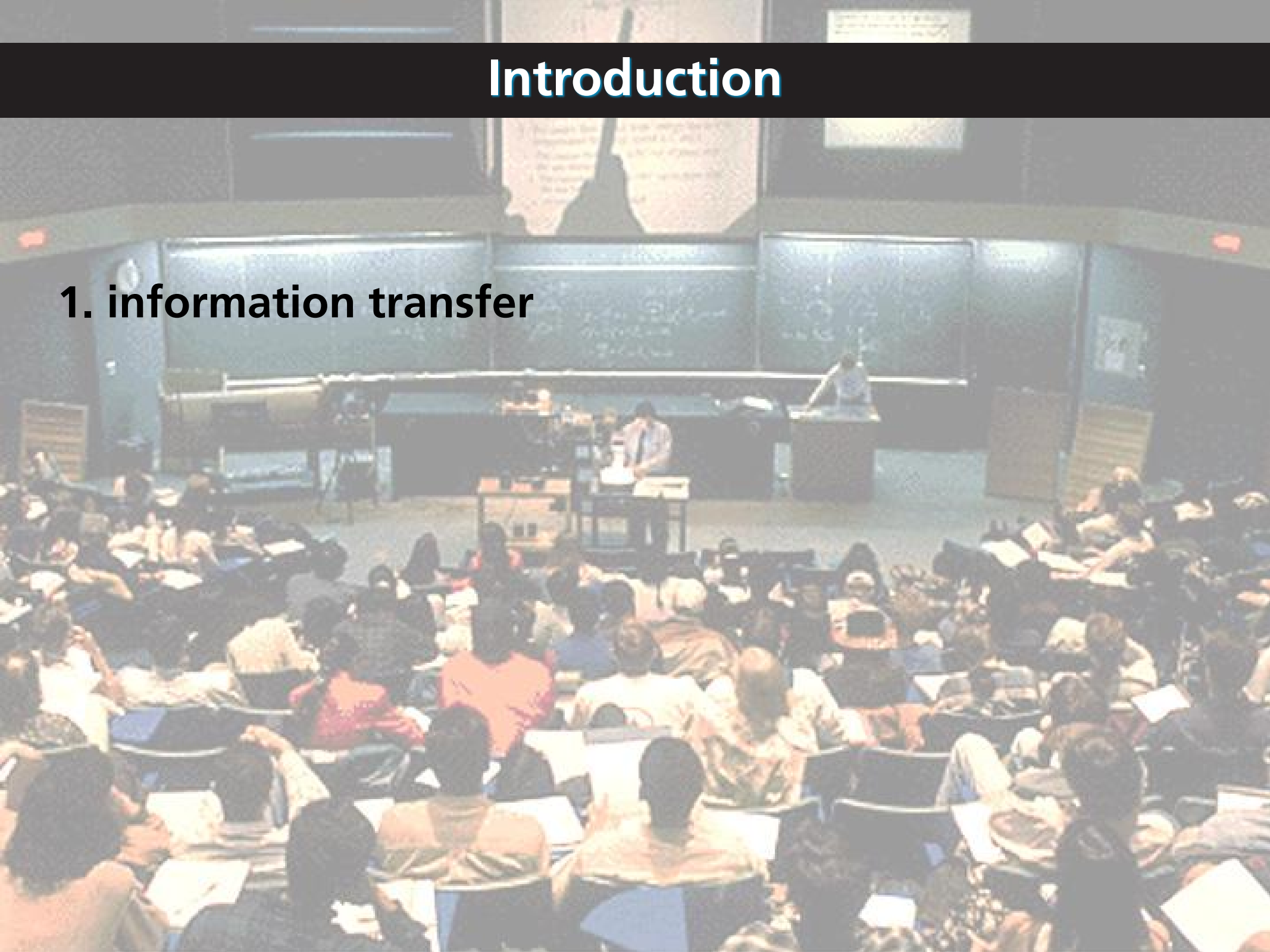
lectures focus on information transfer...

but education is much more!



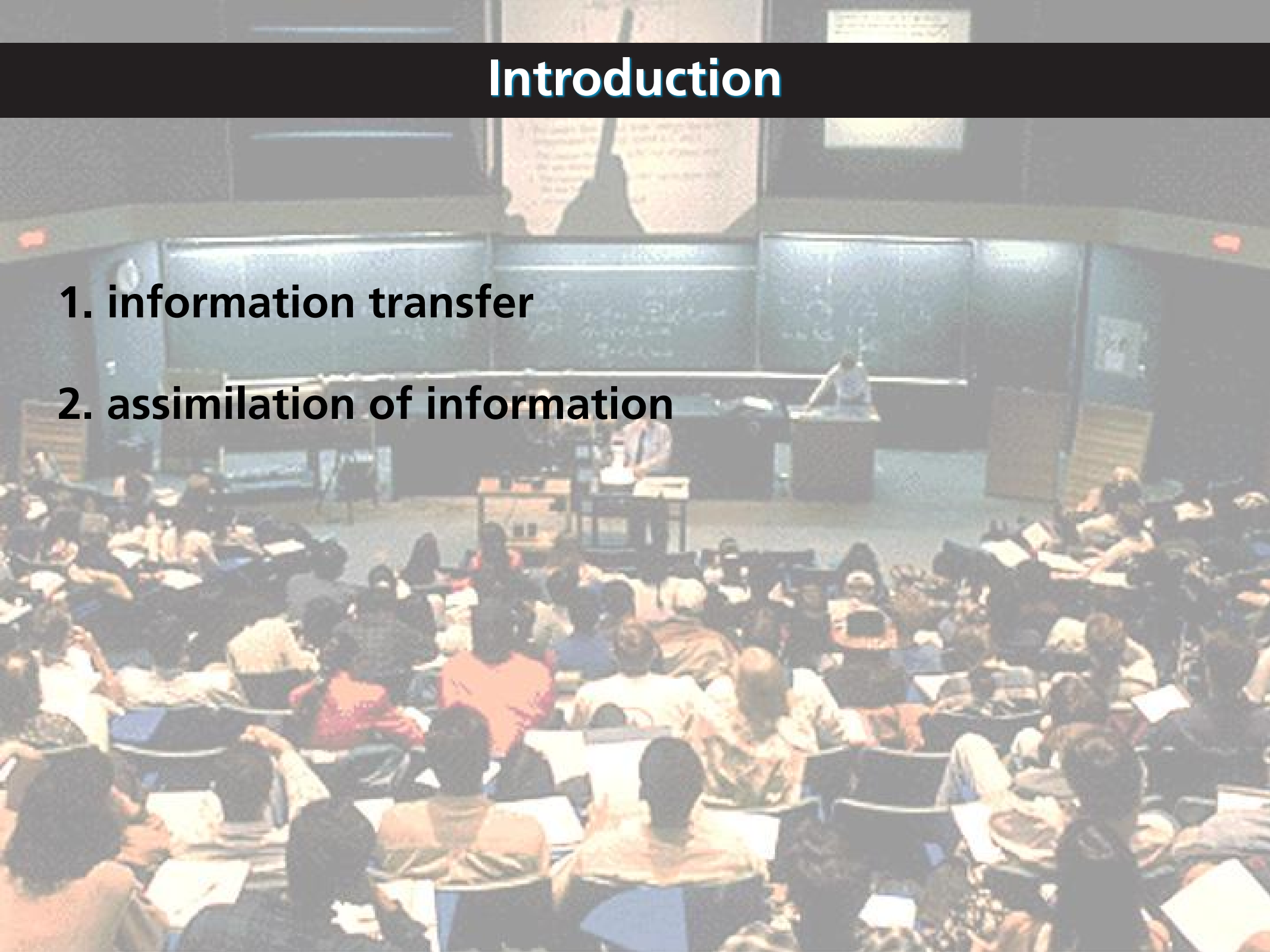
Introduction

1. information transfer



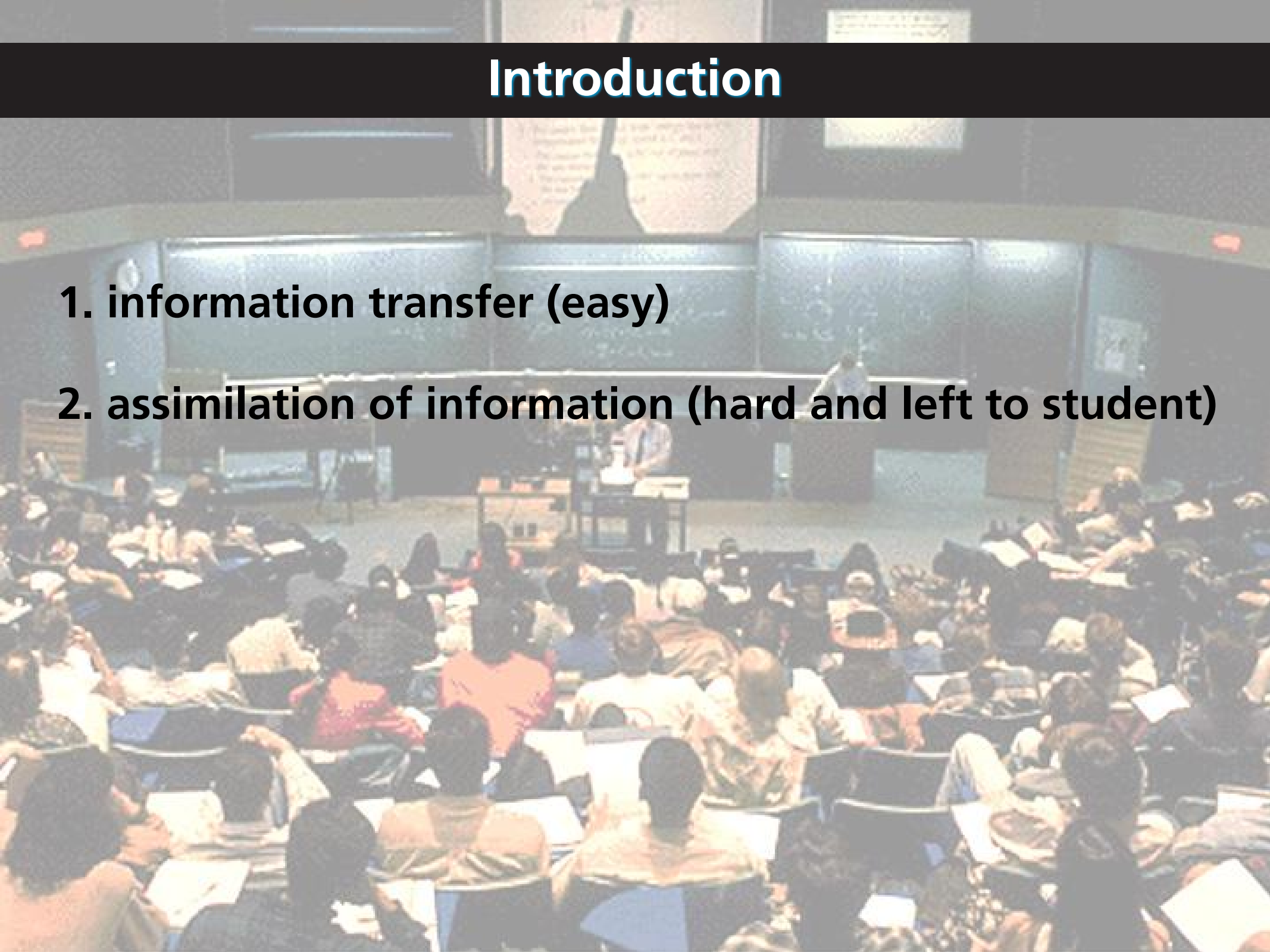
Introduction

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

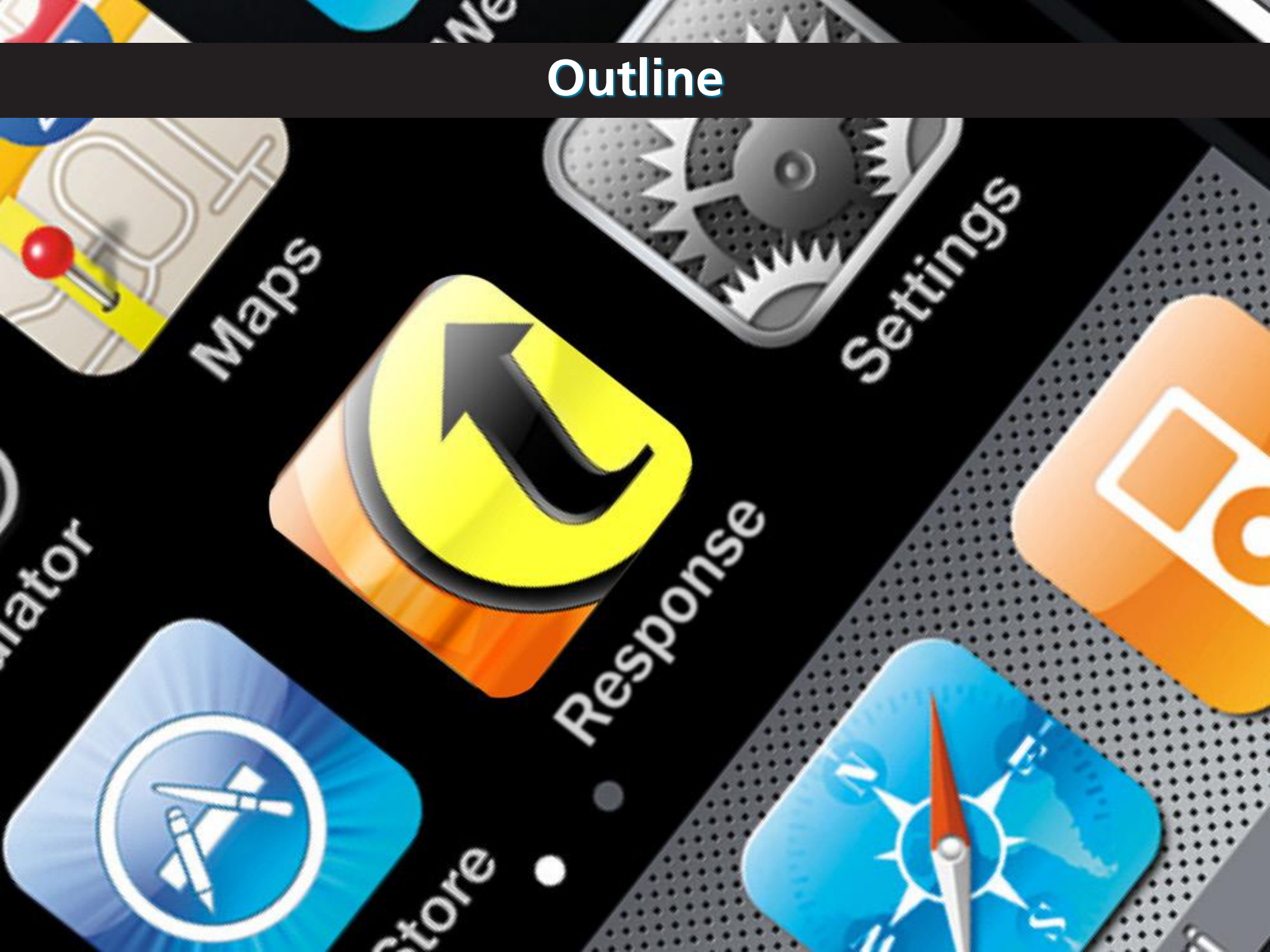
How to move information transfer out of classroom?

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**
- **ConceptTests**

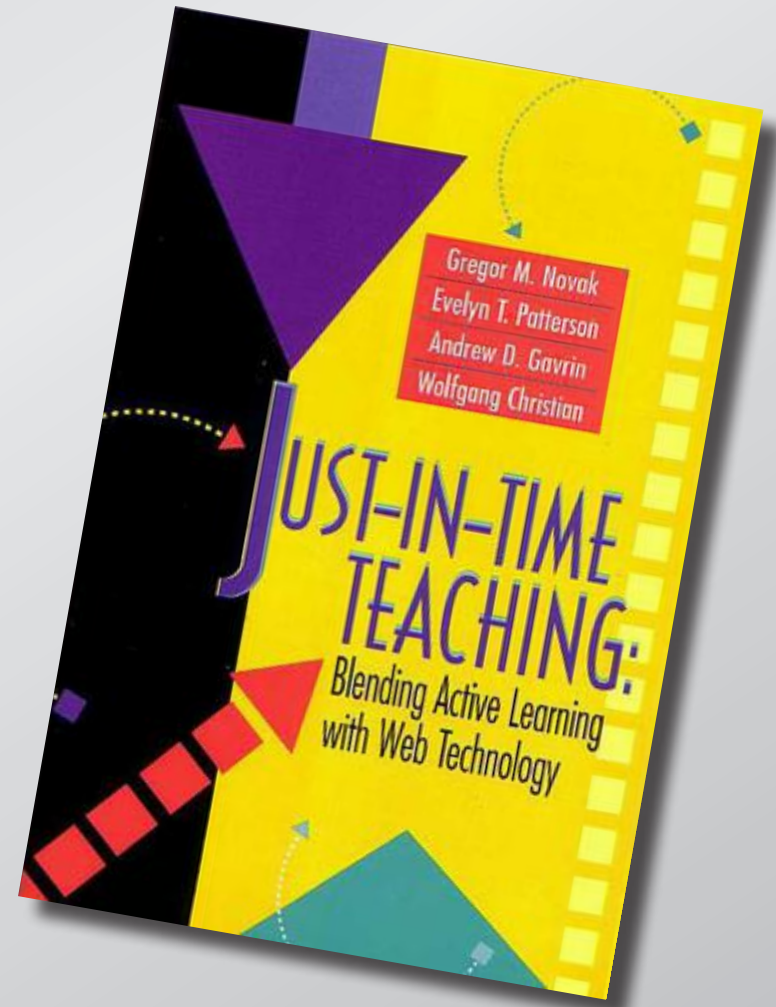
PI & JiTT Overview

“How to motivate students to read before class?”

PI & JiTT Overview

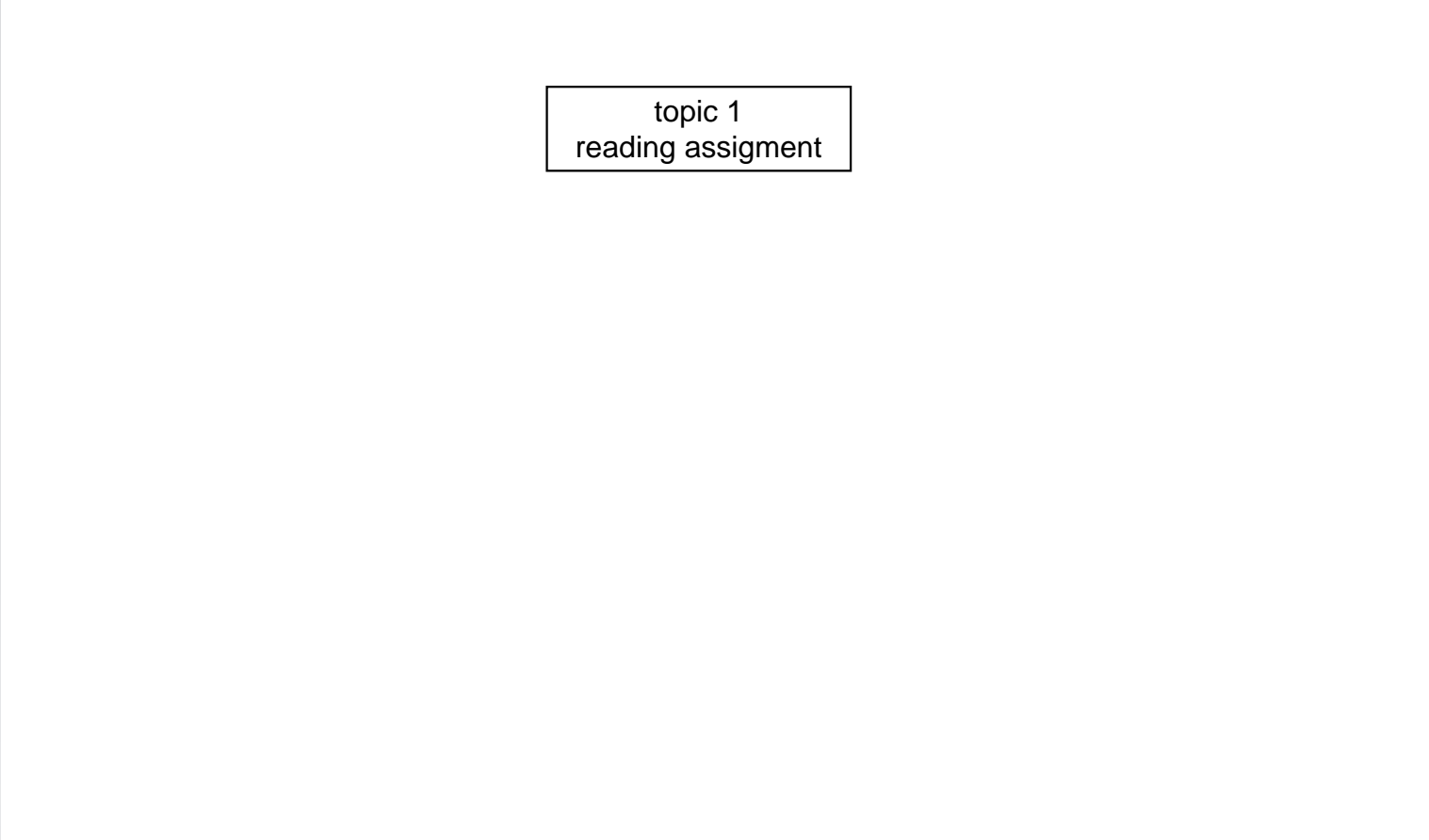
Just-in-time-Teaching (JiTT)

www.jitt.org



PI & JiTT Overview

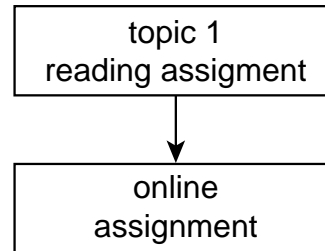
JiTT workflow



topic 1
reading assignment

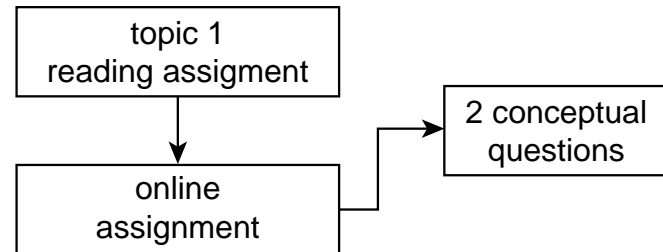
PI & JiTT Overview

JiTT workflow



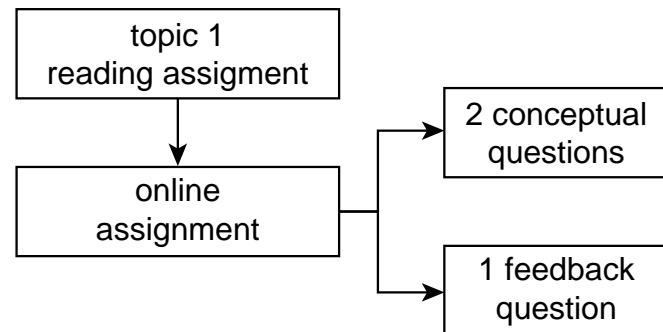
PI & JiTT Overview

JiTT workflow



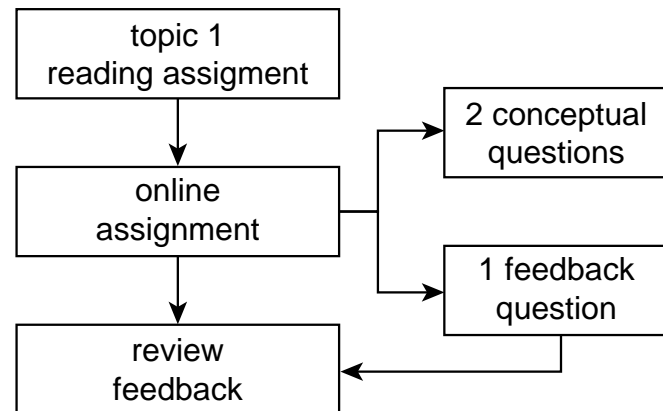
PI & JiTT Overview

JiTT workflow



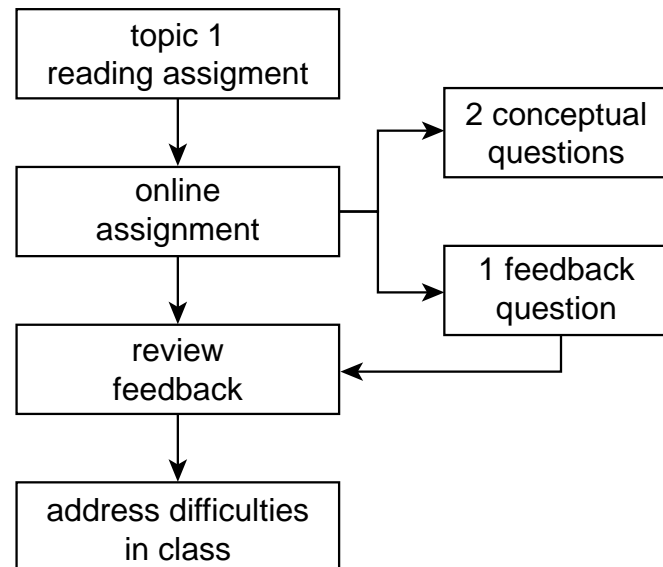
PI & JiTT Overview

JiTT workflow



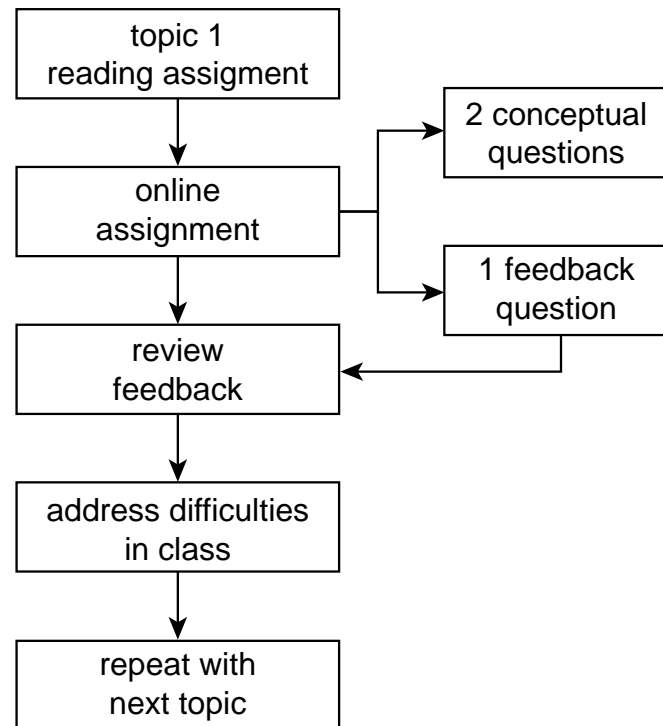
PI & JiTT Overview

JiTT workflow



PI & JiTT Overview

JiTT workflow



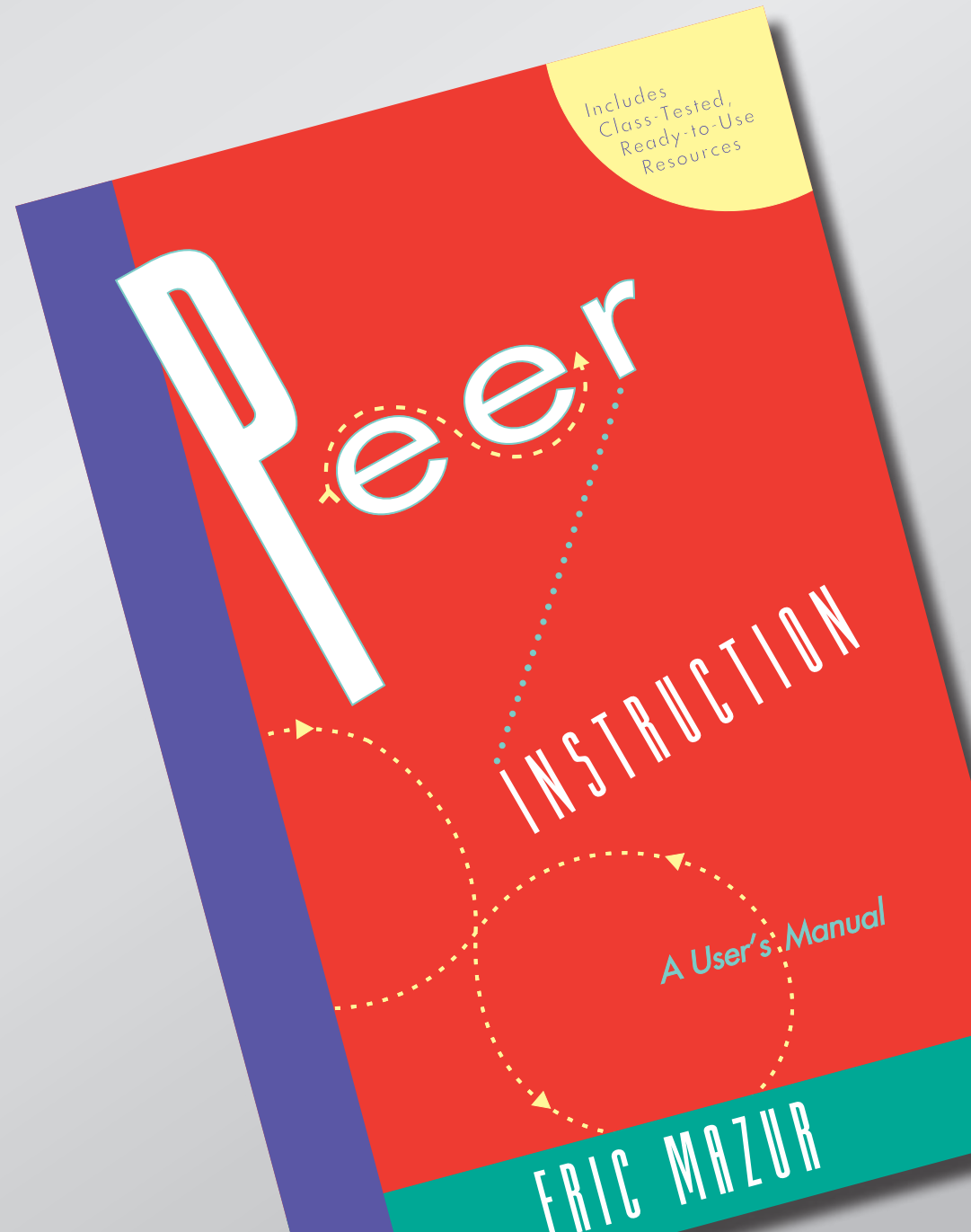
PI & JiTT Overview

JiTT:

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

PI & JiTT Overview

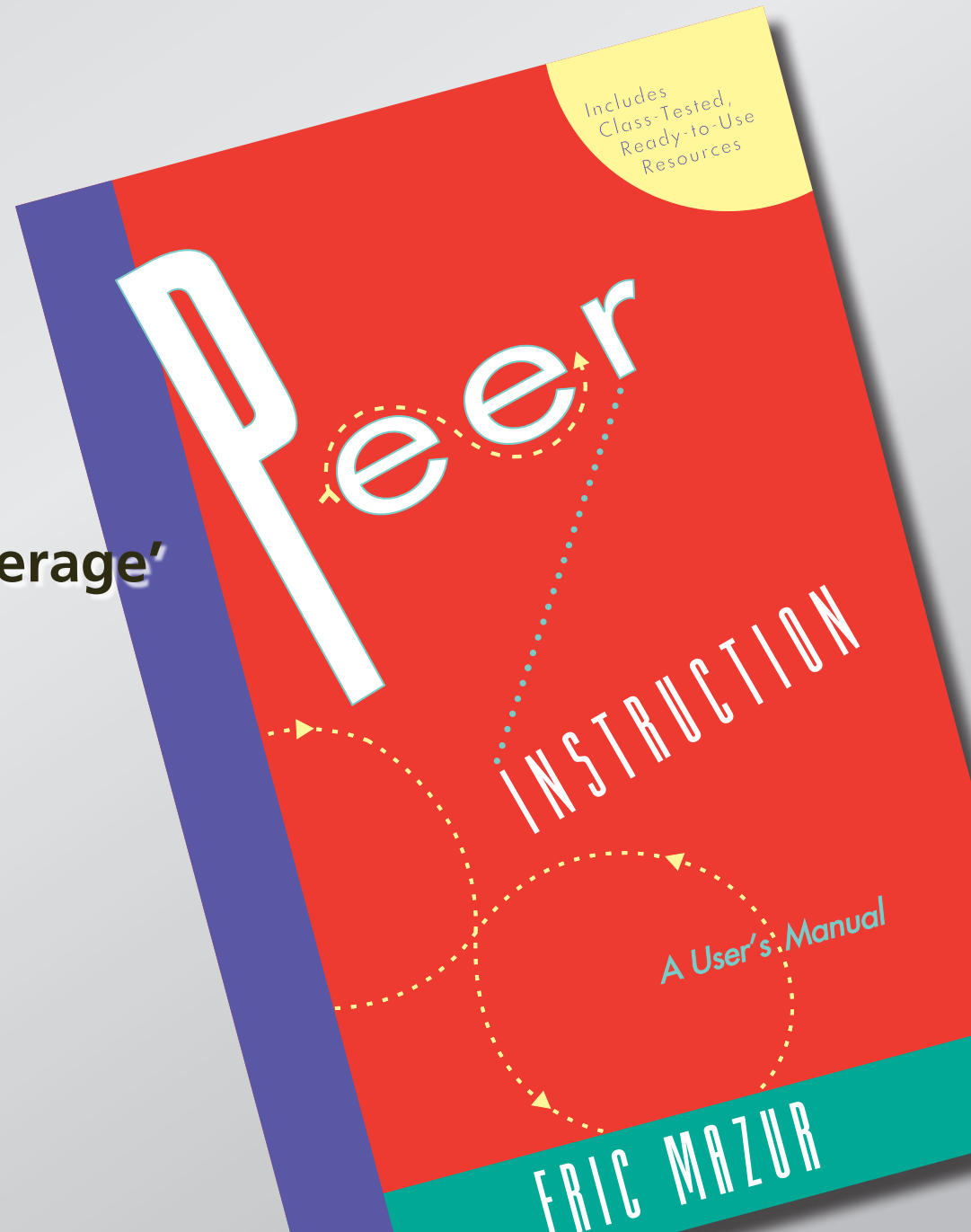
Peer Instruction (PI)



PI & JiTT Overview

Main features:

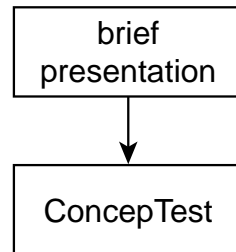
- pre-class reading
- in-class: depth, not 'coverage'
- ConcepTests



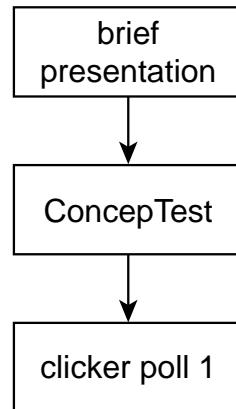
PI & JiTT Overview

brief
presentation

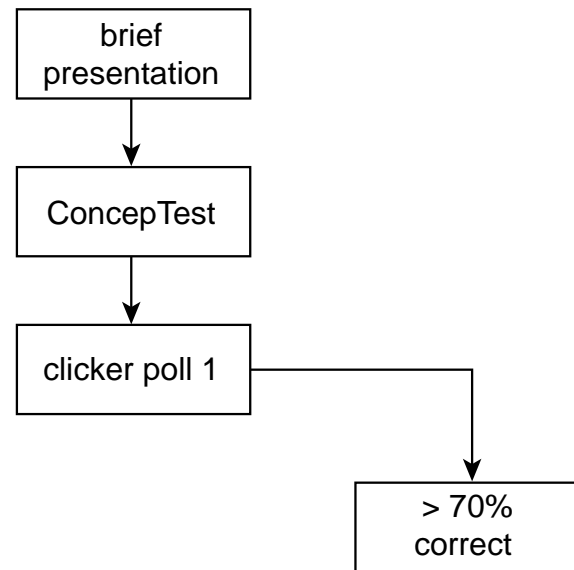
PI & JiTT Overview



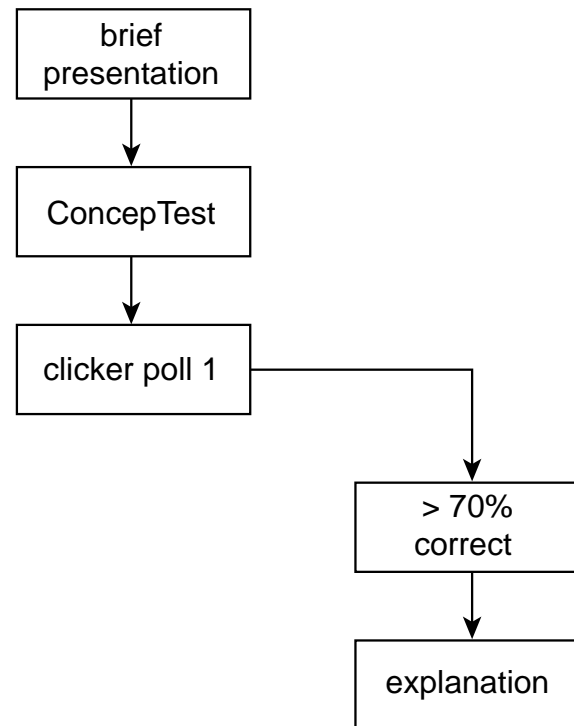
PI & JiTT Overview



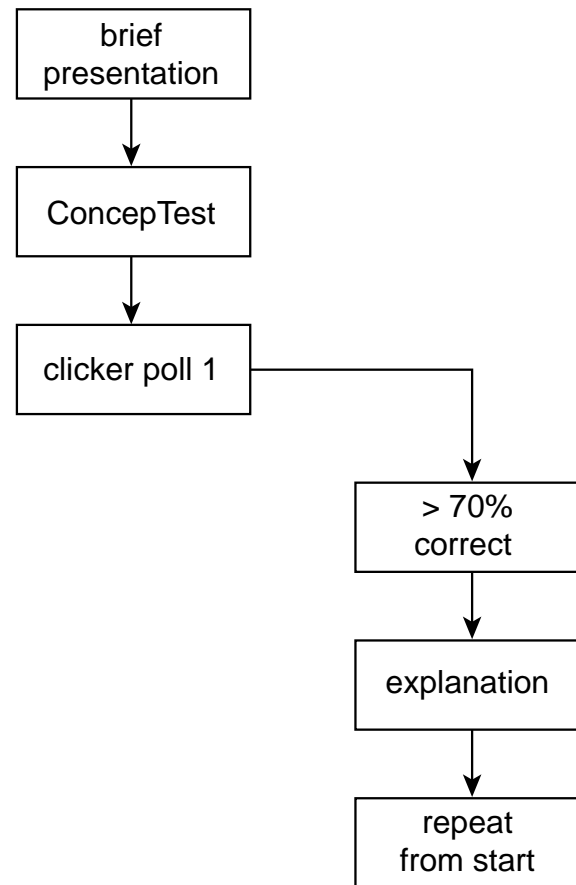
PI & JiTT Overview



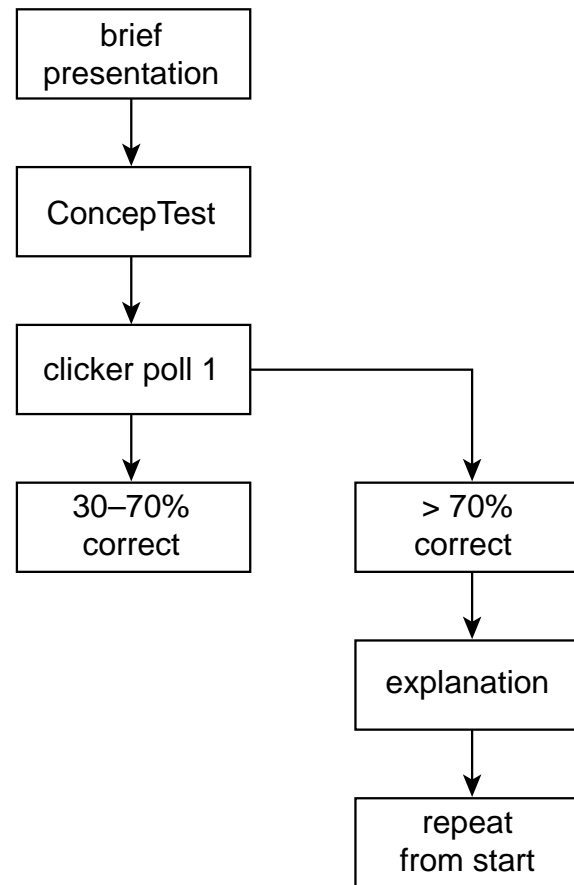
PI & JiTT Overview



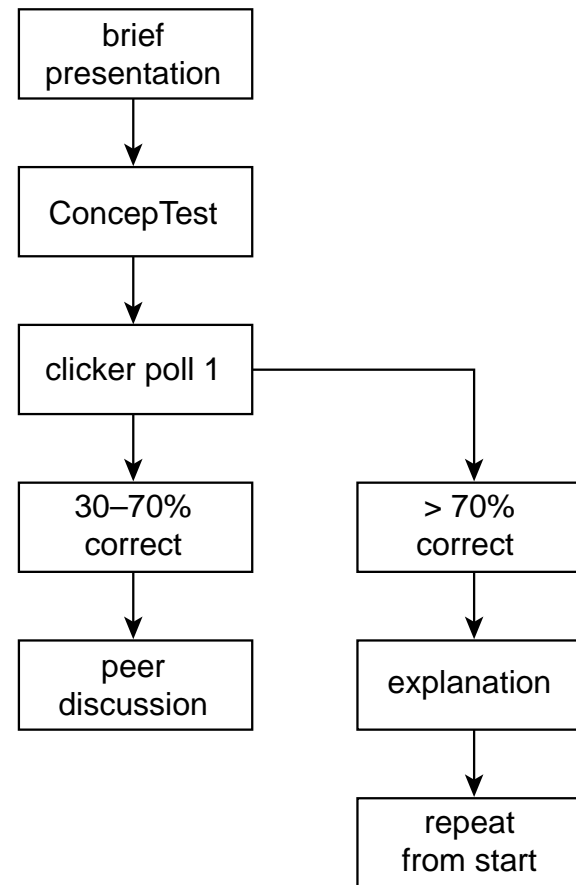
PI & JiTT Overview



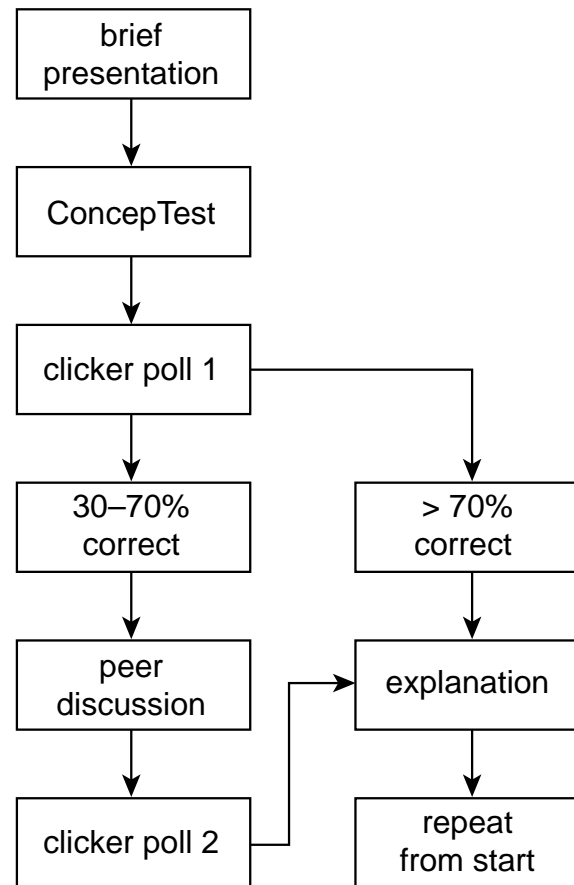
PI & JiTT Overview



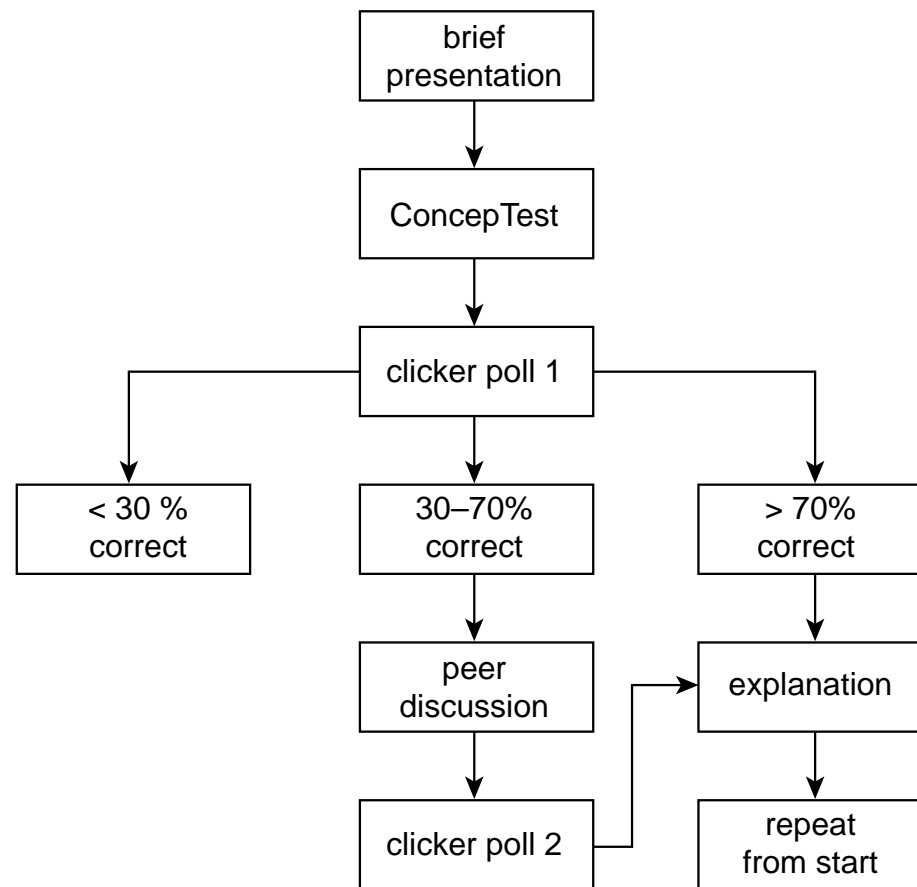
PI & JiTT Overview



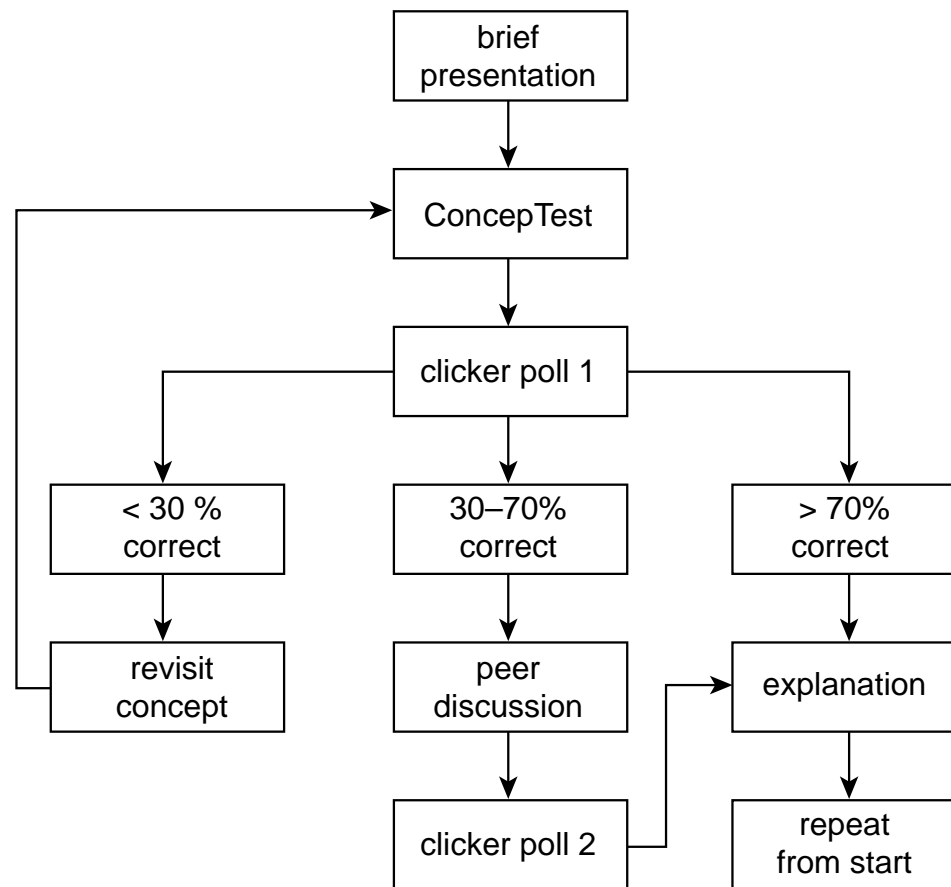
PI & JiTT Overview



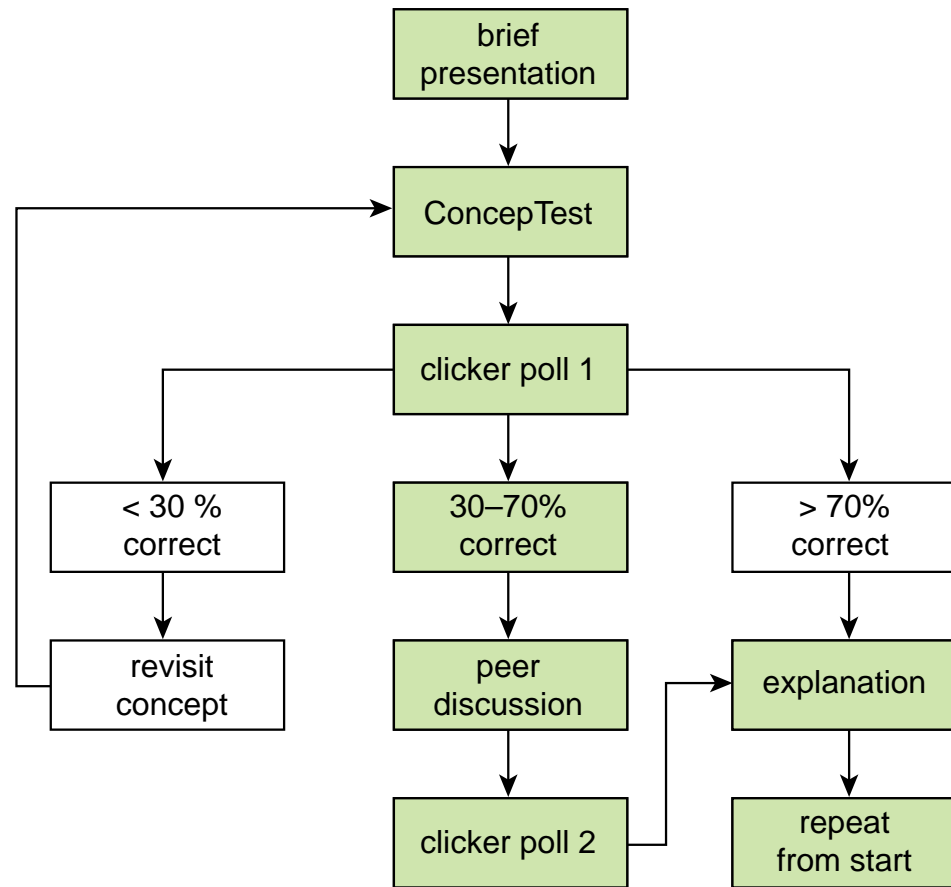
PI & JiTT Overview



PI & JiTT Overview



PI & JiTT Overview



PI & JiTT Overview

PI:

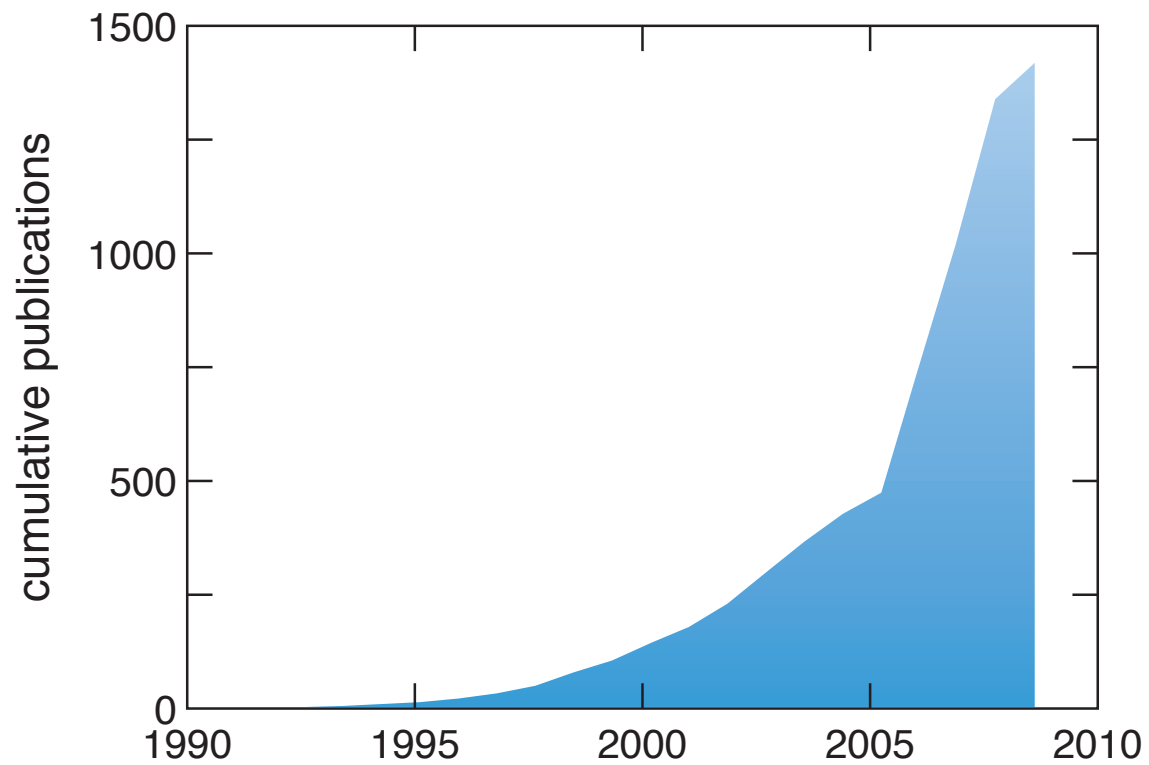
- **helps students overcome difficulties**
- **encourages deep learning**
- **provides depth, not “coverage”**
- **helps you become aware of misconceptions**

PI & JiTT Overview

“What is the percentage of success of PI?”

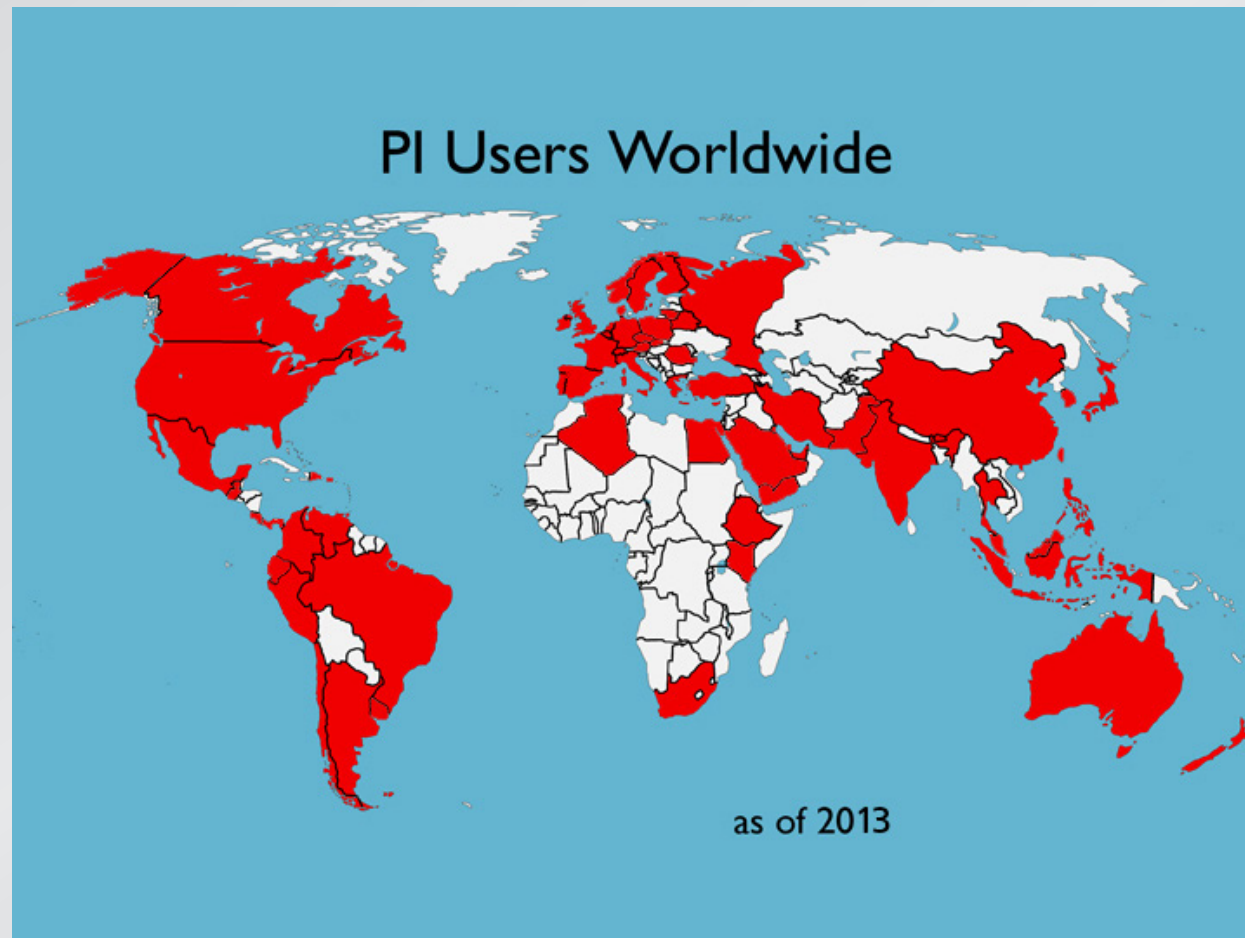
PI & JiTT Overview

publications mentioning PI



PI & JiTT Overview

registered PI users



PI & JiTT Overview

“What to do if students who know the answer sit together and students who don’t know the answer sit together?”

PI & JiTT Overview

find someone with a *different* answer

Let's try it!

Online Polling System

1. Go to learningcatalytics.com/demo
2. Enter info, click "Start"
3. Join session 123456789

Let's try it!

statistics

Let's try it!



Let's try it!



$1/6$

Let's try it!



Let's try it!



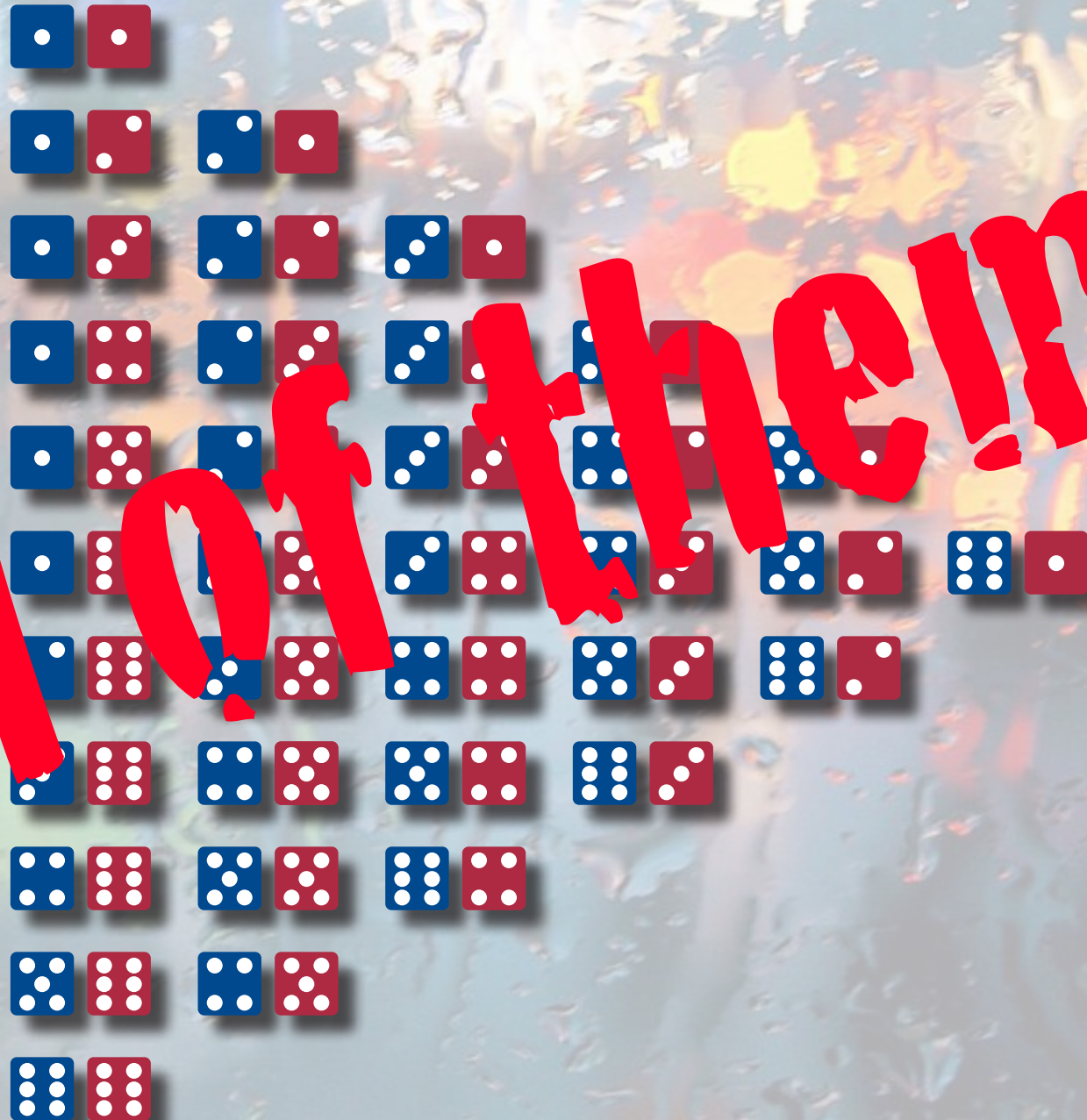
1/36

Let's try it!



Let's try it!

all of them



Let's try it!

A meteorologist predicts a 40% chance of rain in London and a 70% chance in Chicago.

Let's try it!

A meteorologist predicts a 40% chance of rain in London and a 70% chance in Chicago.

What is the most likely outcome?

Let's try it!

A meteorologist predicts a 40% chance of rain in London and a 70% chance in Chicago.

What is the most likely outcome?

- 1. It rains only in London**
- 2. It rains only in Chicago**
- 3. It rains in London and Chicago**
- 4. It rains in London or Chicago**

Let's try it!

A meteorologist predicts a 40% chance of rain in London and a 70% chance in Chicago.

What is the most likely outcome?

1. It rains only in London
2. It rains only in Chicago
3. It rains in London and Chicago
4. It rains in London or Chicago

you got all fired up!

Let's try it!

A meteorologist predicts a 40% chance of rain in London and a 70% chance in Chicago.

What is the most likely outcome?

- 1. It rains only in London**
- 2. It rains only in Chicago**
- 3. It rains in London and Chicago**
- 4. It rains in London or Chicago**

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!

A meteorologist predicts a 40% chance of rain in London and a 70% chance in Chicago.

What is the most likely outcome?

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Let's try it!

ALL CASES

LONDON

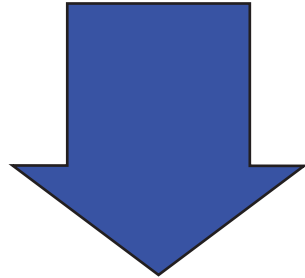
CHICAGO

Let's try it!

ALL CASES

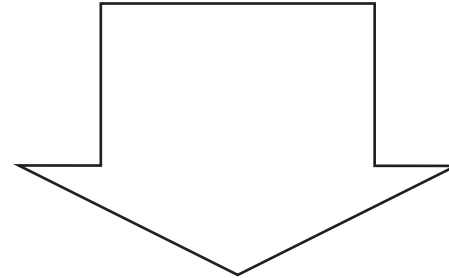
LONDON

40%



rain

60%

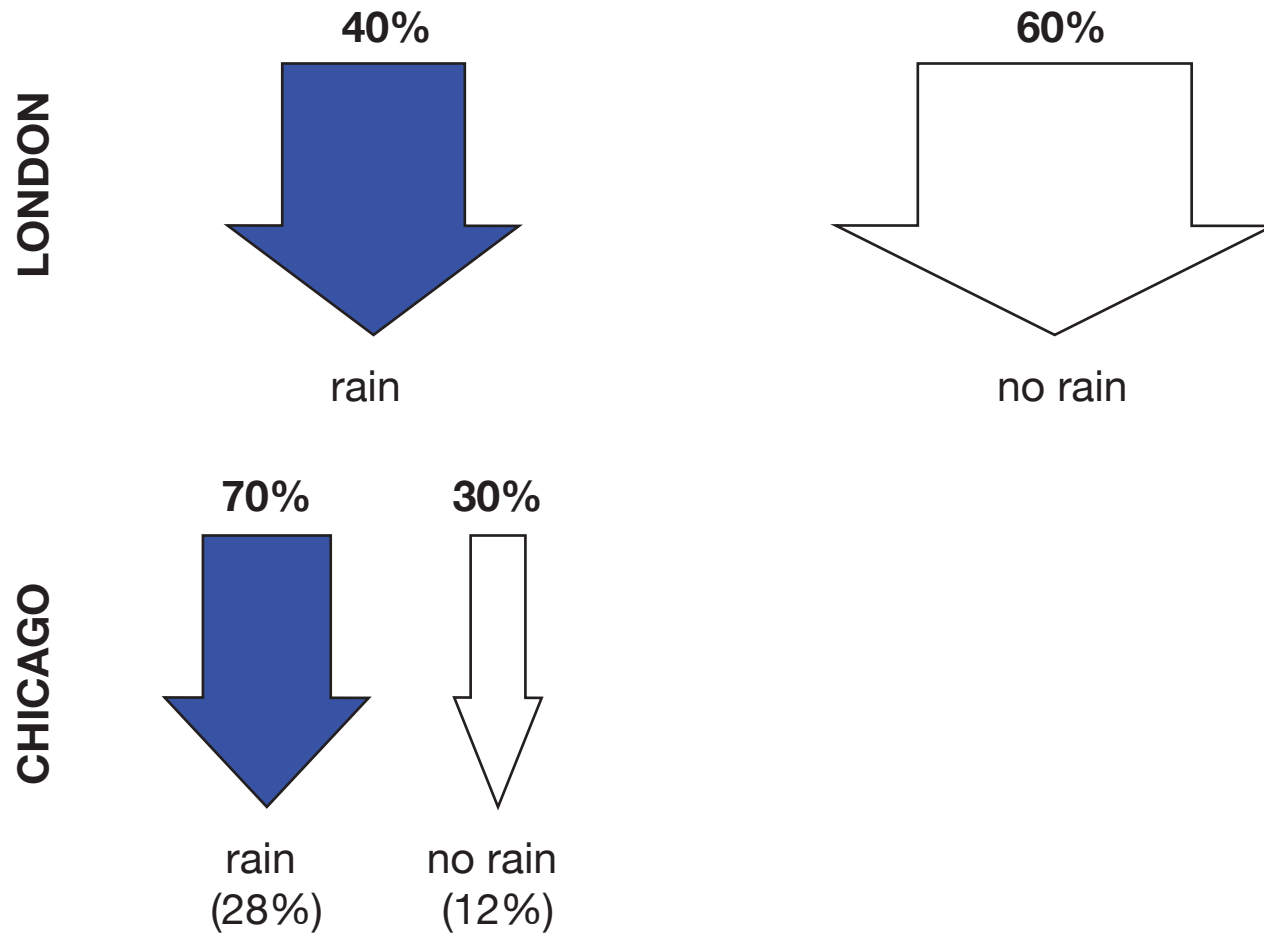


no rain

CHICAGO

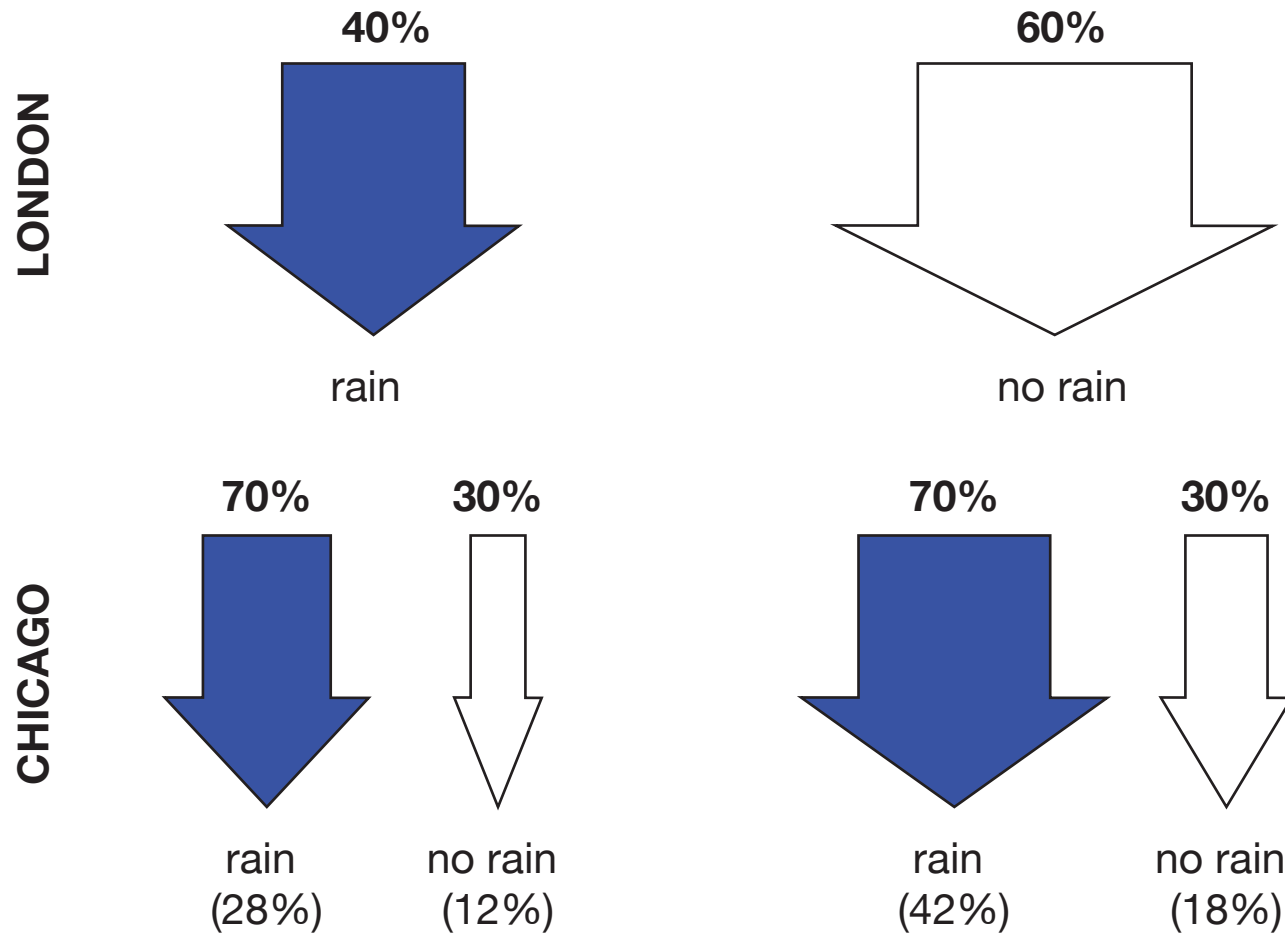
Let's try it!

ALL CASES



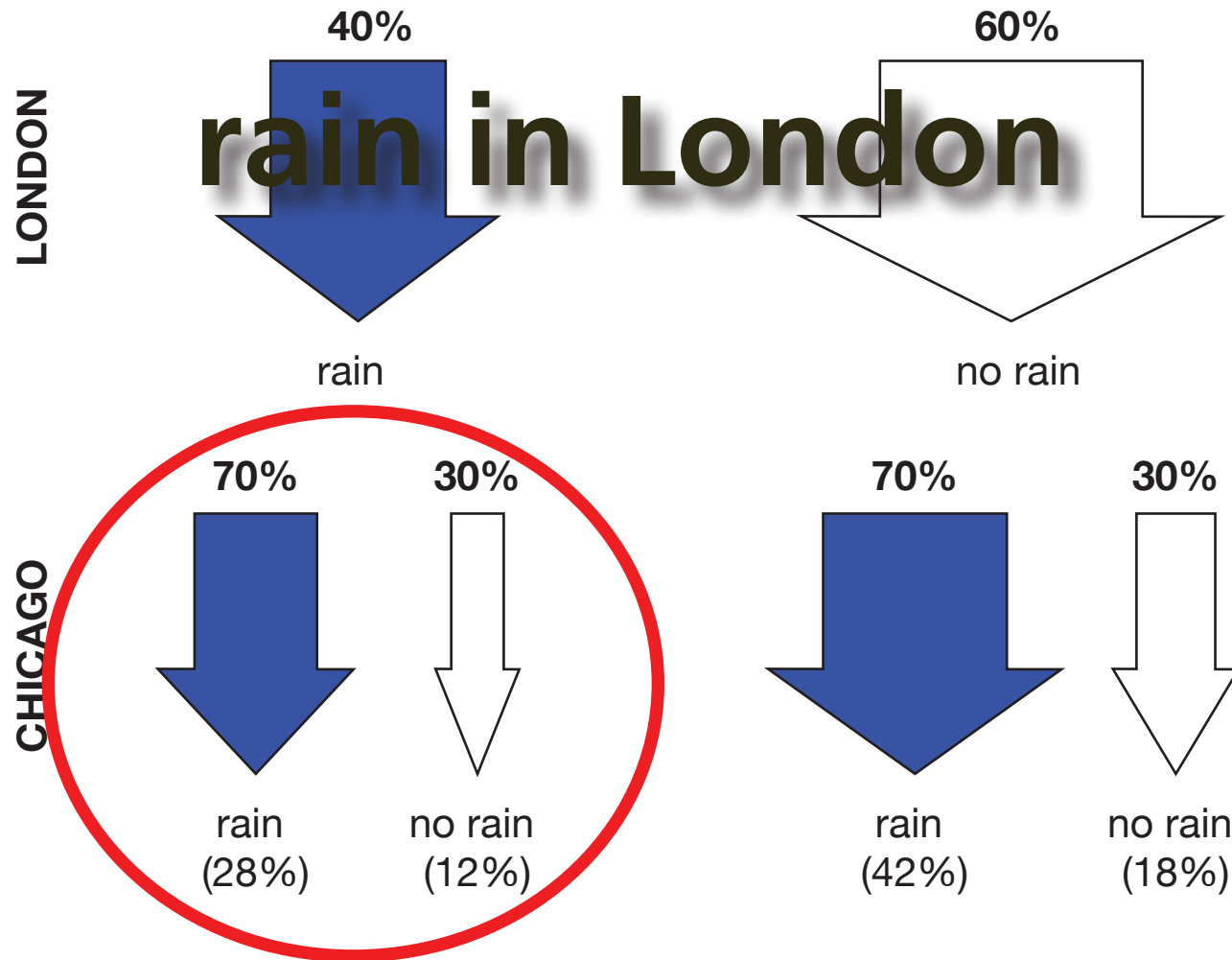
Let's try it!

ALL CASES



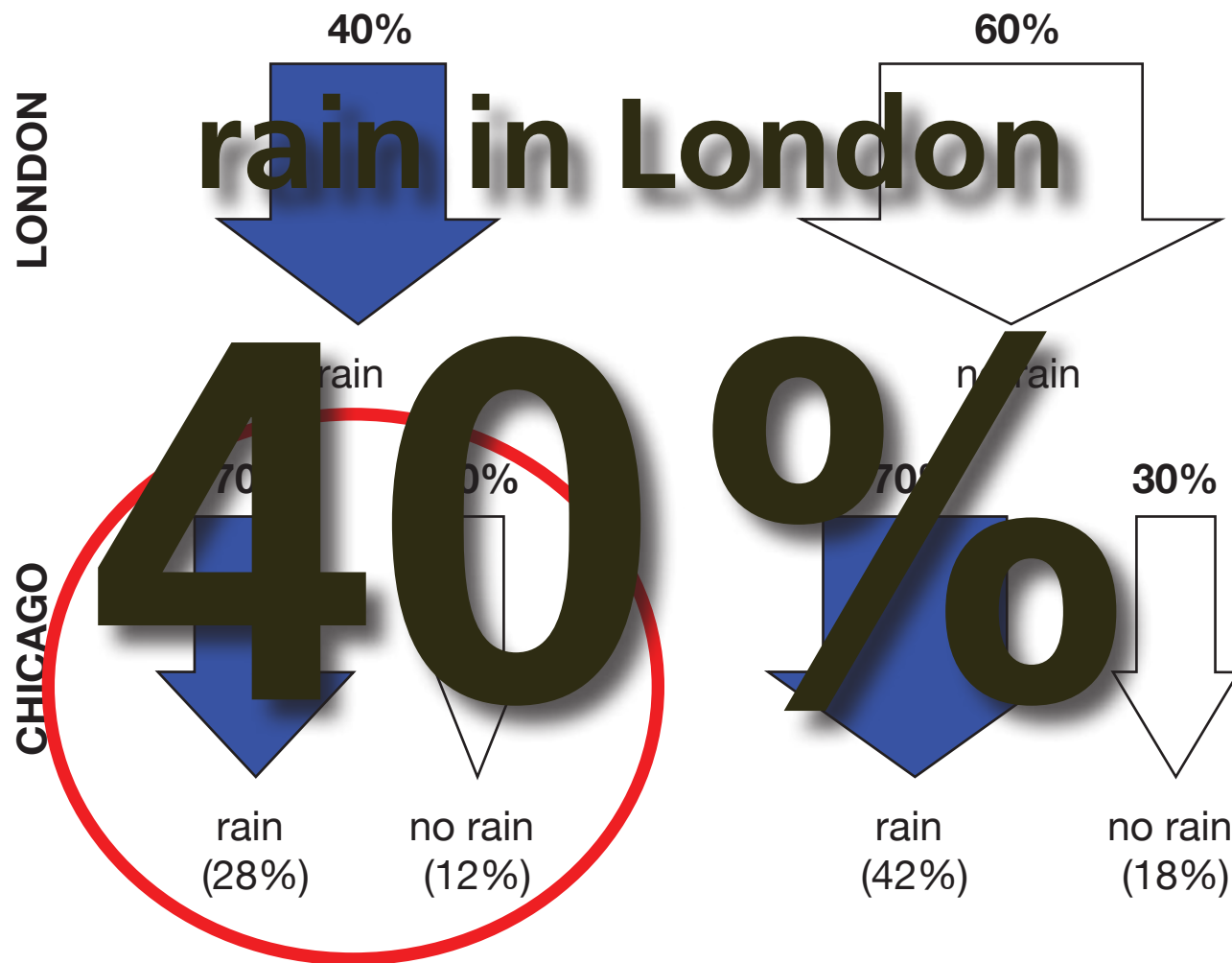
Let's try it!

ALL CASES



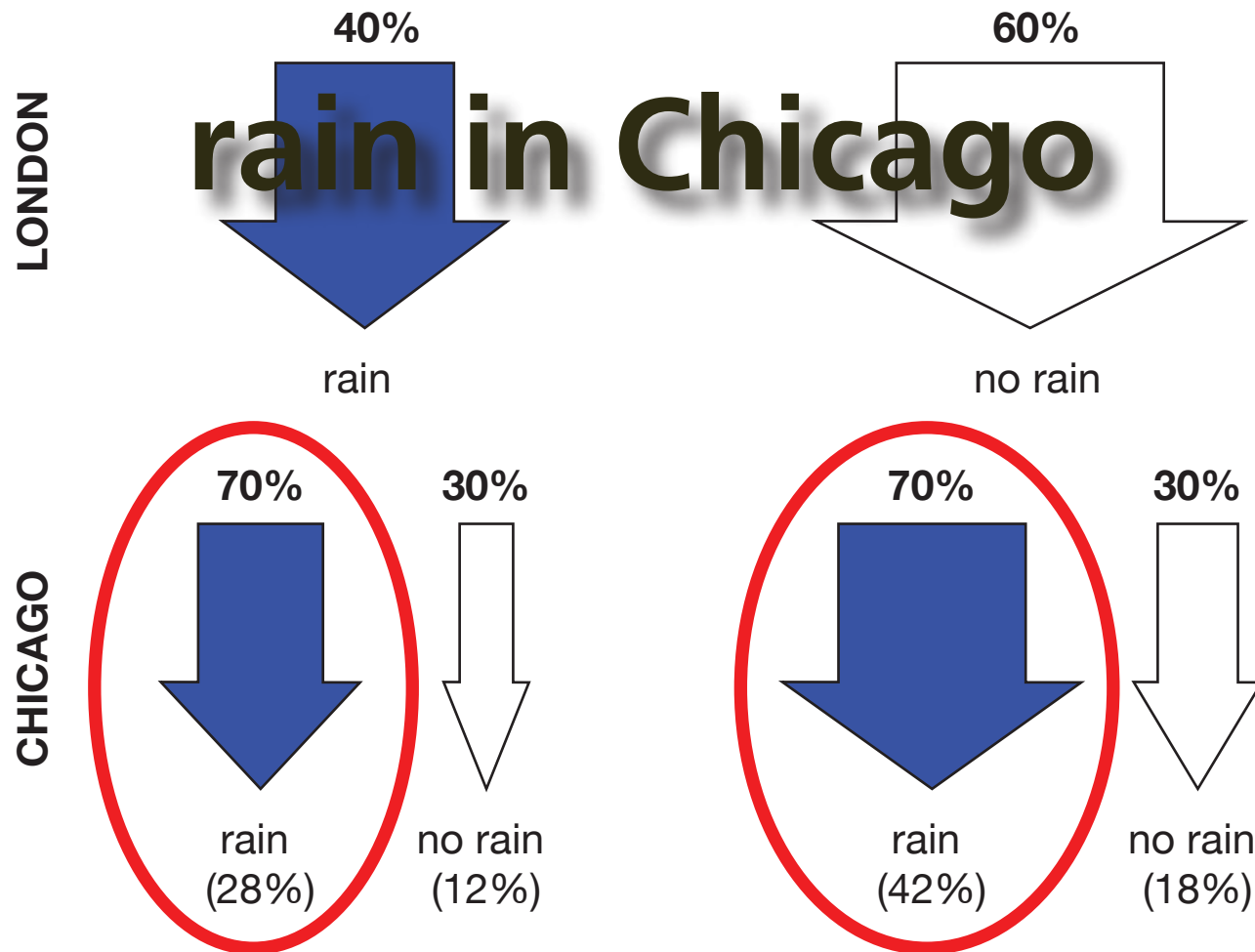
Let's try it!

ALL CASES



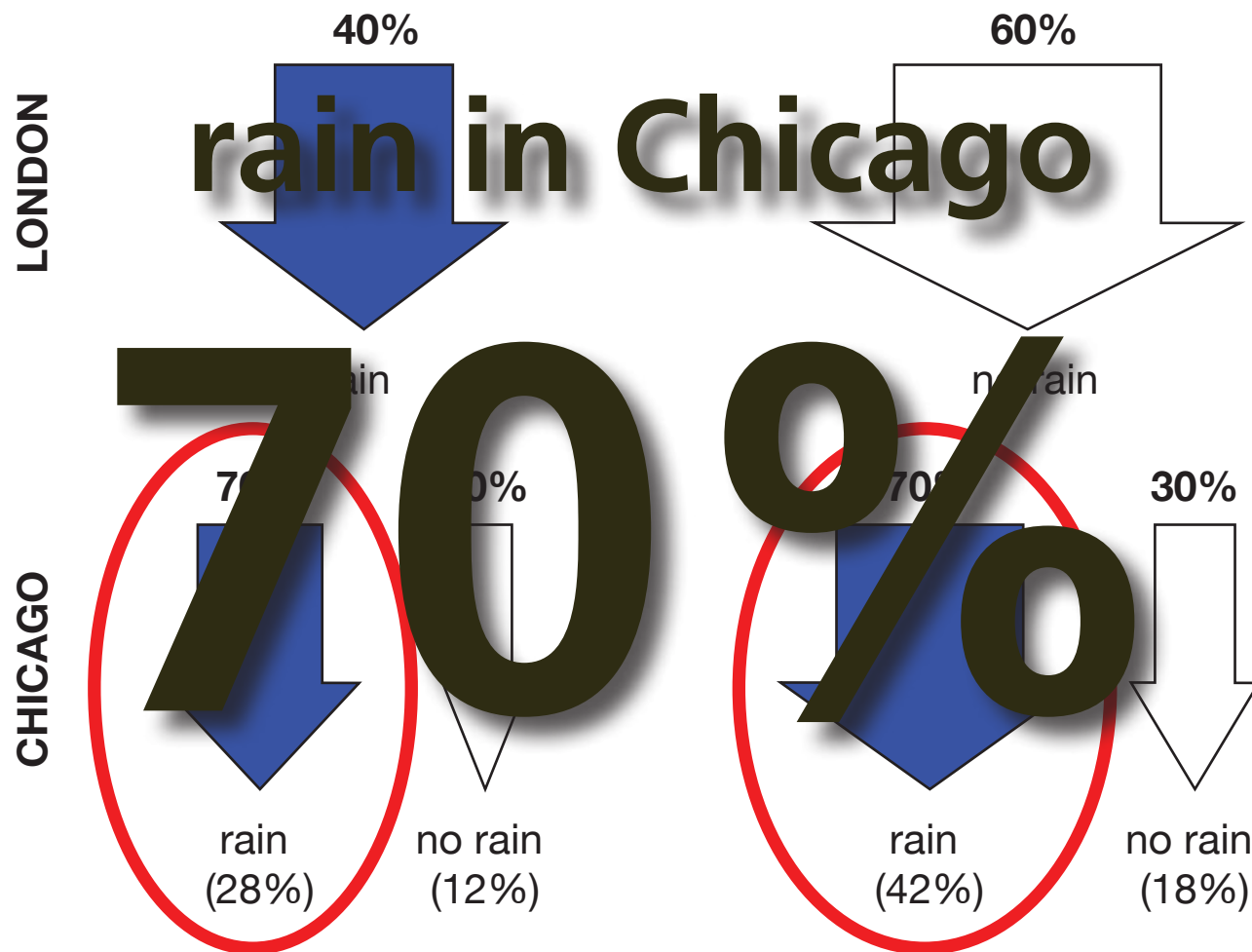
Let's try it!

ALL CASES



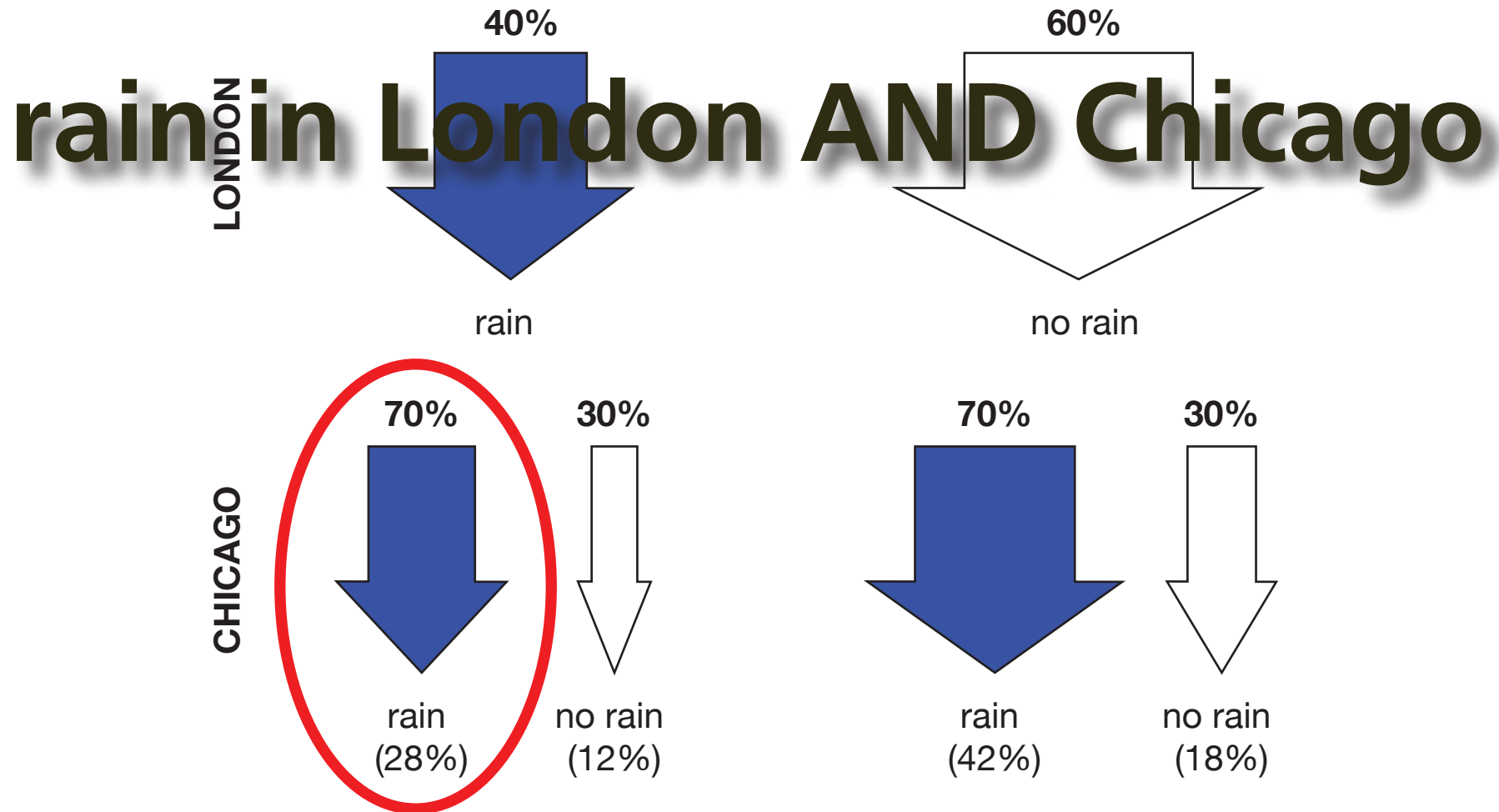
Let's try it!

ALL CASES



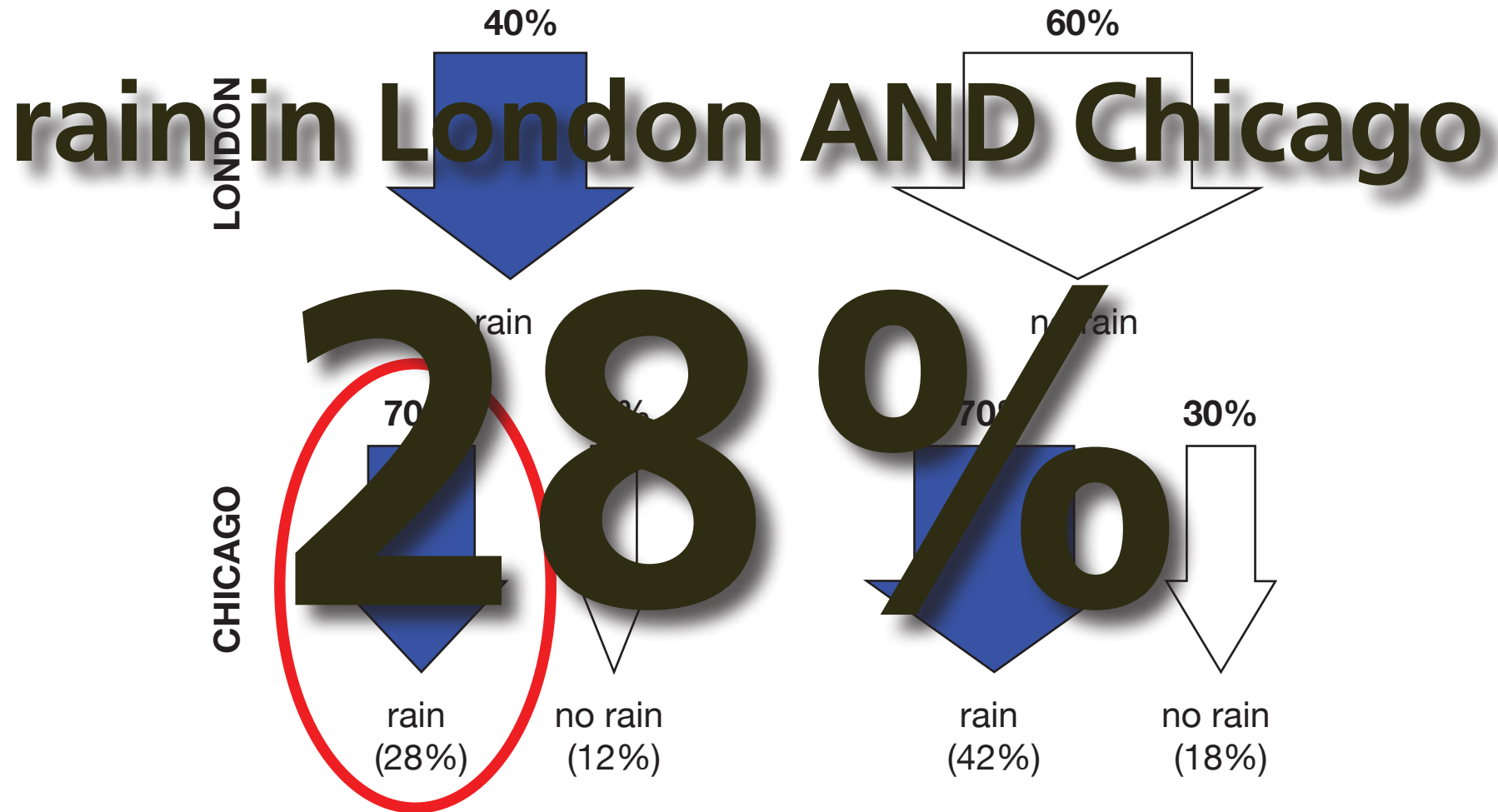
Let's try it!

ALL CASES



Let's try it!

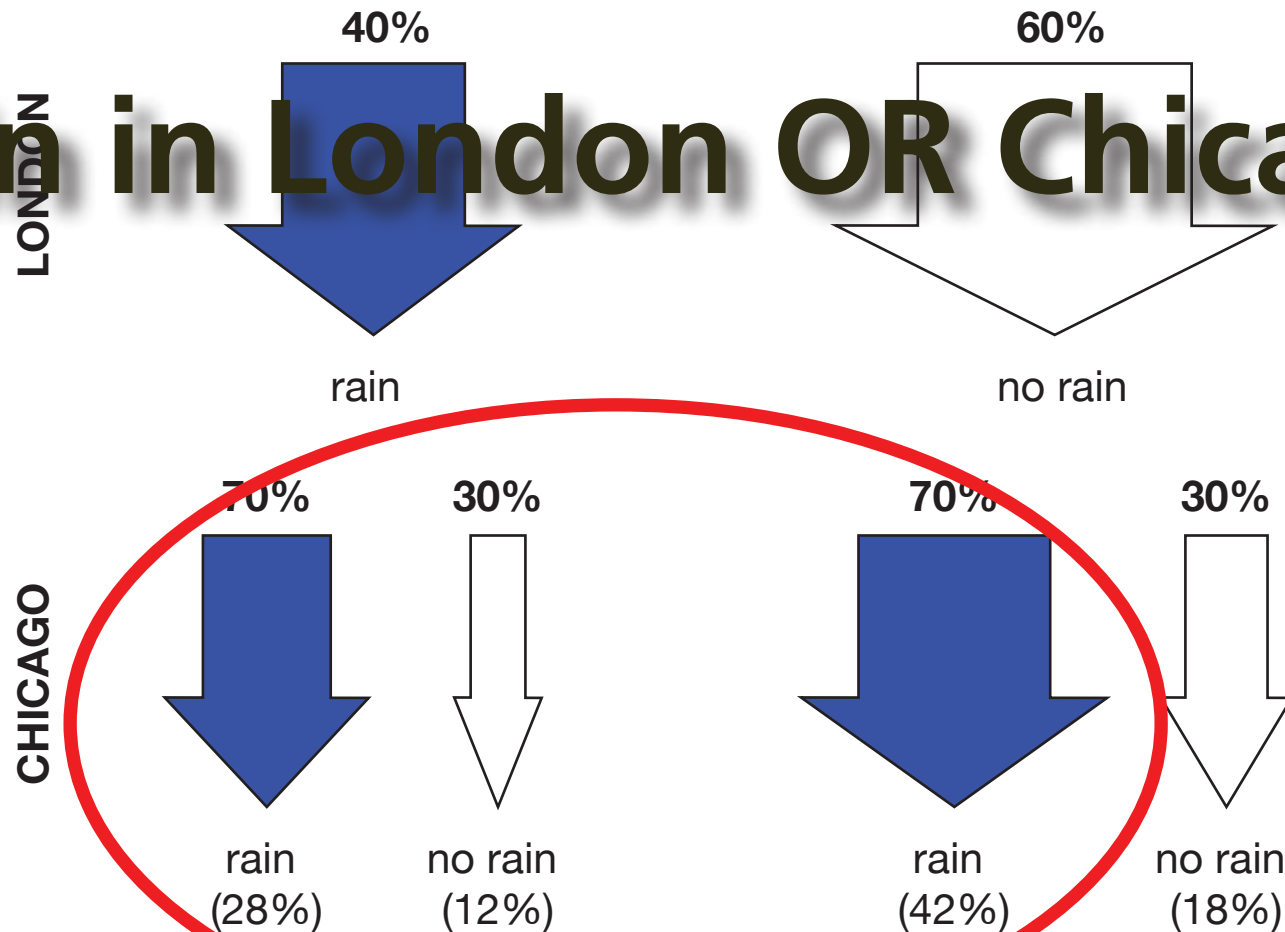
ALL CASES



Let's try it!

ALL CASES

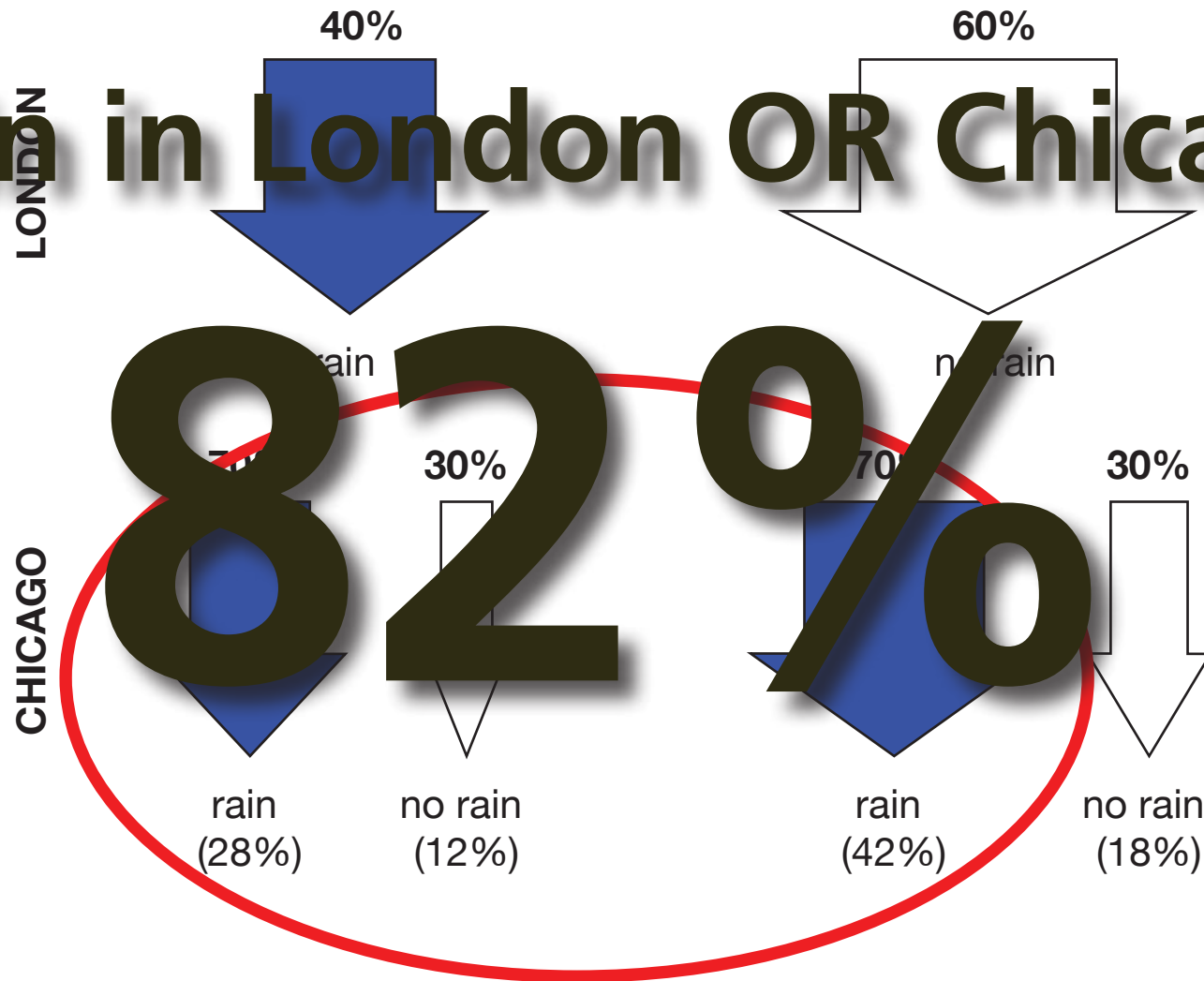
rain in London OR Chicago



Let's try it!

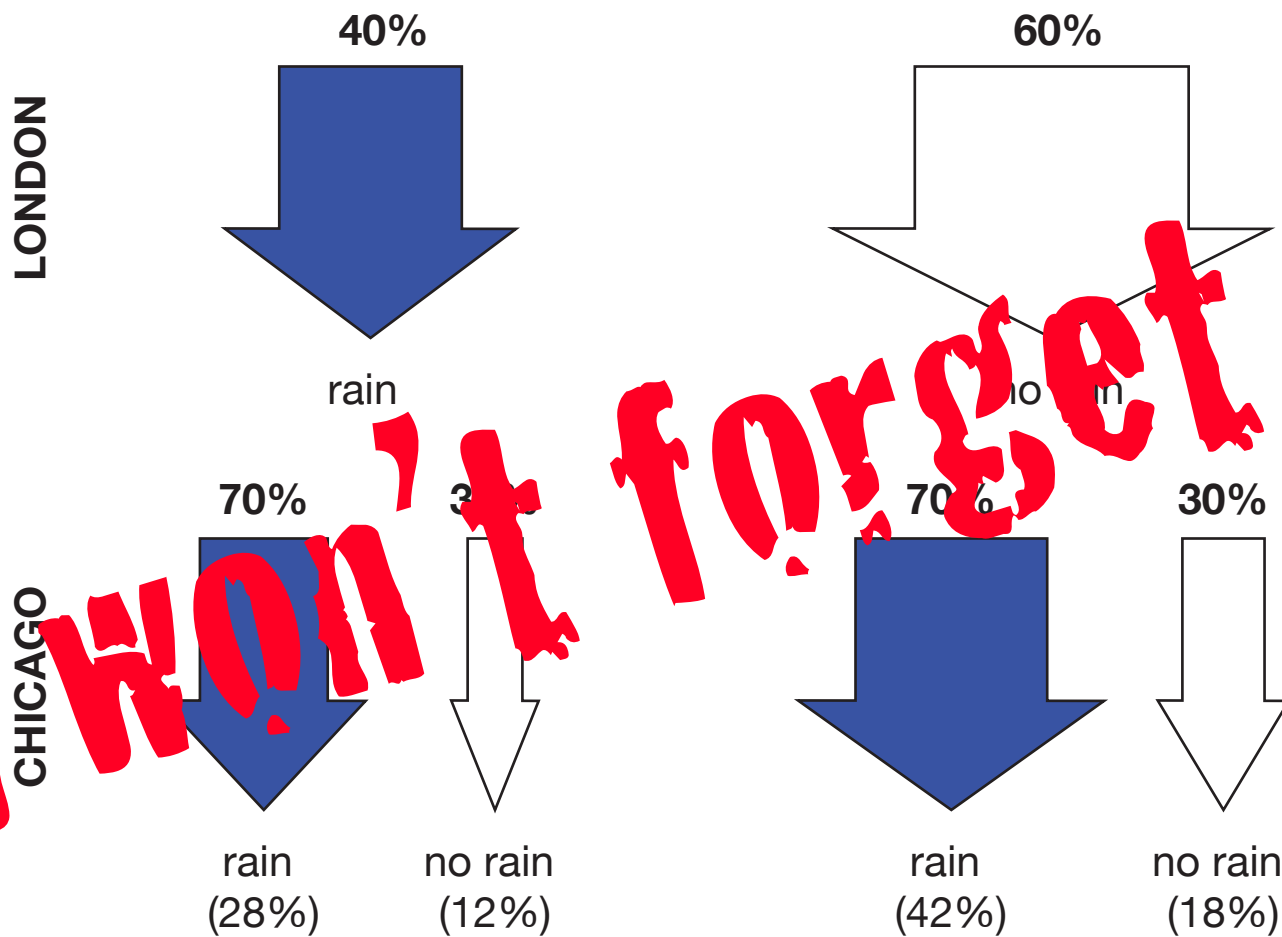
ALL CASES

rain in London OR Chicago



Let's try it!

ALL CASES



you won't forget this

PI & JiTT Overview

“What if some students don’t have a cell phone or clicker?”

PI & JiTT Overview

“For science subjects, you usually have a definite answer.

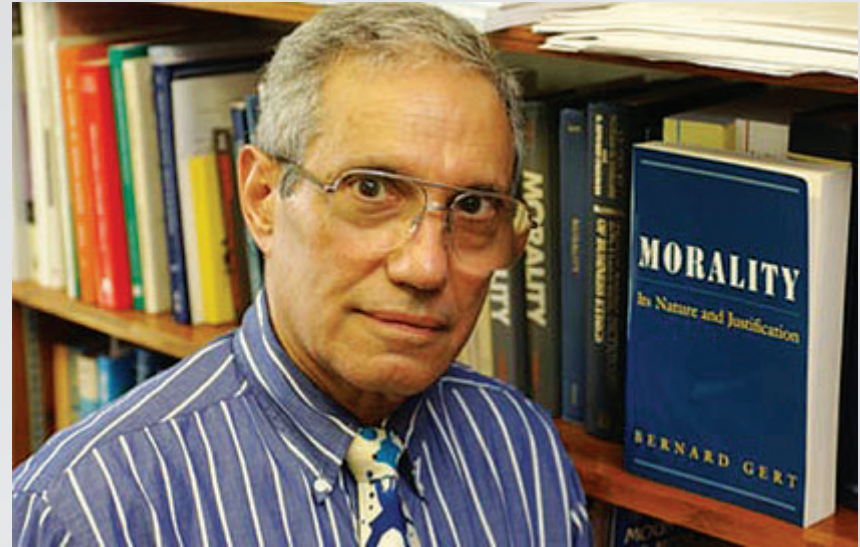
For the humanities, students are encouraged to think critically.

What is the value of Peer Instruction in such a course?”

Let's try it!

Bernard Gert (1934 – 2011)

**Moral philosopher
Professor at Dartmouth**

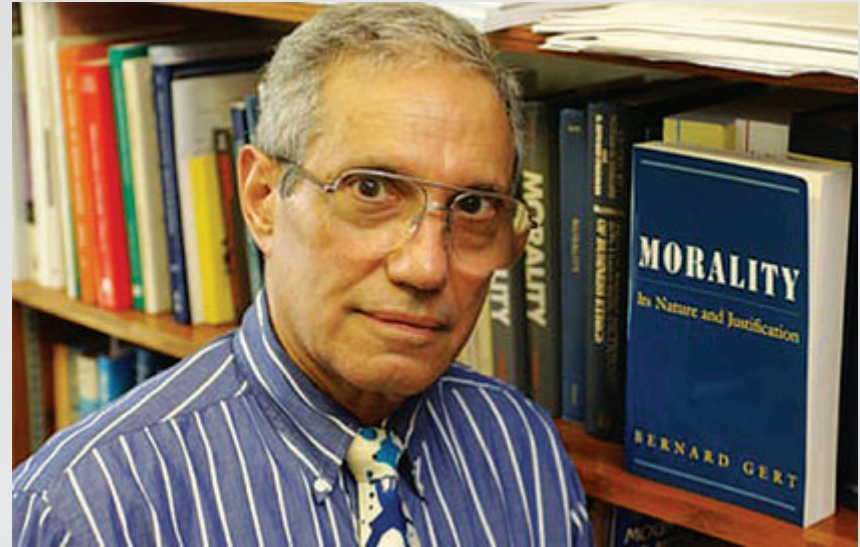


“Morality is an informal public system applying to all rational persons, governing behavior that affects others, and includes what are commonly known as the moral rules, ideals, and virtues and has the lessening of evil or harm as its goal.”

Let's try it!

Bernard Gert (1934 – 2011)

**Moral philosopher
Professor at Dartmouth**



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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5. Do not deprive of pleasure
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8. Do not cheat
9. Obey the law
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!

PI & JiTT Overview

Benefits:

- helps develop conceptual models
- solidifies understanding
- provides feedback
- empowers students

Outline

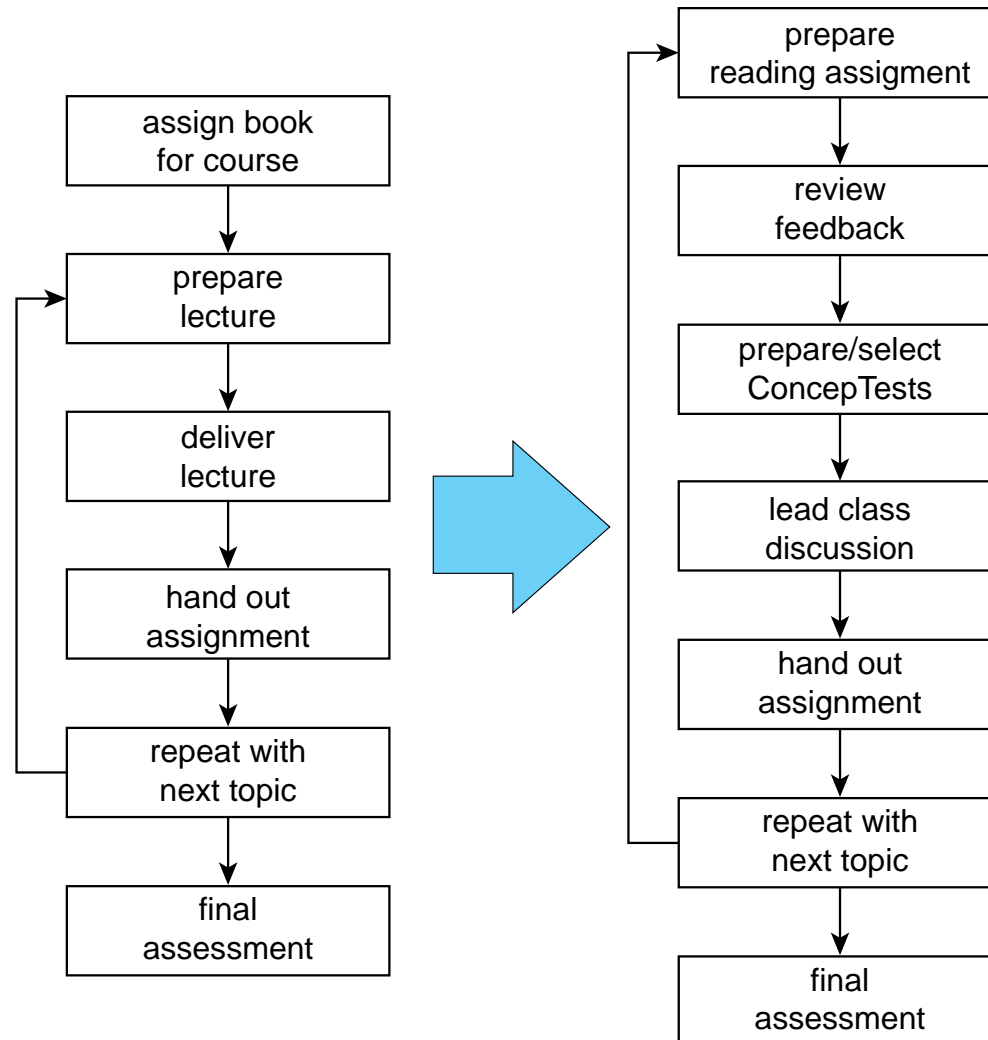
- **PI & JiTT Overview**
- **Implementing PI & JiTT**
- **ConceptTests**

Implementing PI & JiTT

“How demanding is this approach on the time of instructor?”

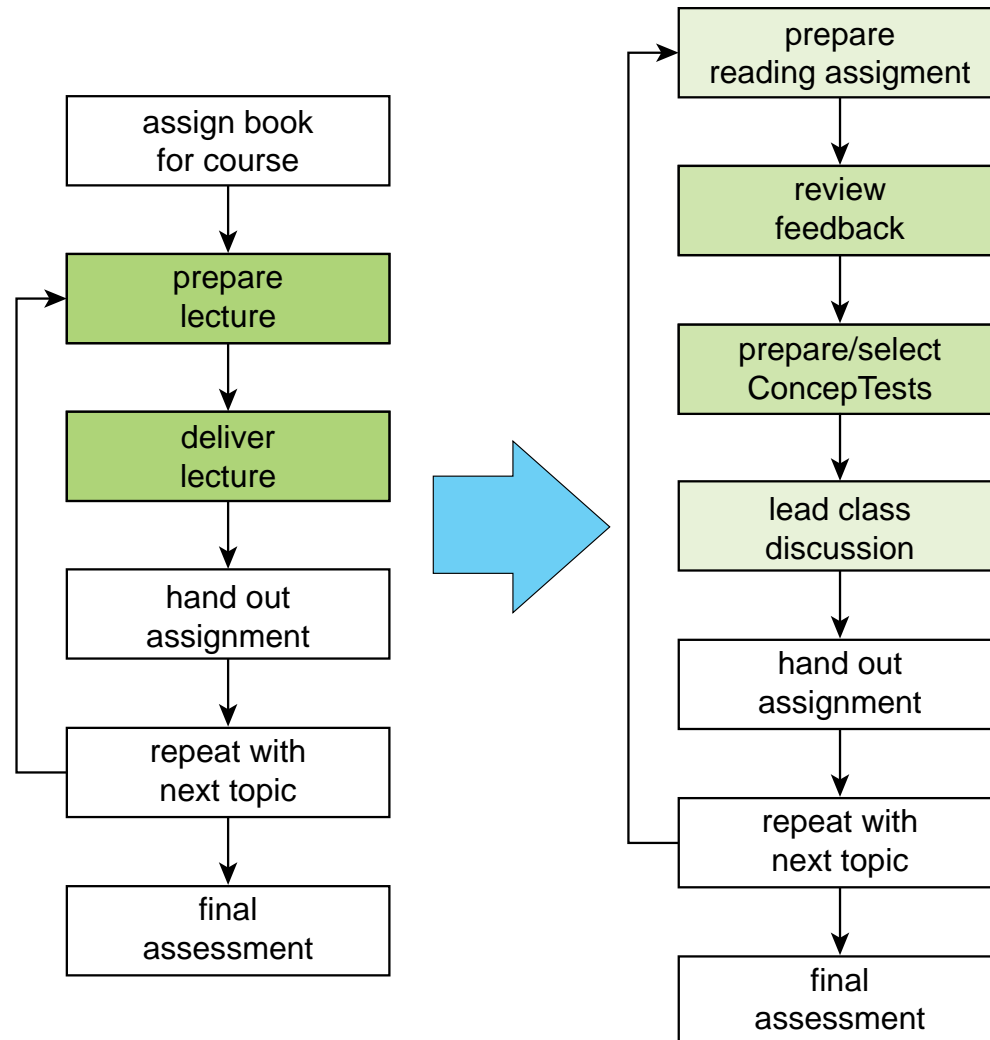
Implementing PI & JiTT

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 to efficiently review answers to JiTT questions in a class with 100-200 students?”

Implementing PI & JiTT

“How do I make sure all topics can be covered using this method?”

Implementing PI & JiTT

“This approach of teaching is based on the assumption that information is readily available. What to do if this is not the case, especially for graduate courses?”

Implementing PI & JiTT

“What do I do when some students do their assignments and others don’t?”

PI & JiTT Overview

“How can I encourage my students to work with each other while individualism is highly preferred in their culture?”

“What can be done to avoid misusing PI? Sometimes students lazily depend on each other without learning anything.”

PI & JiTT Overview

“I am wondering how to properly apply PI and JiTT with a very small class size such as 6 students?”

Outline

- **PI & JiTT Overview**
- **Implementing PI & JiTT**
- **ConceptTests**

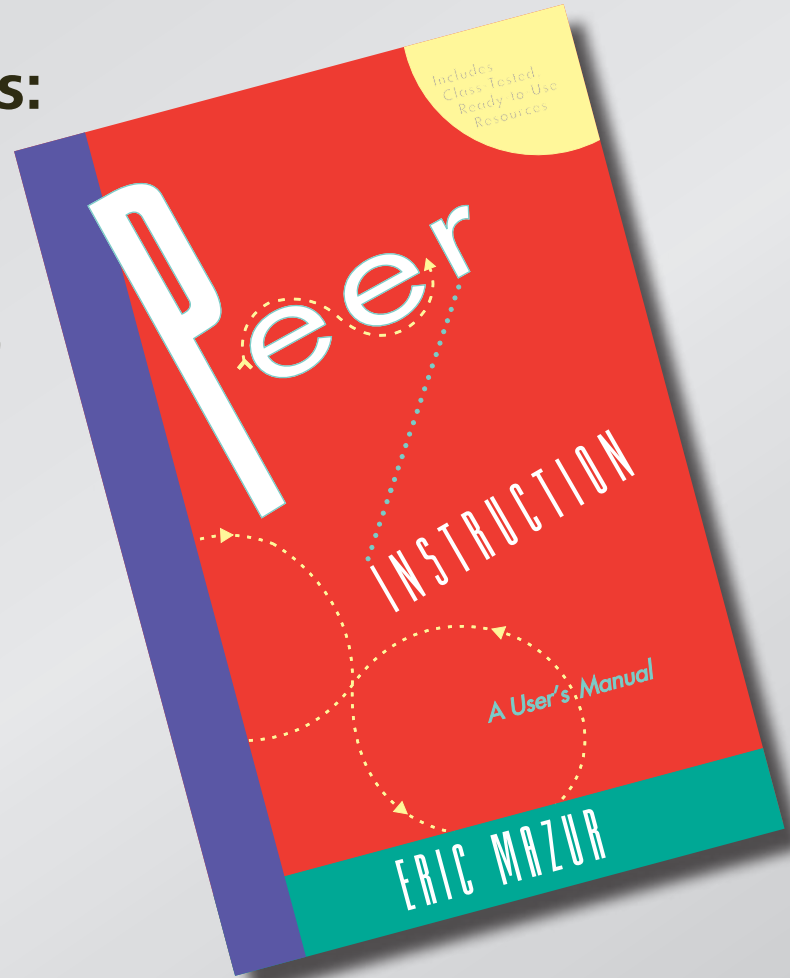
ConcepTests

***“Would you mind to share your experience
of designing a good ConcepTest?”***

ConceptTests

Books with ConceptTests:

- Physics (Prentice Hall)



ConcepTests

Books with ConcepTests:

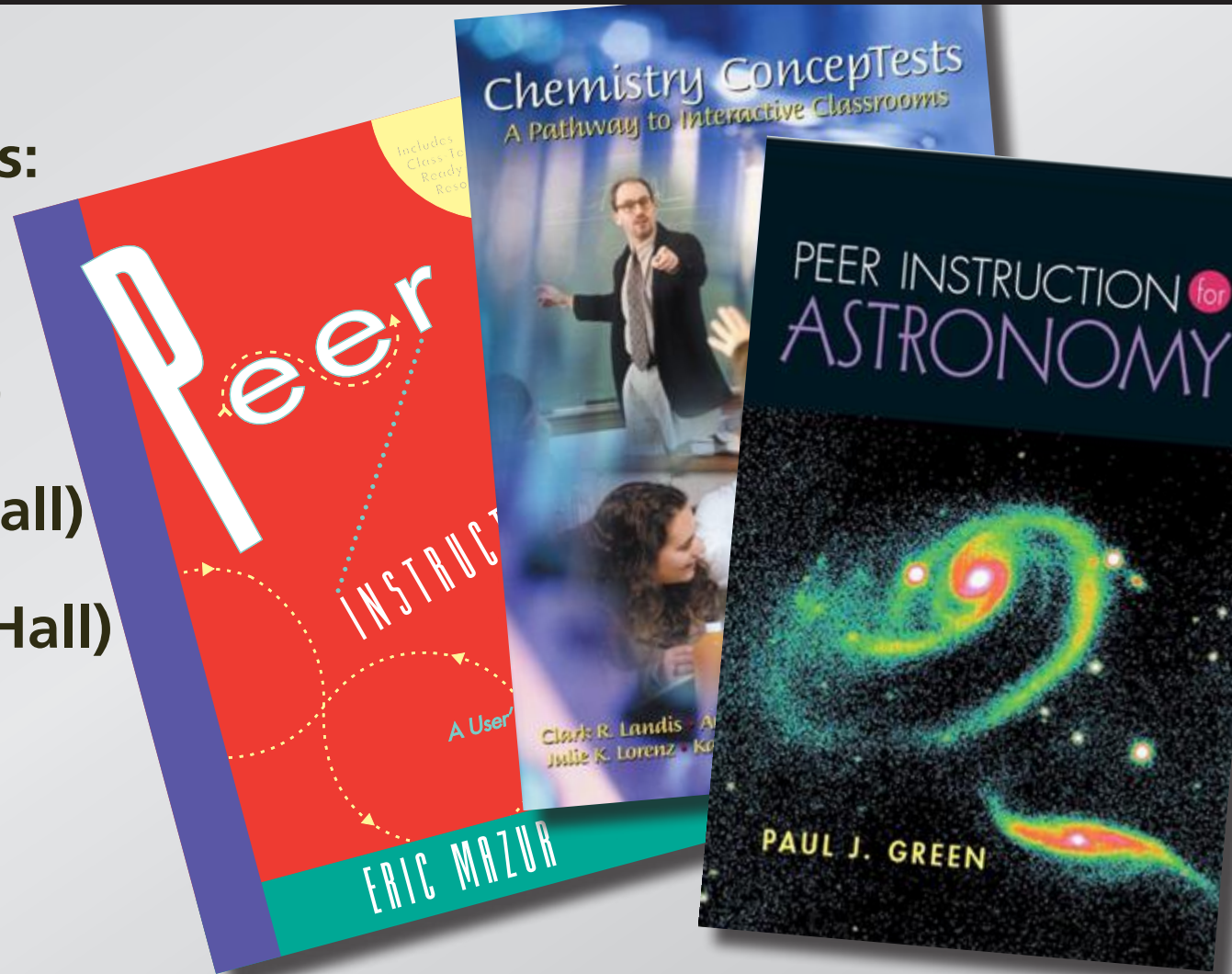
- Physics (Prentice Hall)
- Chemistry (Prentice Hall)



ConceptTests

Books with ConceptTests:

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



ConcepTests

Books with ConcepTests:

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



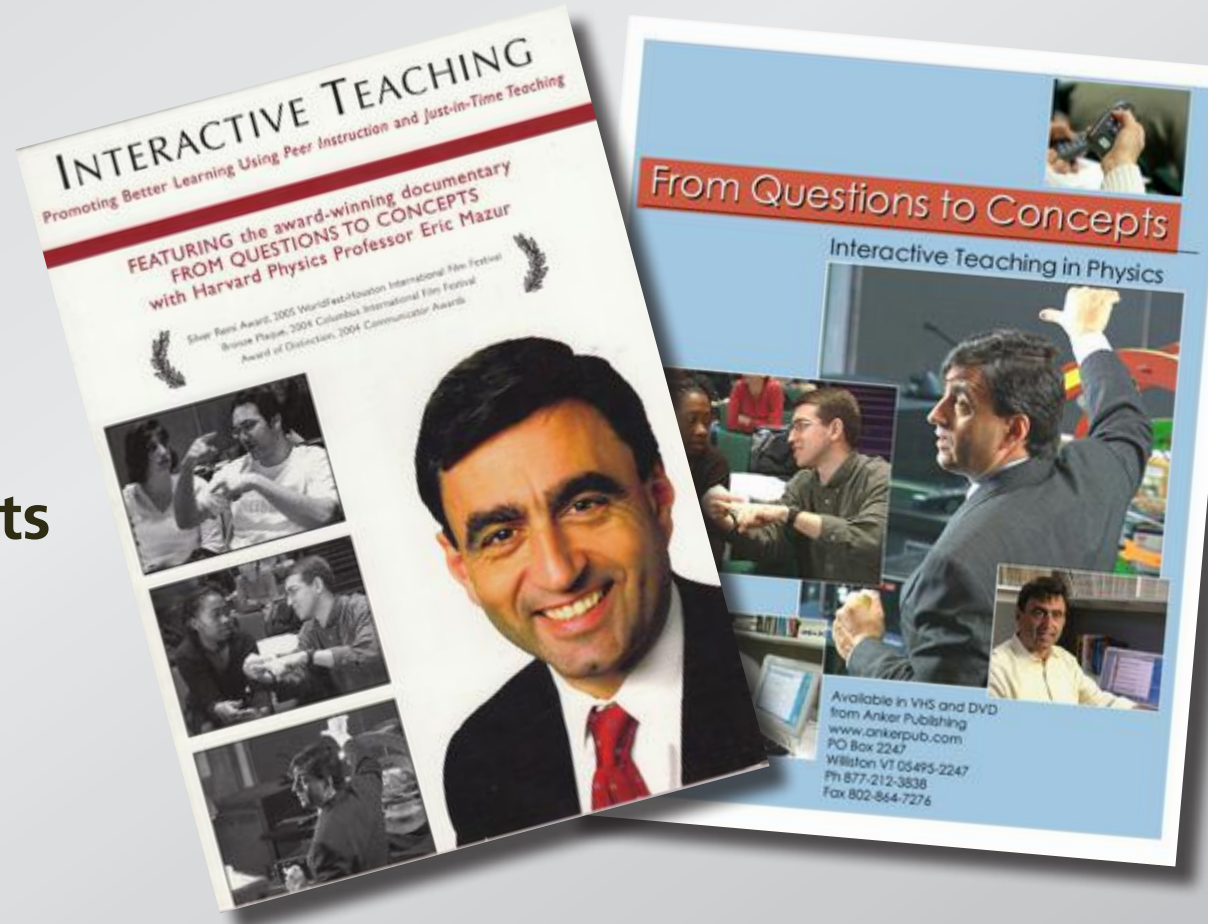
ConcepTests

***“Are there helpful short films
that can help us learn more about Peer Instruction?”***

ConcepTests

Videos:

- Interactive Teaching DVD
- From questions to concepts



ConceptTests

Google:

<your discipline> ConceptTest

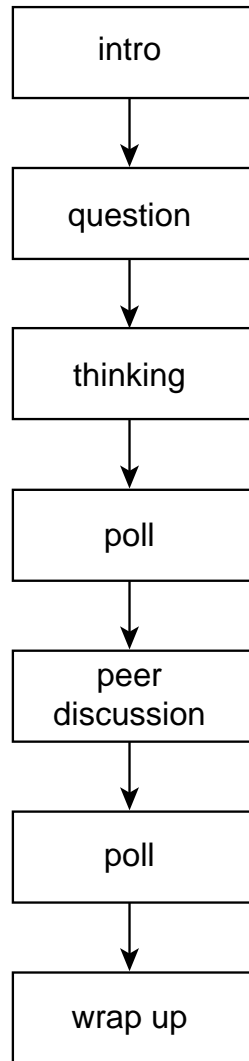
<your discipline> "Concept Test"

<your discipline> "Peer Instruction"

ConcepTests

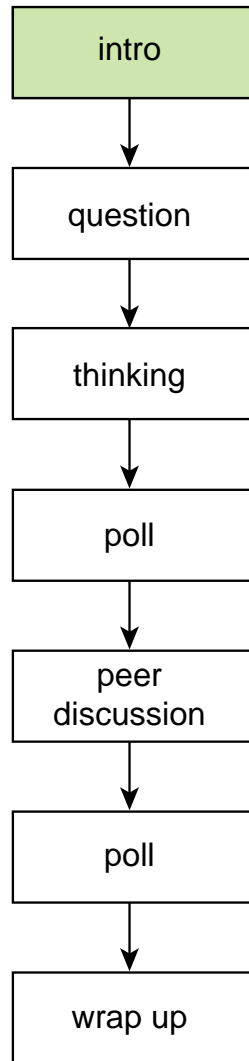
“What are the important parts of a ConcepTest?”

ConceptTests

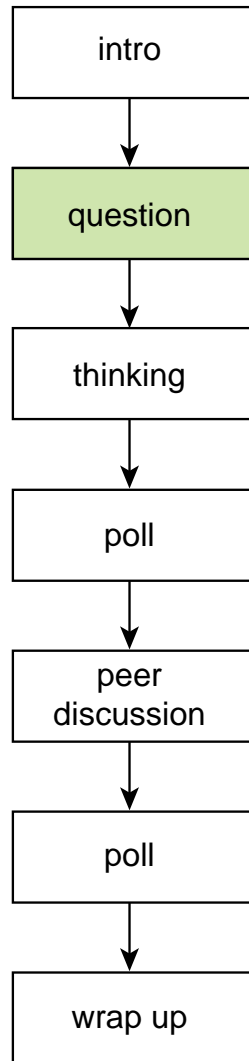


ConceptTests

setting context



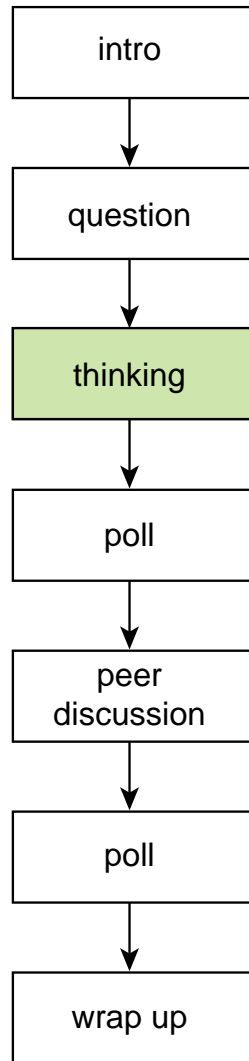
ConceptTests



setting context

posing question

ConceptTests

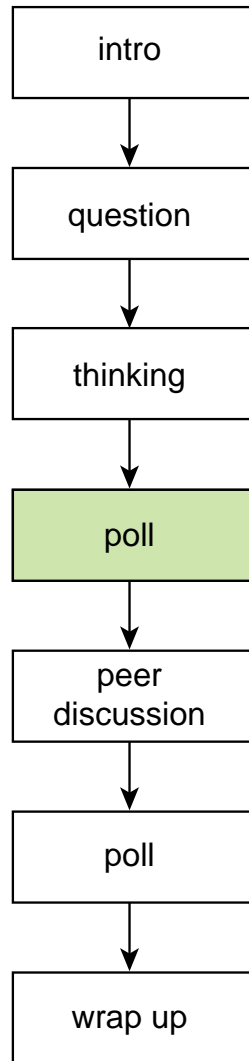


setting context

posing question

reflection

ConcepTests



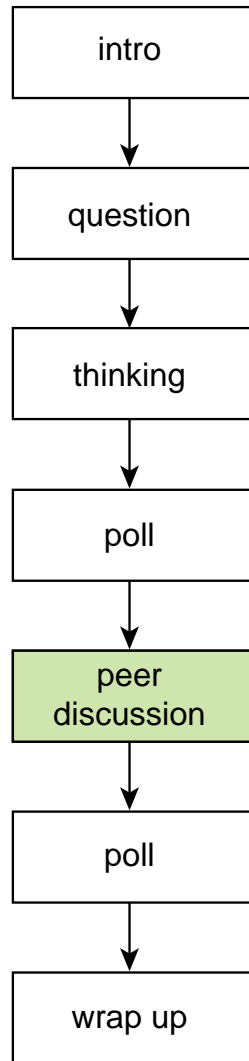
setting context

posing question

reflection

baseline data

ConcepTests



setting context

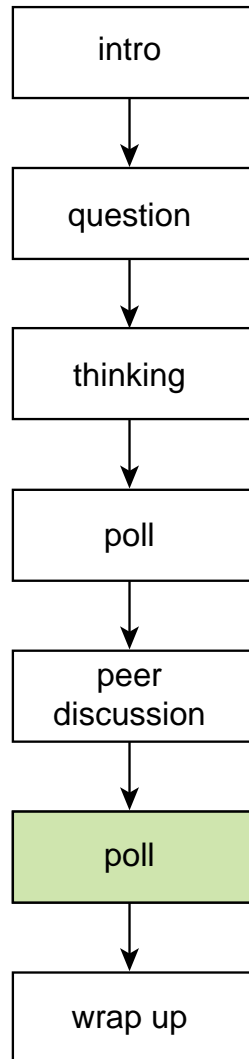
posing question

reflection

baseline data

peer instruction

ConcepTests



setting context

posing question

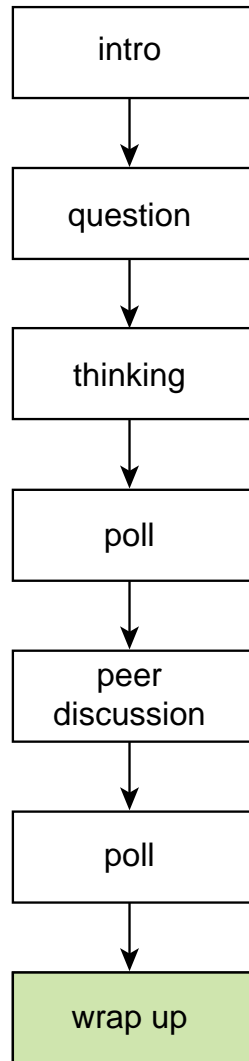
reflection

baseline data

peer instruction

gain data

ConcepTests



setting context

posing question

reflection

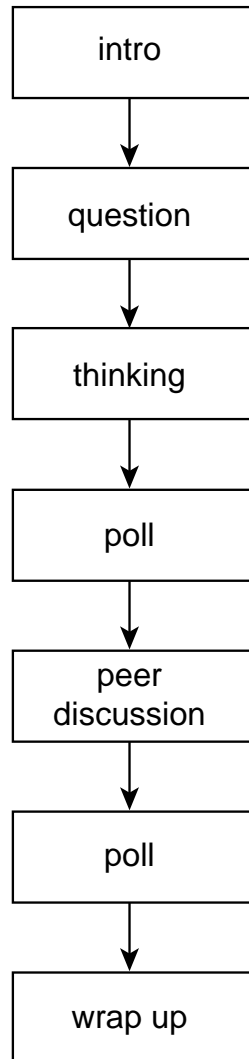
baseline data

peer instruction

gain data

closure

ConcepTests



setting context

5 min (max)

posing question

1 min

reflection

1–2 min

baseline data

peer instruction

2–3 min

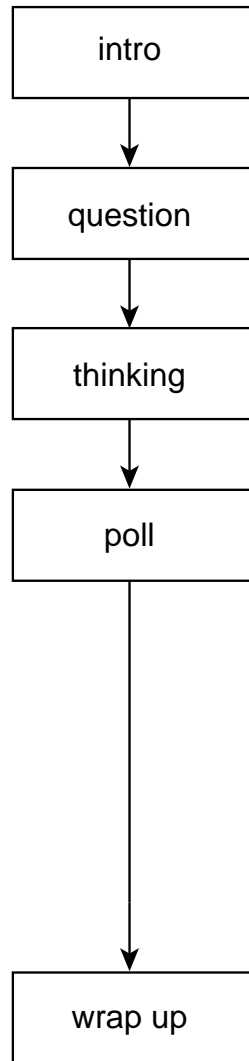
gain data

closure

5 min (max)

ConceptTests

potential shortcuts

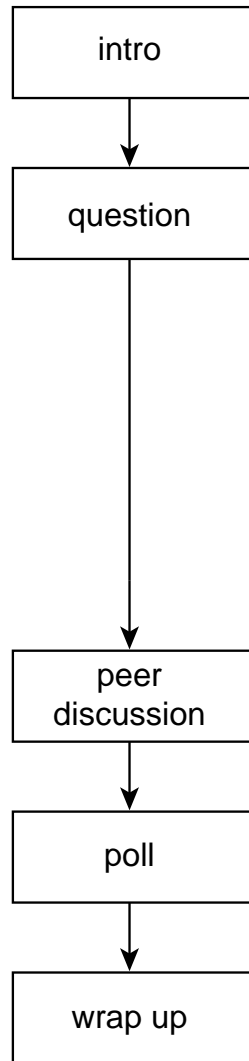


2–3 min saved, but...

takes the “Peer” out of “Peer Instruction”

ConceptTests

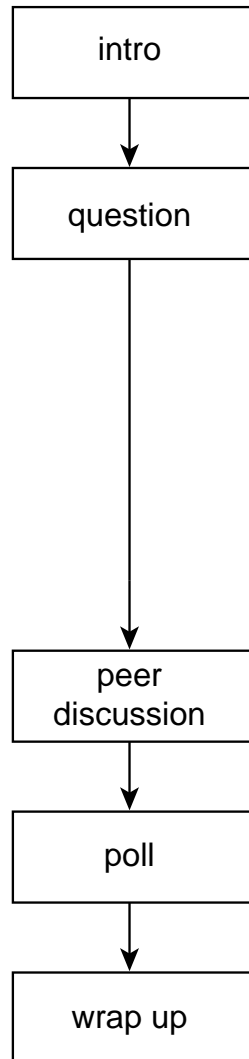
potential shortcuts



launch straight into discussion?

ConceptTests

potential shortcuts

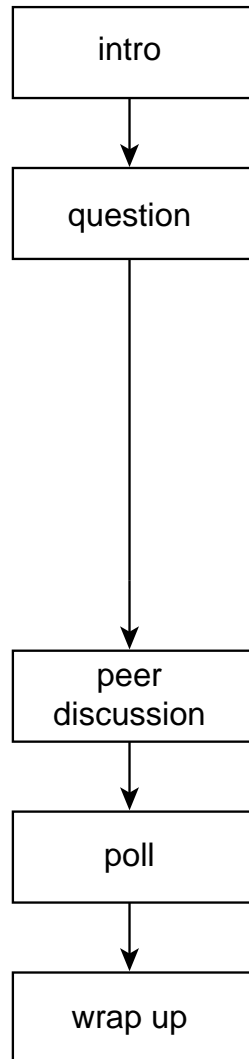


1–2 min saved, but...

no opportunity to commit before discussion

ConceptTests

potential shortcuts



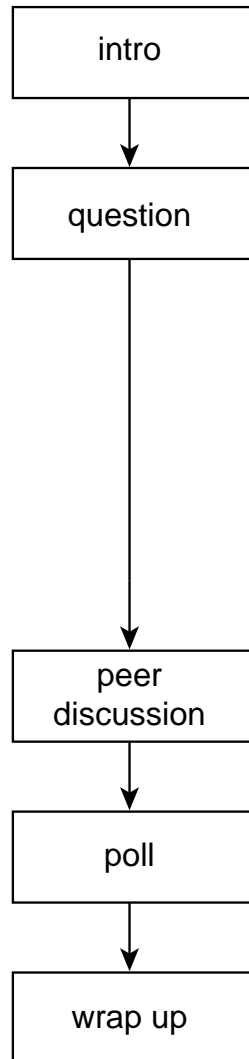
1–2 min saved, but...

no opportunity to commit before discussion

Boyle, et. al, Studies in Higher Education, 28, 4 (2003) 457

ConceptTests

potential shortcuts



1–2 min saved, but...

no opportunity to commit before discussion

(and no information on effectiveness of CT!)

ConcepTests

“How much time do you allocate in a two-hour lecture for the use of Peer Instruction?”

ConcepTests

should count on about 15 min per ConcepTest

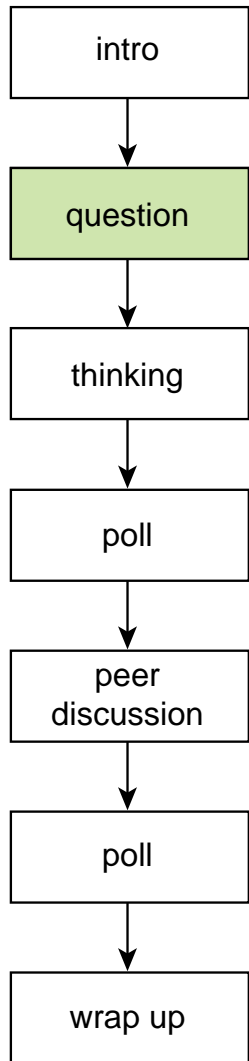
ConcepTests

**should count on about 15 min per ConcepTest
(including two pollings)**

ConcepTests

***“What are the main characteristics
of a good ConcepTest?”***

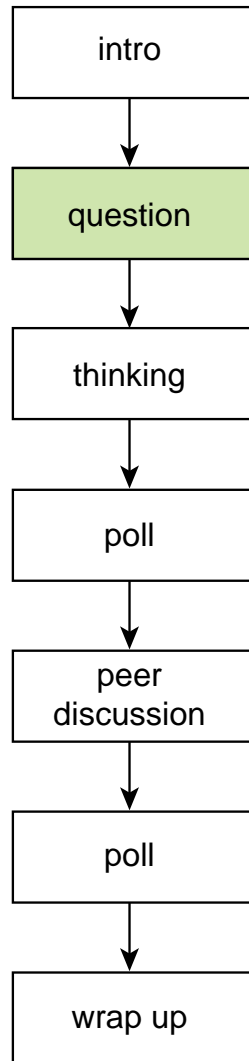
ConcepTests



An effective ConcepTest...

- is driven by student needs
- tests understanding, not memorization
- pushes students (but not too much)

ConcepTests



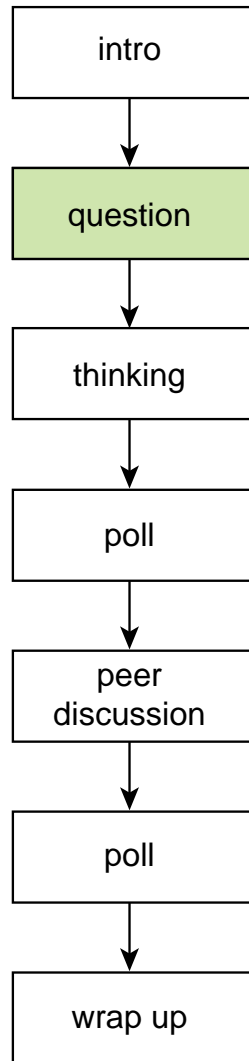
Sources of ConcepTests:

- literature/web (you'd be surprised!)
- pre-class assignments
- other assignments

ConcepTests

“With this method, can I use only multiple choice questions?”

ConcepTests



You can start with free response questions!

Outline

- **PI & JiTT Overview**
- **Implementing PI & JiTT**
- **ConceptTests**



Join now!

PeerInstruction.net

In closing...

*“Experience from those who have used PI?
Anyone in my subject (partial differential equations)?”*

In closing...

*“Experience from those who have used PI?
Anyone in my subject (partial differential equations)?”*

*“Are there any institutions in Hong Kong
that use PI for teaching?”*

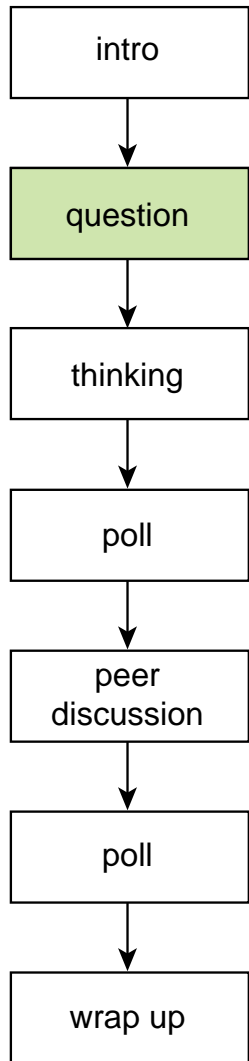
Assignment

To do before next online session:

- 1. learn more about Peer Instruction**
- 2. identify resources/ConceptTests in your discipline**
- 3. find PI Users in your discipline**
- 4. review & score ConceptTests**
- 5. create a ConceptTest in your field (optional)**

Assignment

To create **YOUR** ConcepTests, you need...



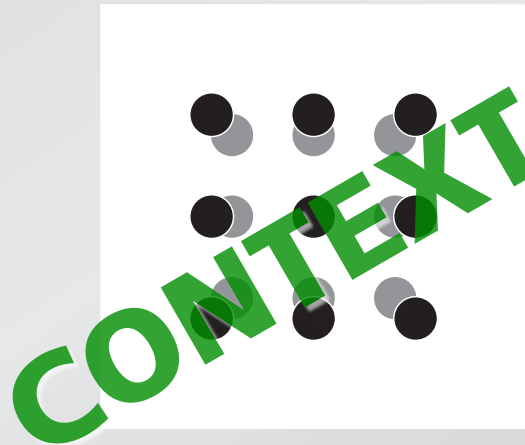
1. context

2. question

3. closure

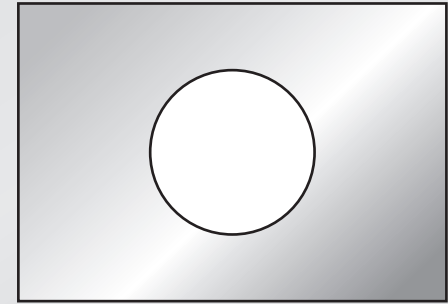
Assignment

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



Assignment

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.

QUESTION

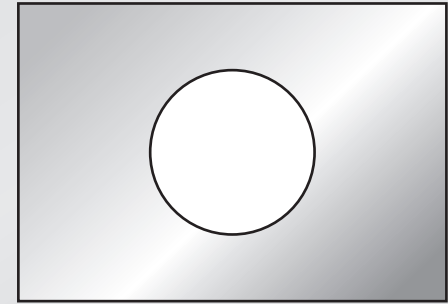
Assignment

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

stem

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

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



QUESTION

Assignment

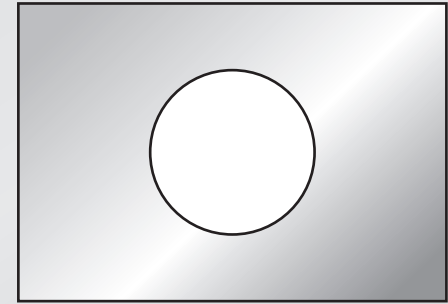
Consider a rectangular metal plate with a circular hole in it.

stem

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

choices

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



QUESTION

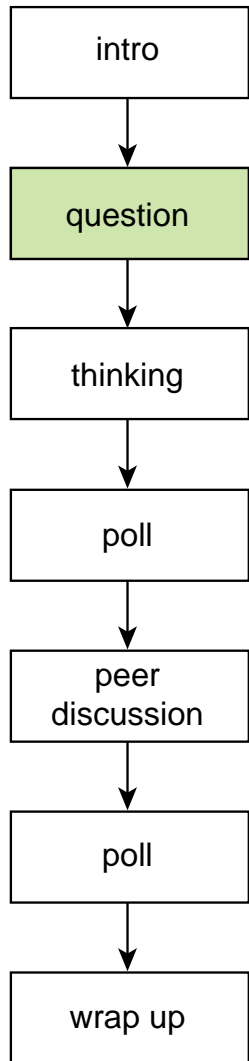
Assignment

consider the atoms at the rim of the hole



Assignment

to create **YOUR** ConcepTests, you need...



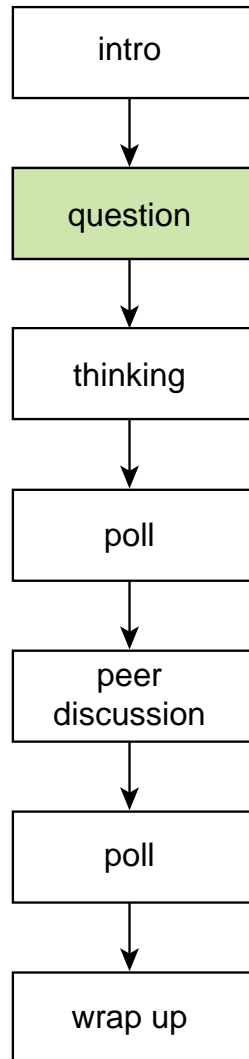
1. context

2. question

3. closure

Assignment

some basic design rules

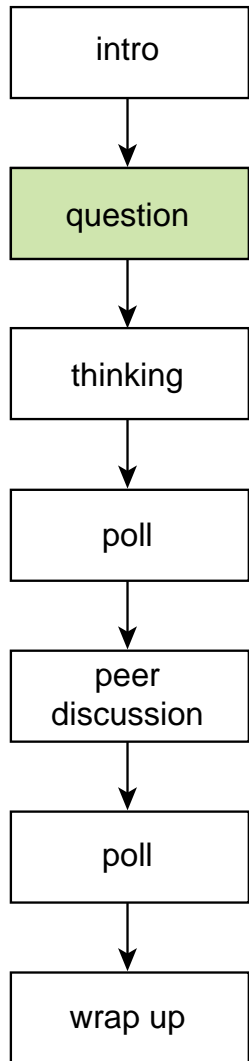


General tips:

- focus on one idea/concept/model
- keep questions concise
- define all terms
- keep vocabulary simple

Assignment

some basic design rules

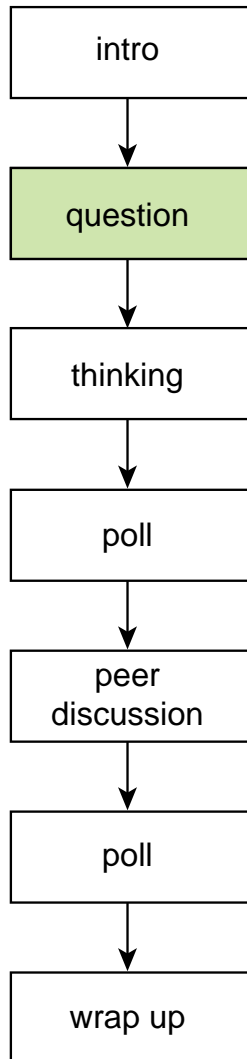


Remove:

- **barriers for knowledgeable students**
- **clues for less-knowledgeable students**

Assignment

some basic design rules

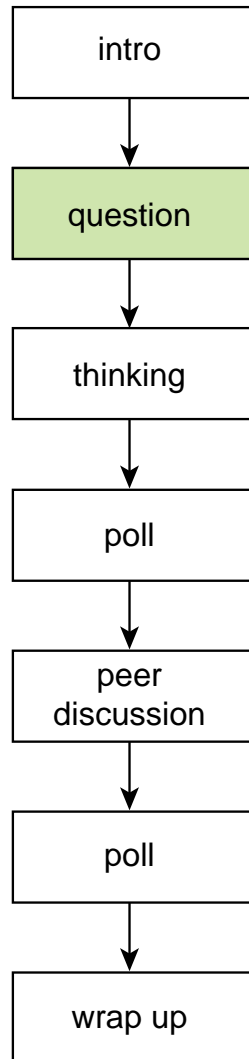


Writing good “stems”:

- ask complete question
- avoid common knowledge
- avoid negative statements (“not”, “no”,...)

Assignment

some basic design rules

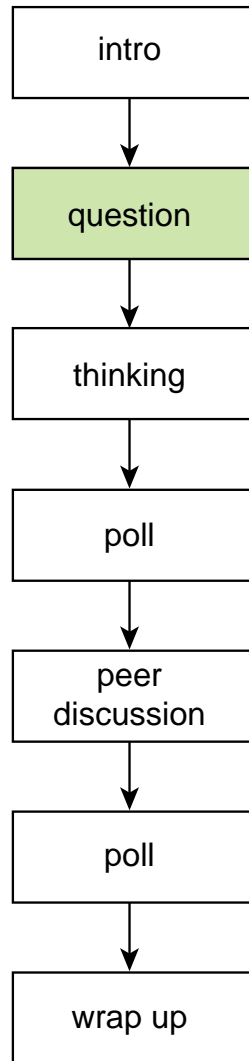


Writing good answer choices:

- aim for 3–5 options
- order choices logically
- make all roughly same length
- avoid repeating words (move to stem)
- avoid “All/None of the above”, “Other”

Assignment

Example: a nonsense question



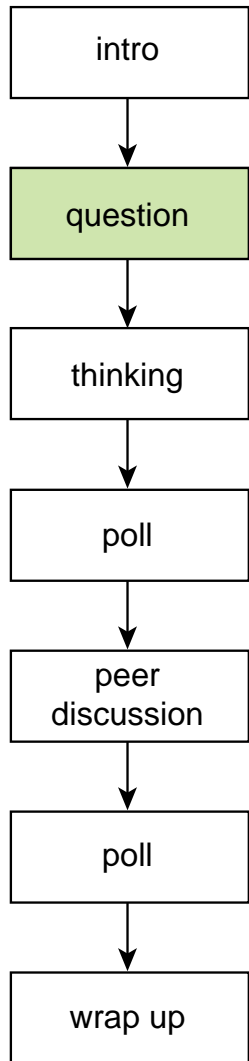
Choose most likely correct answer, based on what you know about informed guessing on tests.

Under what circumstances do *ermazoa* coagulate?

- A. Only when *jushespora* increase.
- B. Only when *jushespora* change color.
- C. When *jushespora* draw into a circle.
- D. Usually when *jushespora* increase, but occasionally when *jushespora* decrease.

Assignment

Example: another nonsense question



What is the color of *ermazoa*?

A. Blue.

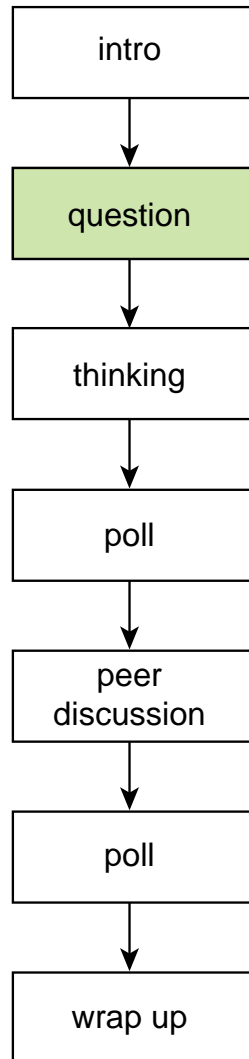
B. Red.

C. Green.

D. Yellow.

Assignment

Example: a well-crafted question



Which statement refers to measurement as opposed to evaluation?

- A. Emily got 90% correct on her math quiz.**
- B. Mary's test scores have increased satisfactorily this year.**
- C. Paul's score of 20 on this test indicates that his study habits are ineffective.**
- D. Linda received a B+ for her art project.**

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