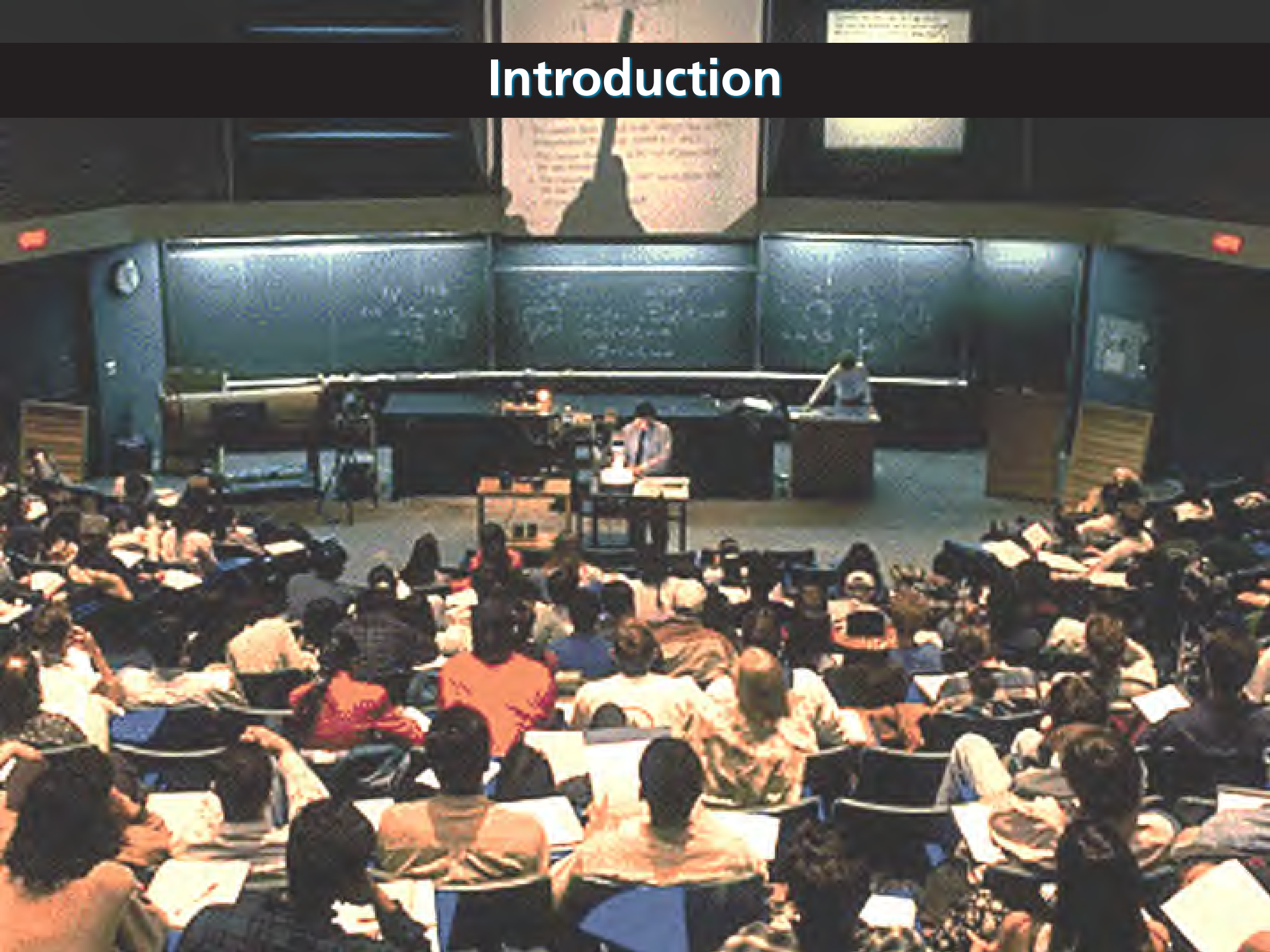
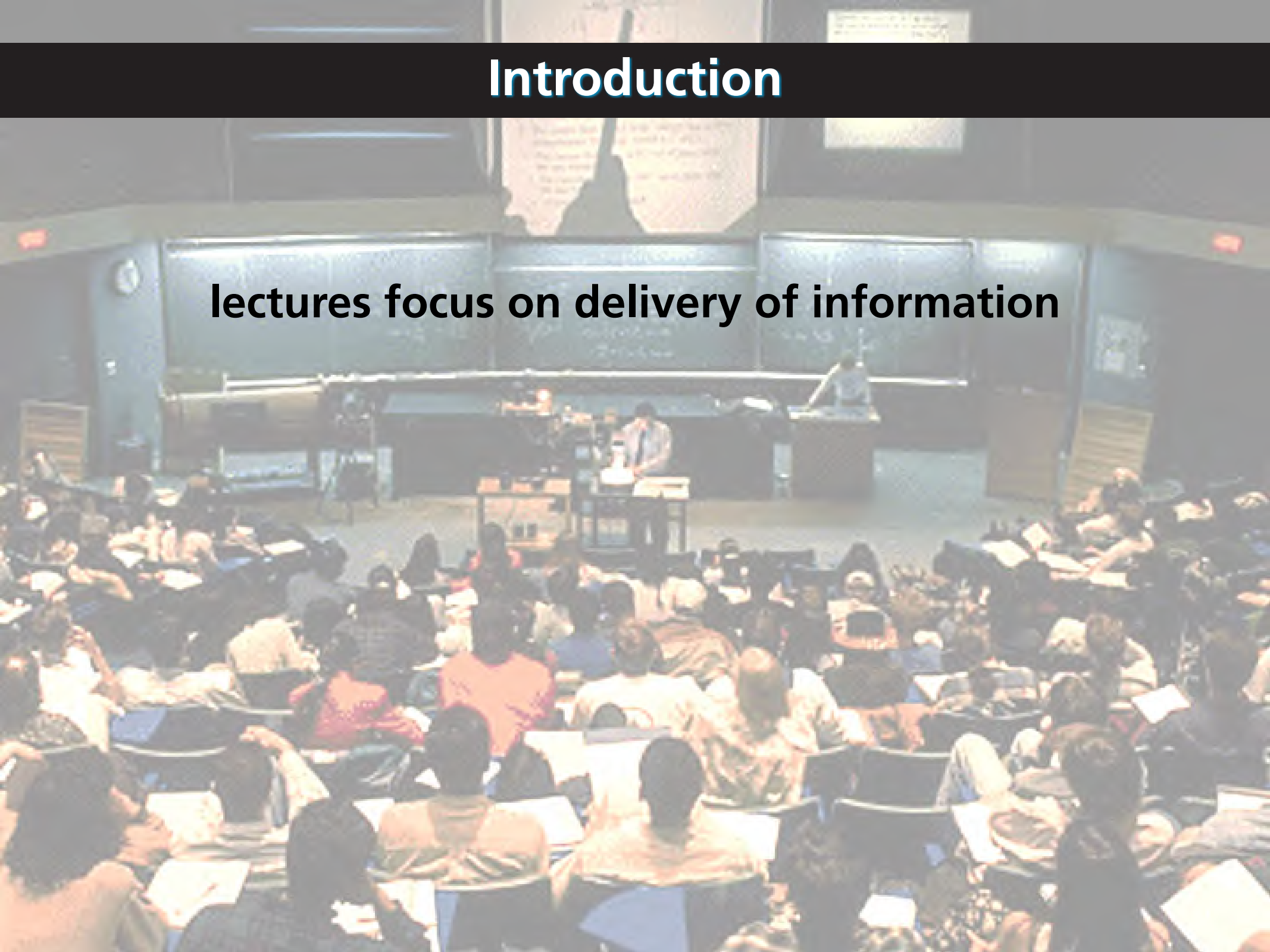
Using technology to engage students

ELI 2011 Annual Meeting
Washington, DC, February 14, 2011

Introduction

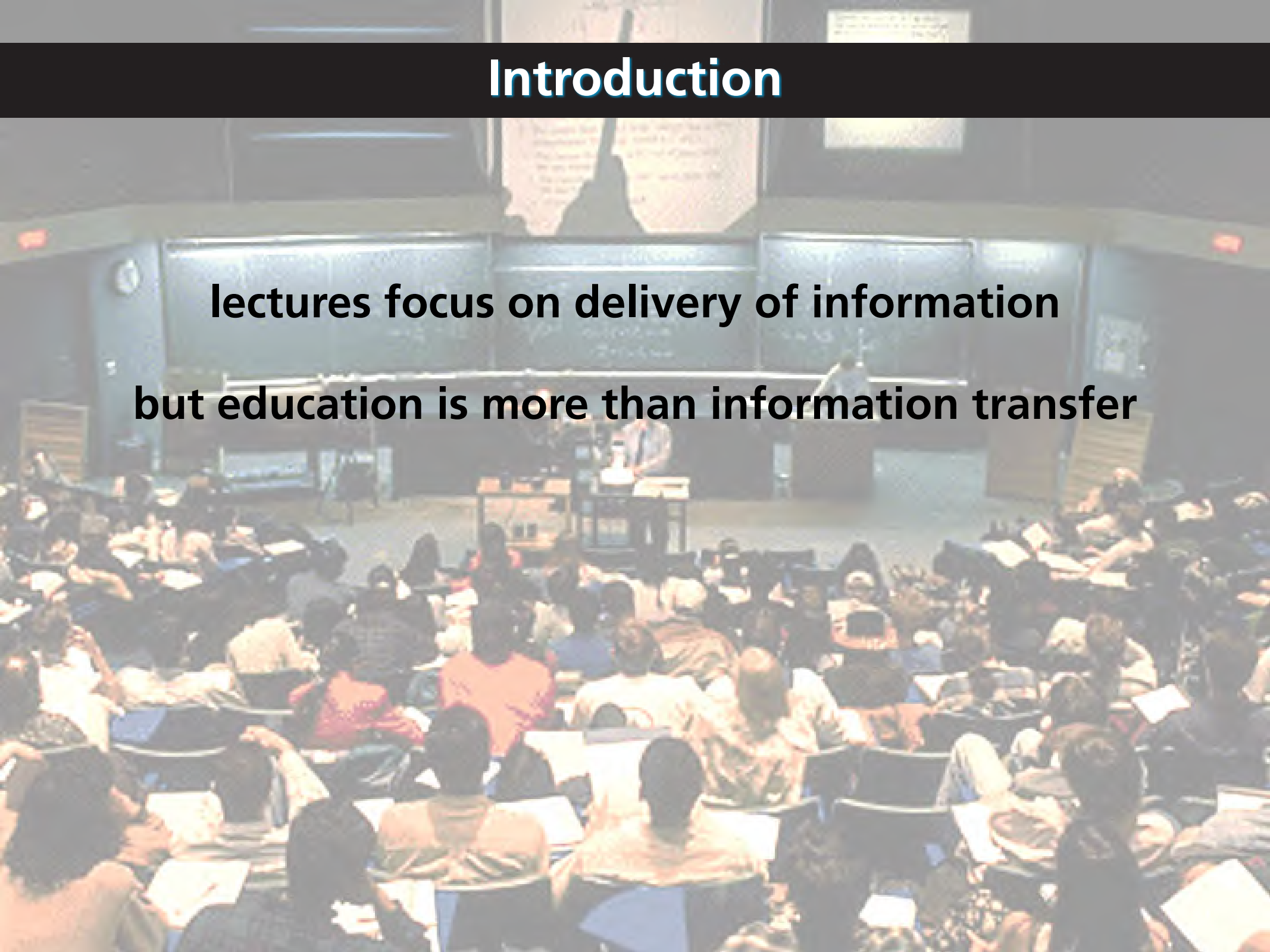


Introduction



lectures focus on delivery of information

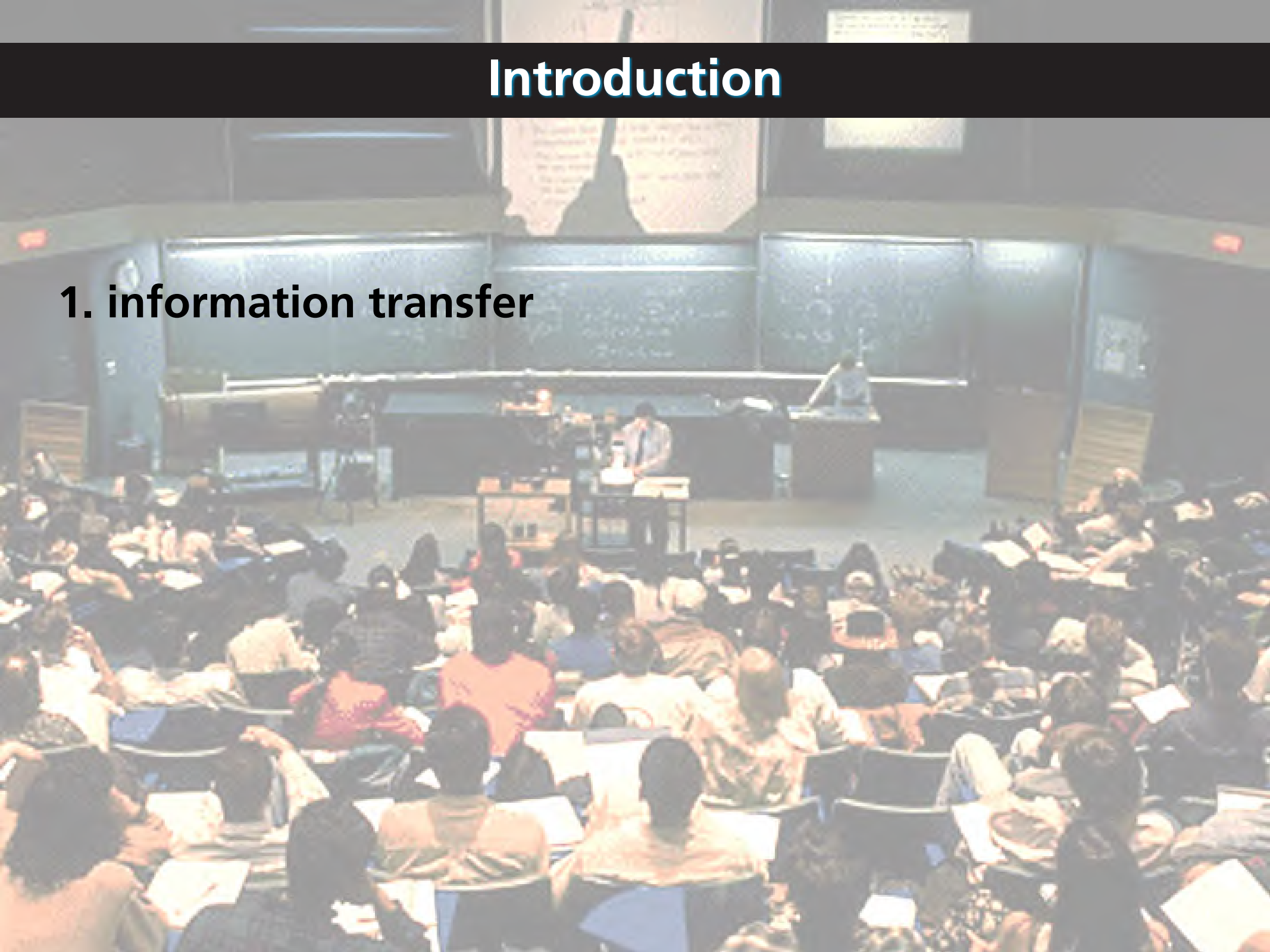
Introduction



lectures focus on delivery of information

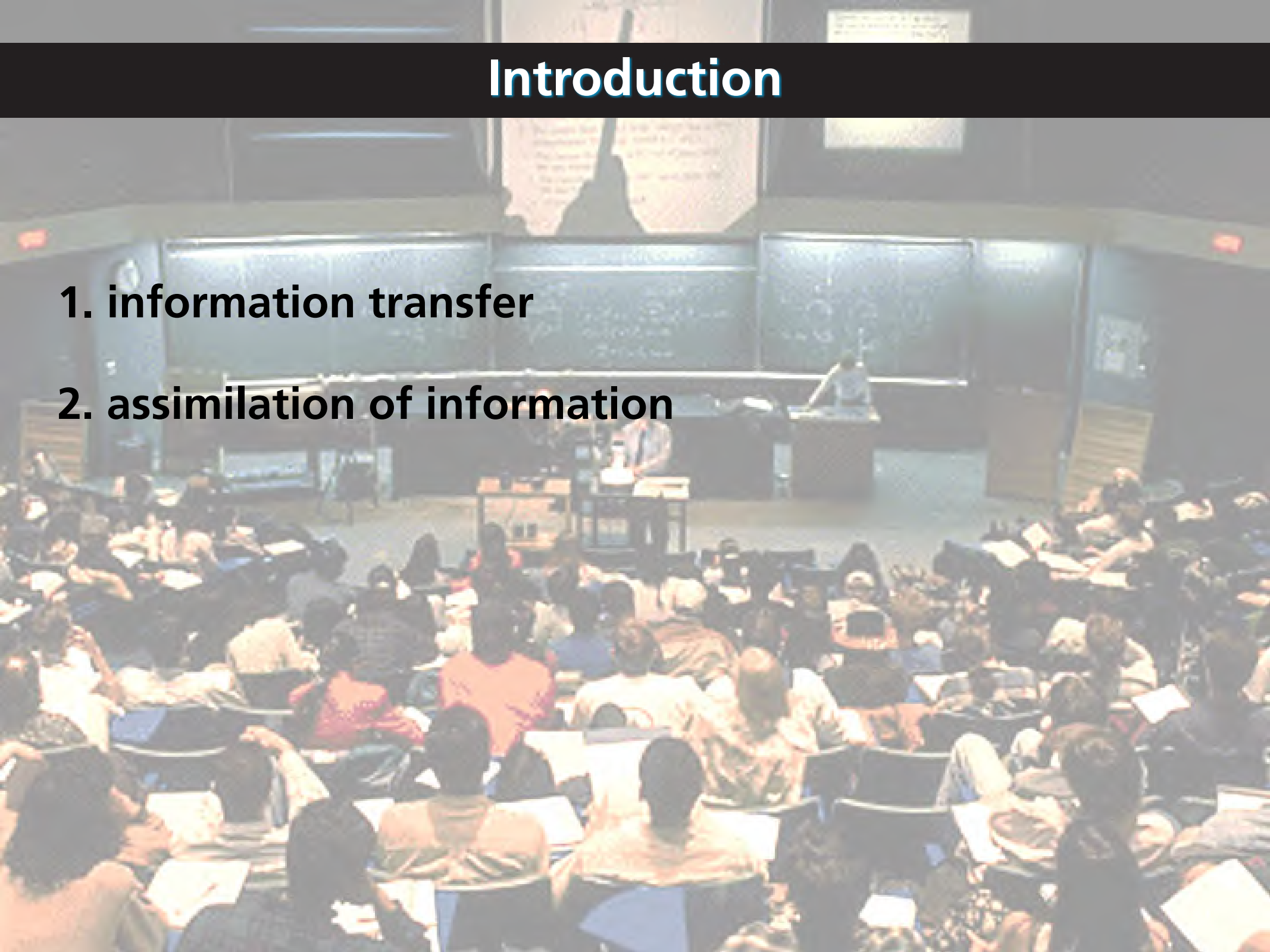
but education is more than information transfer

Introduction



1. information transfer

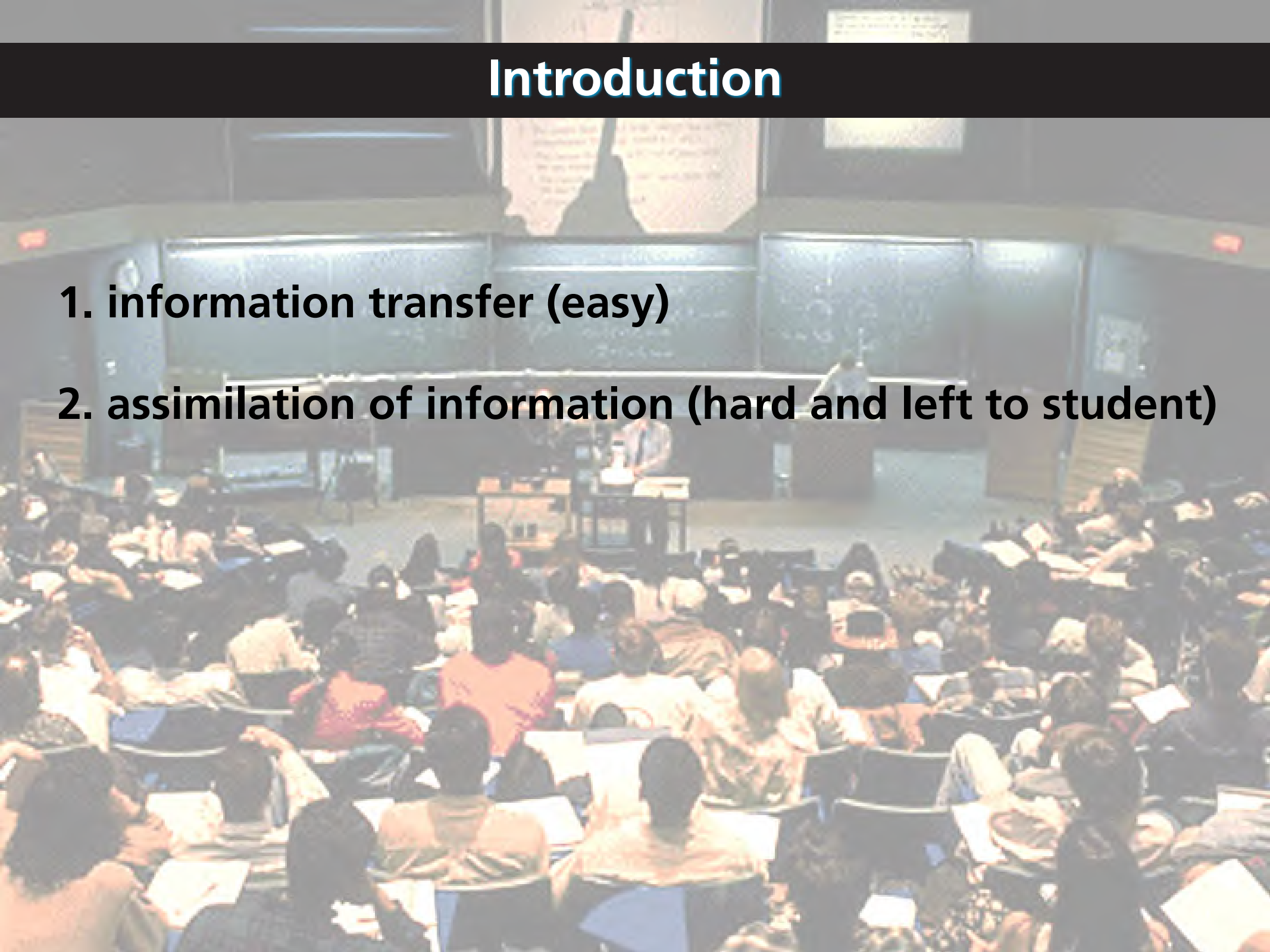
Introduction



1. information transfer

2. assimilation of information

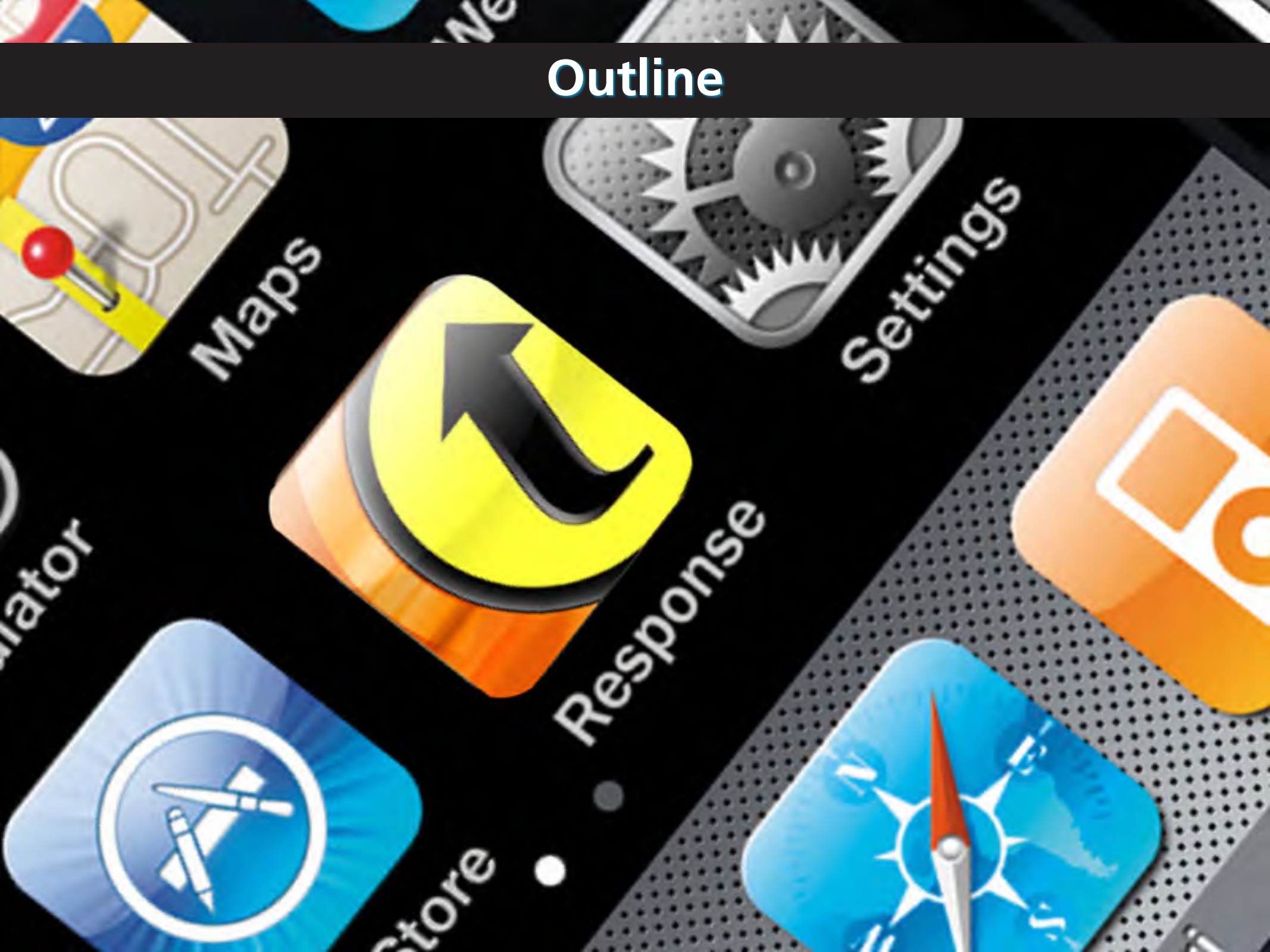
Introduction



1. information transfer (easy)

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

Outline



Outline

- Peer Instruction
- Let's try it!
- Results

Introduction

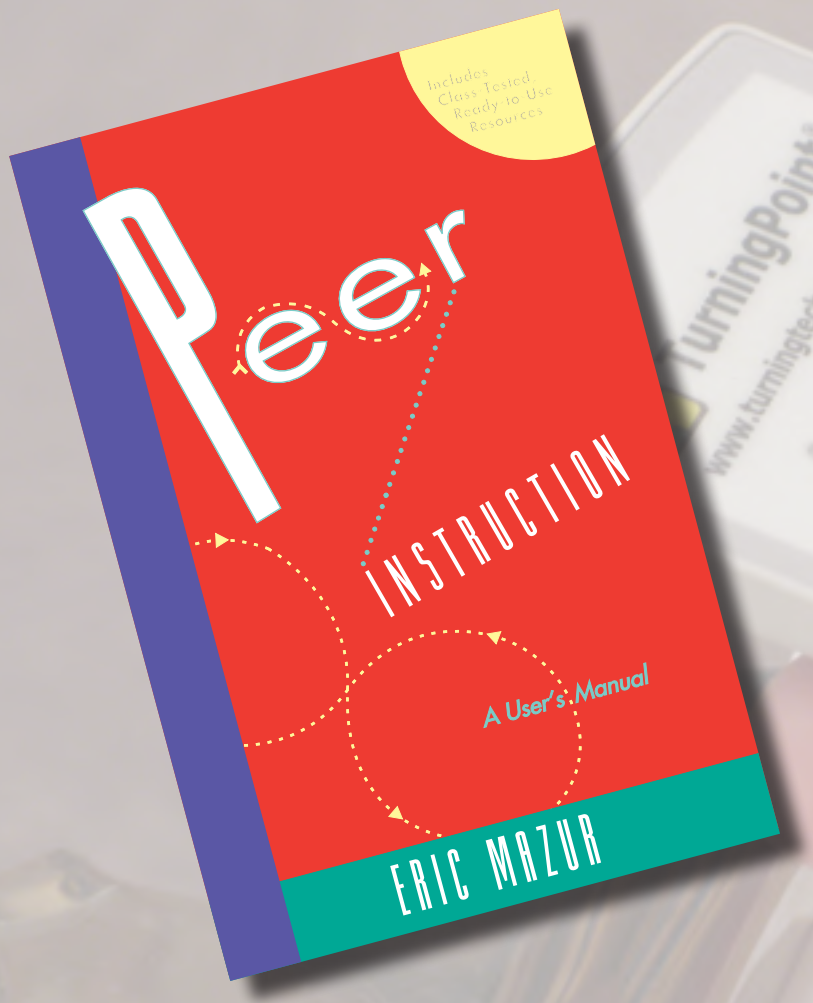
Solution: move information transfer out of classroom!

Introduction

Solution: move information transfer out of classroom!

(so we can help students assimilate the information in class)

Peer Instruction

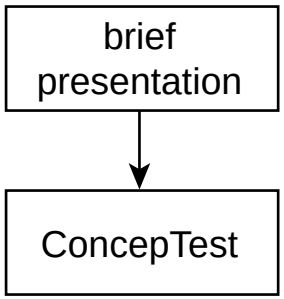


- assign reading
- teach by questioning

Peer Instruction

brief
presentation

Peer Instruction



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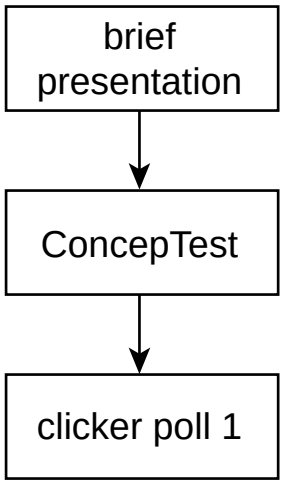

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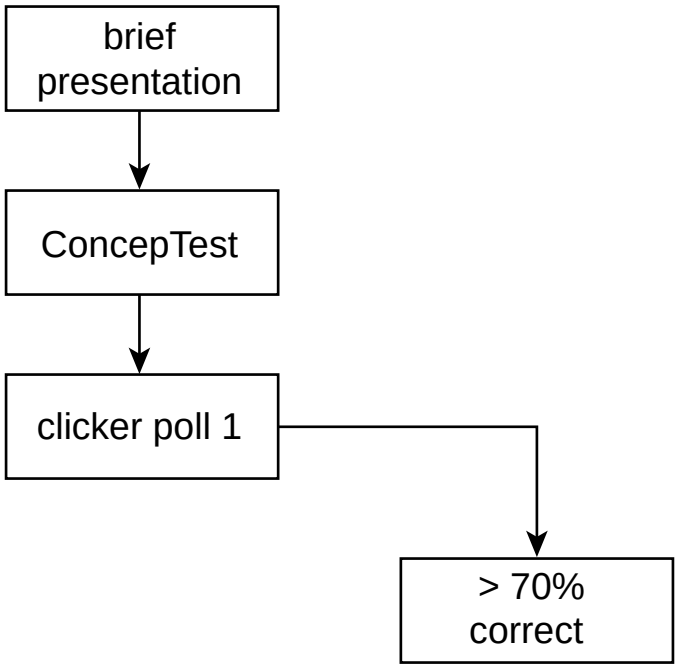

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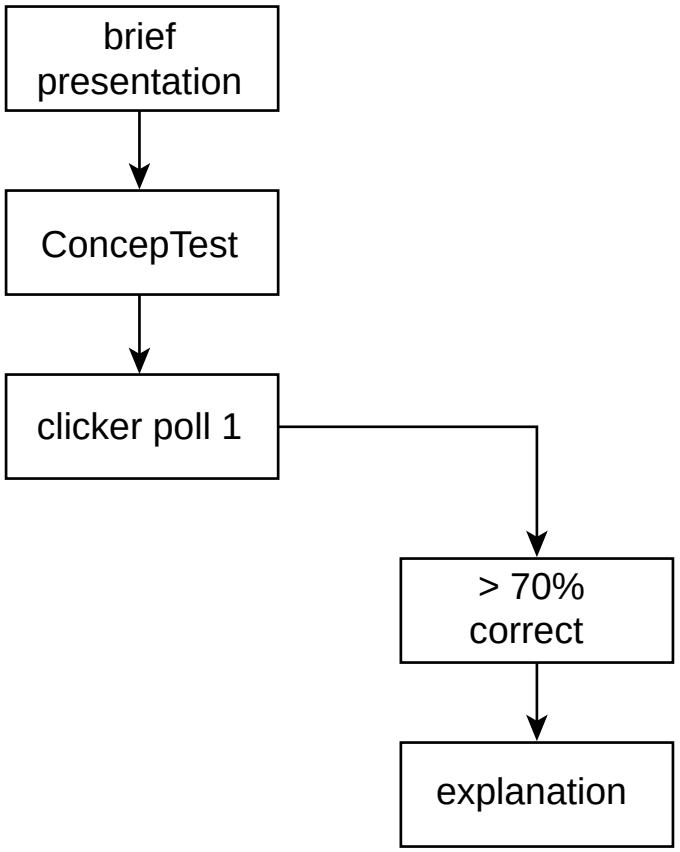

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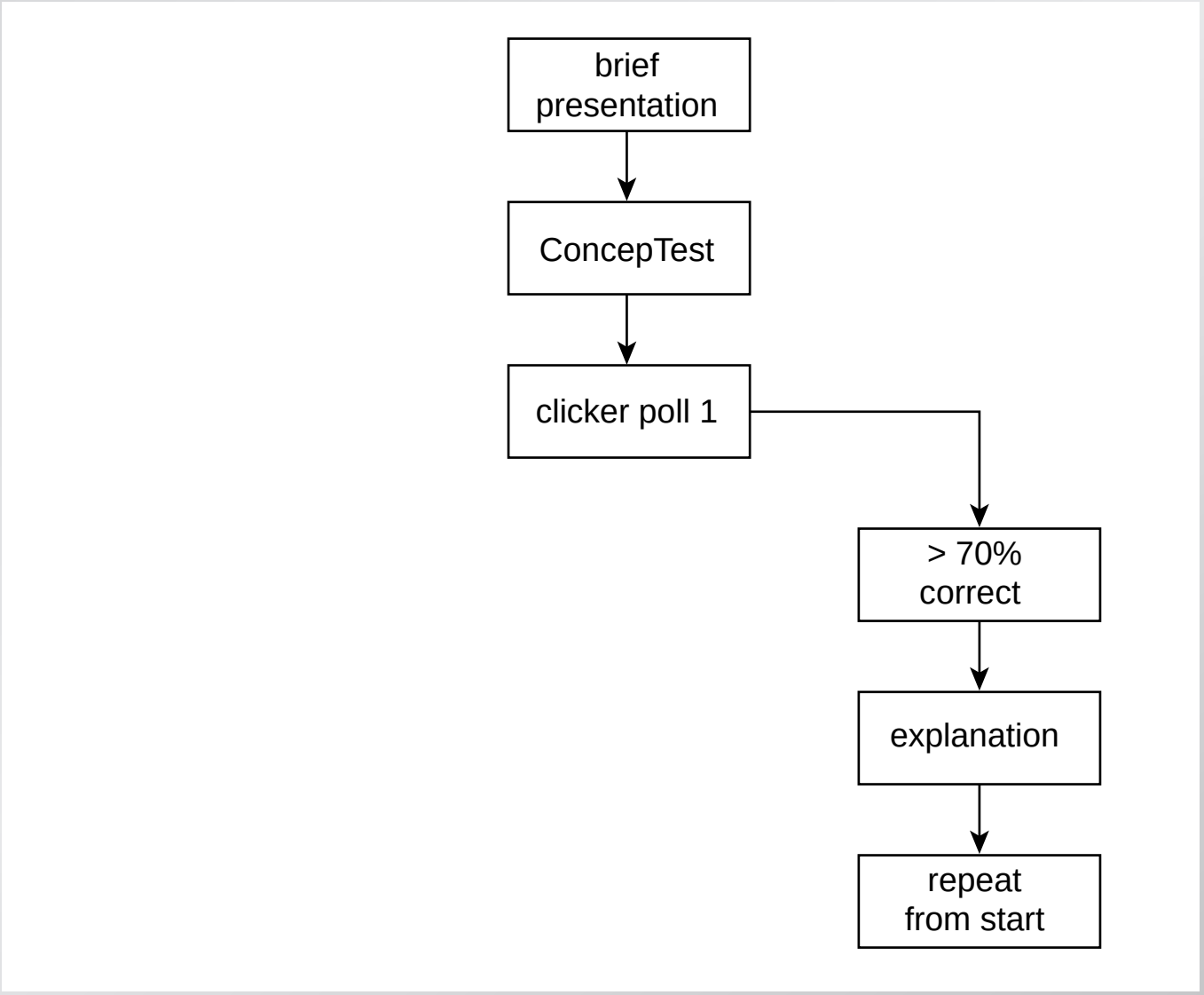

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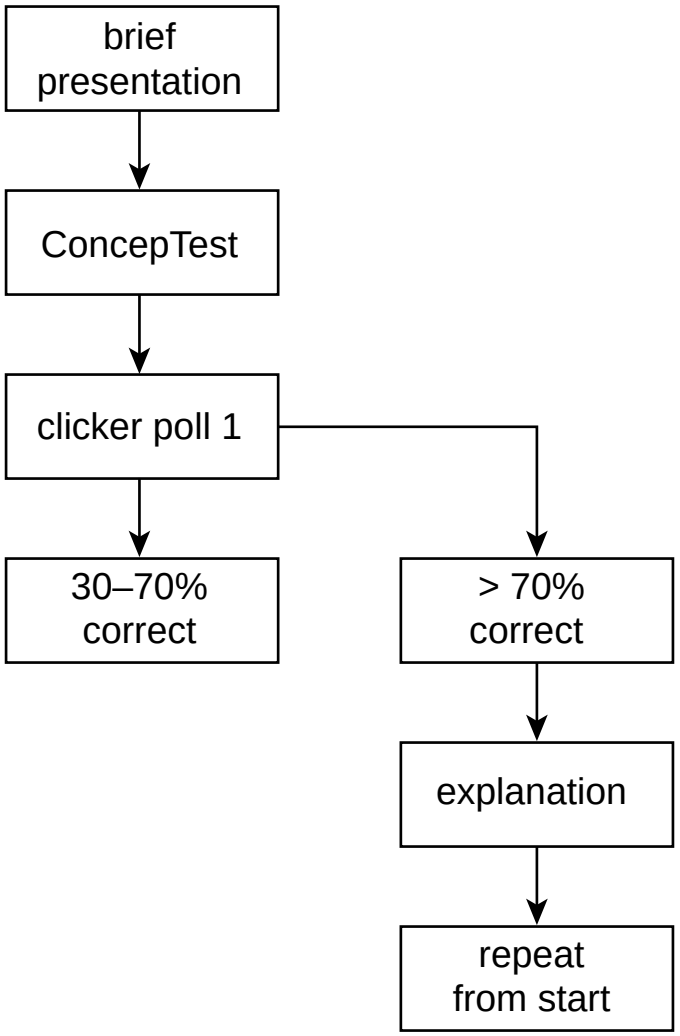

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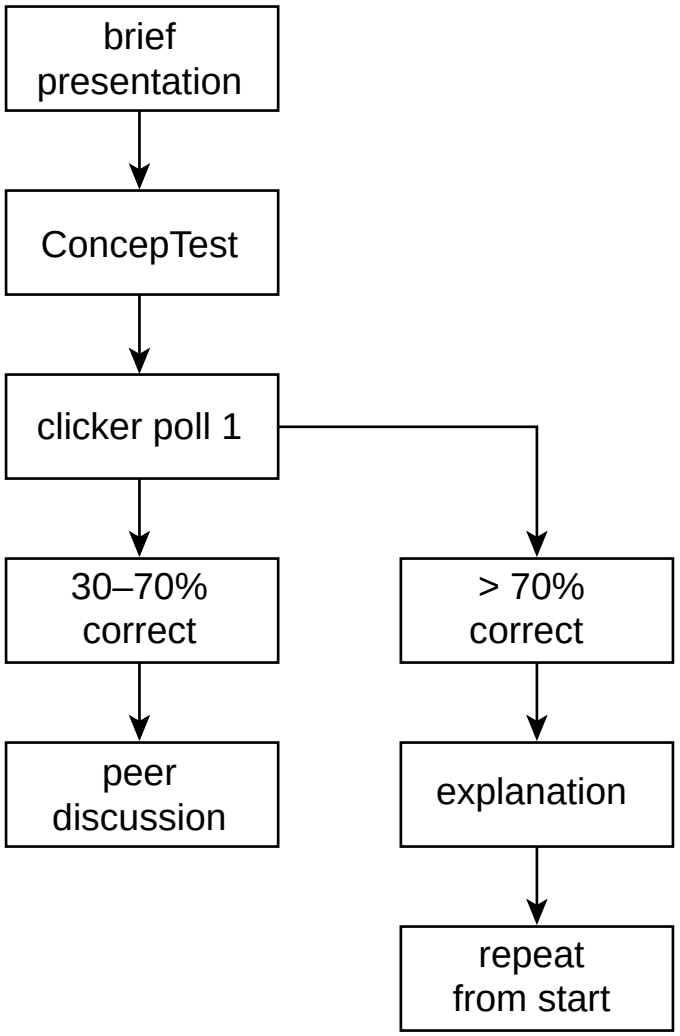

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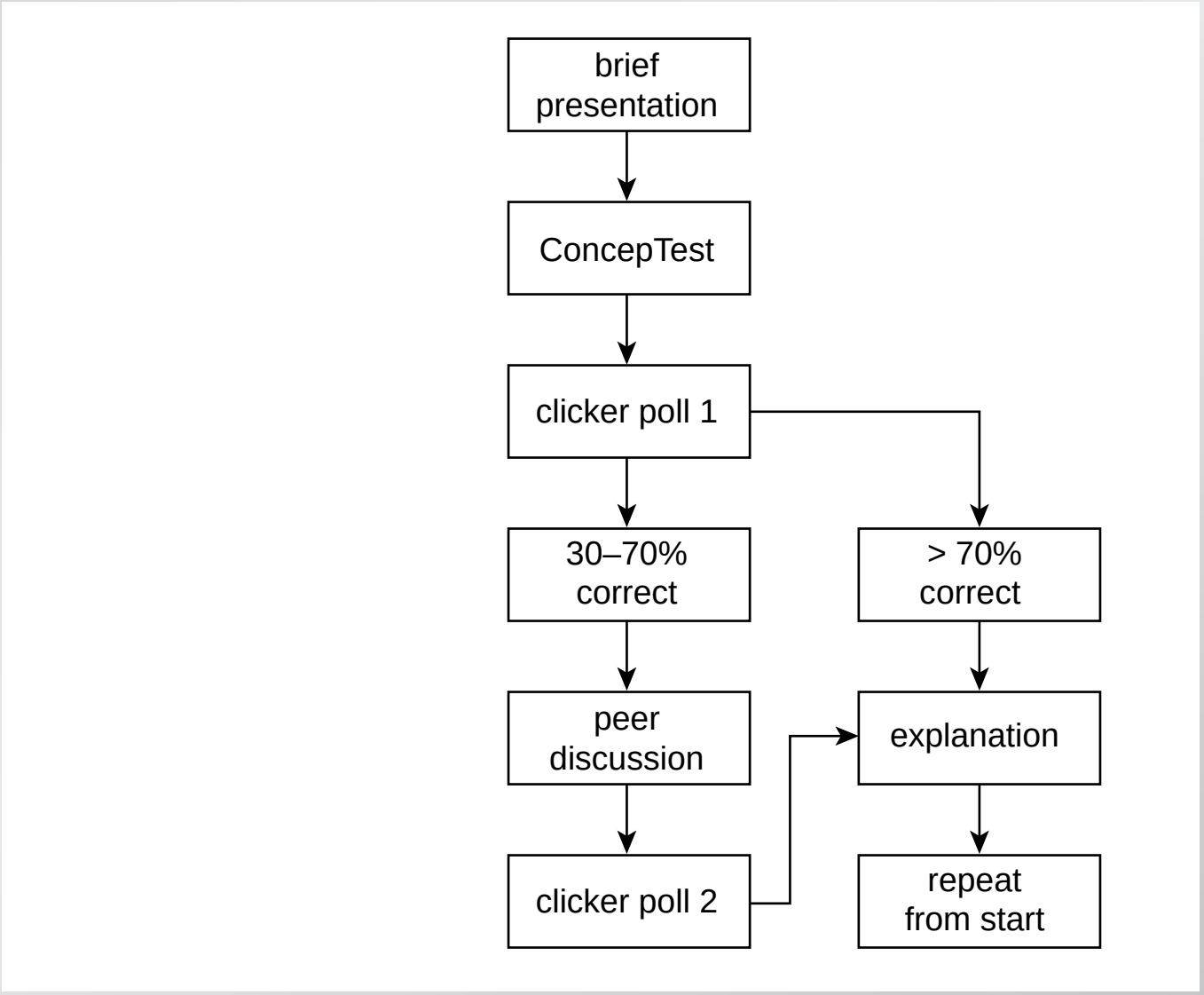

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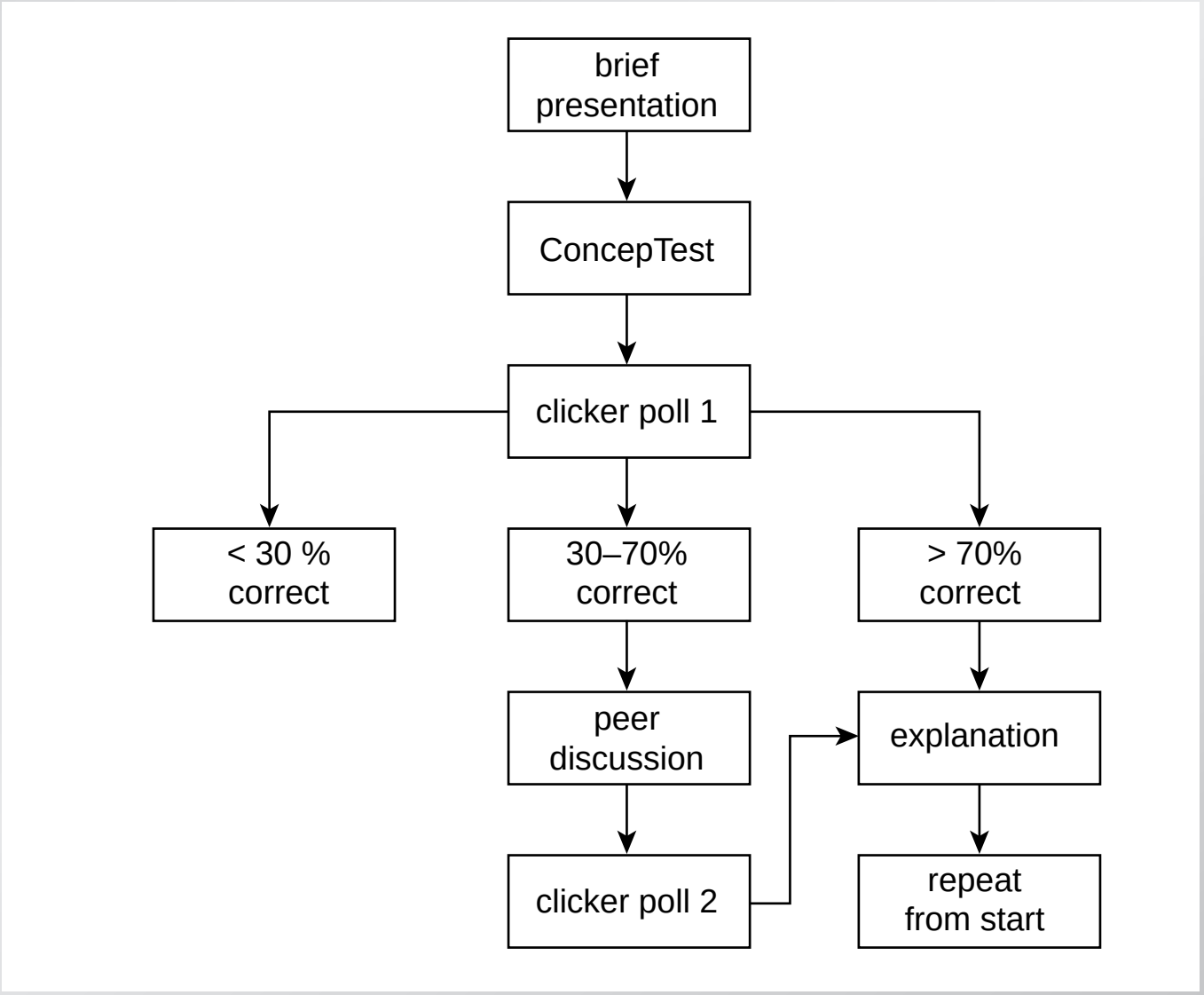

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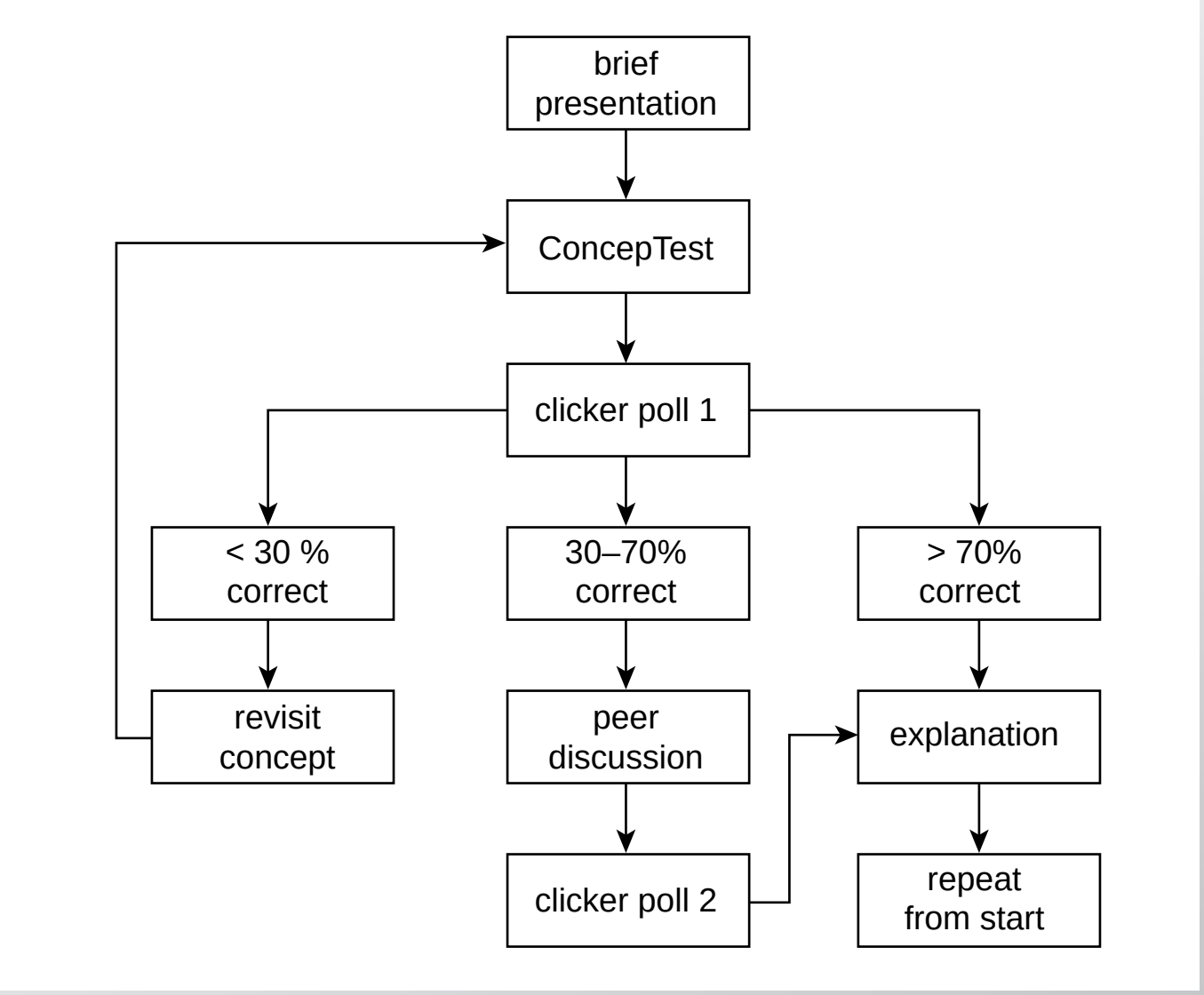

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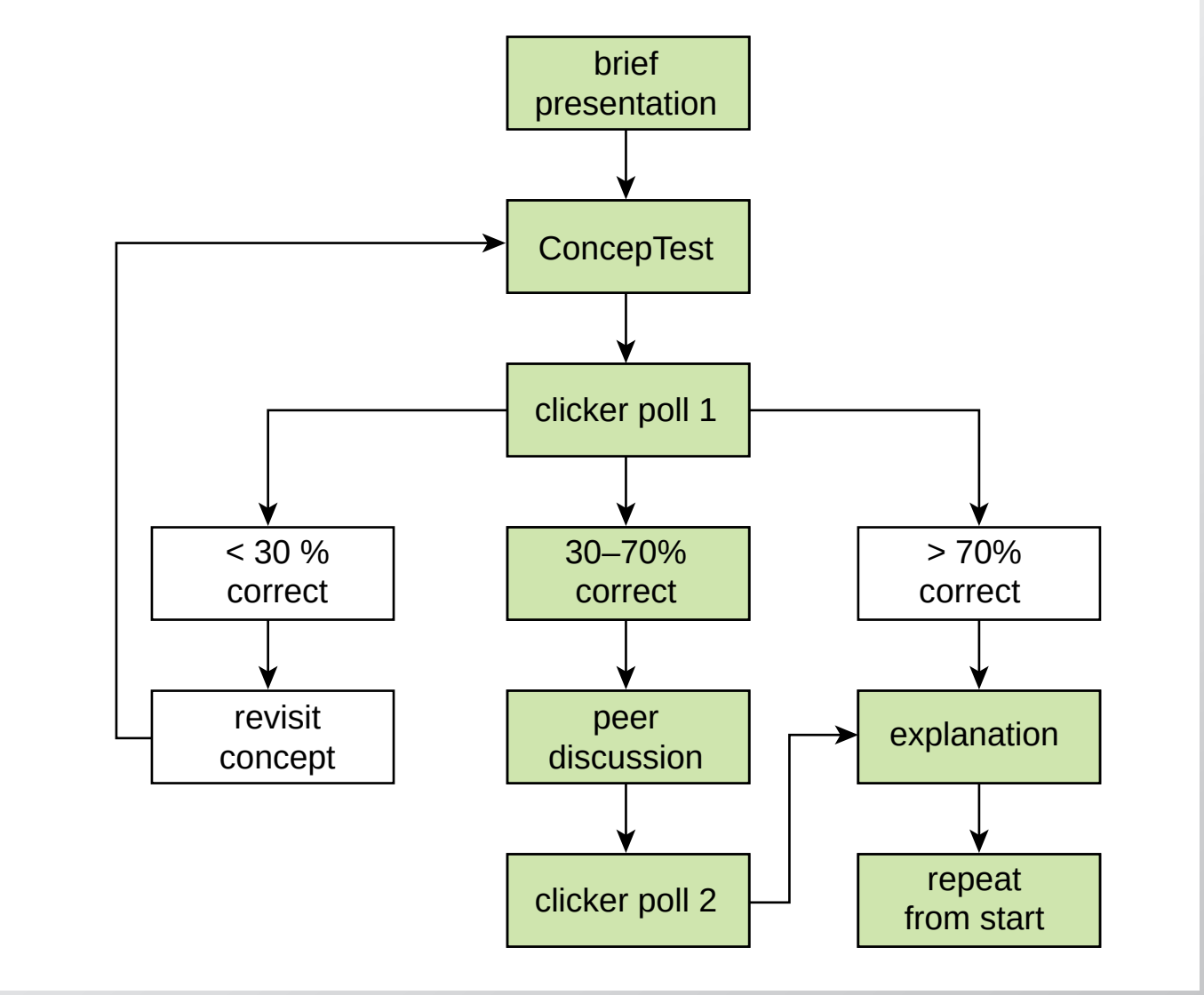

Outline

- Peer Instruction
- Let's try it!
- Results

Get your clickers ready!

- no ON/OFF button
- only last “click” counts
- display shows recorded answer

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Get your clickers ready!

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Get your clickers ready!

unique ID on back of clicker

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Let's try it!

projectile trajectories

Let's try it!

projectile trajectories

motion up = inverse of motion down

Let's try it!

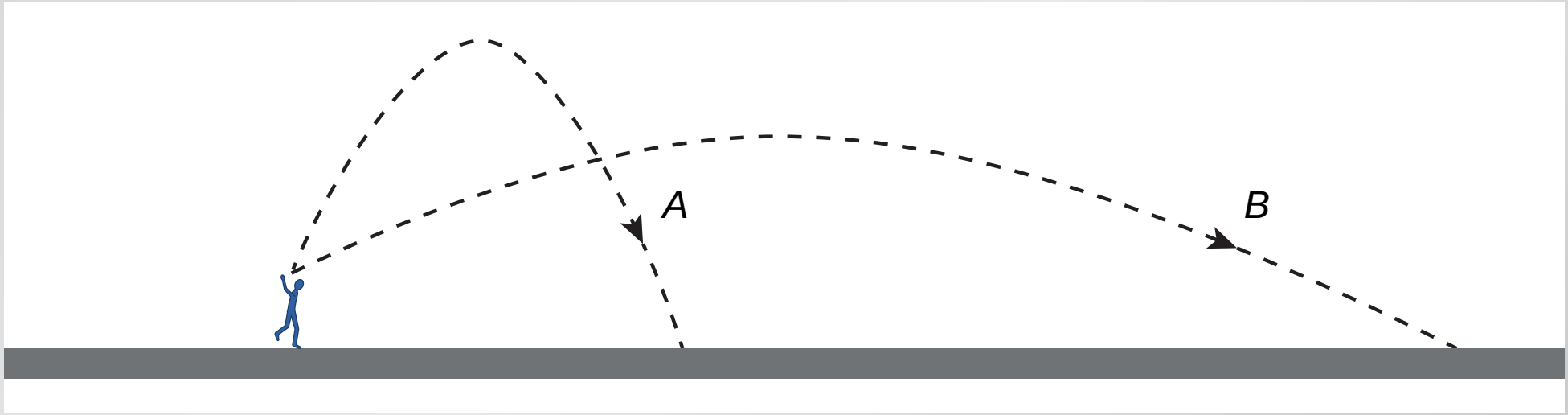
projectile trajectories

motion up = inverse of motion down

horizontal/vertical motion decoupled

Let's try it!

You simultaneously throw two coins. If the coins follow the parabolic trajectories shown below, which coin hits the ground first?



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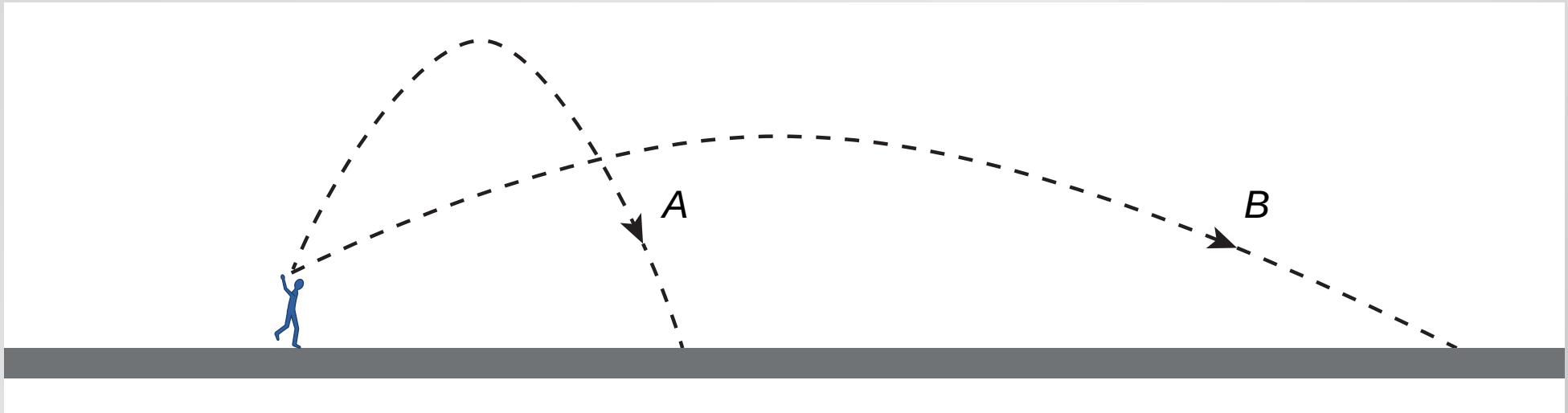


1. A
2. both at (nearly) the same time
3. B
4. need more information

Let's try it!

It's easy to fire up the audience!

Let's try it!

time each coin spends in air

Let's try it!

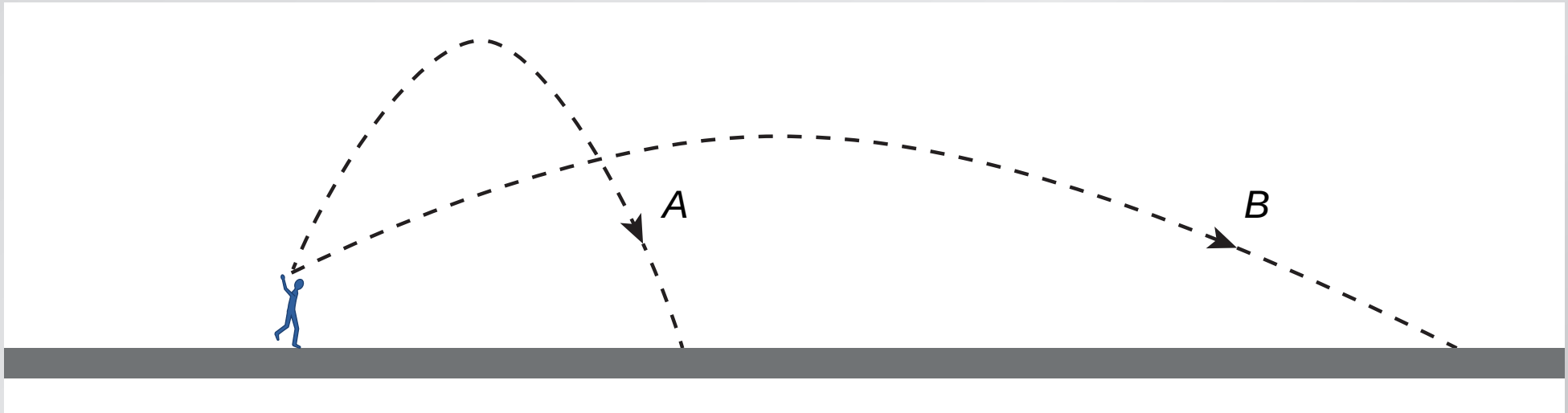
time each coin spends in air

$$2t_{\mathrm{h}}$$

(twice time to fall from maximum height)

Let's try it!

You simultaneously throw two coins. If the coins follow the parabolic trajectories shown below, which coin hits the ground first?



1. A
2. both at (nearly) the same time
3. B ✔
4. need more information

Let's try it!

deep *versus* surface approaches to learning

surface learning

goal: pass examination
result: fragmented knowledge, poor retention

deep learning

goal: construct meaning
result: well-structured knowledge, long-term retention

Let's try it!

Which is most accurate?

1. **For survey courses, a surface approach is more efficient — no time for details.**

Let's try it!

Which is most accurate?

1. **For survey courses, a surface approach is more efficient — no time for details.**
2. **It's a trade-off: the deep approach provides conceptual understanding, but students also need a surface approach to memorize facts.**

Let's try it!

Which is most accurate?

1. **For survey courses, a surface approach is more efficient — no time for details.**
2. **It's a trade-off: the deep approach provides conceptual understanding, but students also need a surface approach to memorize facts.**
3. **When students use a deep approach, they are more likely to remember details and learn problem solving.**

Let's try it!

Which is most accurate?

1. **For survey courses, a surface approach is more efficient — no time for details.**
2. **It's a trade-off: the deep approach provides conceptual understanding, but students also need a surface approach to memorize facts.**
3. **When students use a deep approach, they are more likely to remember details and learn problem solving.**
4. **For each course we need to determine for which parts of the content each approach is most appropriate.**

Let's try it!

a couple of points worth noting:

Let's try it!

a couple of points worth noting:

1. you got engaged

Let's try it!

a couple of points worth noting:

1. you got engaged
2. no "correct" answer

Let's try it!

a couple of points worth noting:

1. you got engaged
2. no "correct" answer
3. you got engaged

Let's try it!

a couple of points worth noting:

1. you got engaged
2. no "correct" answer
3. you got engaged
4. you don't need a correct answer!

Let's try it!

Which of the following airlines tries to save fuel by suggesting that its passengers use the bathroom before boarding?

1. Delta Airlines
2. Lufthansa
3. All Nippon Airways
4. British Midland Airways
5. Air France
6. JAL
7. Aboriginal Air Services
8. Aeroflot
9. Are you kidding me? None of the above.

Let's try it!

Which of the following airlines tries to save fuel by suggesting that its passengers use the bathroom before boarding?

1. Delta Airlines
2. Lufthansa
3. **All Nippon Airways** ✔
4. British Midland Airways
5. Air France
6. JAL
7. Aboriginal Air Services
8. Aeroflot
9. Are you kidding me? None of the above.

Let's try it!

2 coins

learning approaches

airline

model

discussion

fact

Let's try it!

2 coins

learning approaches

airline

model

discussion

fact

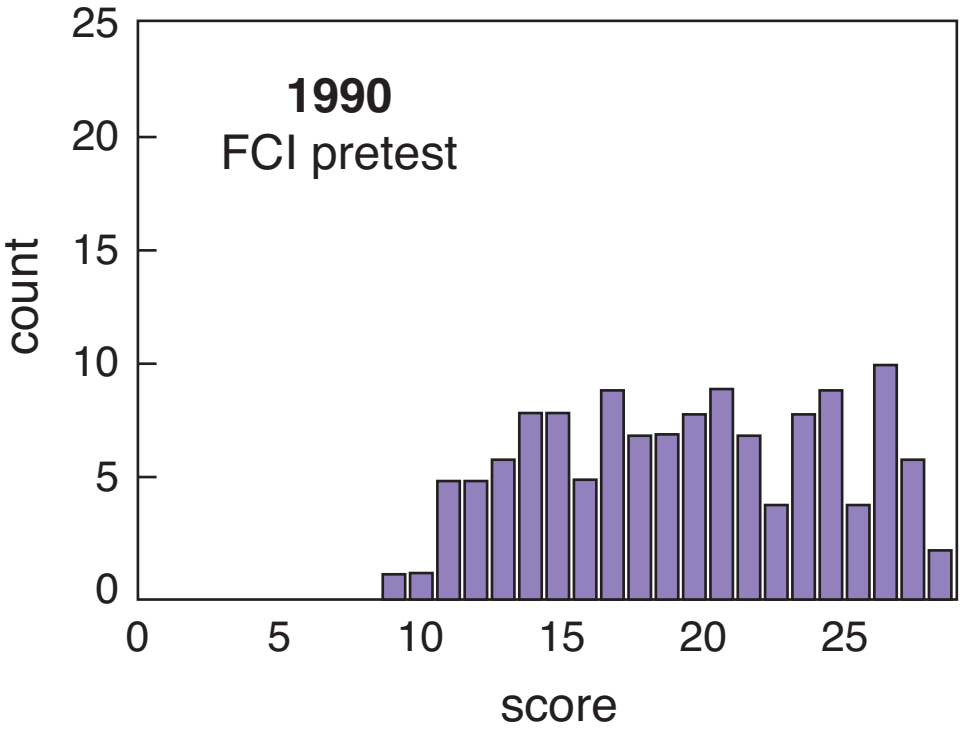
fact-recall not engaging

Outline

- Peer Instruction
- Let's try it!
- **Results**

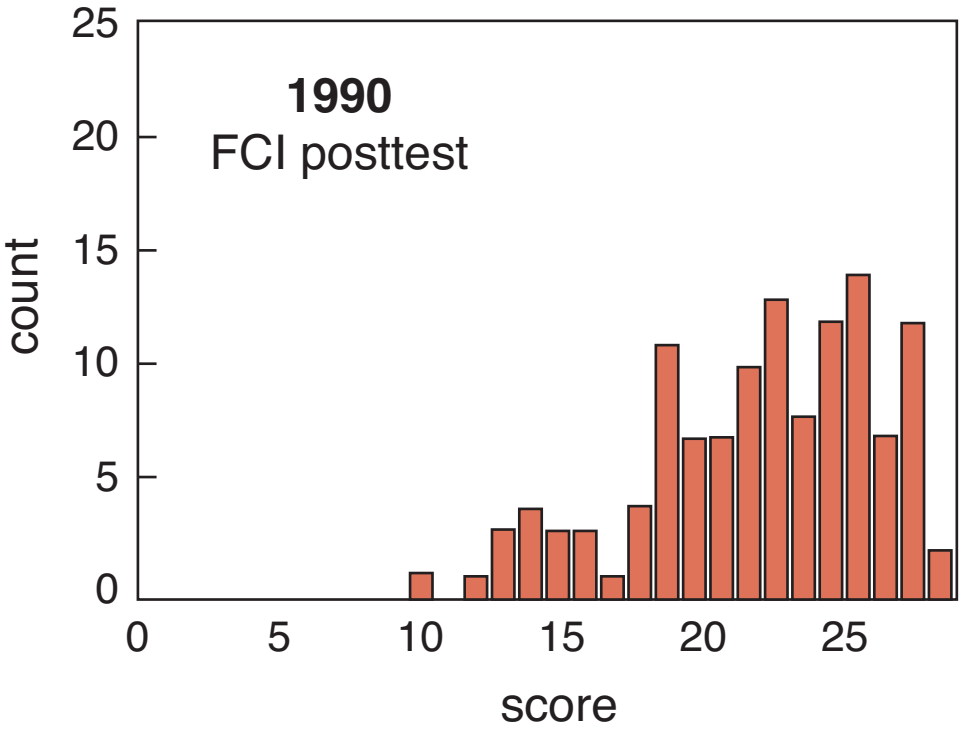
Results

traditional instruction



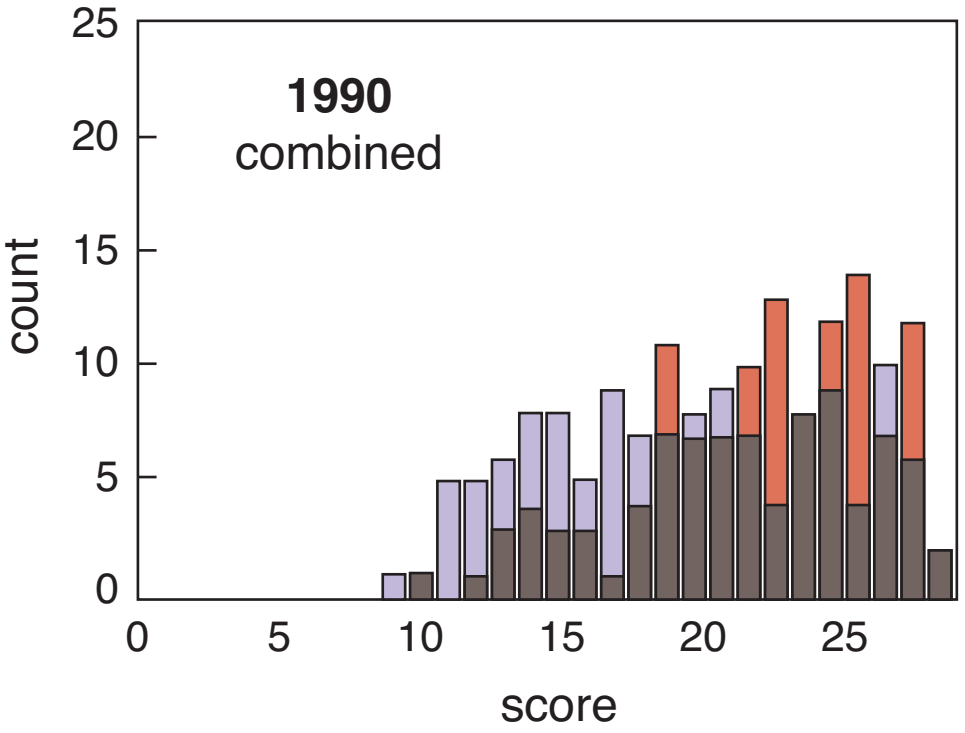
Results

traditional instruction



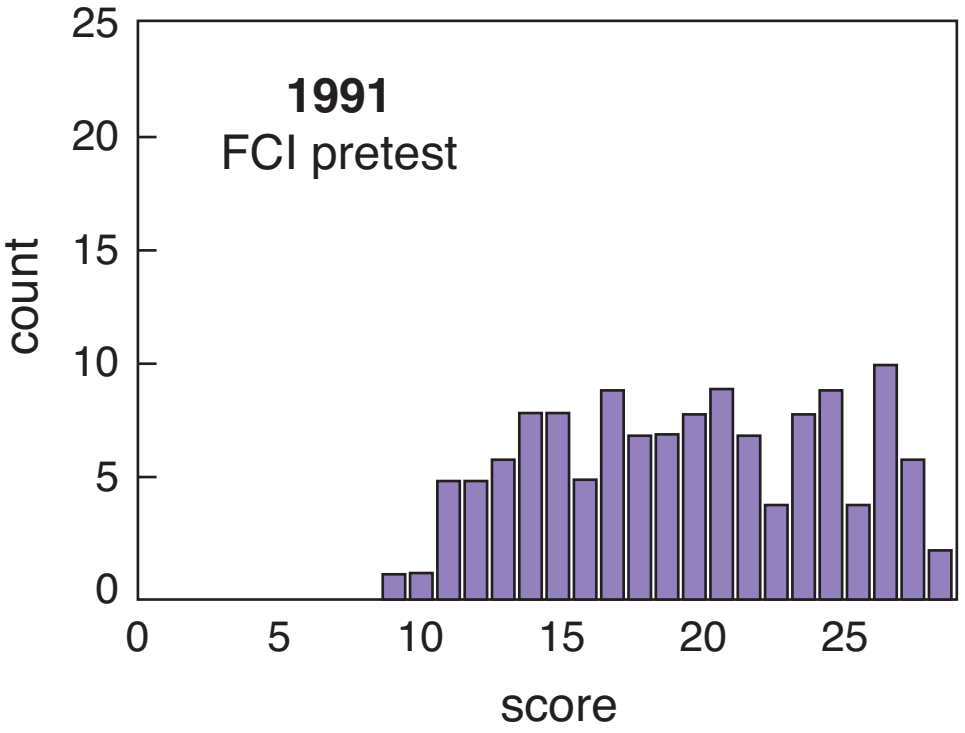
Results

traditional instruction



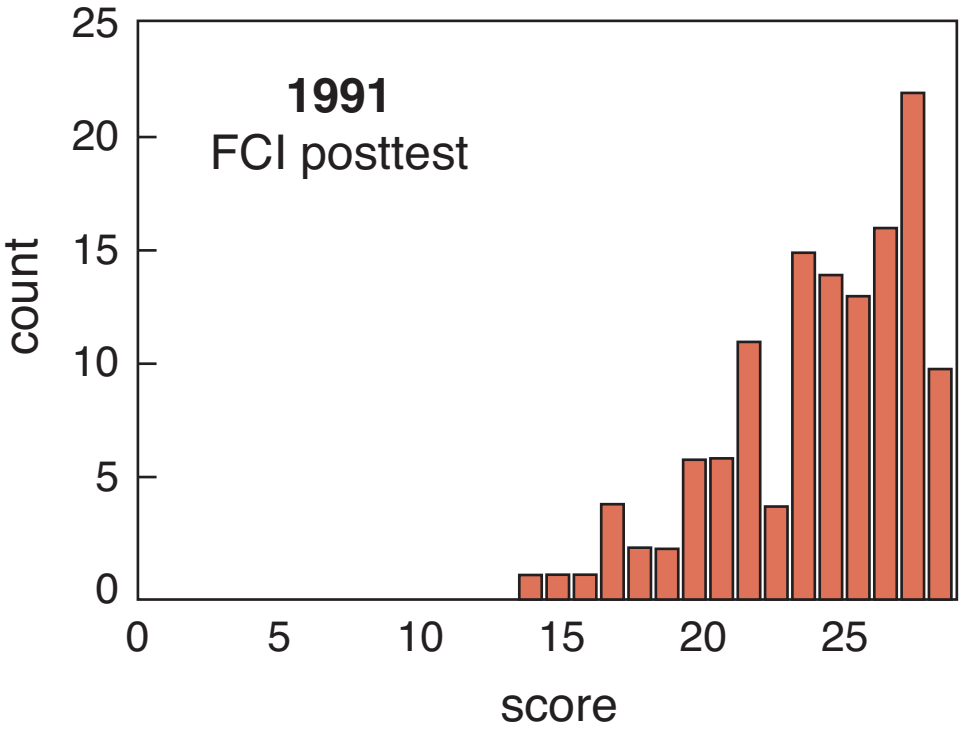
Results

first year of implementing PI



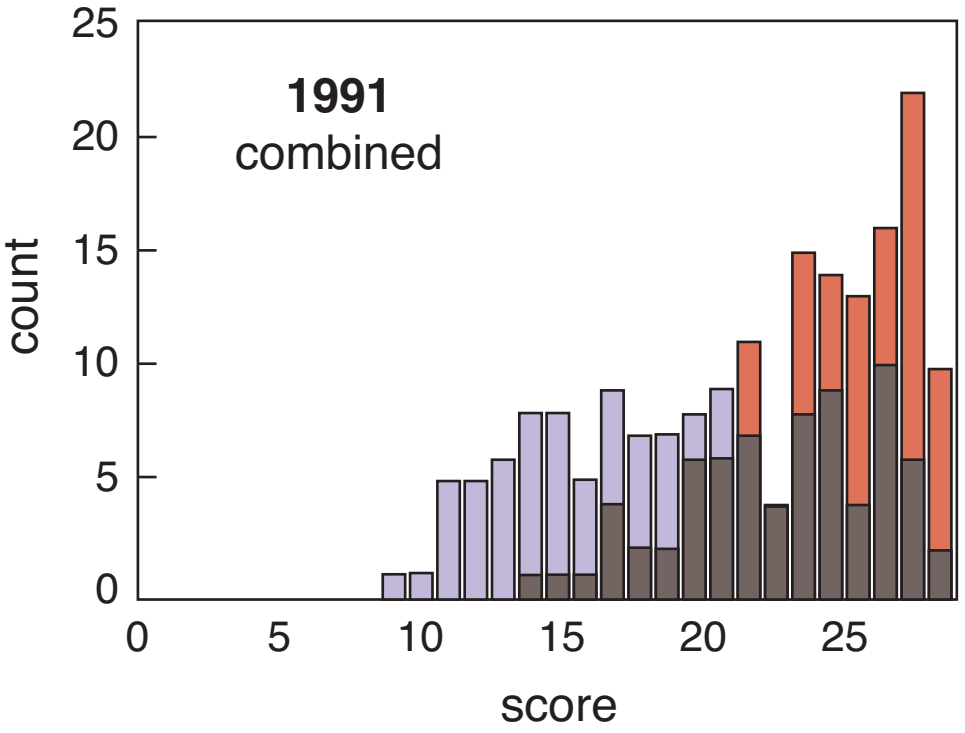
Results

first year of implementing PI



Results

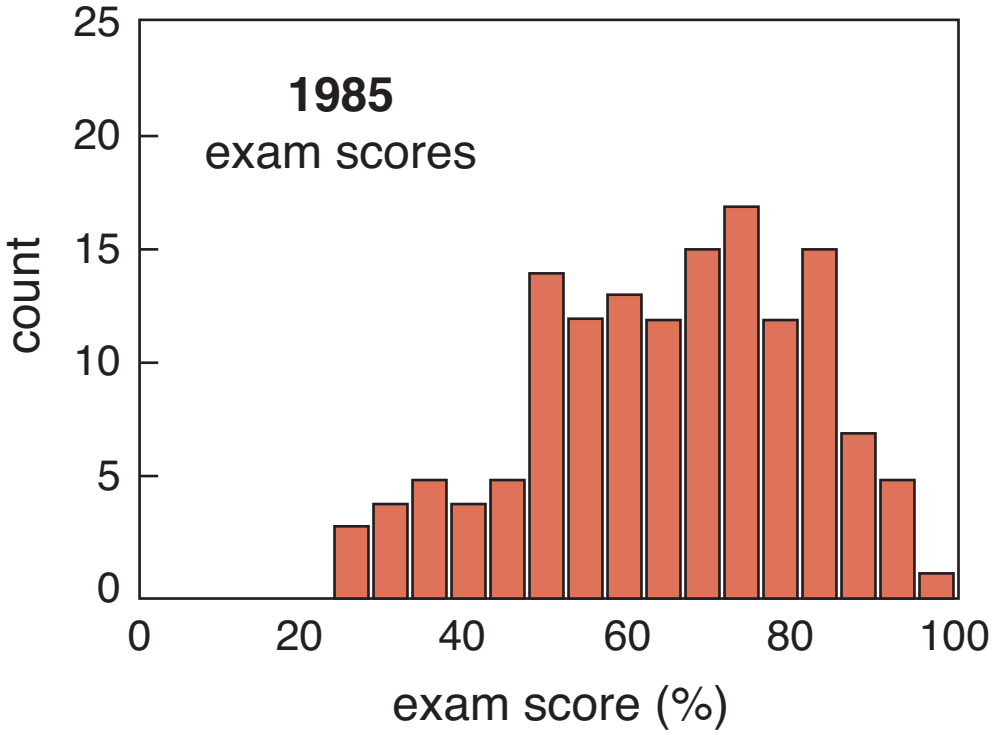
first year of implementing PI



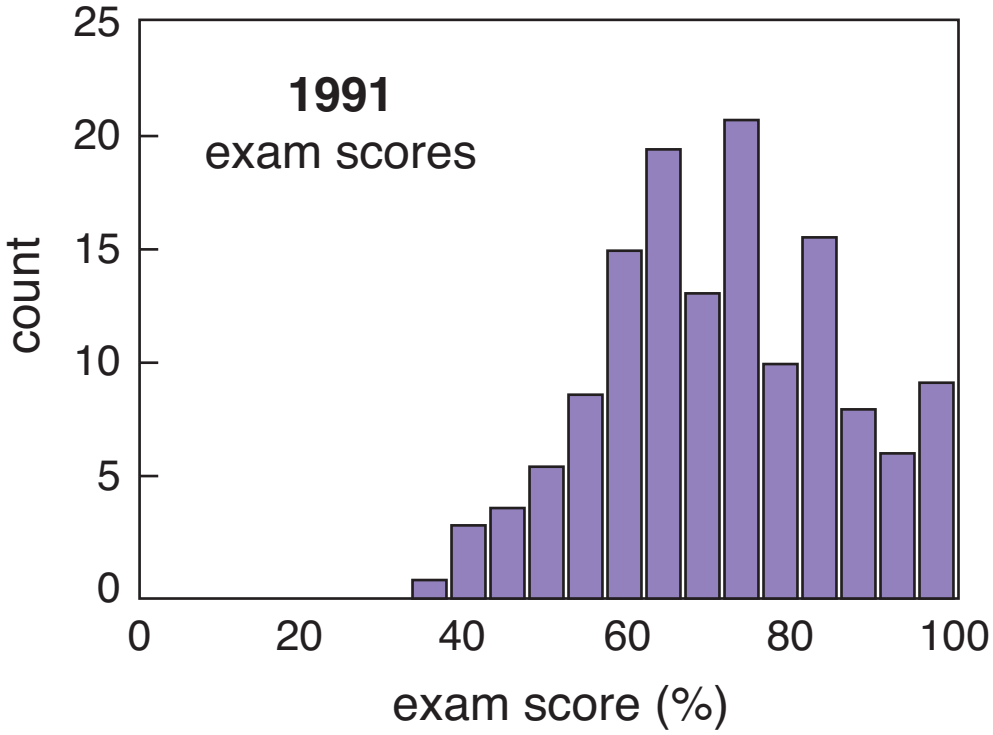
Results

what about problem solving?

Results

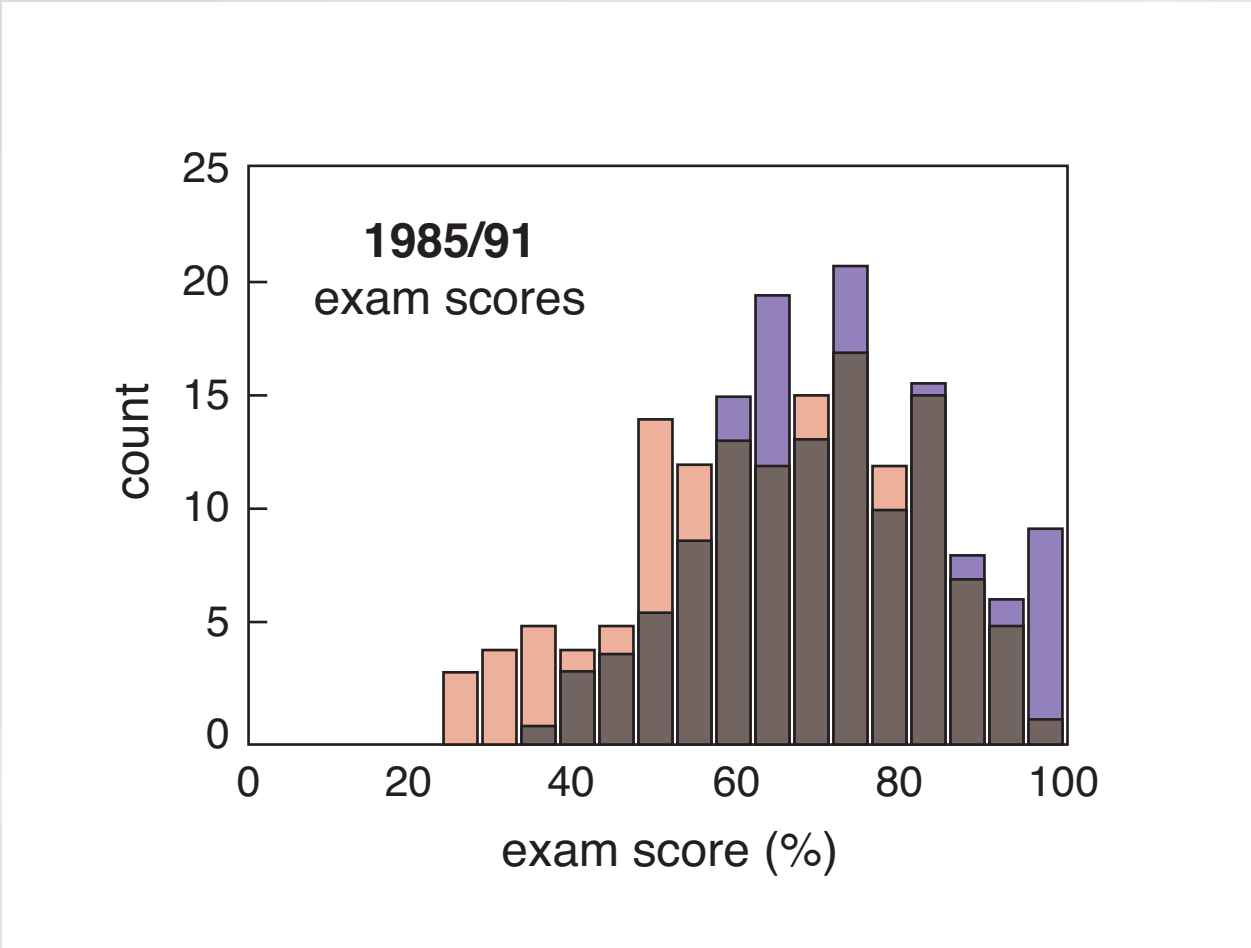

1985
exam scores
count
25
20
15
10
5
0
0
20
40
60
80
100
exam score (%)

Results


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

Results

better understanding leads to better problem solving



Conclusion

active engagement greatly improves learning gains

Conclusion

active engagement greatly improves learning gains

technology helps enable new modes of learning

Research Funding:

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