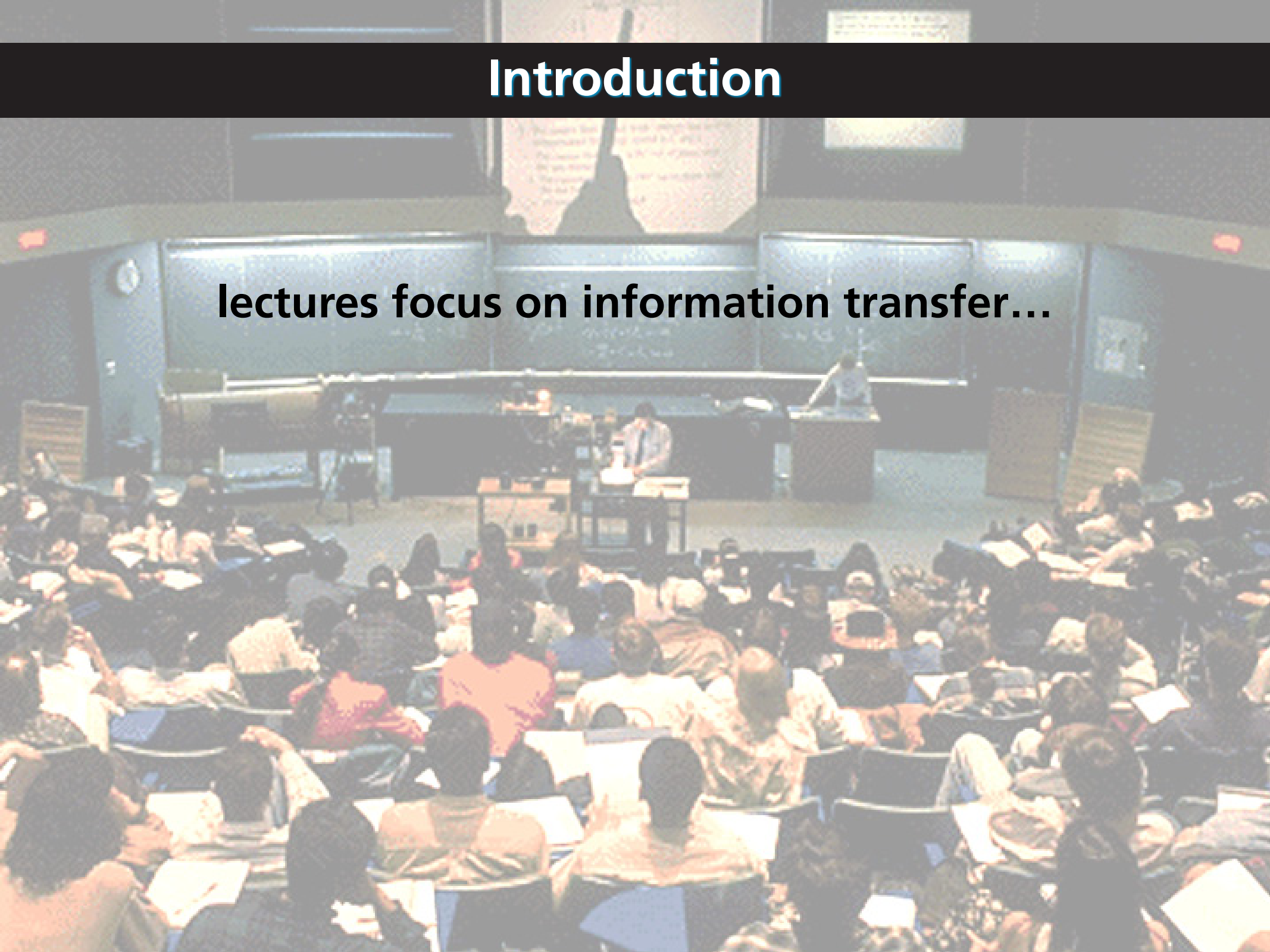
# Engaging students one-on-one, all at once

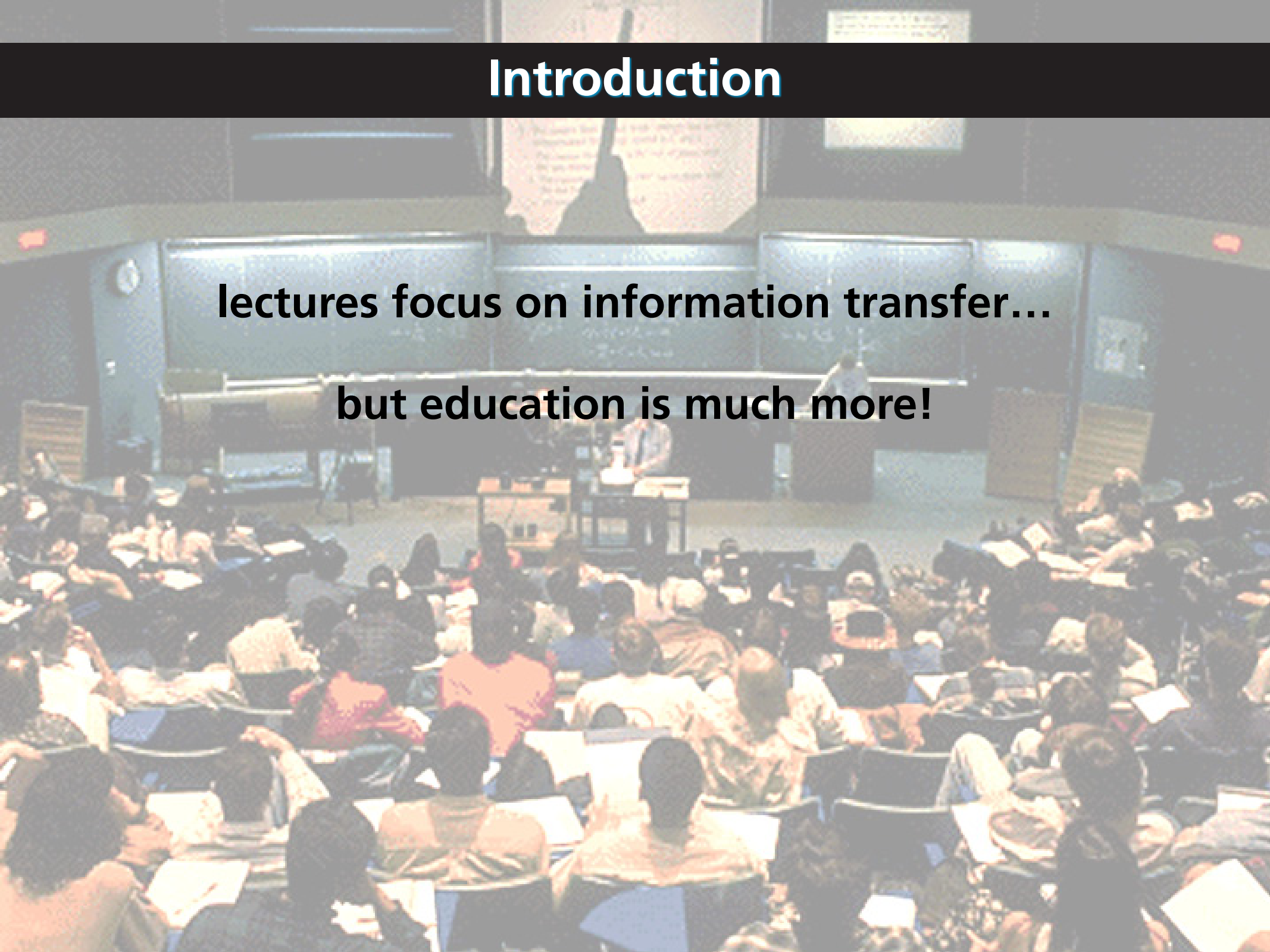

**Woodward Lecture Workshop**
**Penn State College of Medicine**
**Hershey, PA, 12 April 2012**

# Introduction



**lectures focus on information transfer…**

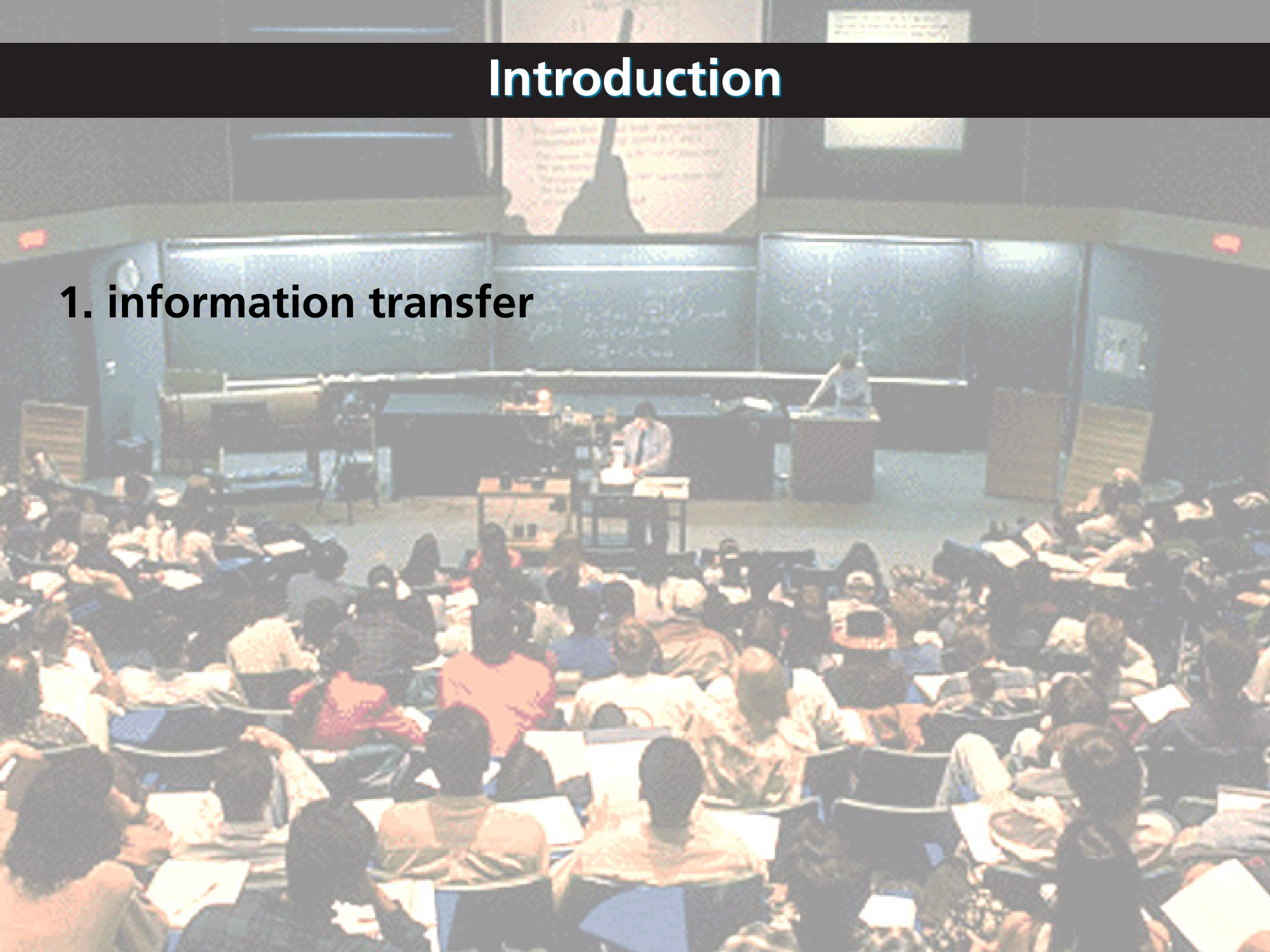
# Introduction



**lectures focus on information transfer…**

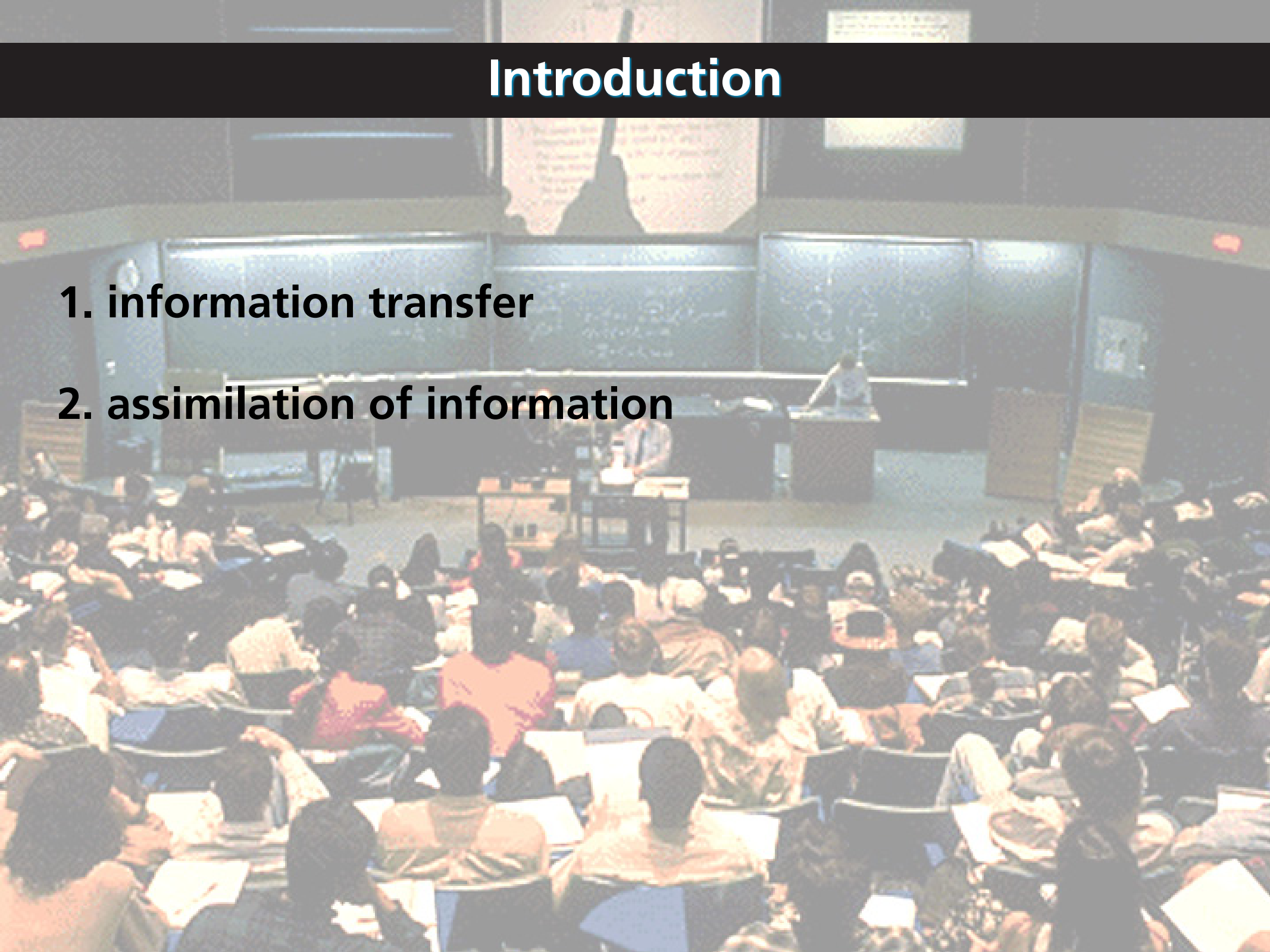
**but education is much more!**

# Introduction



1. information transfer

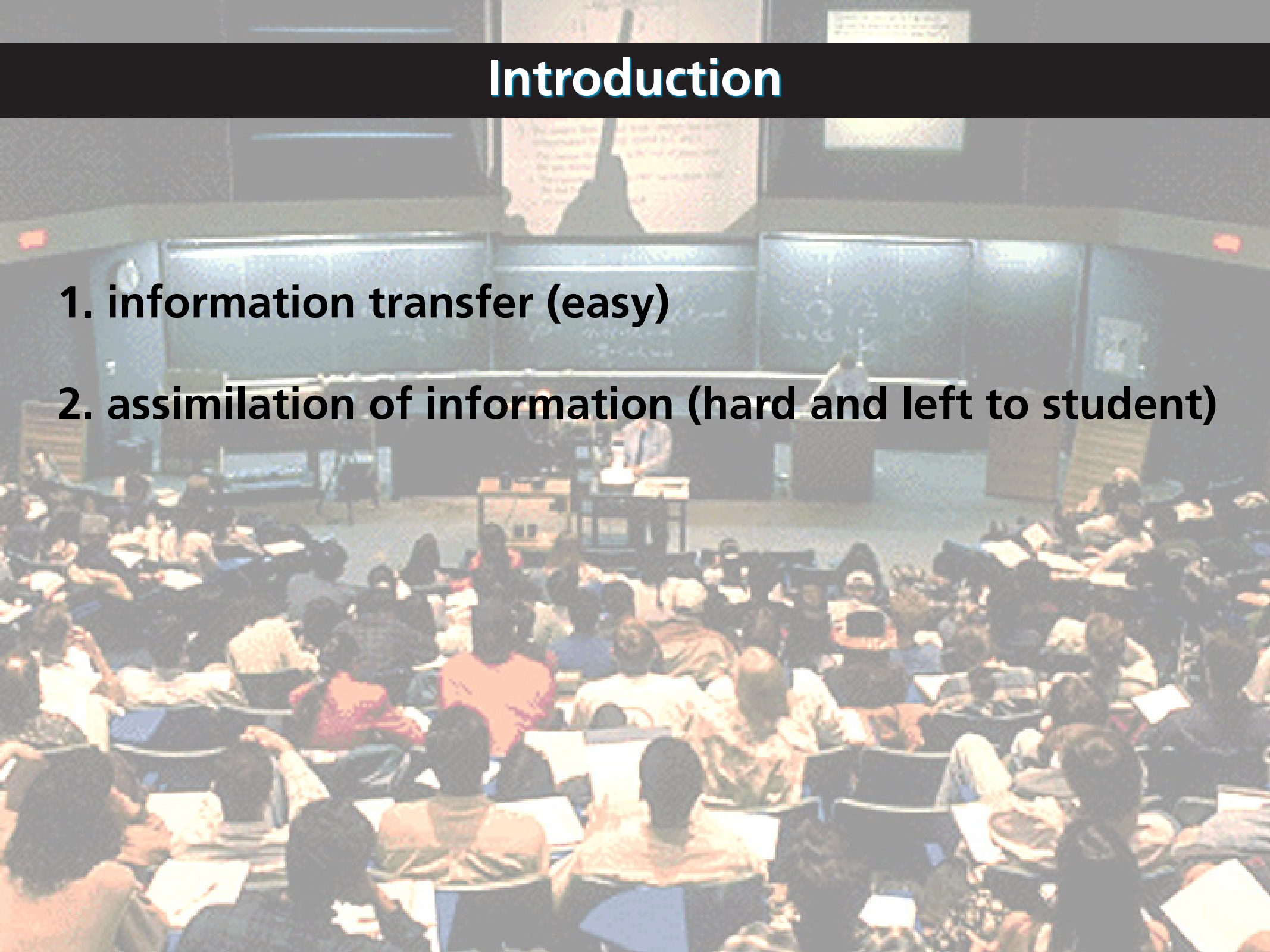
# Introduction



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)!**

# Survey

**Interactive teaching requires significantly more instructor preparation time than traditional lecture.**

1. Strongly Agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly Disagree

# Survey

Interactive teaching requires clickers.

1. Strongly Agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly Disagree

# Survey

If I give my students a pre-class (reading) assignment, most of them will complete it before coming to class.

1. Strongly Agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly Disagree

# Survey

**It is difficult to see how to apply interactive teaching techniques in my courses.**

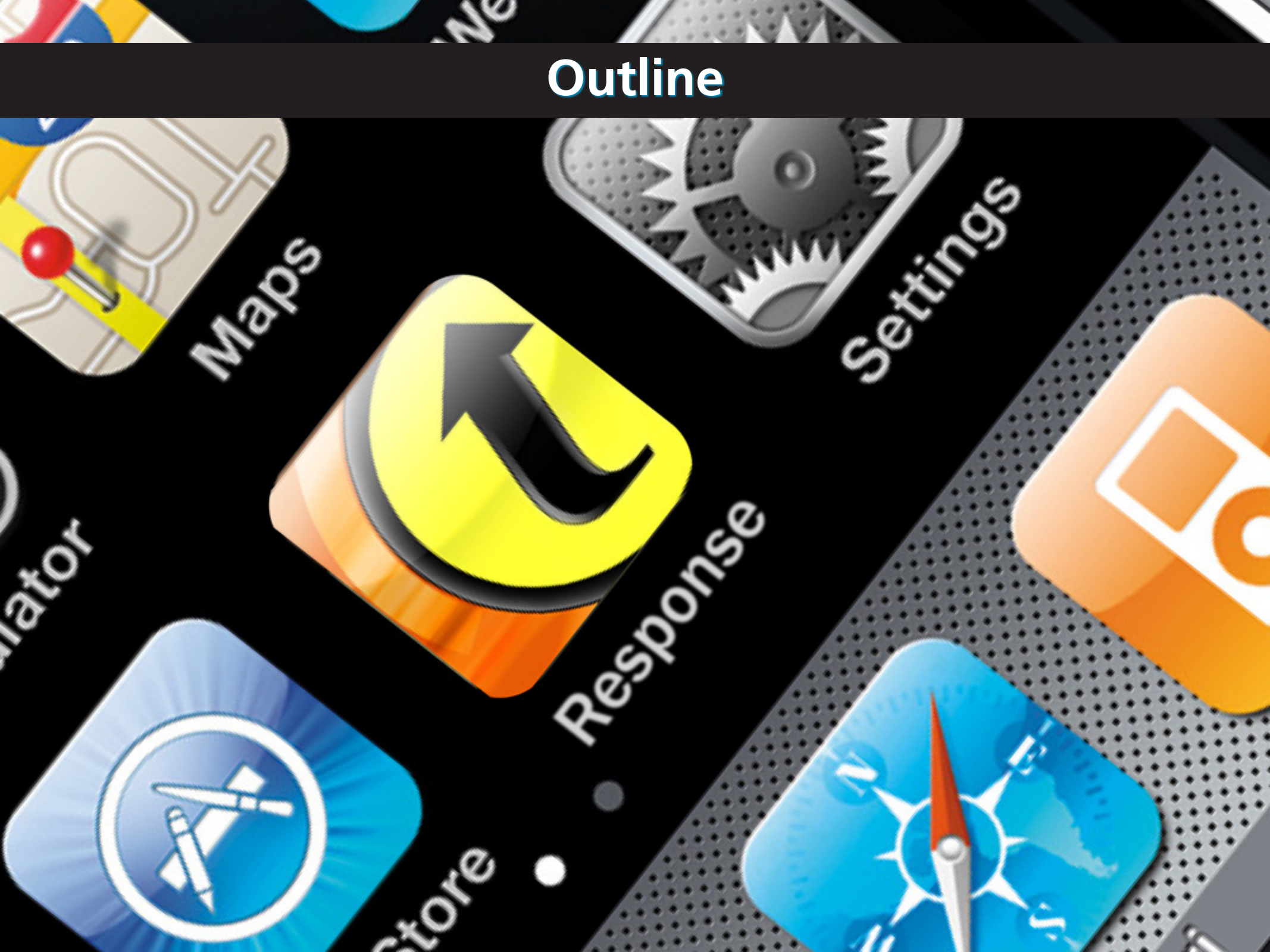
1. Strongly Agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly Disagree

# Survey

I am worried that interactive teaching will negatively affect my end-of-course evaluations.

1. Strongly Agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly Disagree

# 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...

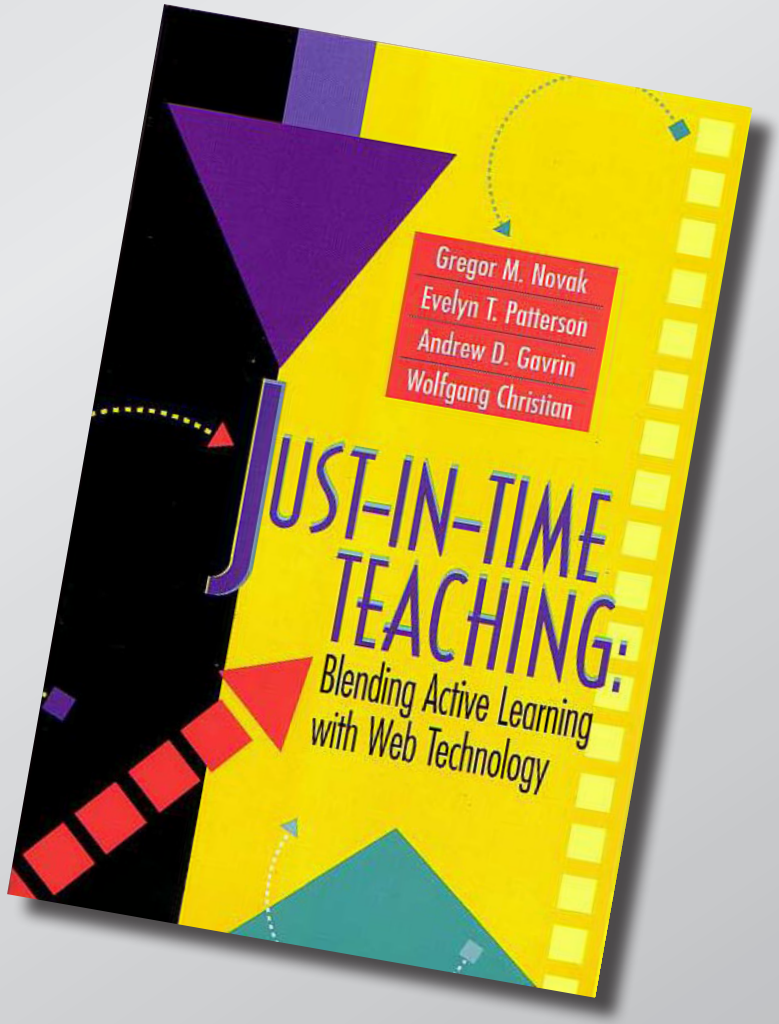
1. they don't have time.
2. they are not motivated to learn.
3. their instructors take away the incentive.
4. they do not have the requisite skills.
5. of some other reason.
6. They do come prepared in my class!

(select what you consider to be the main reason)

# PI & JiTT Overview

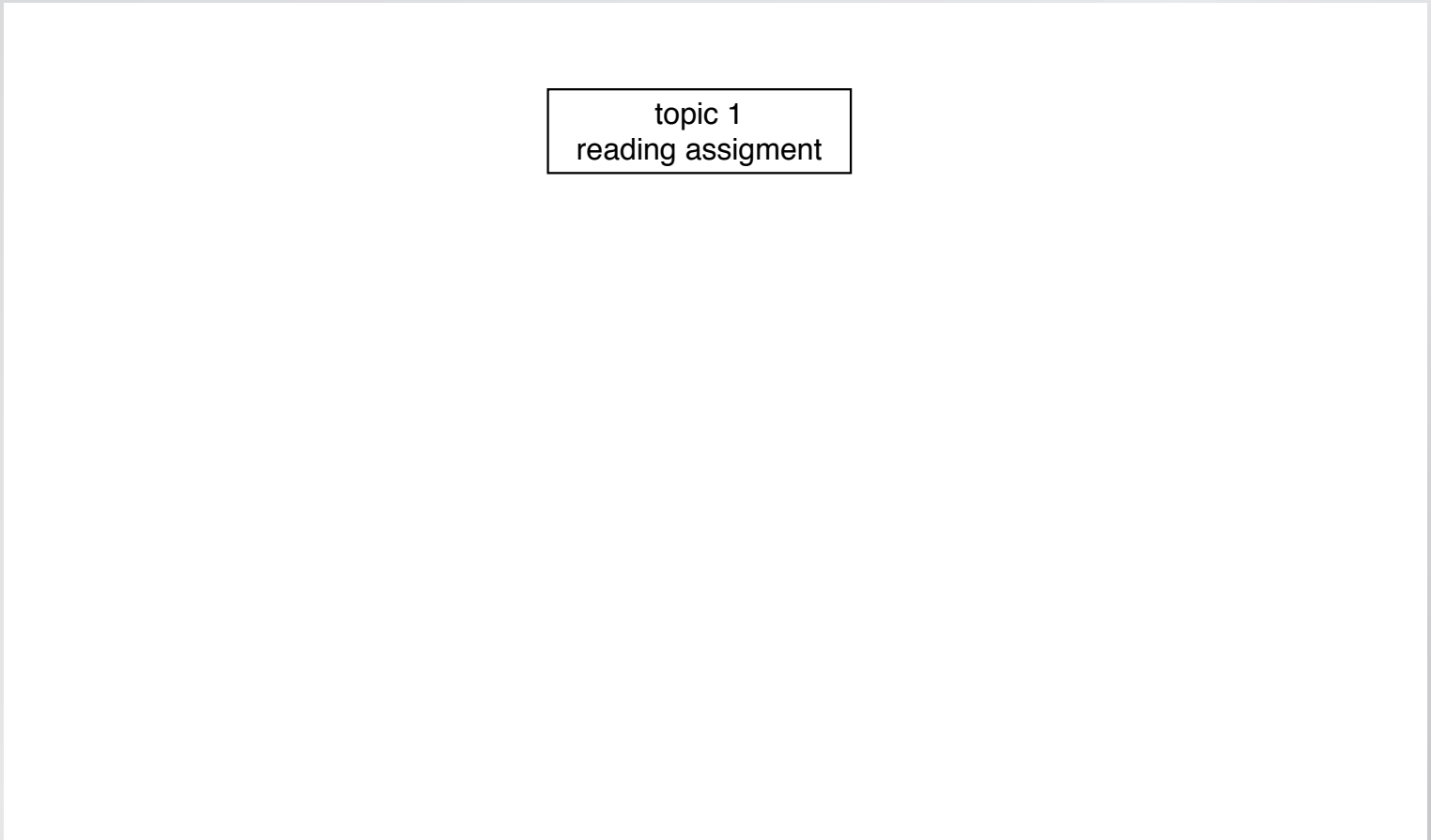
**Just-in-time-Teaching (JiTT)**

**www.jitt.org**



# PI & JiTT Overview

## JiTT workflow



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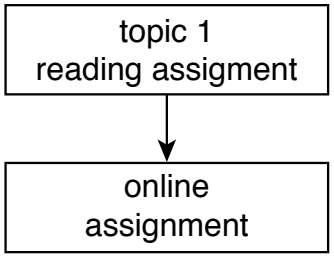
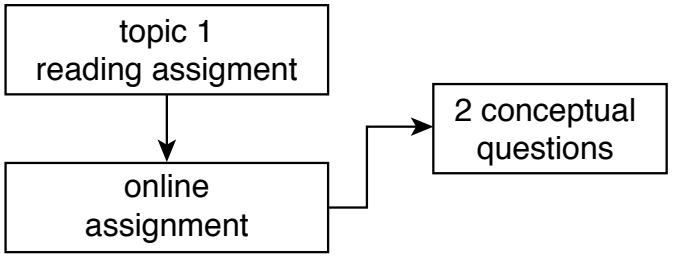


# PI & JiTT Overview

## JiTT workflow



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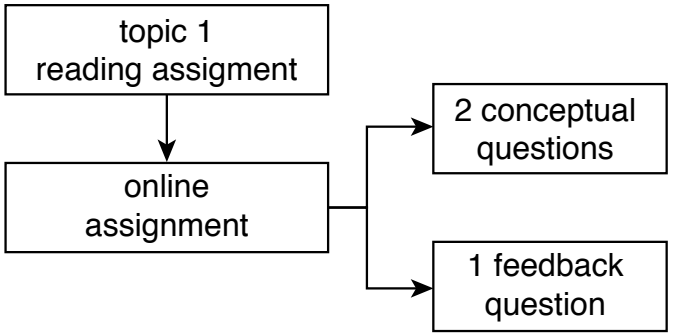

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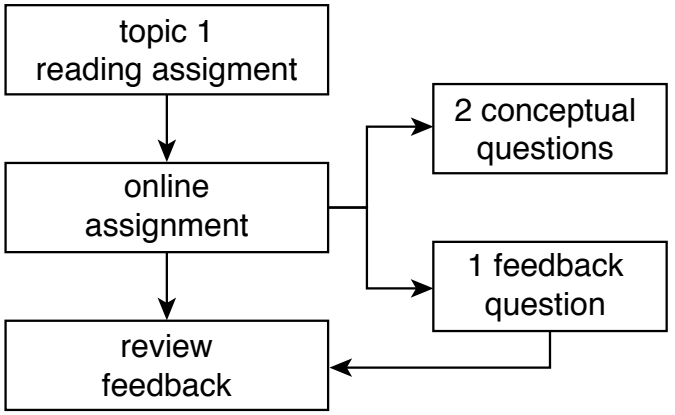

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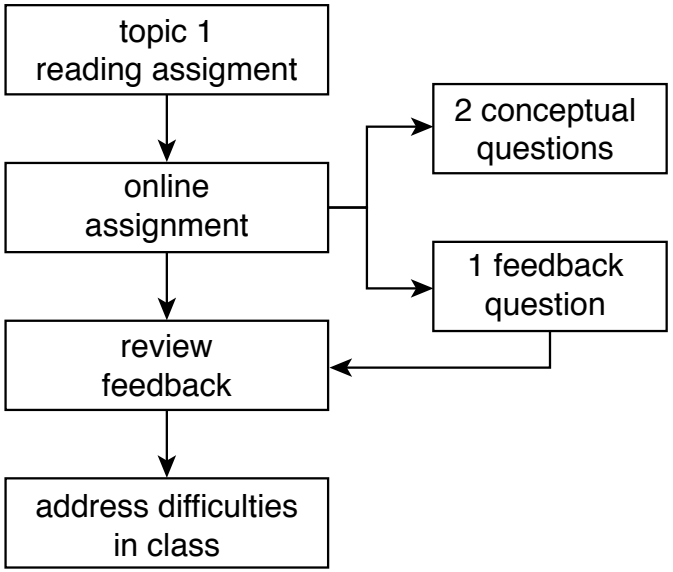
## JiTT workflow



# PI & JiTT Overview

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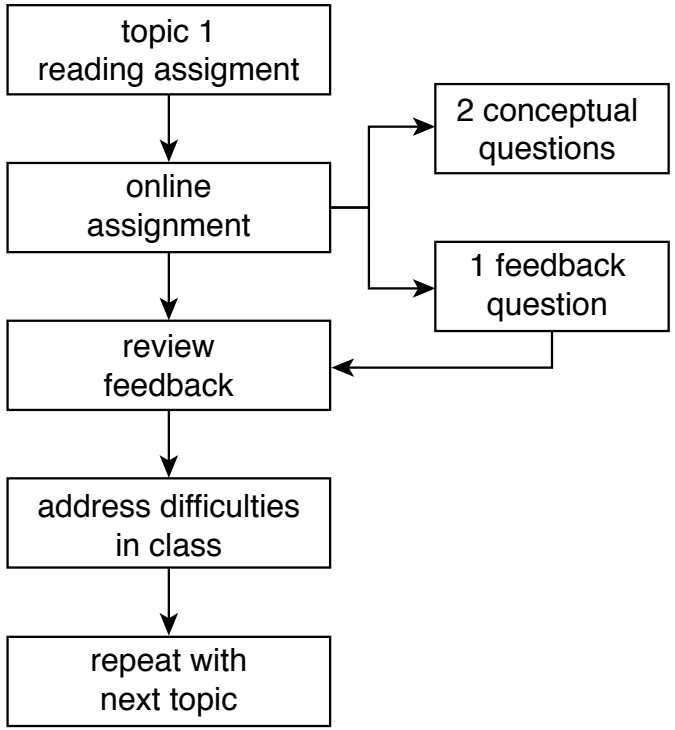


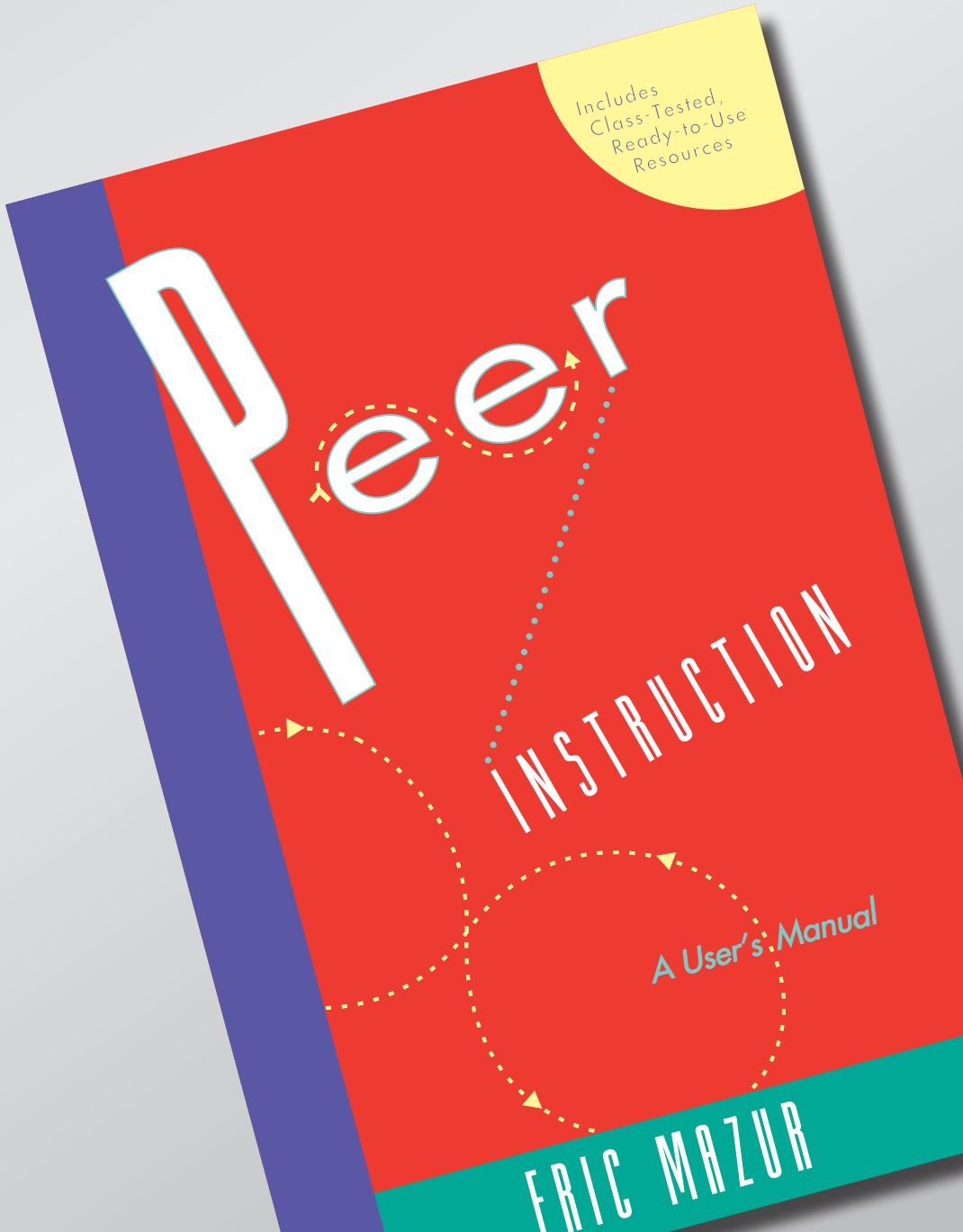
# PI & JiTT Overview

JiTT:

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

# PI & JiTT Overview

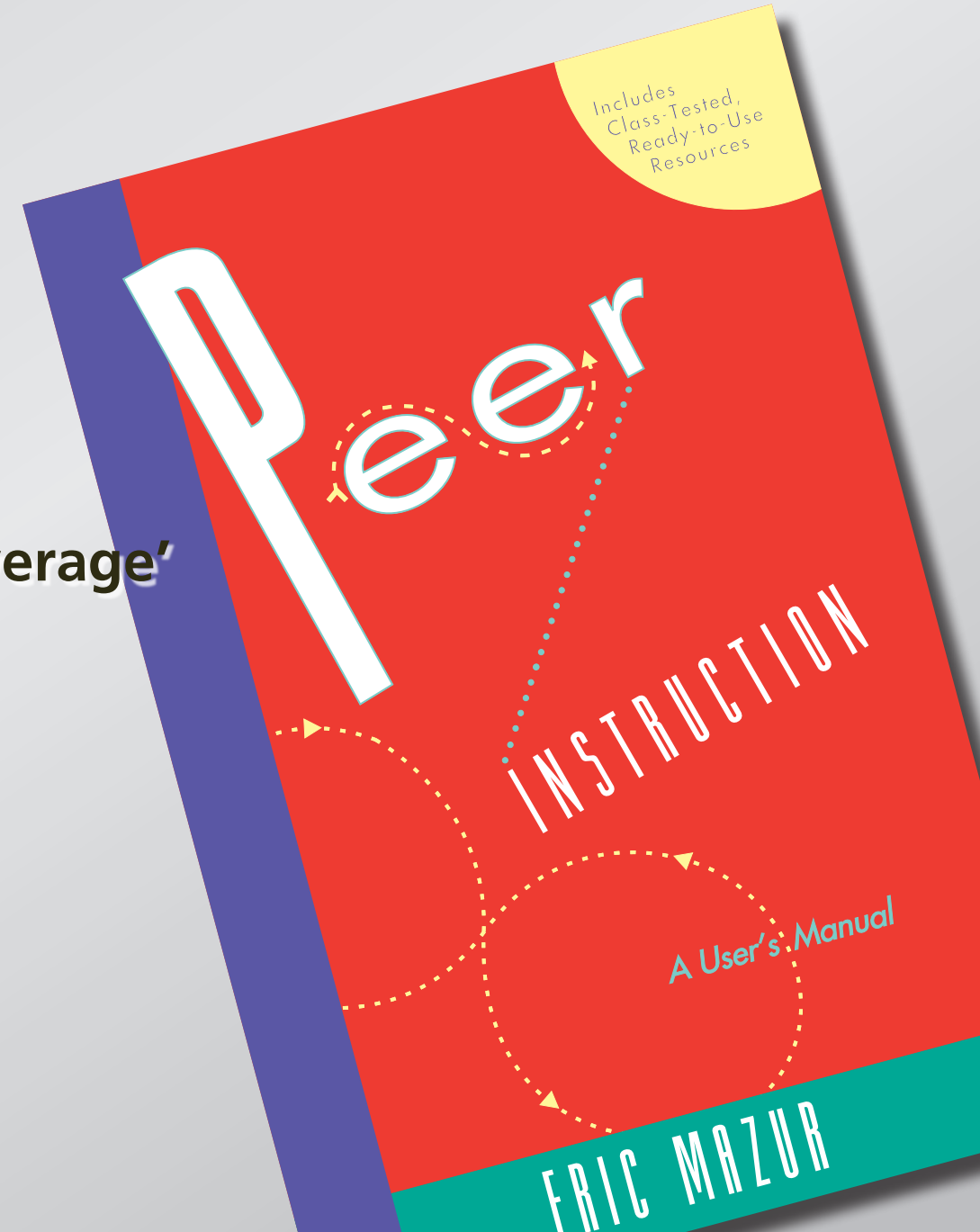
## Peer Instruction (PI)



# PI & JiTT Overview

**Main features:**

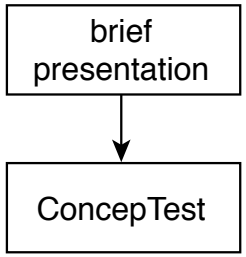
- **pre-class assignment**
- **in-class: depth, not 'coverage'**
- **ConcepTests**



# PI & JiTT Overview

brief
presentation

# PI & JiTT Overview



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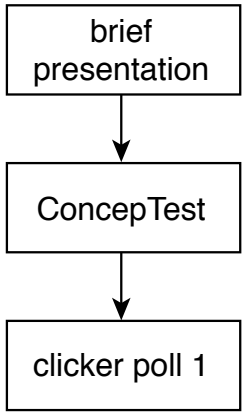

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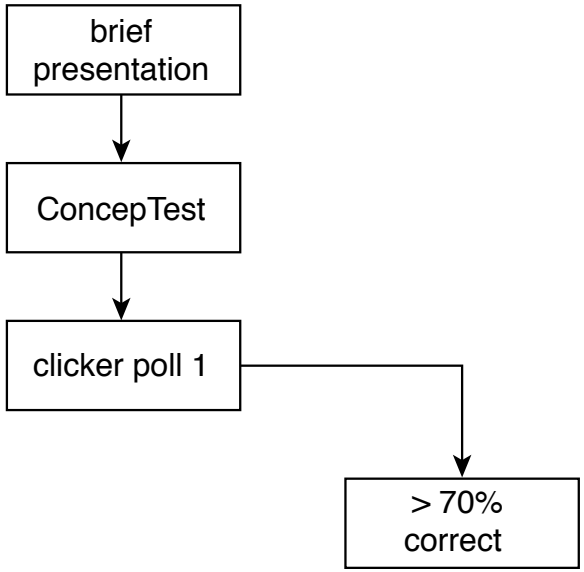

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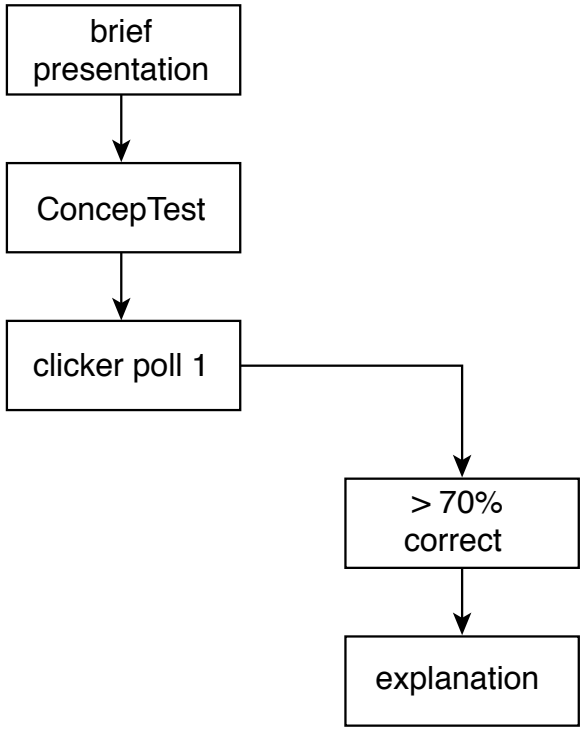

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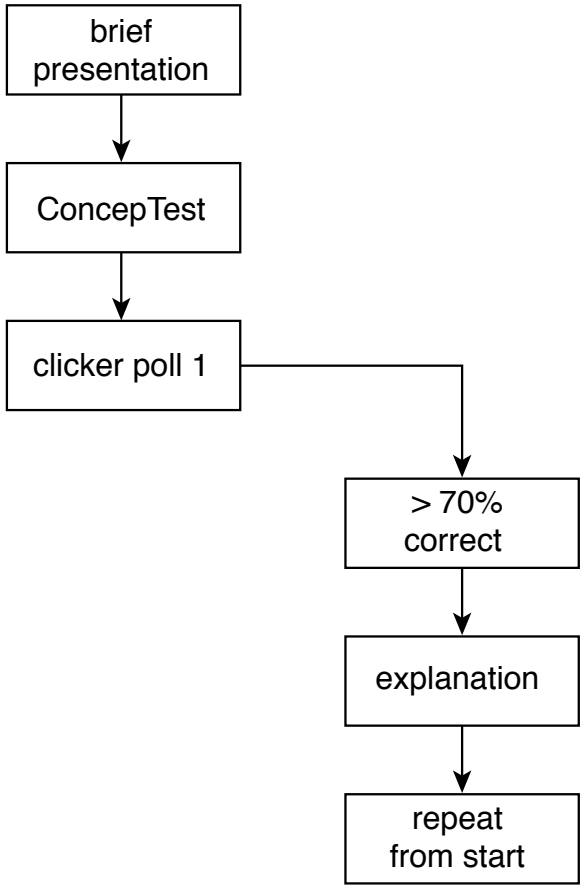

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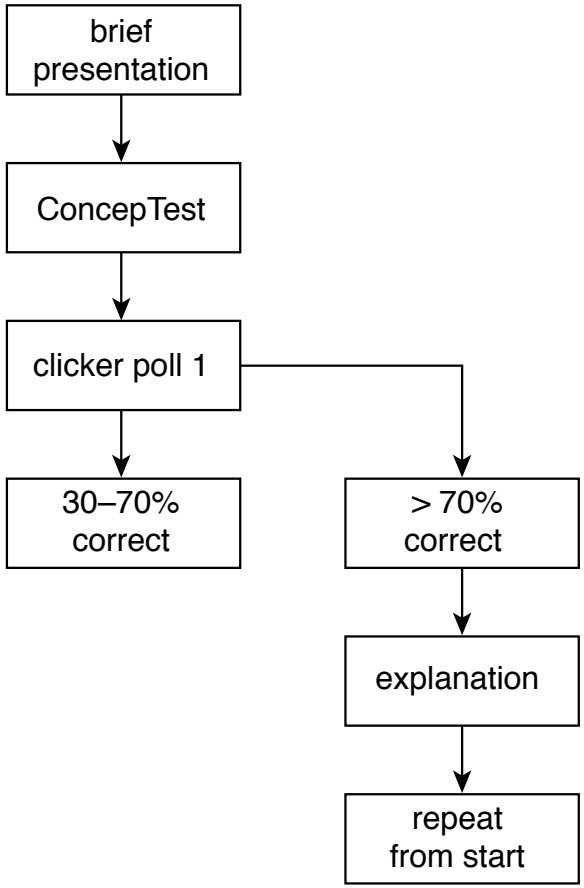

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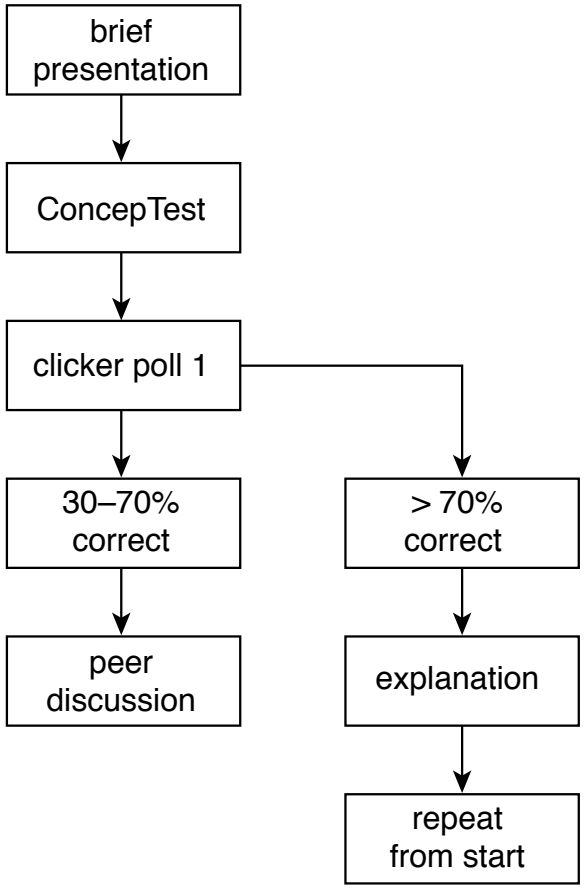

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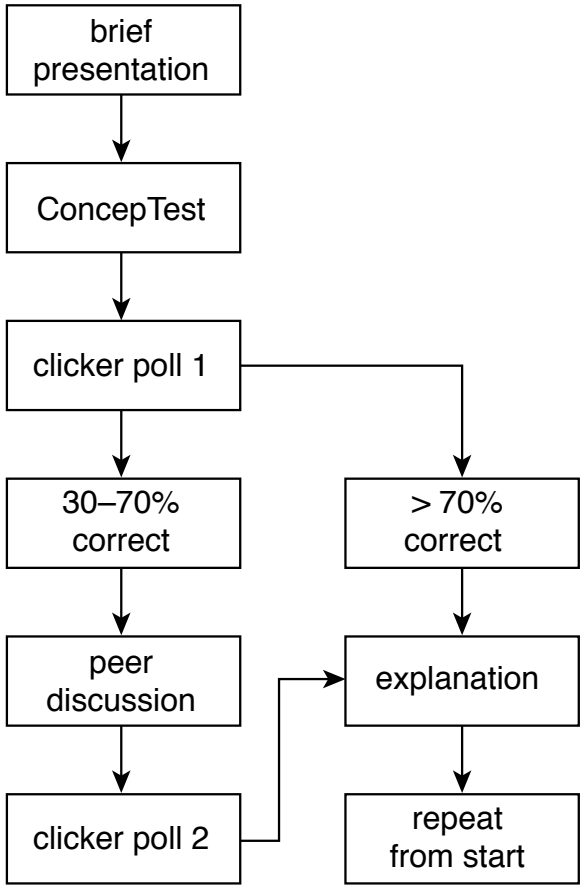

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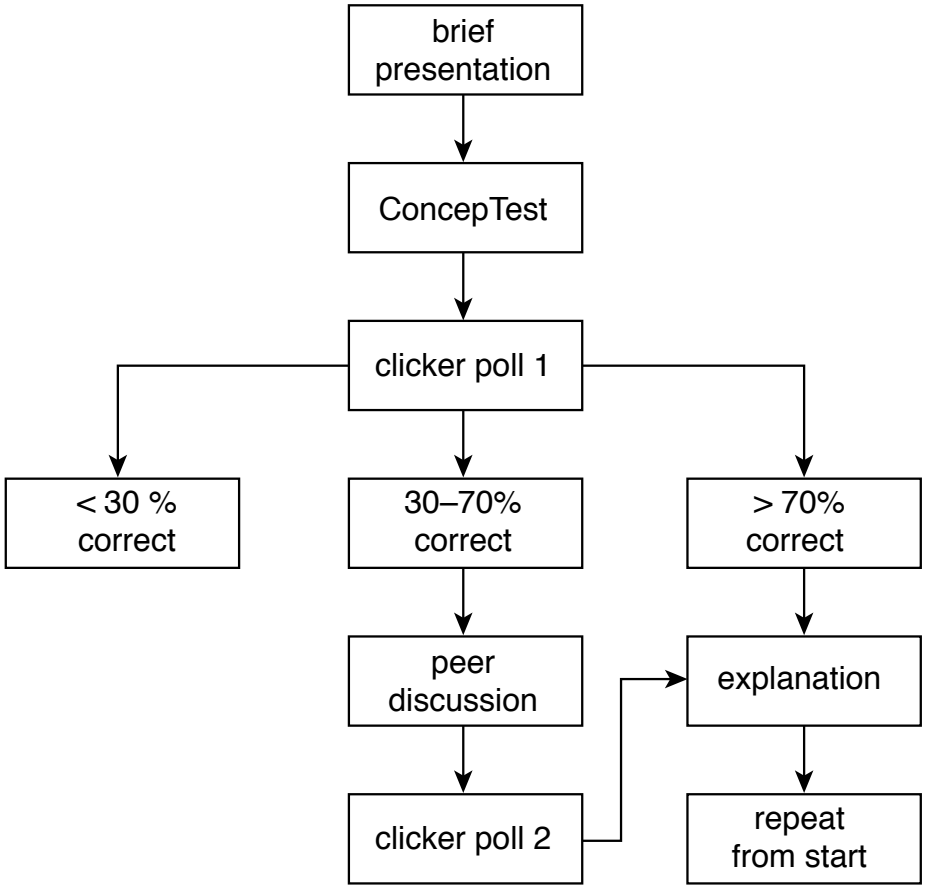

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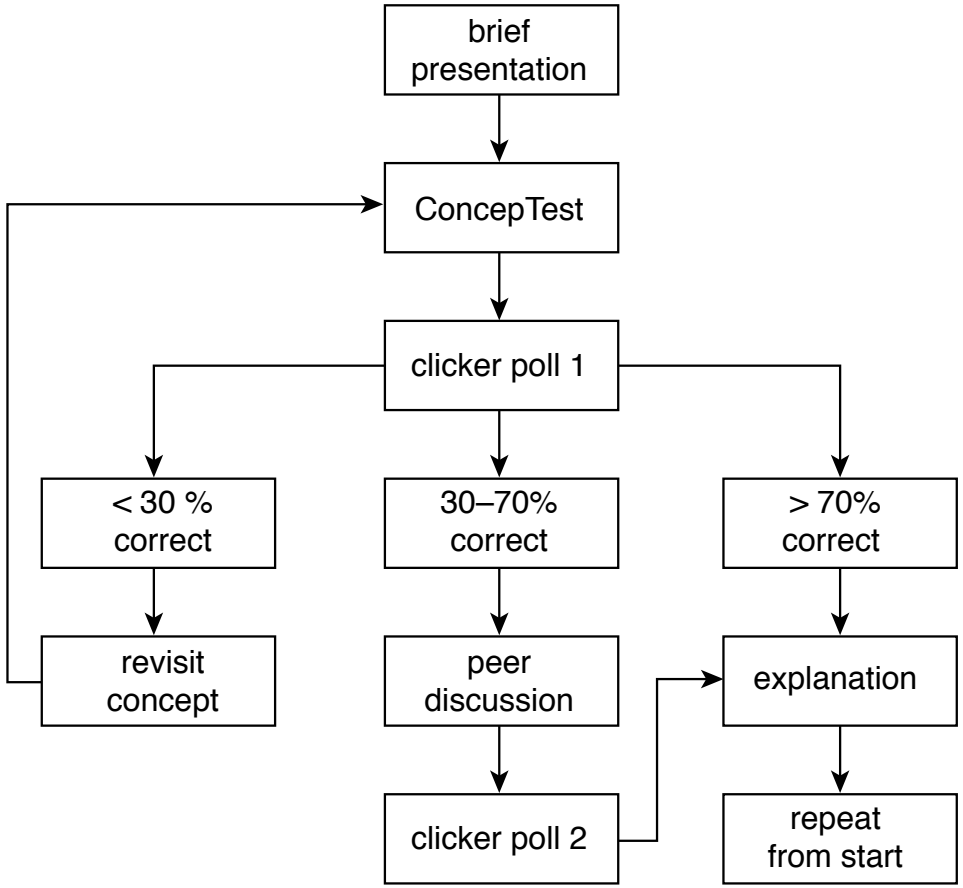

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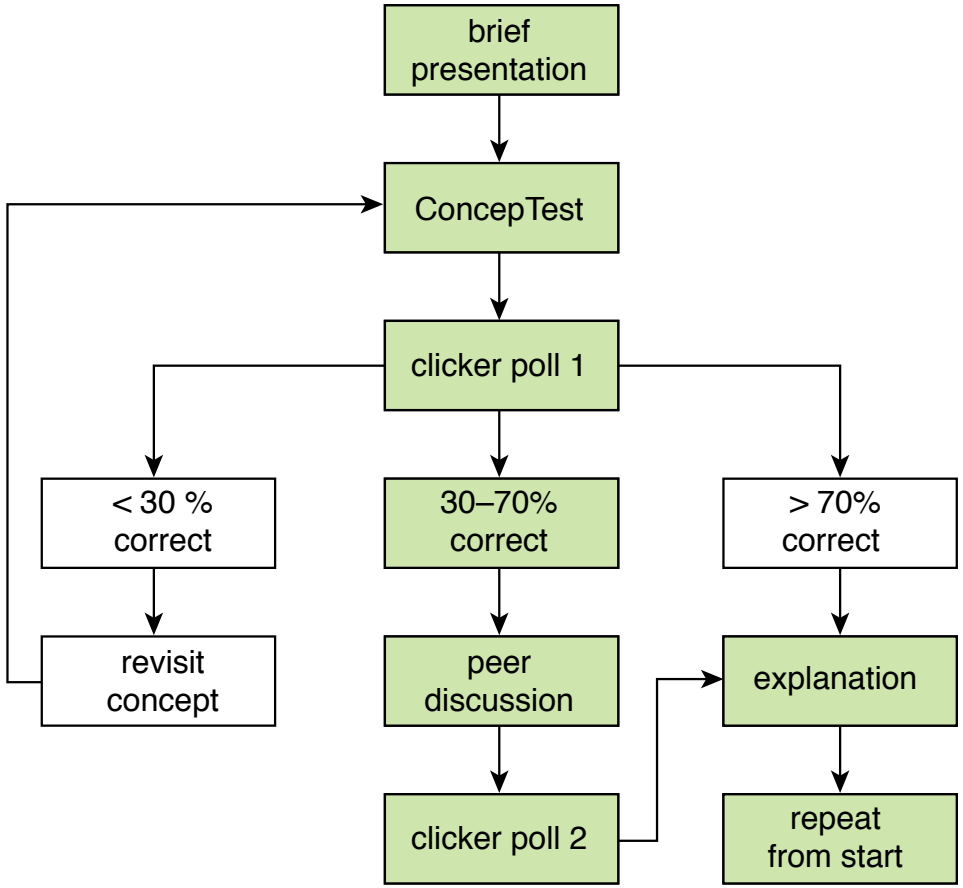


# PI & JiTT Overview

**PI:**

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

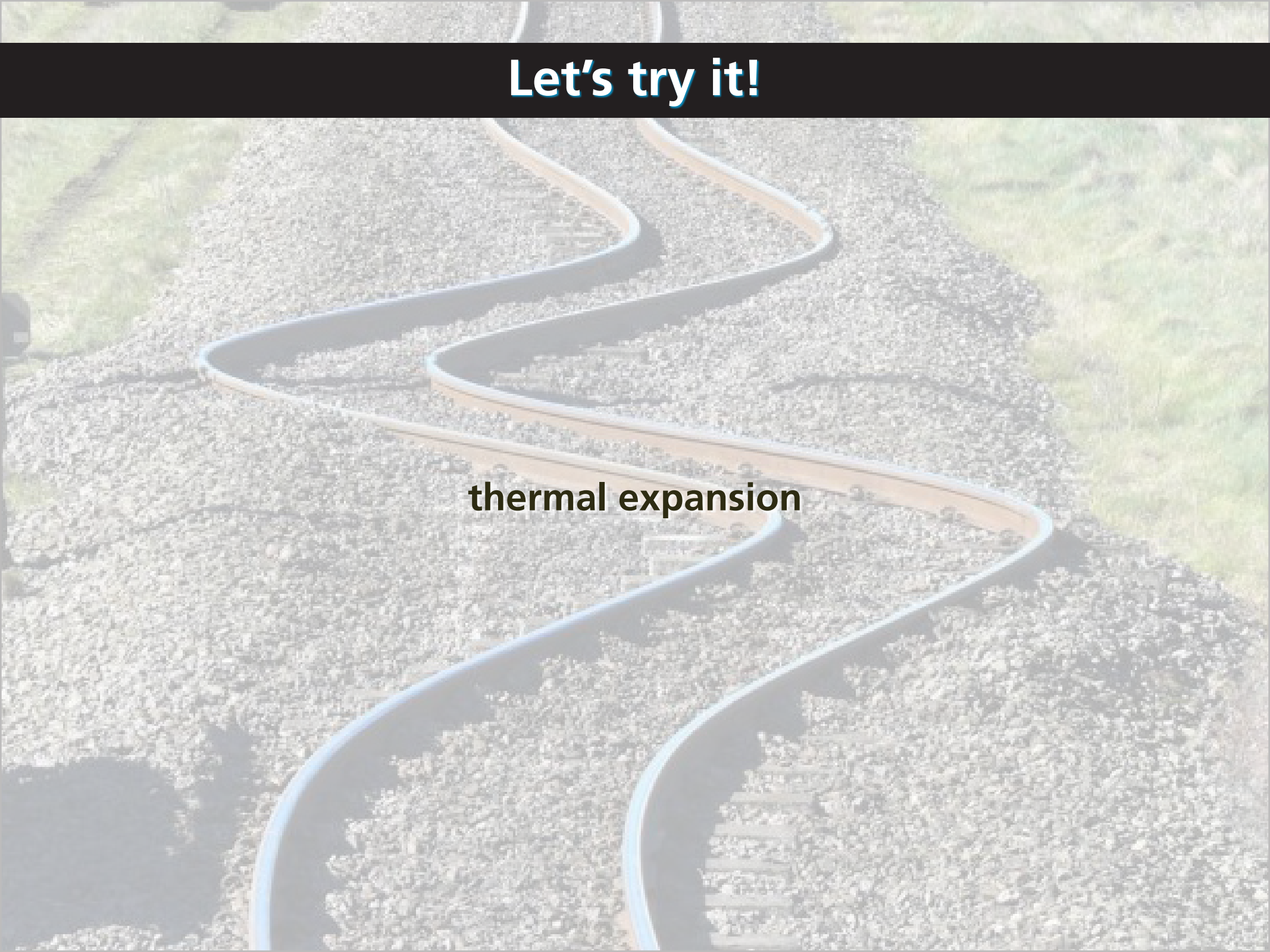
# PI & JiTT Overview

*“How do I promote fruitful discussion?”*

# PI & JiTT Overview

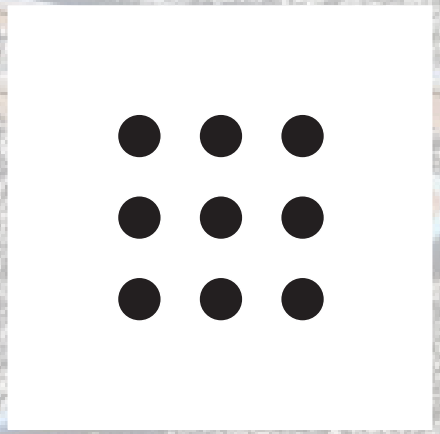
**Find someone with a *different* answer**

# Let's try it!



# Let's try it!

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



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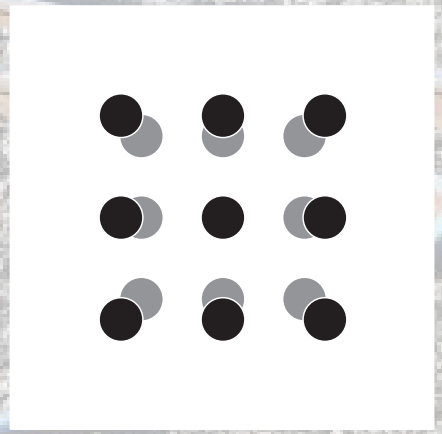
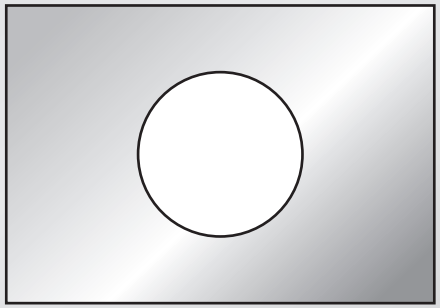


# Let's try it!

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

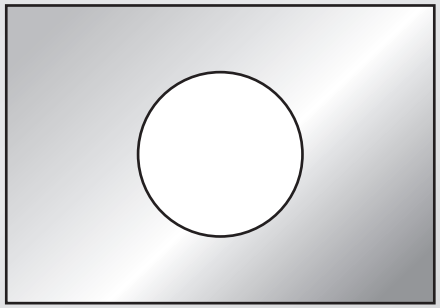
# Let's try it!

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.

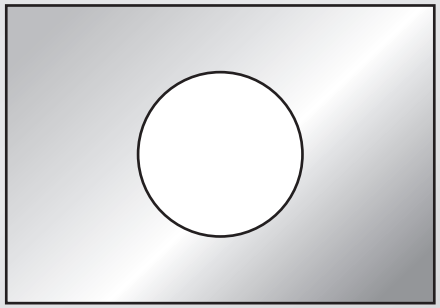
When the plate is uniformly heated, the diameter of the hole

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!

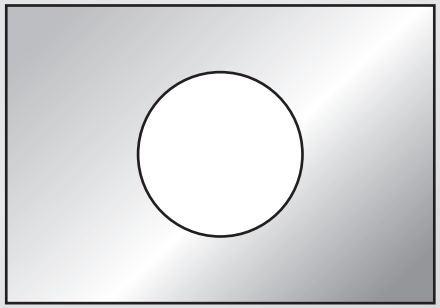
Before I tell you the answer, let's analyze what happened.

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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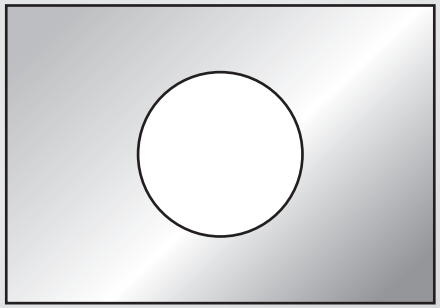
# Let's try it!

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



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

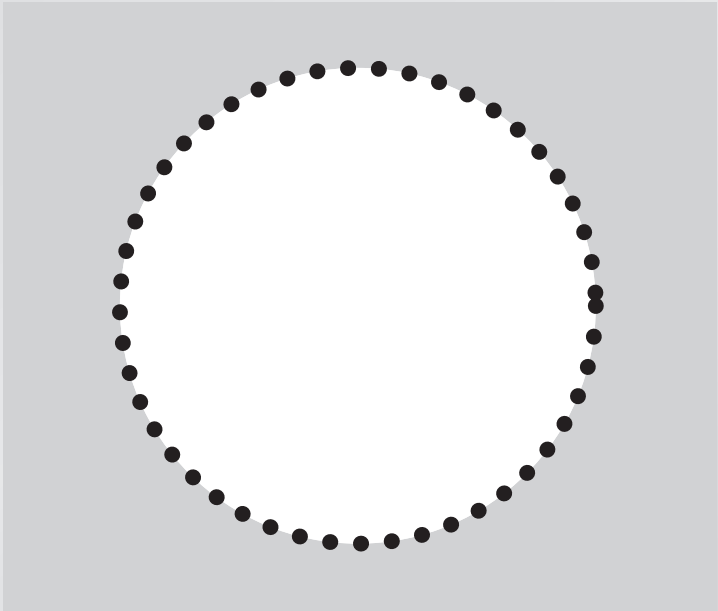
**1. increases.** ✔

2. stays the same.

3. decreases.

# Let's try it!

consider the atoms at the rim of the hole



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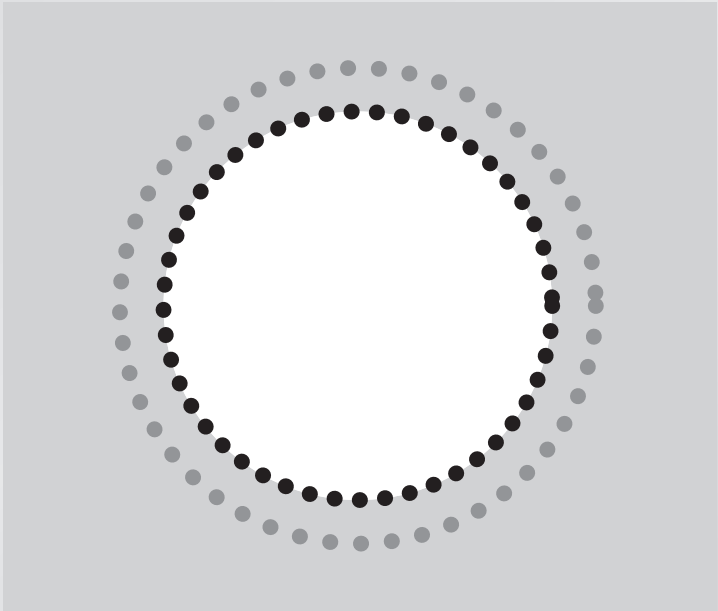
consider the atoms at the rim of the hole



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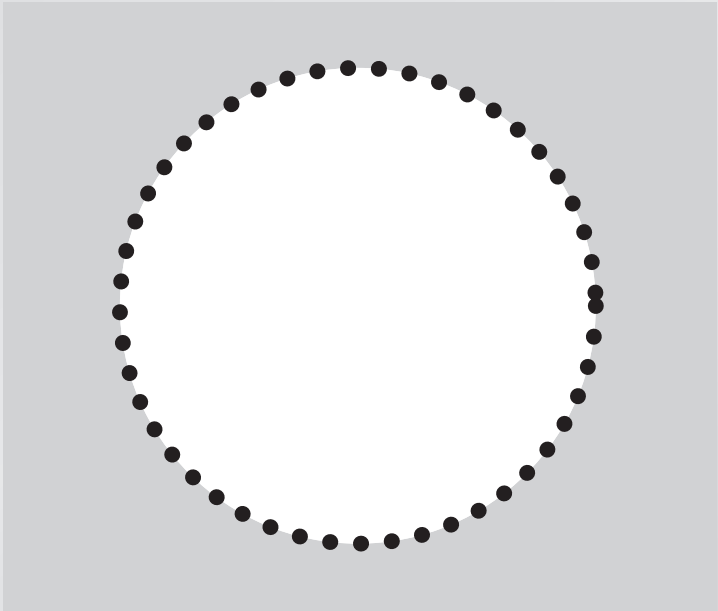

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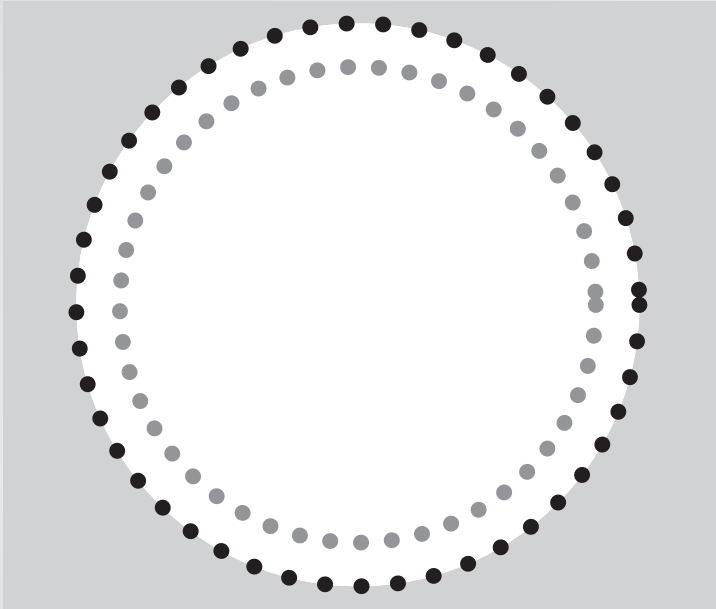

# Let's try it!

consider the atoms at the rim of the hole

# PI & JiTT Overview

*“Can this method be used in my class,*

*where questions don’t necessarily have right answers?”*

# Let's try it!

You are triaging patients in a pediatric urgent care clinic and the following patients are waiting.

# Let's try it!

You are triaging patients in a pediatric urgent care clinic and the following patients are waiting.

1. 3-yr old F with a FUO and *T* = 40 °C who is riding a tricycle in the waiting room

# Let's try it!

You are triaging patients in a pediatric urgent care clinic and the following patients are waiting.

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2. 6-wk old term M, cc: fussy breast, *T* = 38.6 °C

# Let's try it!

You are triaging patients in a pediatric urgent care clinic and the following patients are waiting.

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3. 14-yr old M with hx of epilepsy who had a seizure at home lasting 5 minutes about half hour ago

# Let's try it!

You are triaging patients in a pediatric urgent care clinic and the following patients are waiting.

1. 3-yr old F with a FUO and *T* = 40 °C who is riding a tricycle in the waiting room

2. 6-wk old term M, cc: fussy breast, *T* = 38.6 °C

3. 14-yr old M with hx of epilepsy who had a seizure at home lasting 5 minutes about half hour ago

Whom would you triage first?

# Let's try it!

You are triaging patients in a pediatric urgent care clinic and the following patients are waiting.

1. 3-yr old F with a FUO and *T* = 40 °C who is riding a tricycle in the waiting room

2. 6-wk old term M ex: fussy breast, *T* = 38.6 °C

3. 14-yr old M with hx of epilepsy who had a seizure at home lasting 5 minutes about half hour ago

Whom would you triage first?

you got all engaged!

# PI & JiTT Overview

**Don’t need a correct answer!**

# Outline

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

# Implementing PI & JiTT

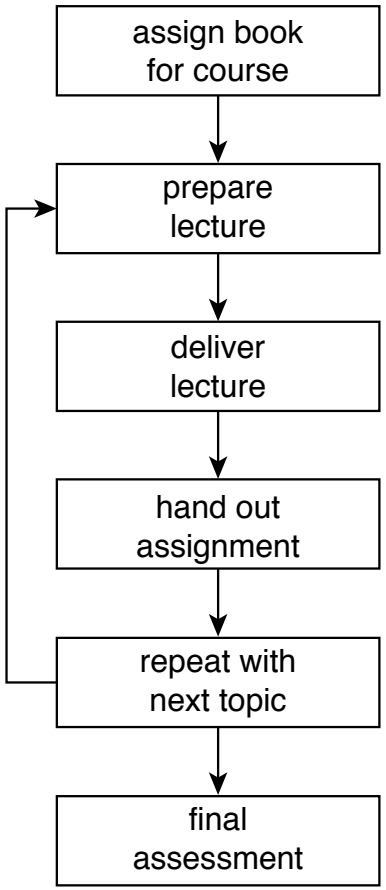
similar learning gains in different environments

# Implementing PI & JiTT

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

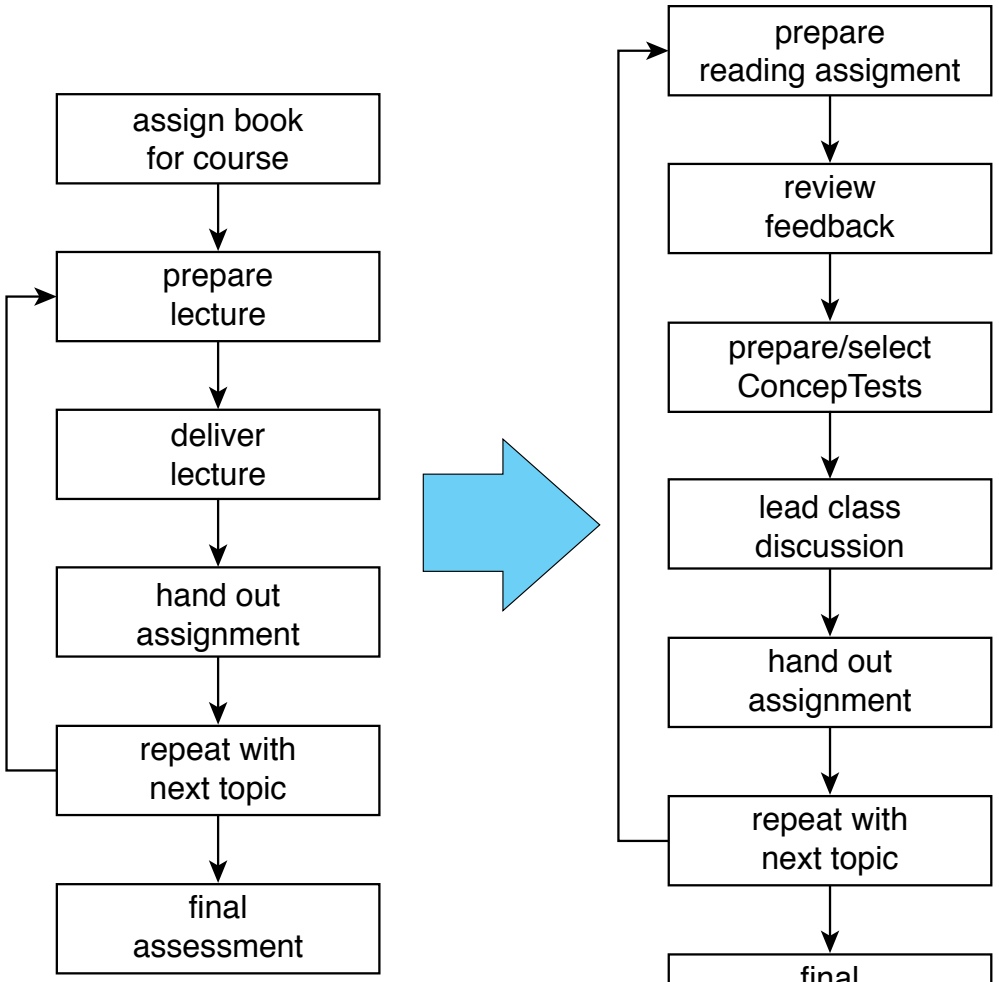
# Implementing PI & JiTT

## preparing for a lecture-based class



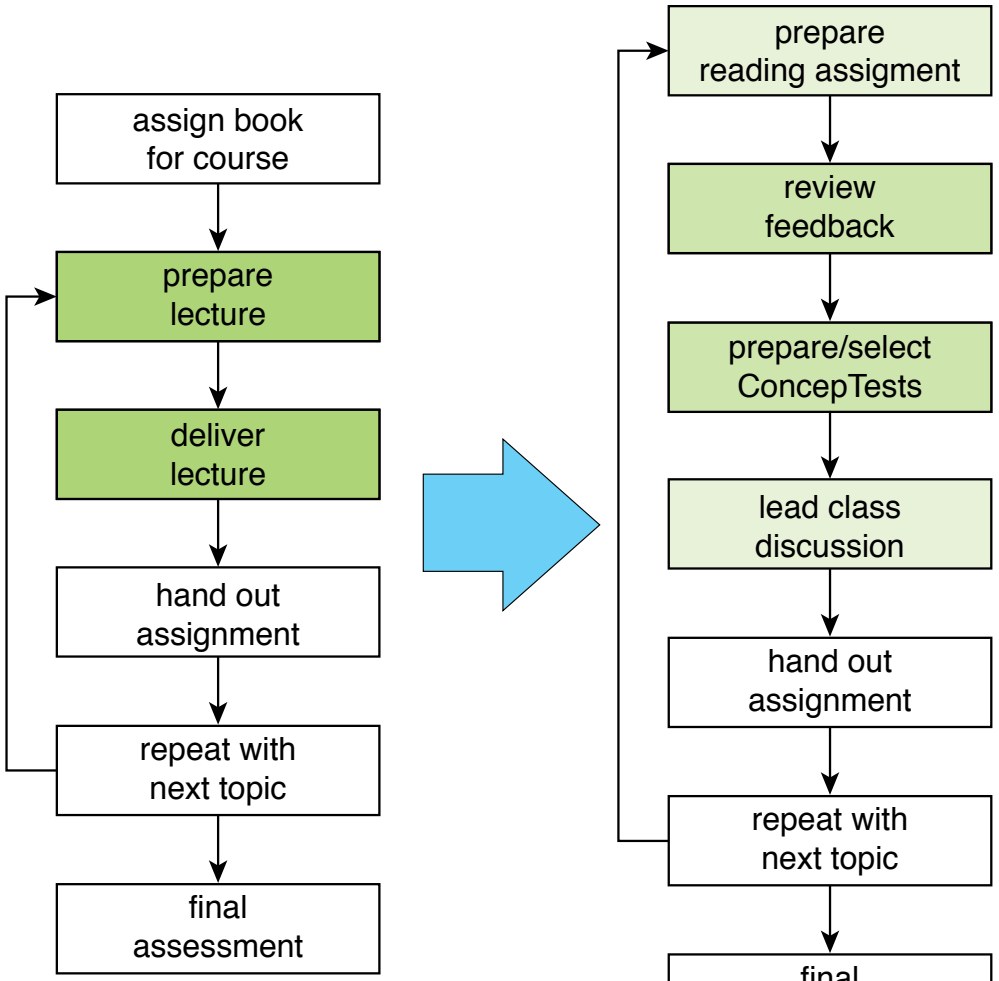
# Implementing PI & JiTT

## 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 |

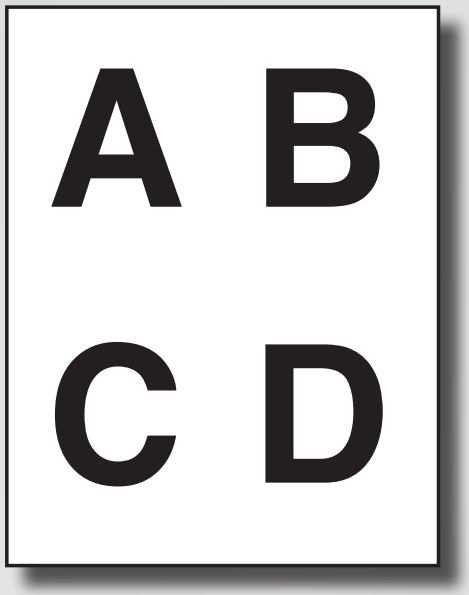
what good is coverage if little is retained?

# Implementing PI & JiTT

*“Do I need clickers?”*

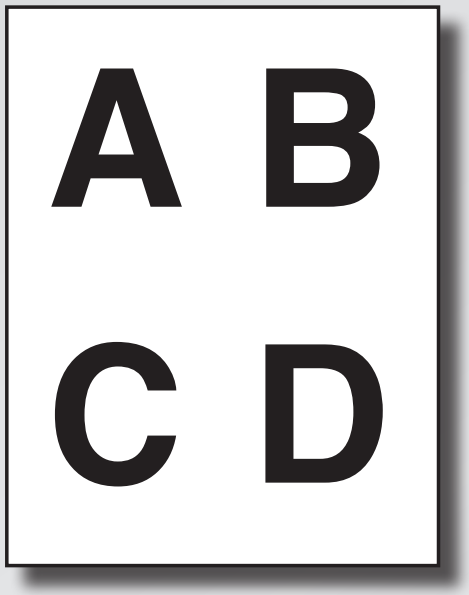
# Implementing PI & JiTT

## Flashcards: simple and effective



# Implementing PI & JiTT

## Flashcards: simple and effective




Meltzer and Mannivanan, South Eastern Louisiana University

# Let's try it!

**The first priority action for a patient experiencing asthma exacerbation is:**

# Let's try it!

The first priority action for a patient experiencing asthma exacerbation is:

1. auscultate breathing sounds
2. position to reduce work of breathing
3. administer bronchodilators via $O_2$-driven nebulizer
4. determine history of last attack and Rx

# Let's try it!

The first priority action for a patient experiencing asthma exacerbation is:

you got all fired up!

1. auscultate breathing sounds
2. position to reduce work of breathing
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3. administer bronchodilators via $O_2$-driven nebulizer
4. determine history of last attack and Rx

you got all fired up!

without clickers

# Implementing PI & JiTT

**Research: same learning gains with and without clickers!**

**Clickers or Flashcards: Is There Really a Difference?**
**N. Lasry, *The Physics Teacher* 46 (2008) 242**

# Implementing PI & JiTT

**It's not the technology, but the pedagogy!**

# Implementing PI & JiTT

**It's not the technology, but the pedagogy!**

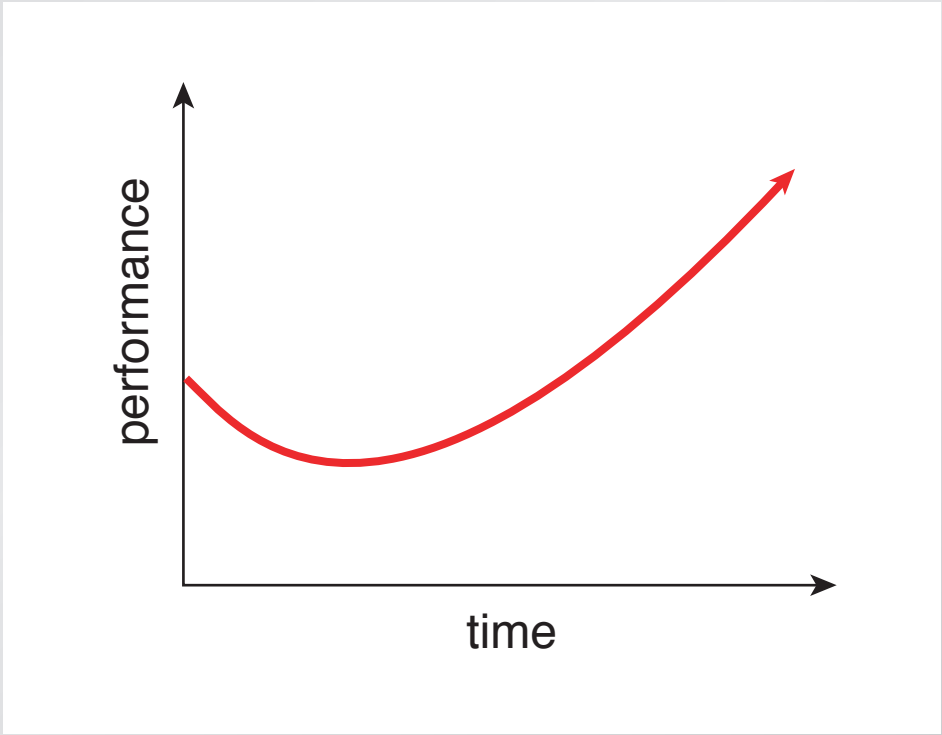
**(but clickers do offer advantages)**

# 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.

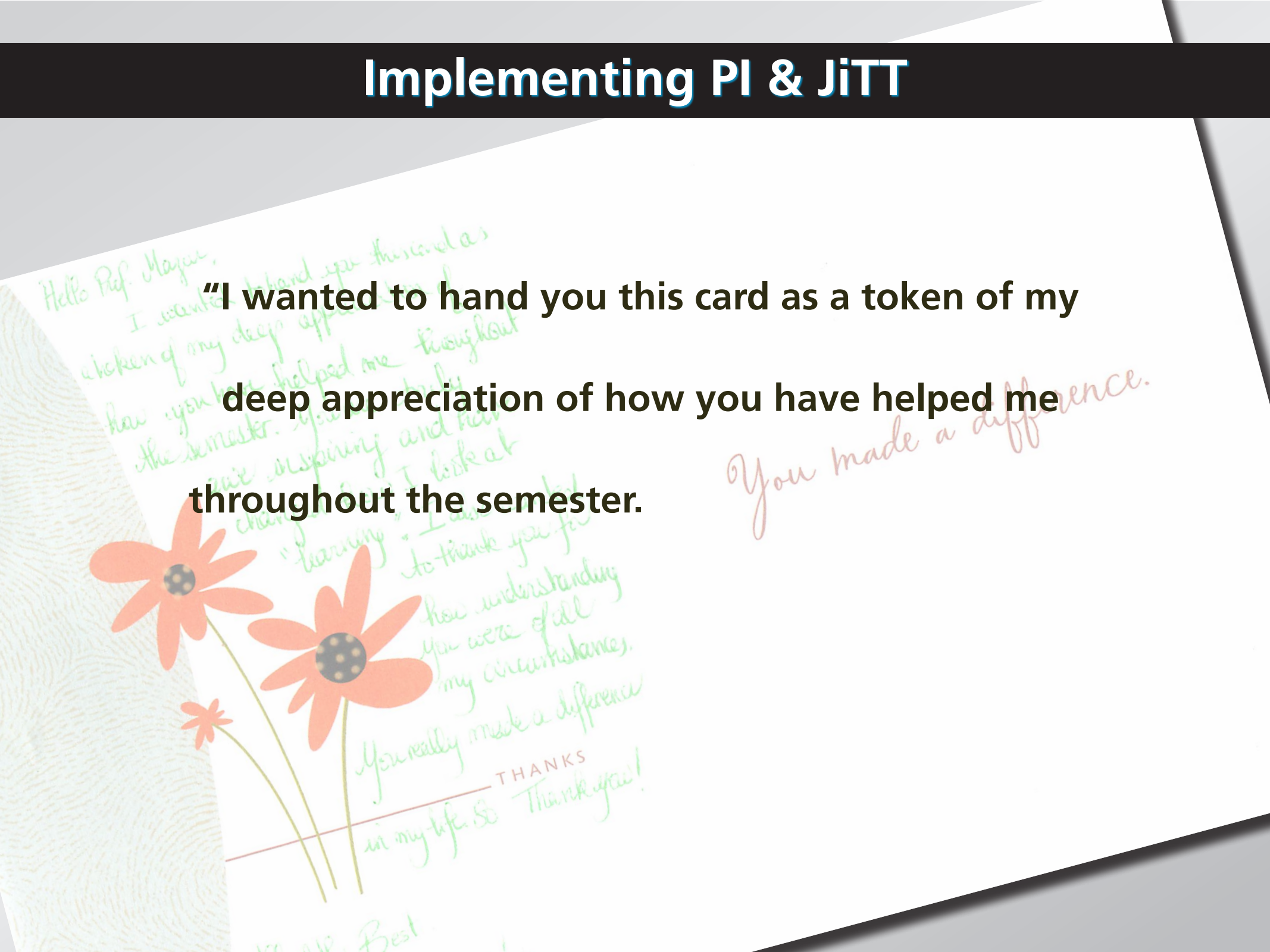
# Implementing PI & JiTT

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

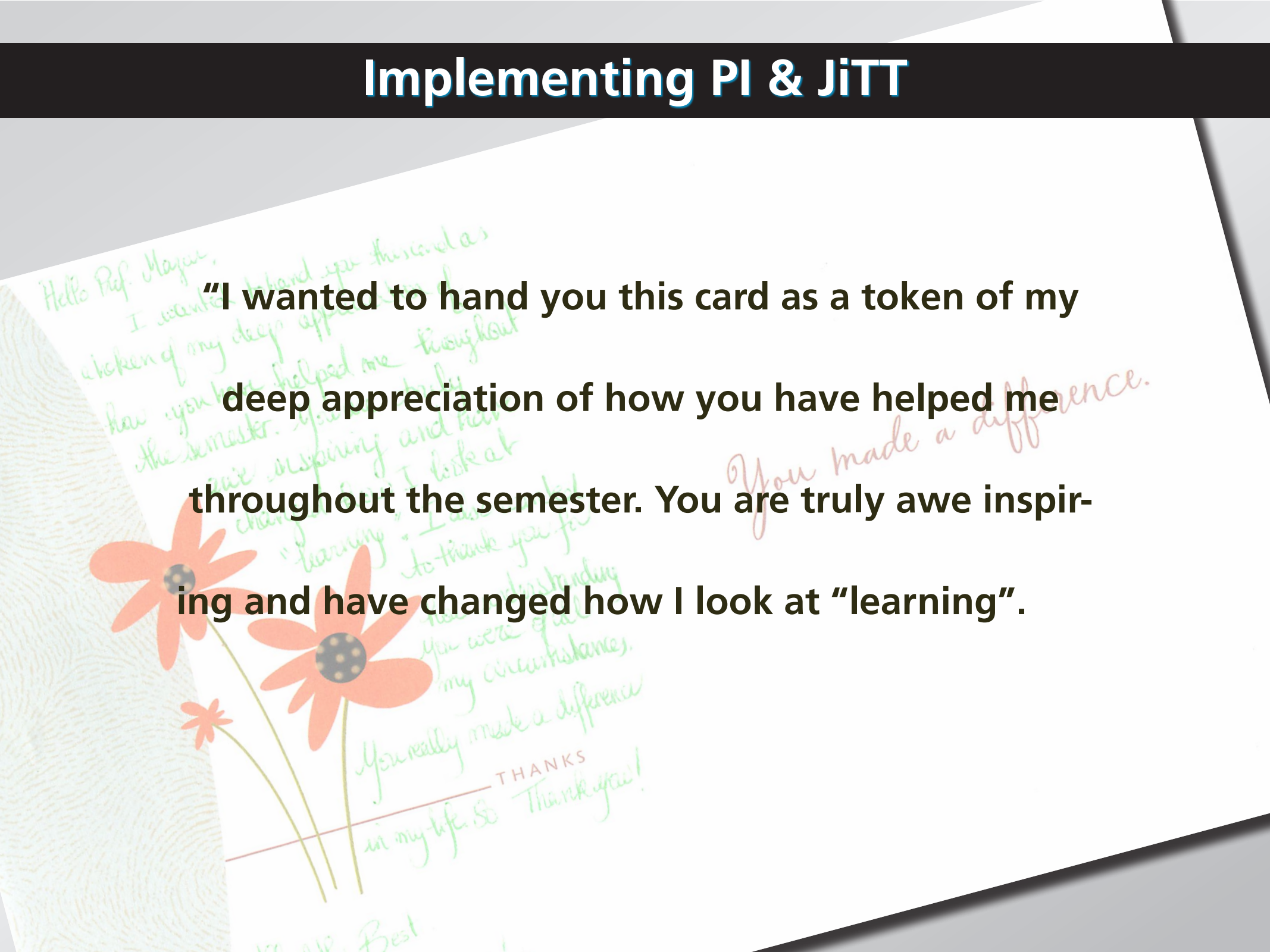
> Subject: Thanks!
>
> Professor Mazur,
>
> First of all I want to thank you for a great semester. You are an excellent professor, and it is clear that you truly care about each and every student.
>
> The exam went well today. I'm not sure to what extent you will curve the final grades (if at all), but 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

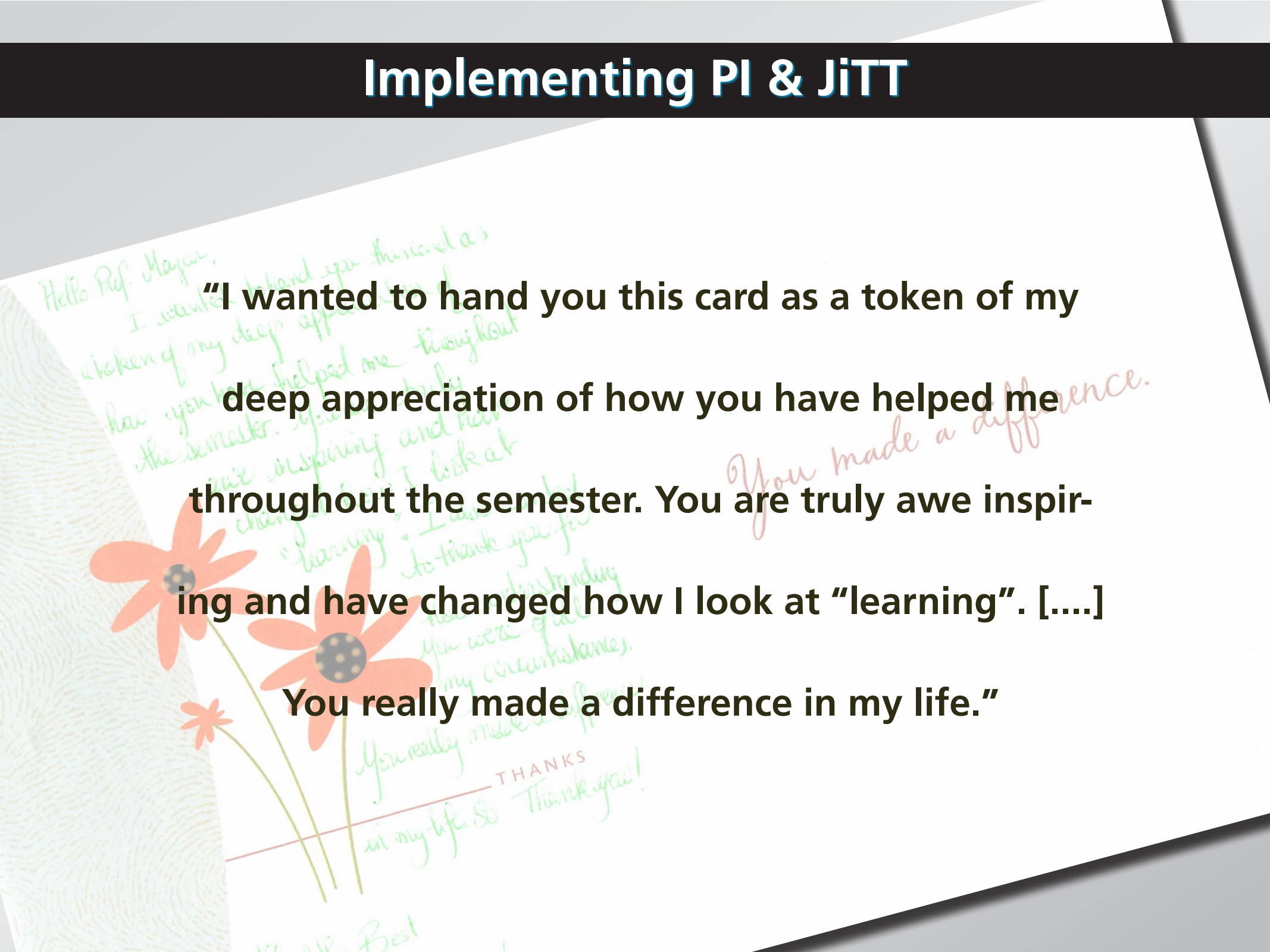


# Implementing PI & JiTT




**"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".**

# 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!**

# Outline

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

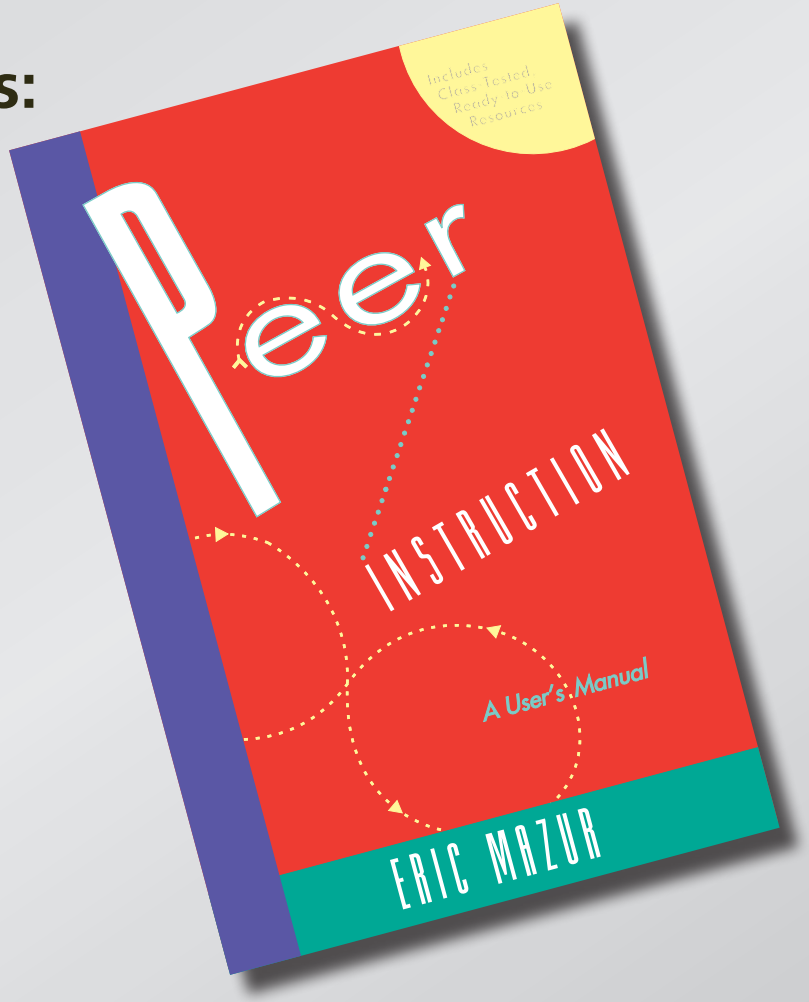
# ConcepTests

*“Where can I get examples of good questions?”*

# ConcepTests

**Books with ConcepTests:**

- **Physics (Prentice Hall)**



# ConcepTests

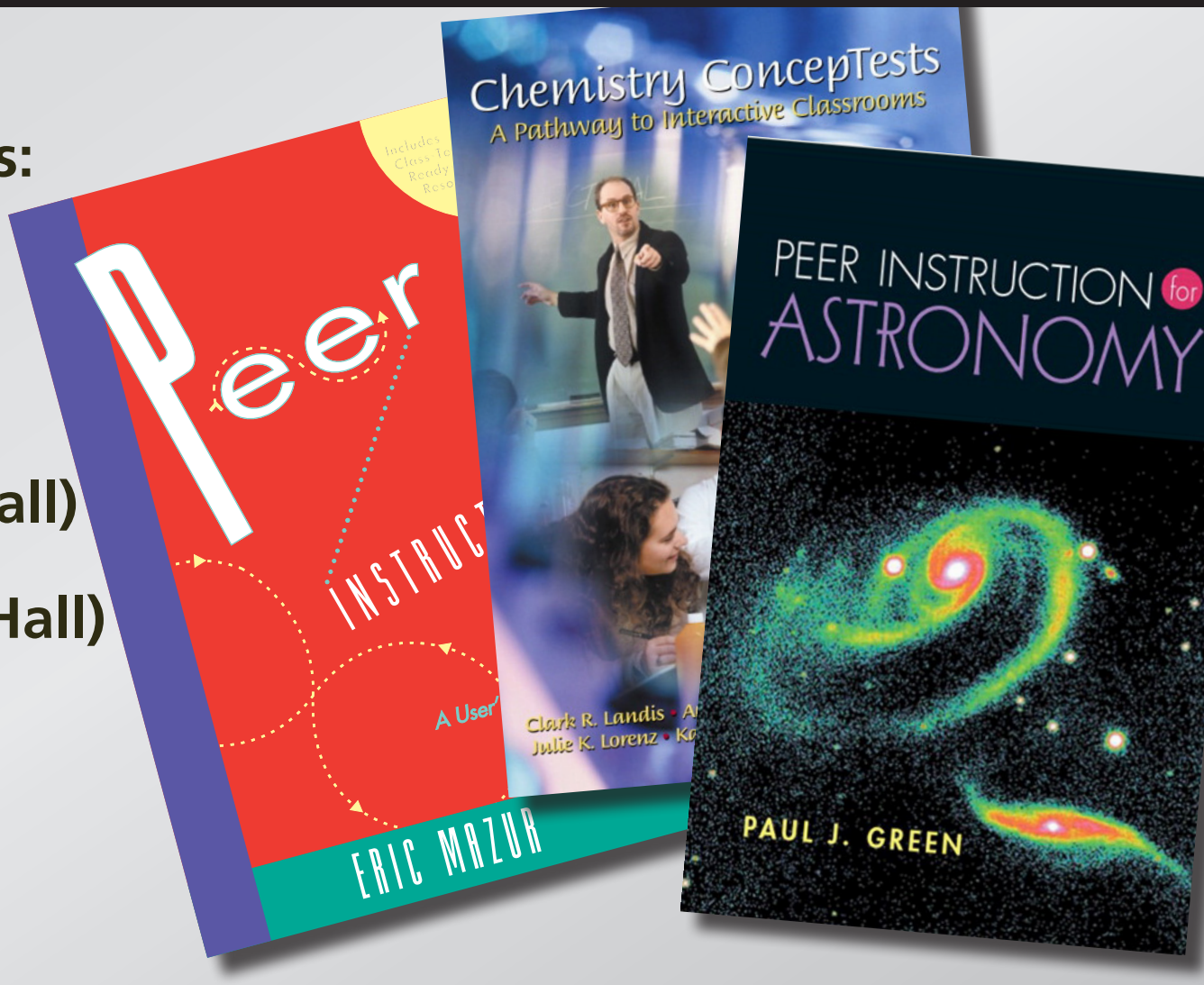
## Books with ConcepTests:

- 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)

# ConcepTests

… or try searching Google:

<subject> “Peer Instruction”

<subject> ConcepTest

<subject> “Concept Test”

<subject> clickers

# ConcepTests

## Types of questions

- survey
- model testing
- discussion
- select from list

# 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!

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# ConcepTests

hole in plate

triage/asthma

airline

model

discussion

fact

# ConcepTests

hole in plate

triage/asthma

airline

model

discussion

fact

fact-recall not engaging

# 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

# Survey

**Interactive teaching requires significantly more instructor preparation time than traditional lecture.**

1. Strongly Agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly Disagree

# Survey

Interactive teaching requires clickers.

1. Strongly Agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly Disagree

# Survey

If I give my students a pre-class (reading) assignment, most of them will complete it before coming to class.

1. Strongly Agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly Disagree

# Survey

**It is difficult to see how to apply interactive teaching techniques in my courses.**

1. Strongly Agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly Disagree

# Survey

I am worried that interactive teaching will negatively affect my end-of-course evaluations.

1. Strongly Agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly Disagree


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