

# Peer Instruction Practical Details



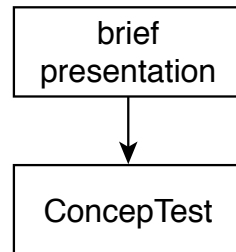
Physics and Astronomy New Faculty Workshop  
Greenbelt, MD 17 November 2011



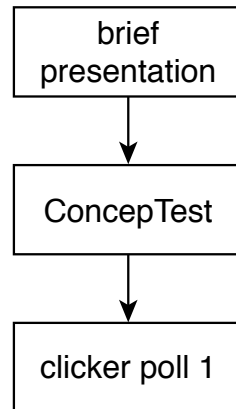
# Peer Instruction: a primer

brief  
presentation

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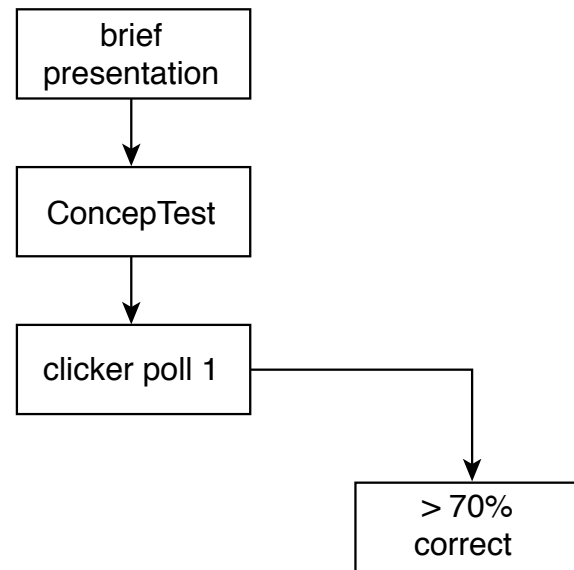


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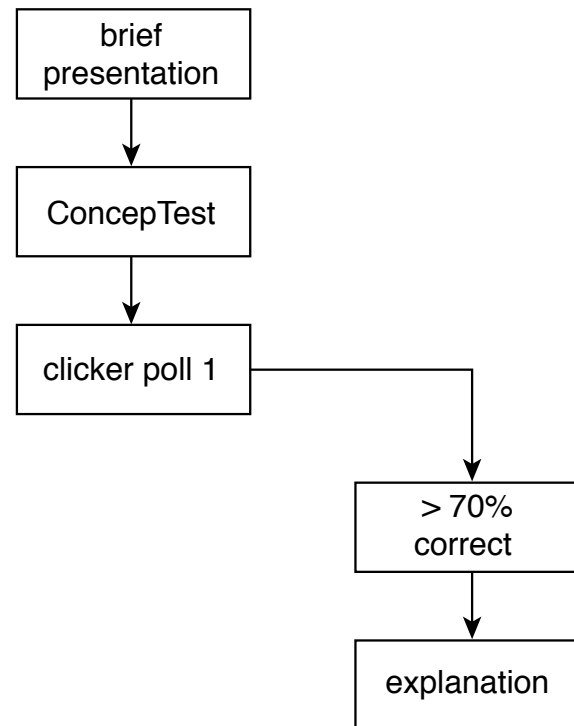




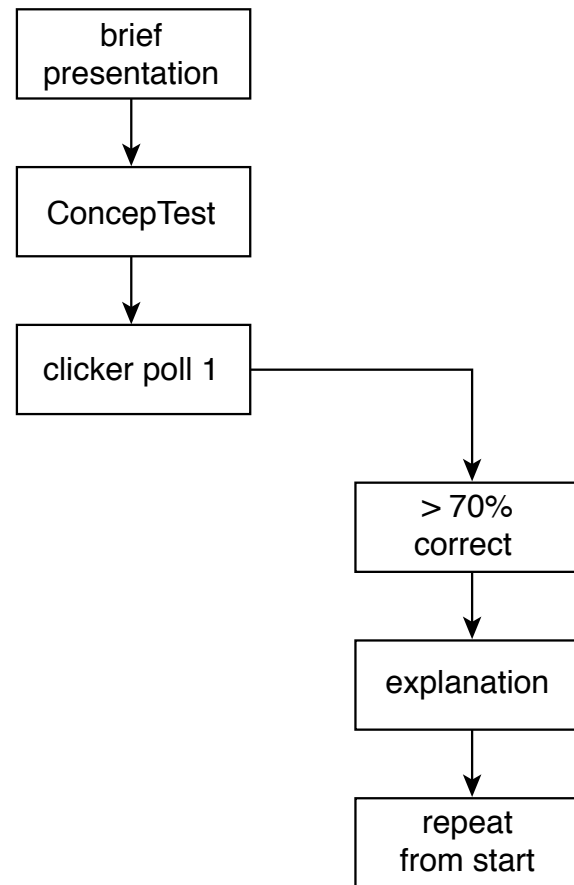
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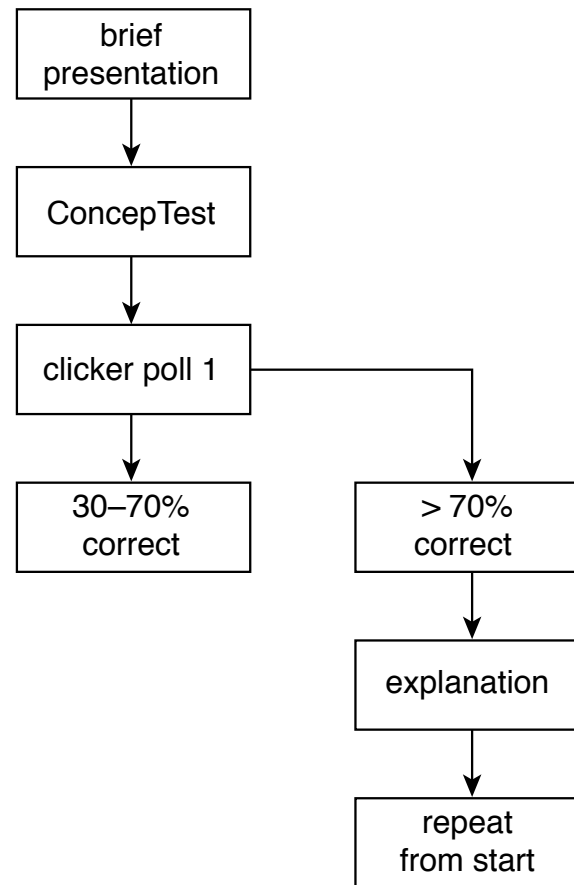
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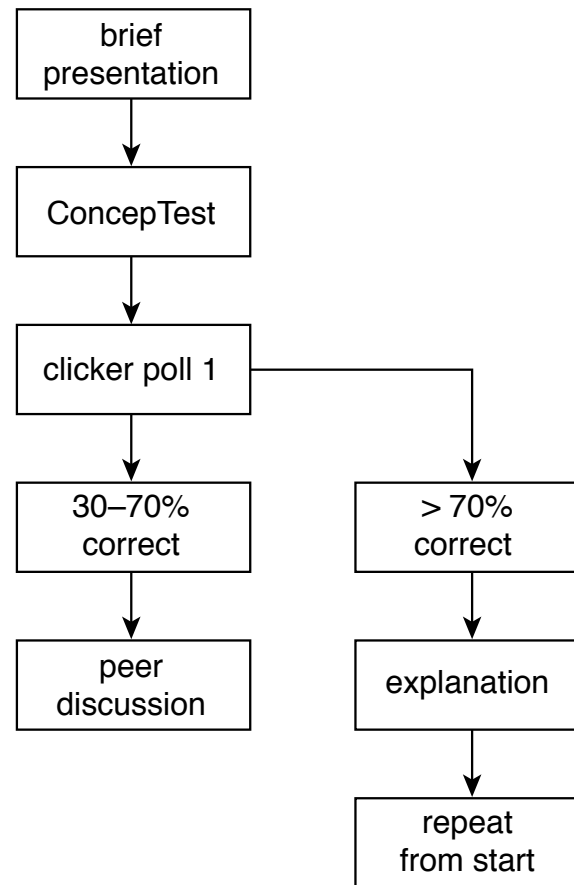
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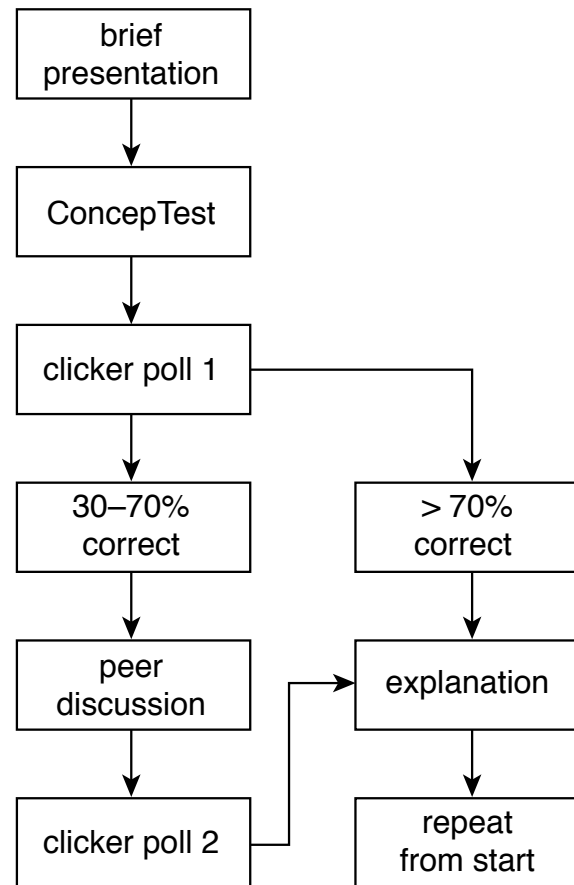
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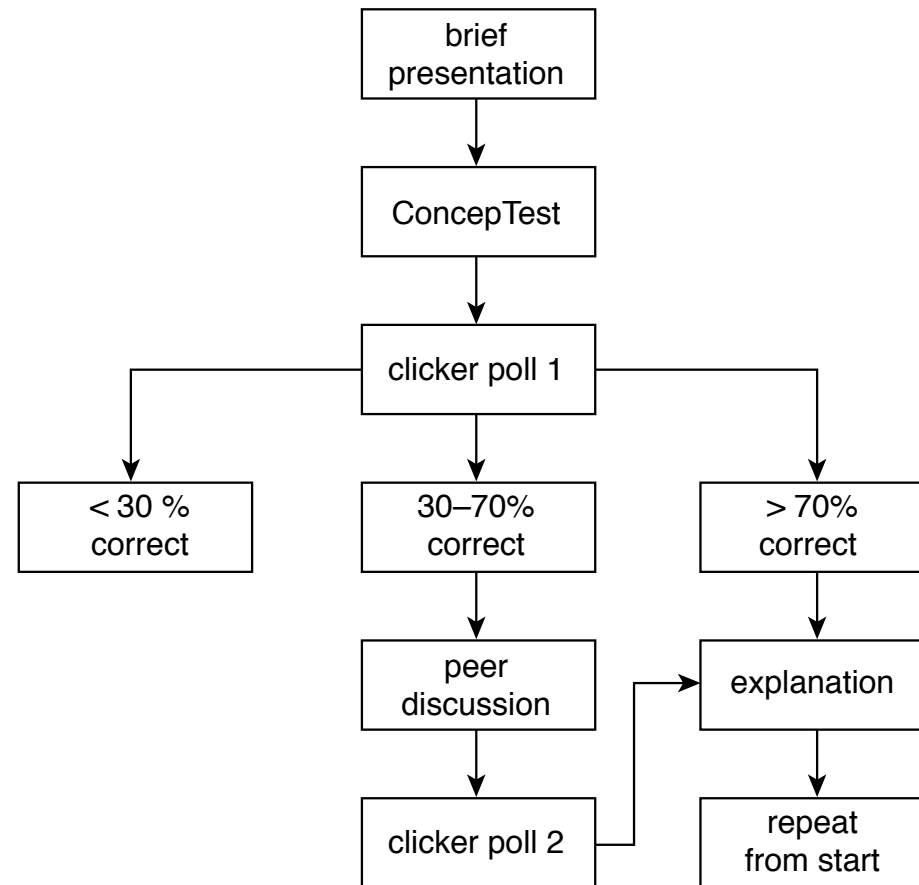
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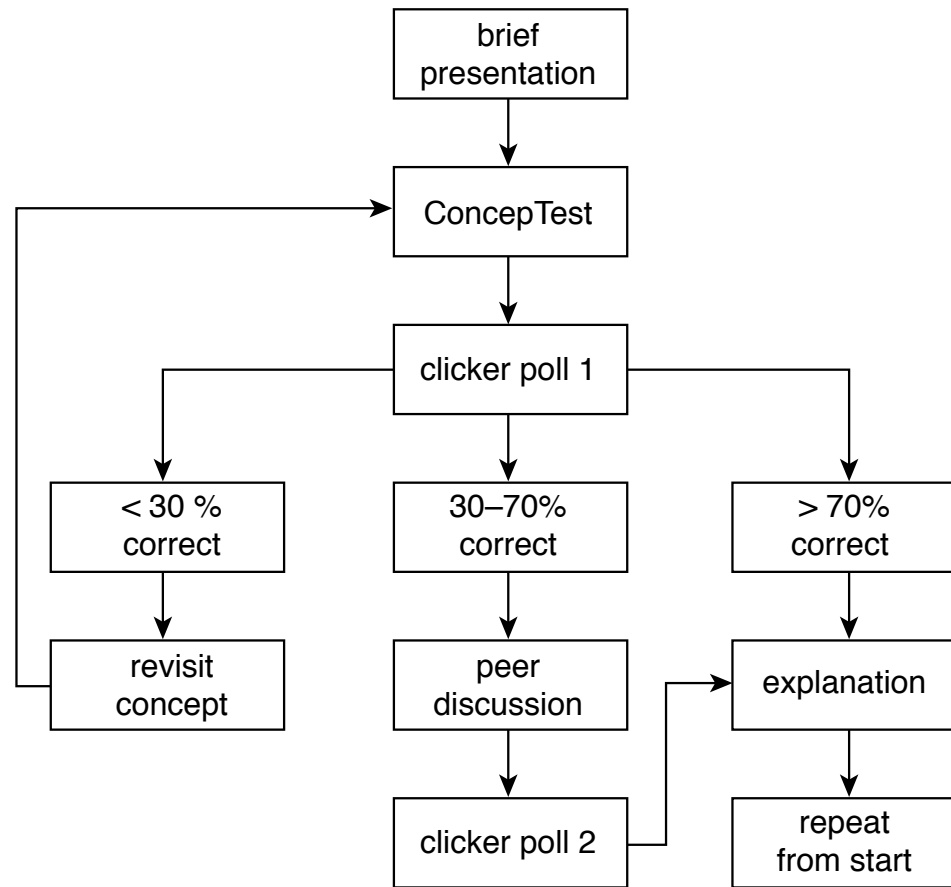
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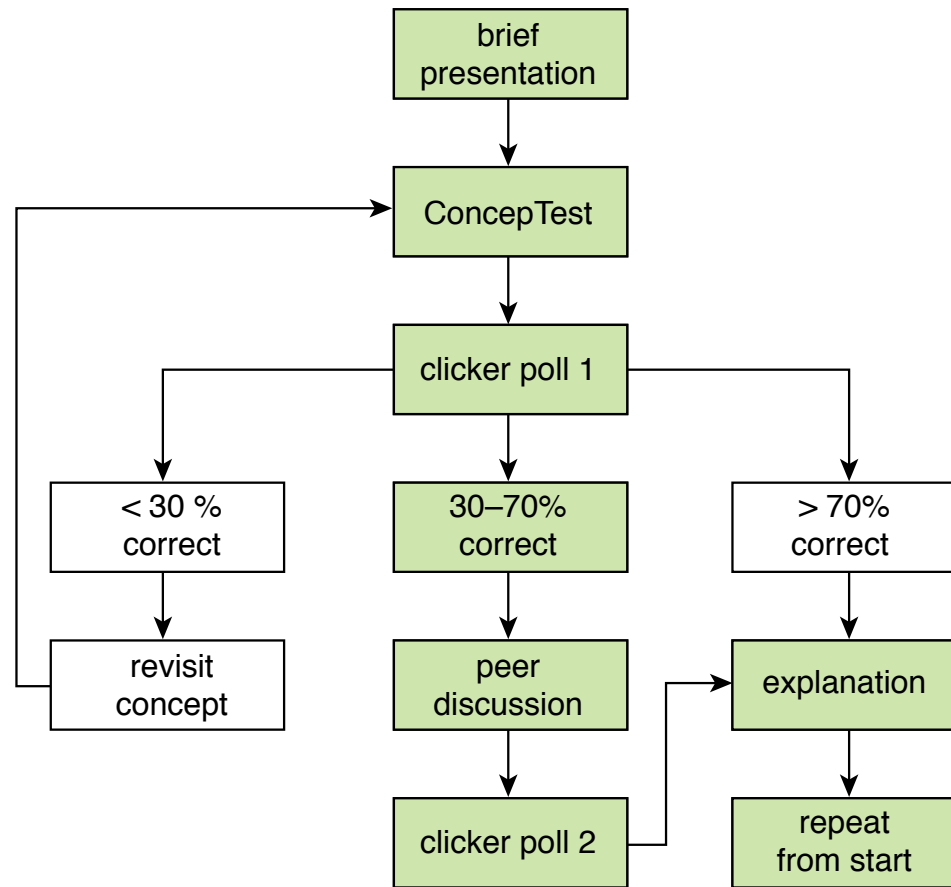


# Peer Instruction: a primer





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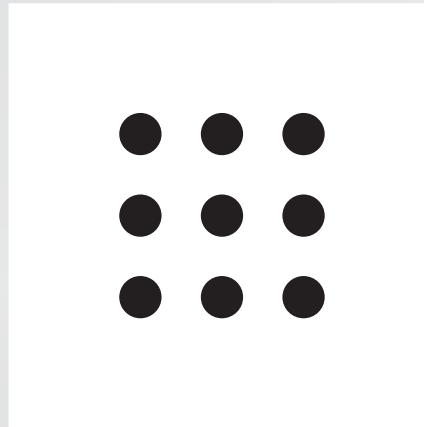


**Let's try it!**

**thermal expansion**

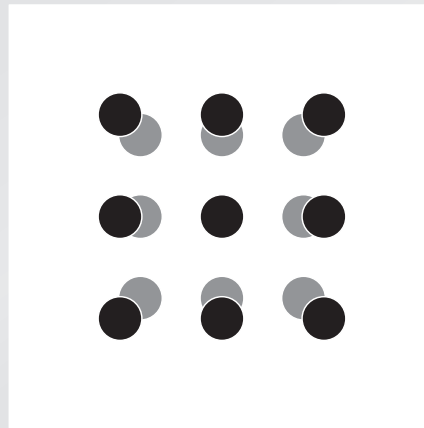
# Let's try it!

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



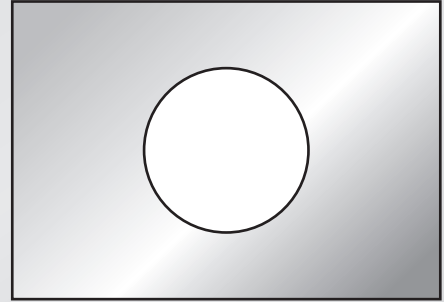
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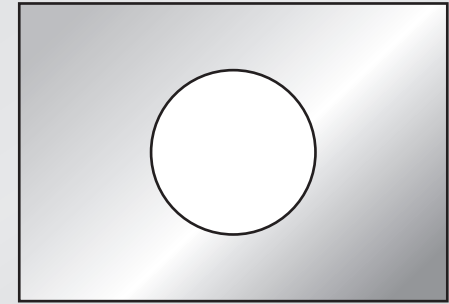
# Let's try it!

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



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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.

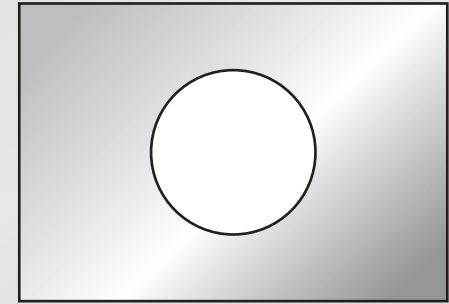


# Let's try it!

*It's easy to fire up the audience!*

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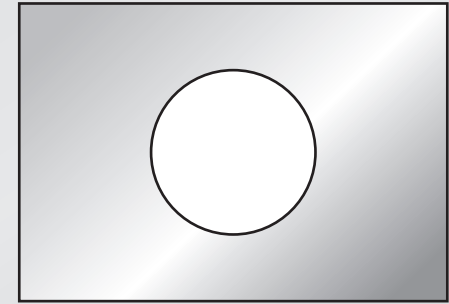
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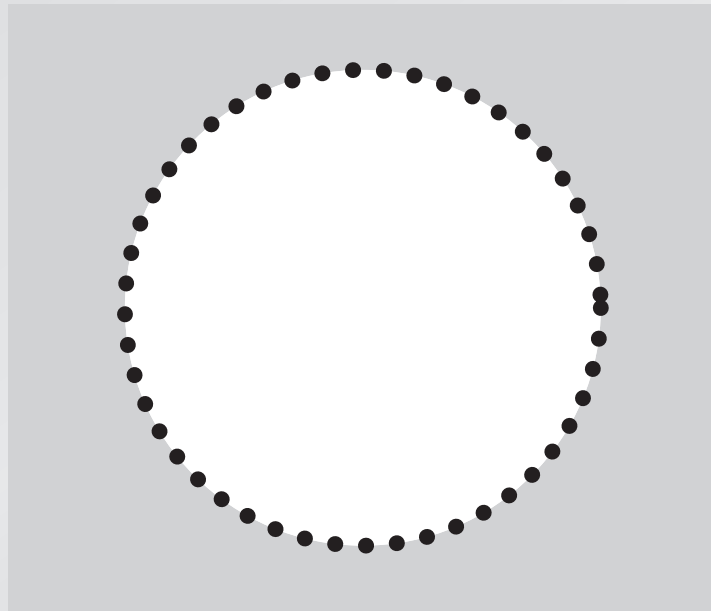
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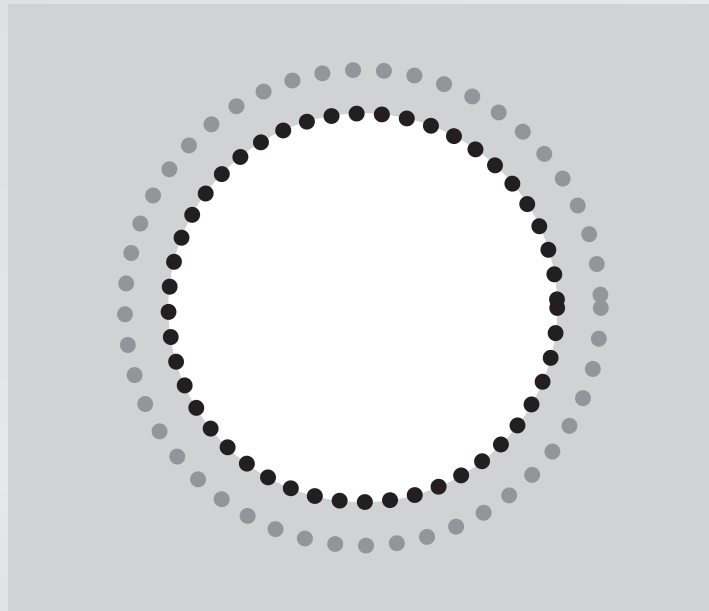
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consider the atoms at the rim of the hole



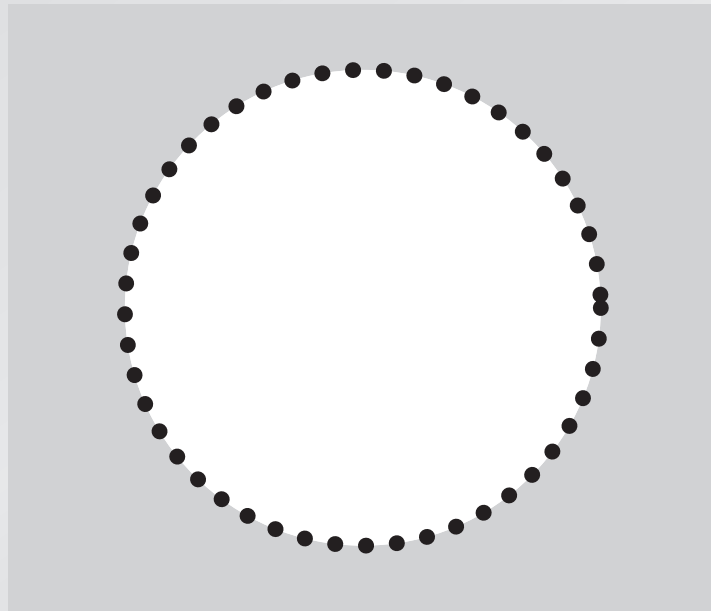
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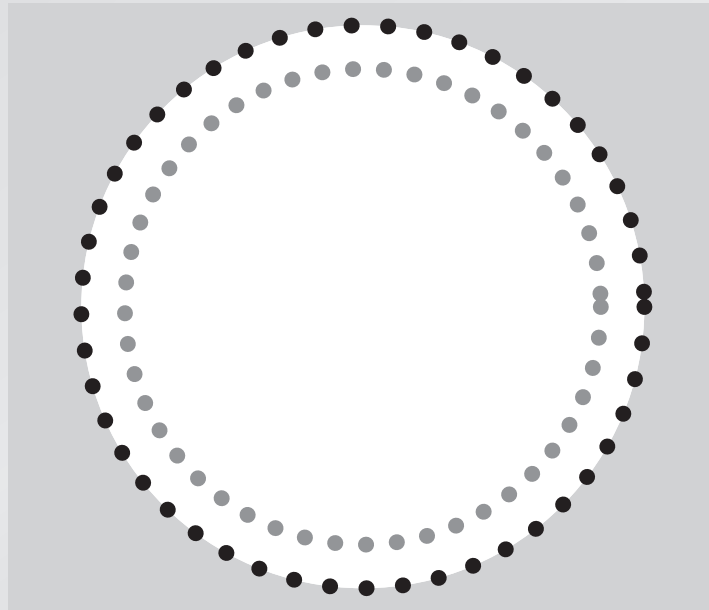
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consider the atoms at the rim of the hole



# Frequently Asked Questions

***“Will it work at my institution?”***

It works here...





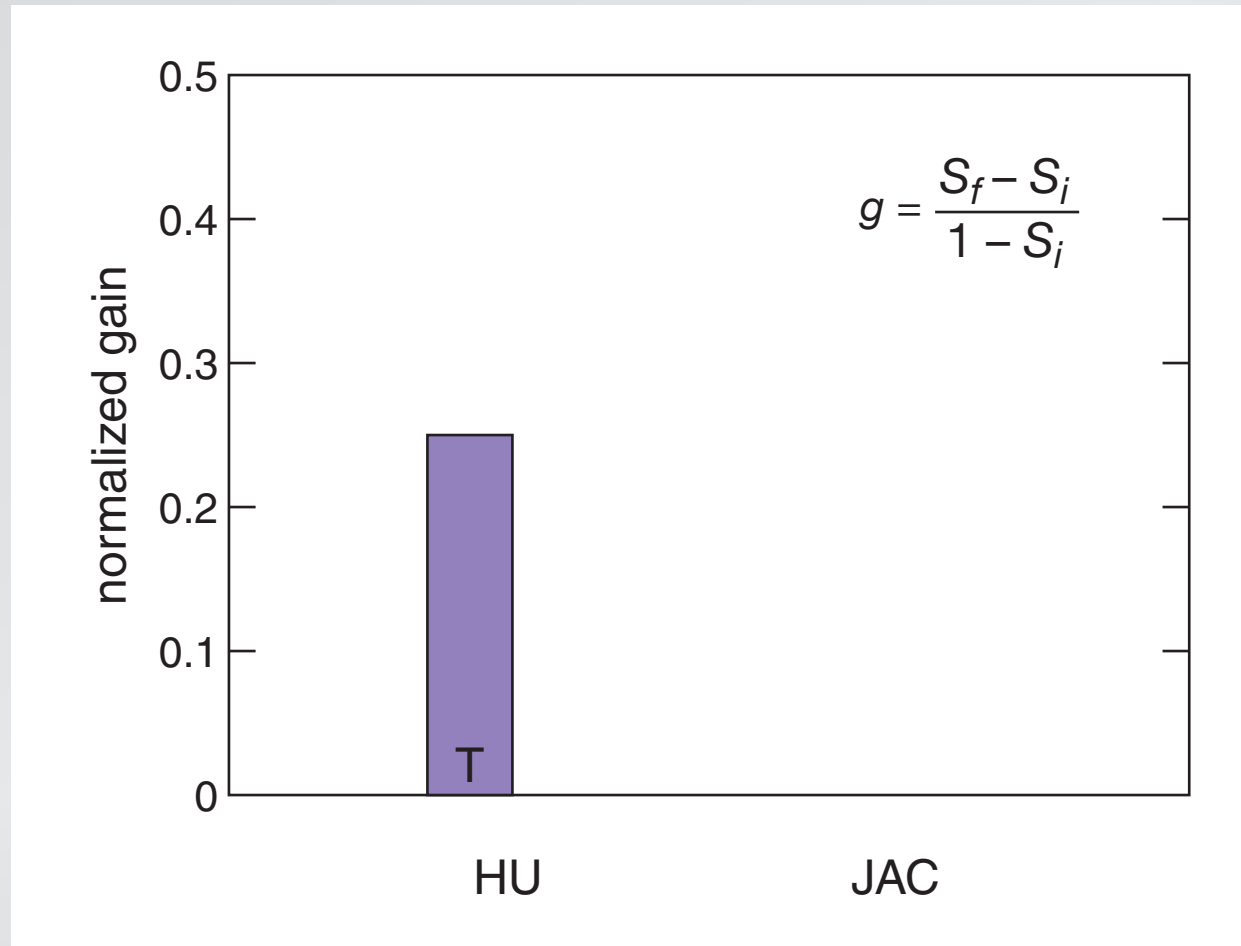
...but will it work here?





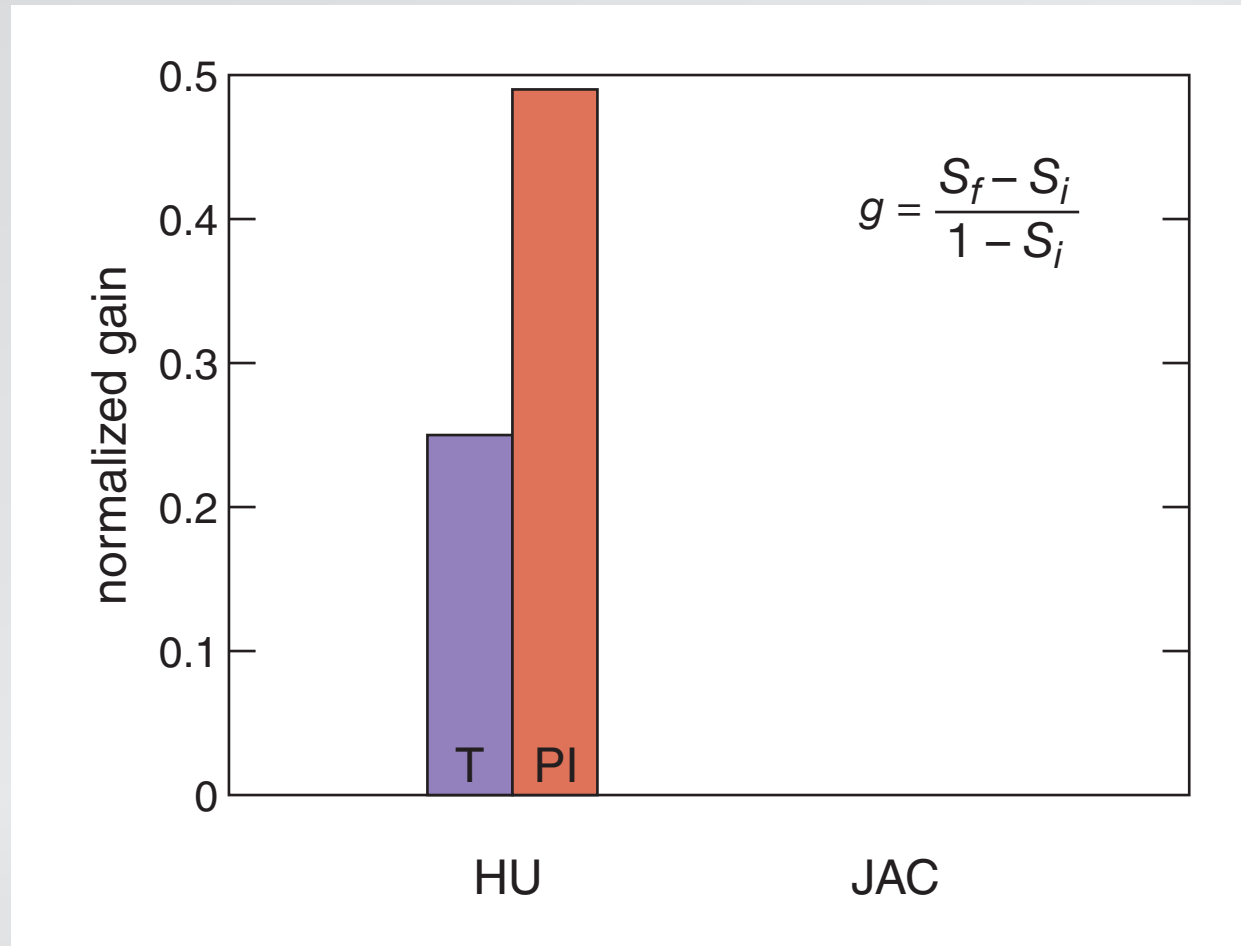
# Will it work at my institution?

## FCI normalized gain



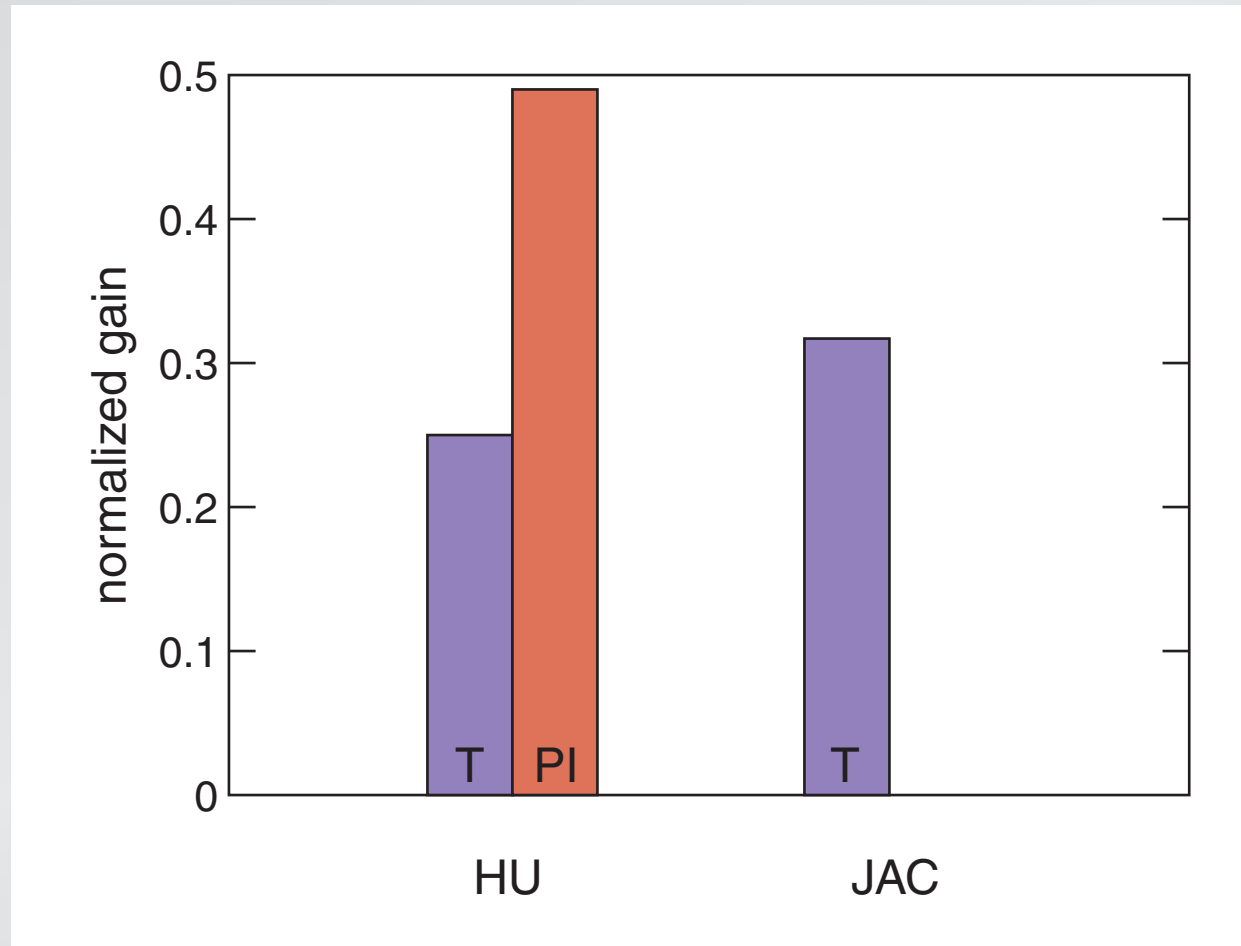
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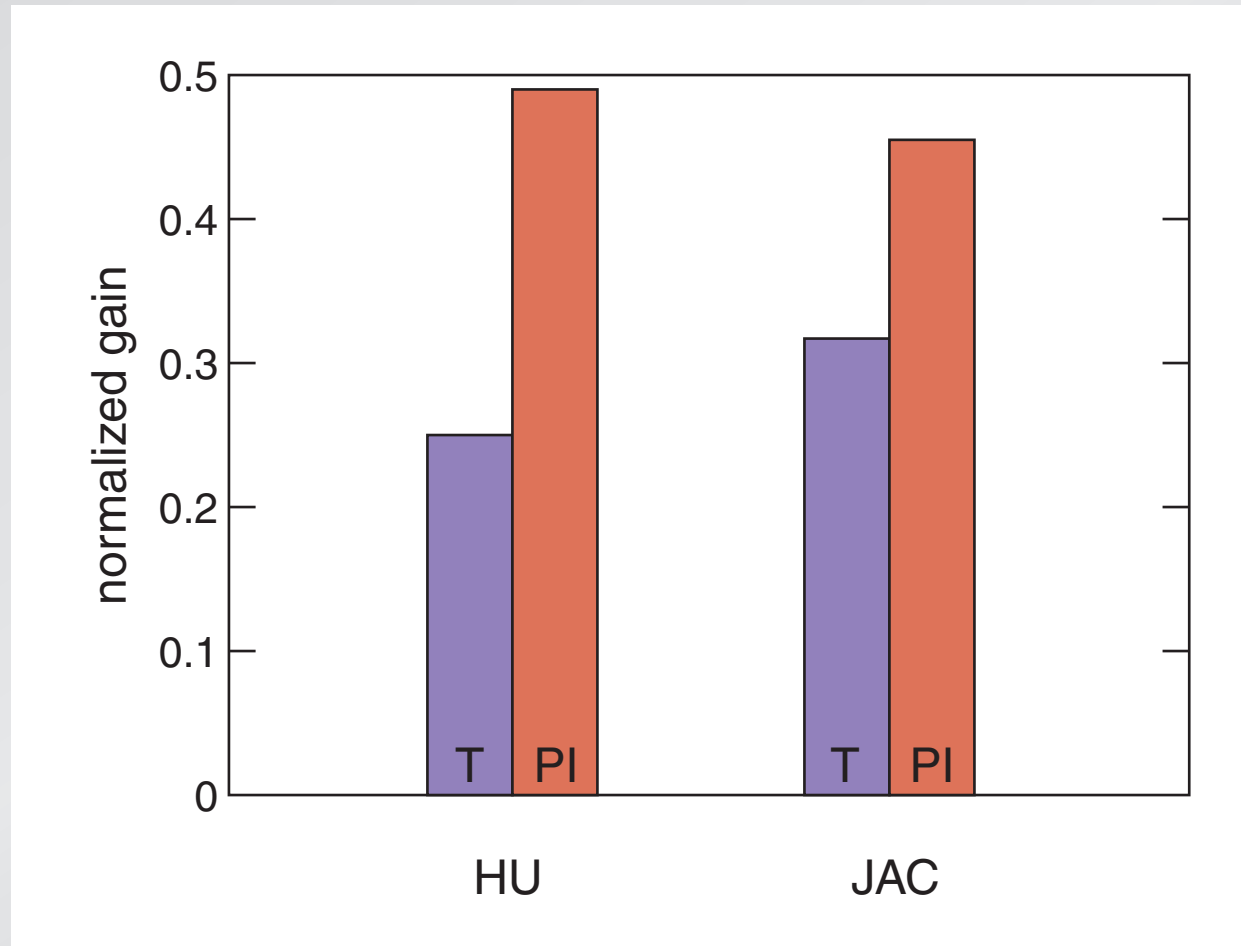
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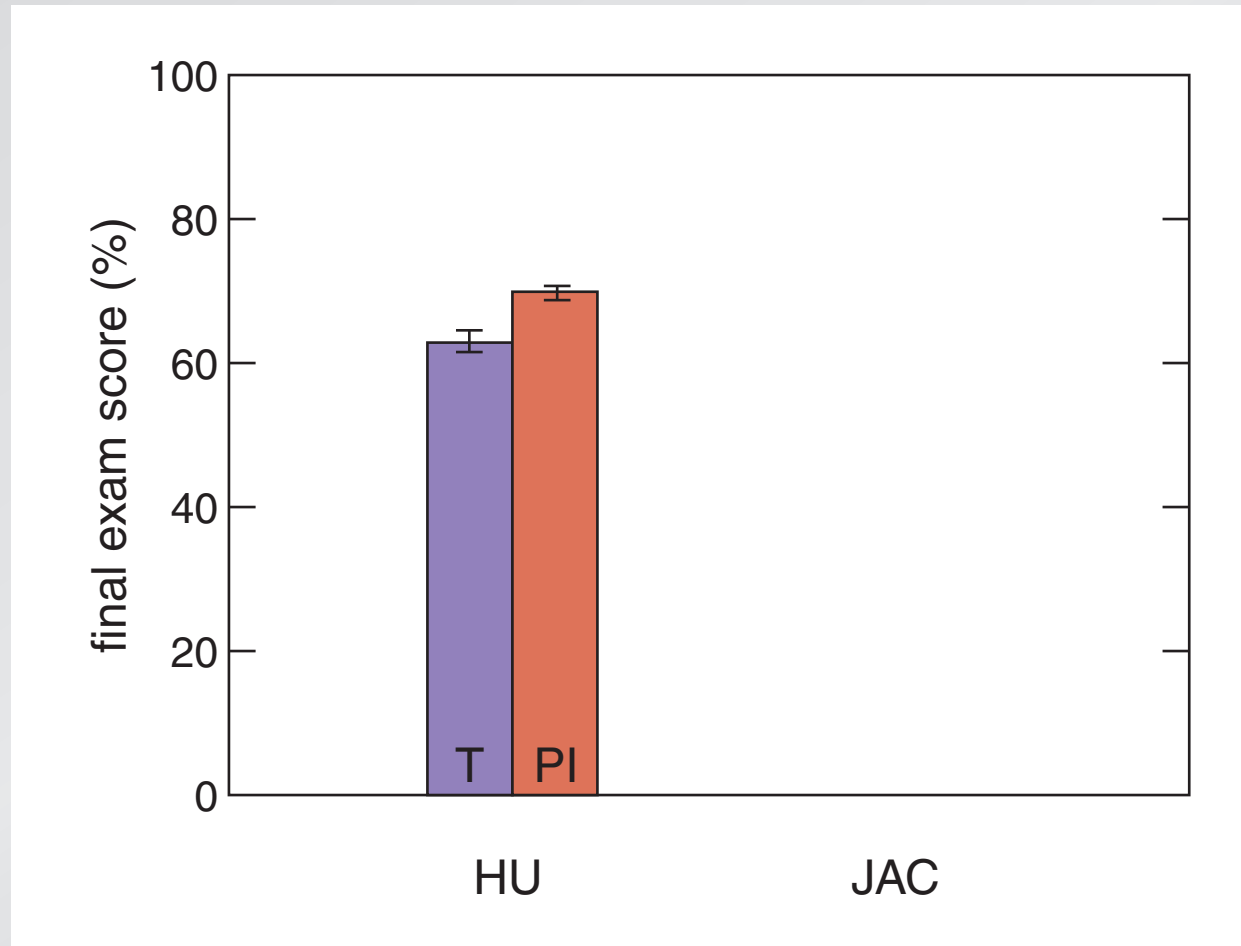
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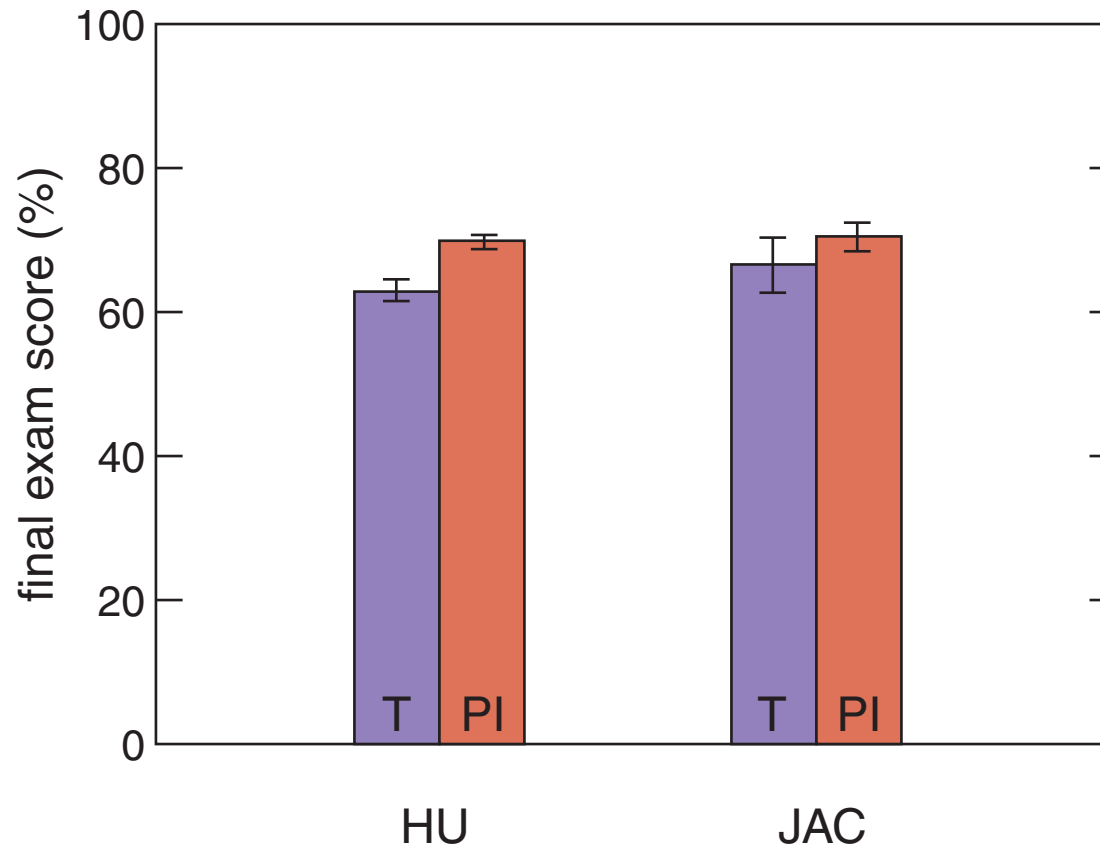
# Will it work at my institution?

exam performance



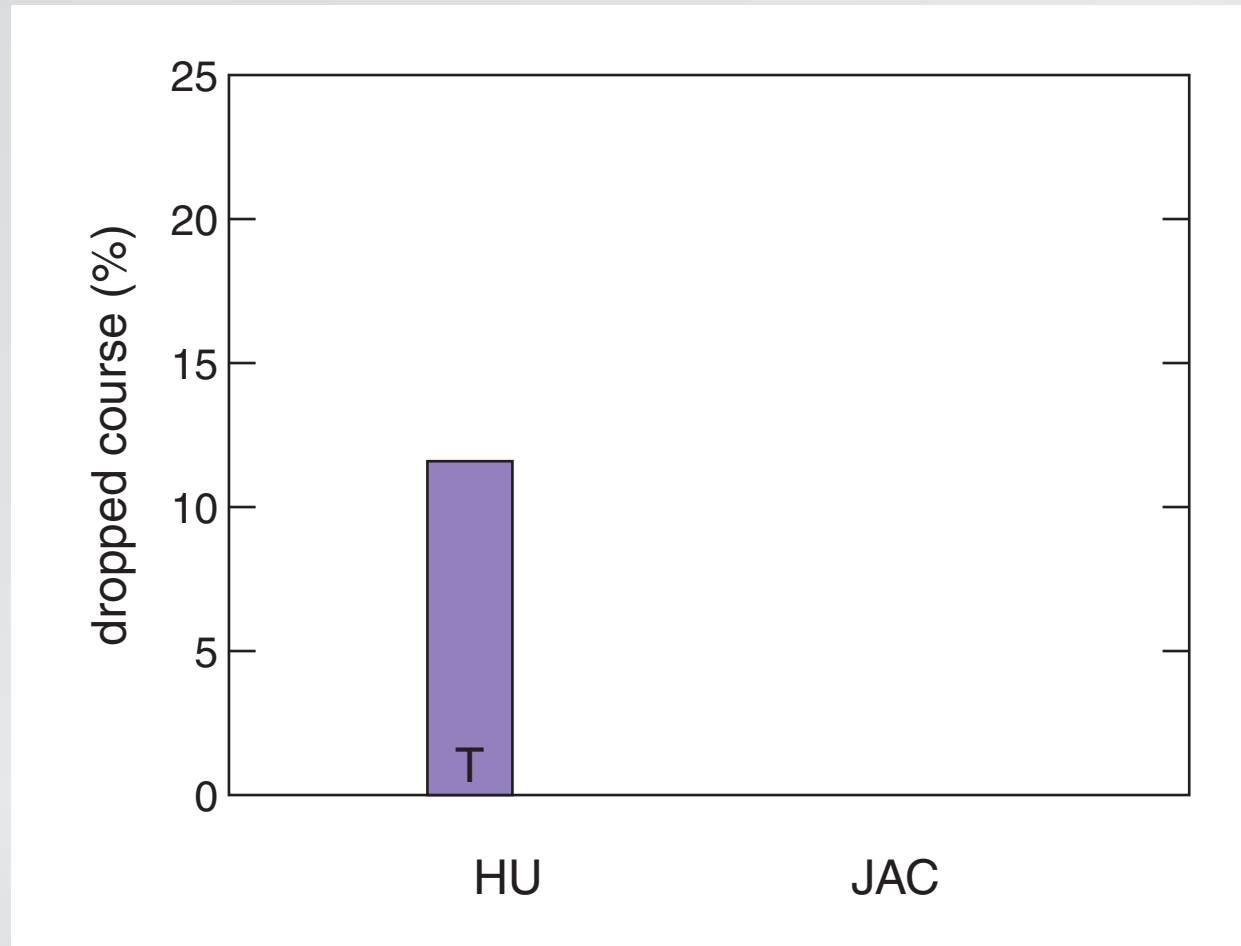
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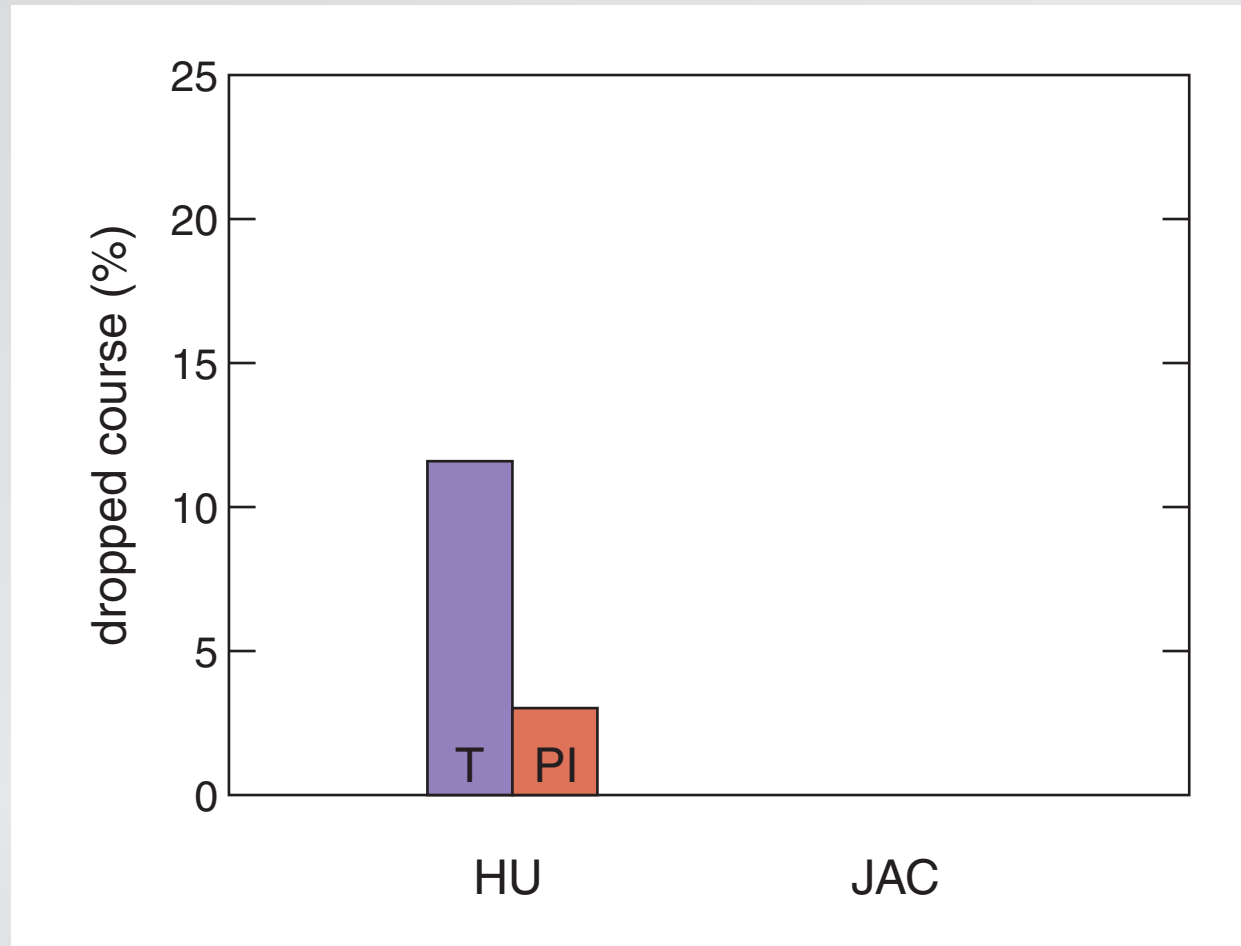
# Will it work at my institution?

student retention



# Will it work at my institution?

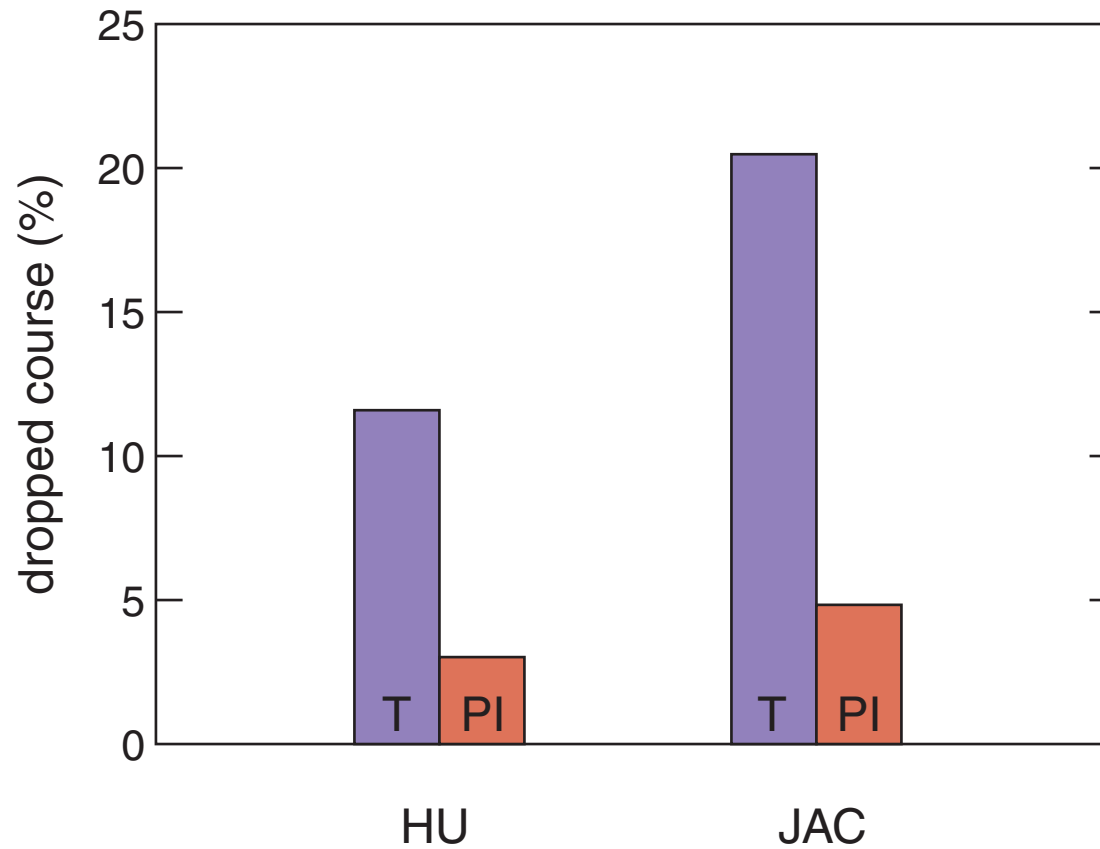
student retention





# Will it work at my institution?

## student retention



# **Will it work at my institution?**

**similar learning gains in different environments**

# Frequently Asked Questions

***“How do I move information transfer out of classroom?”***

# Getting students to read

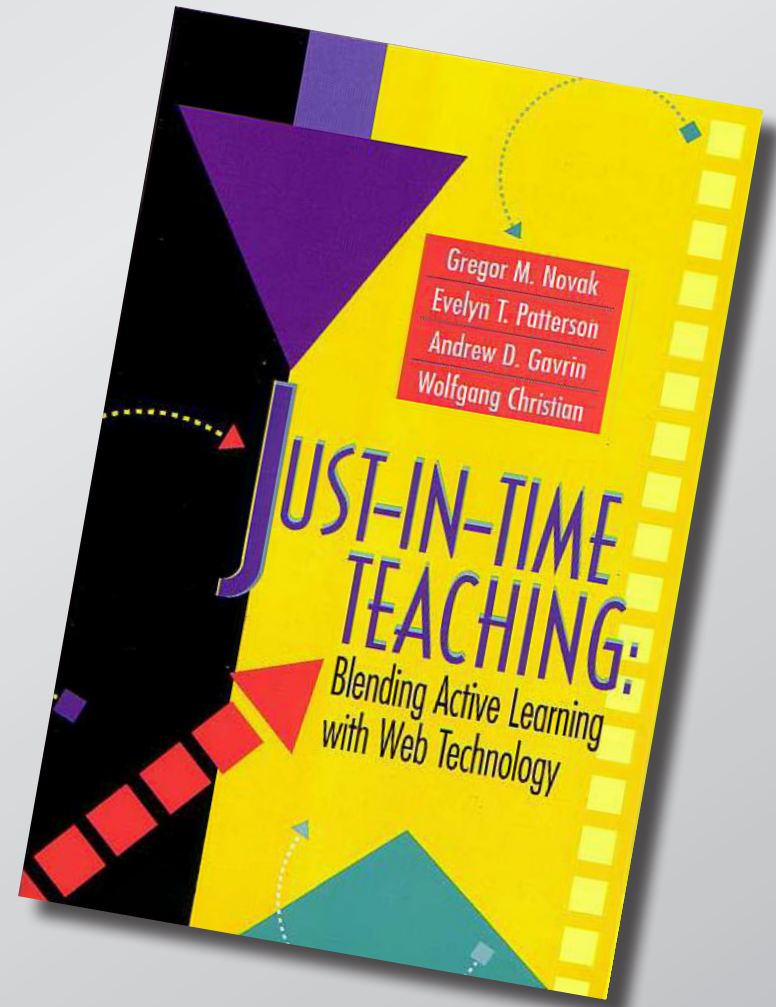
**My approach:**

- **Reading quizzes (1991)**
- **Reading summaries (1994)**
- **Just-in-Time Teaching (1999)**

# Getting students to read

Just-in-time-Teaching (JiTT)

[www.jitt.org](http://www.jitt.org)



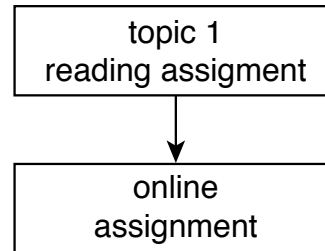
# Getting students to read

## JiTT workflow

topic 1  
reading assignment

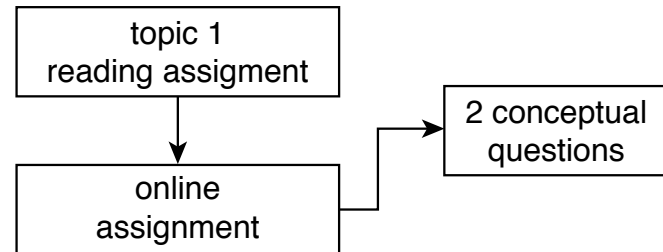
# Getting students to read

## JiTT workflow



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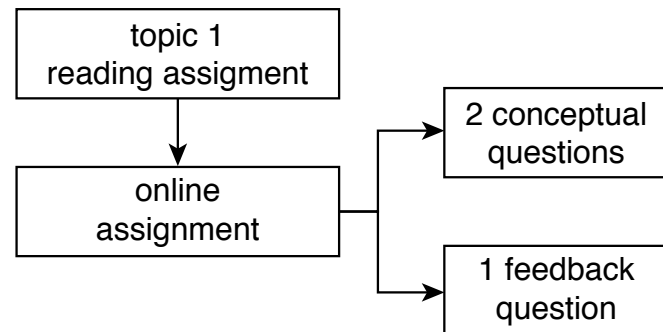
## JiTT workflow





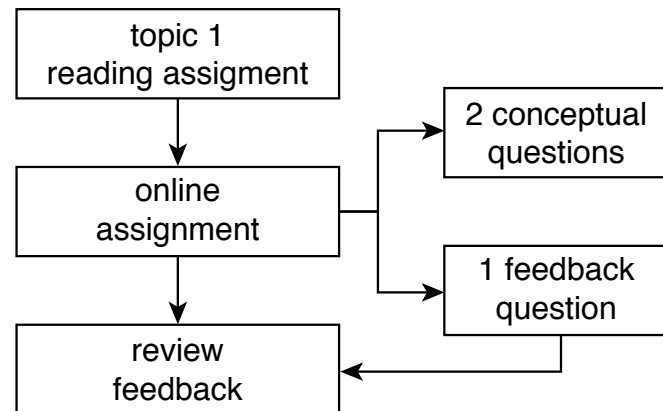
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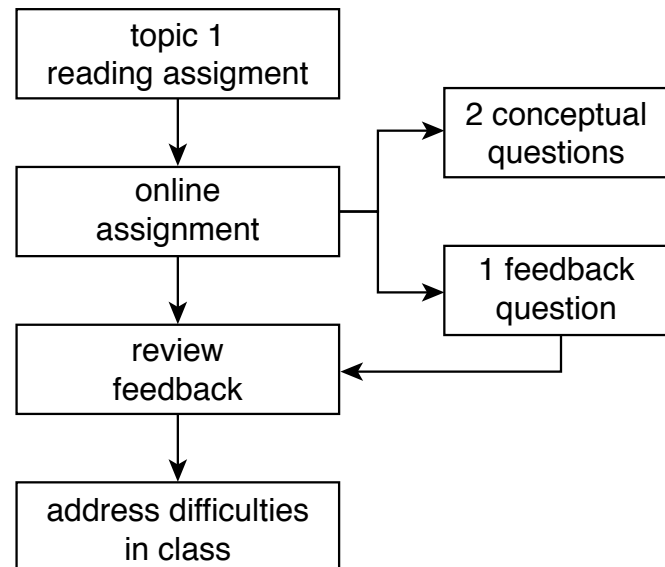
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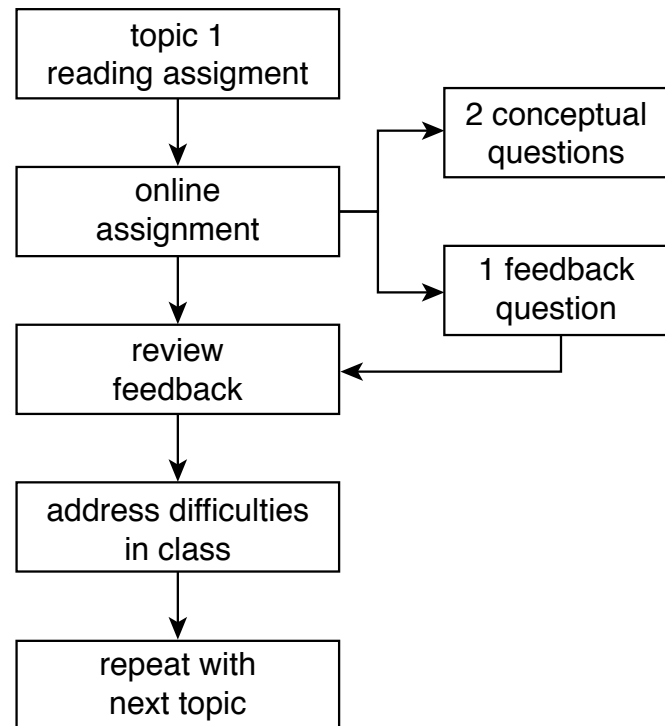
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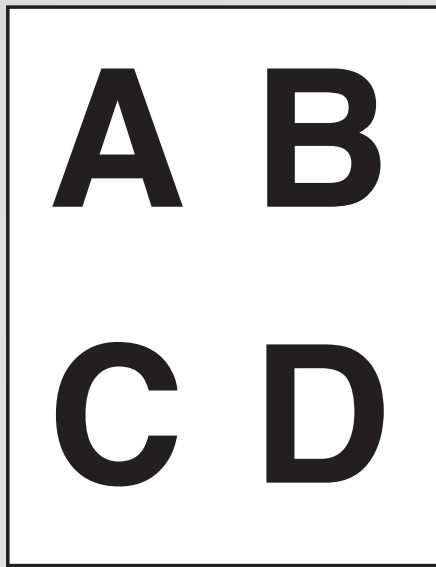


# Frequently Asked Questions

***“Do I need clickers?”***

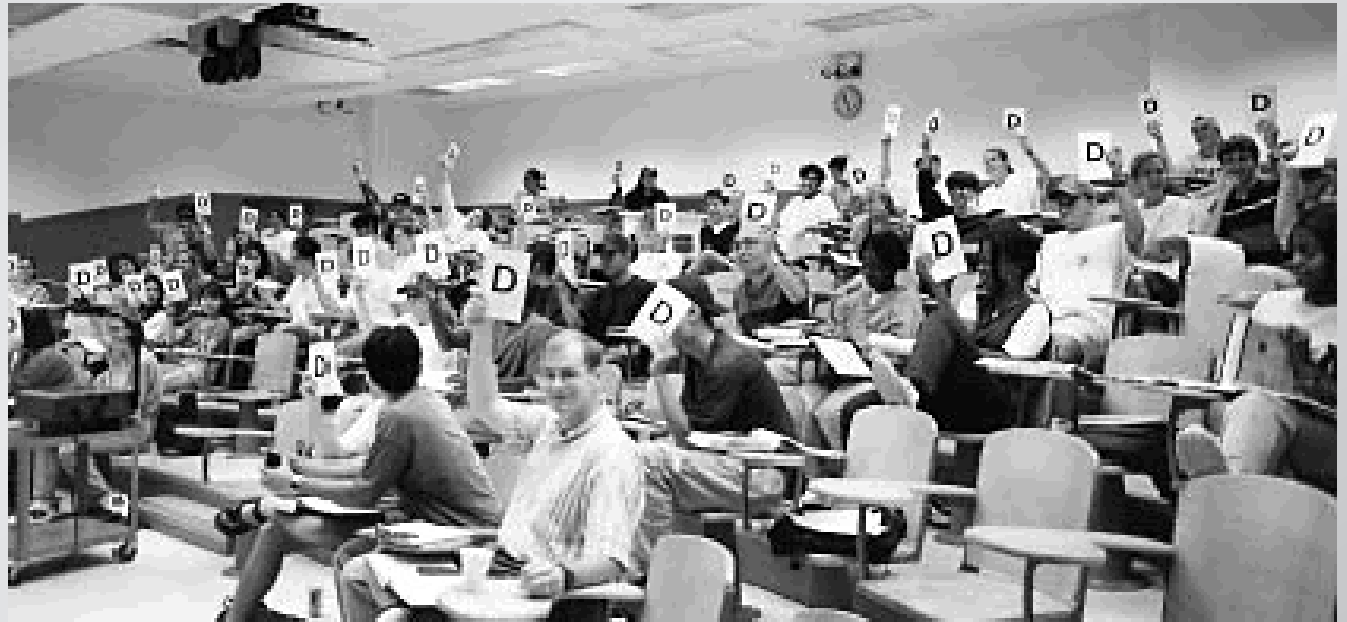
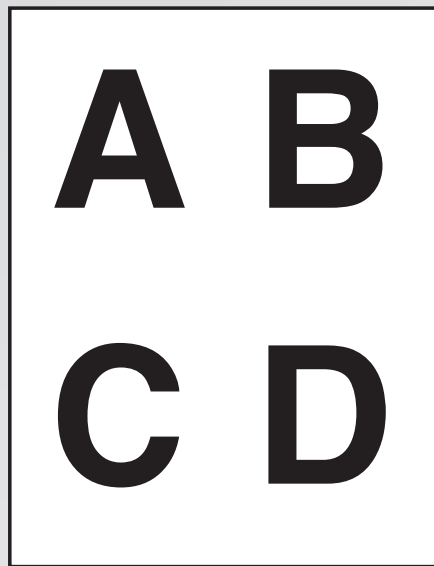
# Clickers necessary?

Flashcards: simple and effective



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Flashcards: simple and effective



Meltzer and Mannivanan, South Eastern Louisiana University

# Clickers necessary?

Imagine a rope that fits snugly along the equator.





# Clickers necessary?

Imagine a rope that fits snugly along the equator.

Suppose the rope is cut and 1 m of rope is inserted between the cut ends. If the rope were to maintain a circular shape, how far off the surface of the Earth would it float?



1. the width of a few atoms
2. the width of a few hairs
3. about 0.15 m
4. exactly 1 m
5. more than 1 m



# Clickers necessary?

*You all got fired up!*

# Clickers necessary?

*You all got fired up!*

**(WITHOUT CLICKERS!)**

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# Clickers necessary?

circumference at the equator:

$$2\pi R_E$$

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circumference at the equator:

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new circumference:

$$2\pi R_E + 1 \text{ m}$$

# Clickers necessary?

circumference at the equator:

$$2\pi R_E$$

new circumference:

$$2\pi R_E + 1 \text{ m}$$

radius of circle with new circumference:

$$2\pi R = 2\pi R_E + 1 \text{ m}, \quad \text{and so} \quad R = R_E + \frac{1 \text{ m}}{2\pi}.$$



# Clickers necessary?

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

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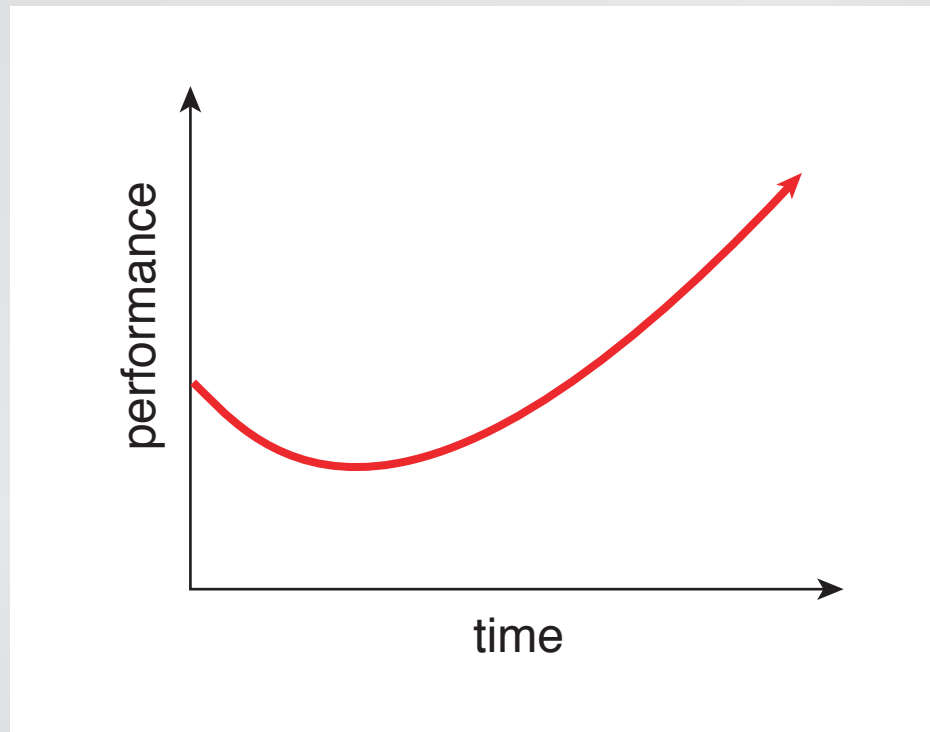
**(but clickers do offer advantages)**

# Frequently Asked Questions

*“How do I deal with students who resist  
this new approach to studying?”*

# Student resistance

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



# Student resistance

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 too 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.

# Student resistance

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!

# Student resistance

Hello Prof. Mayer,  
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  
an inspiring and have  
changed how I look at  
"learning". I also wanted  
to thank you for  
how understanding  
you were of all  
my circumstances.  
You really made a difference  
in my life. So THANKS  
Thank you!  
Best.

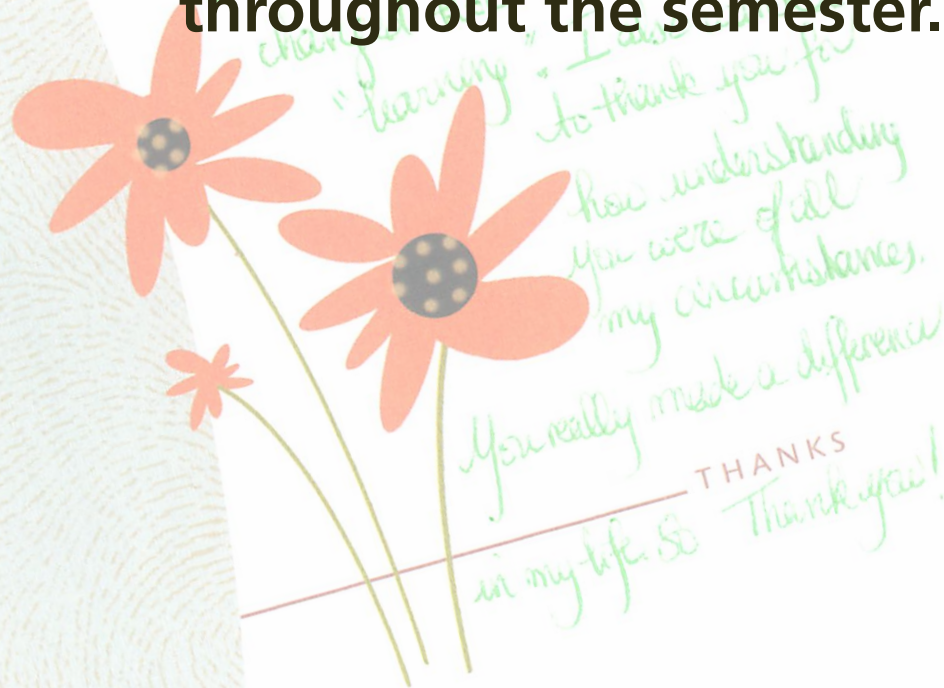
You made a difference.



# Student resistance

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

*You made a difference.*





# Student resistance

**"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".**

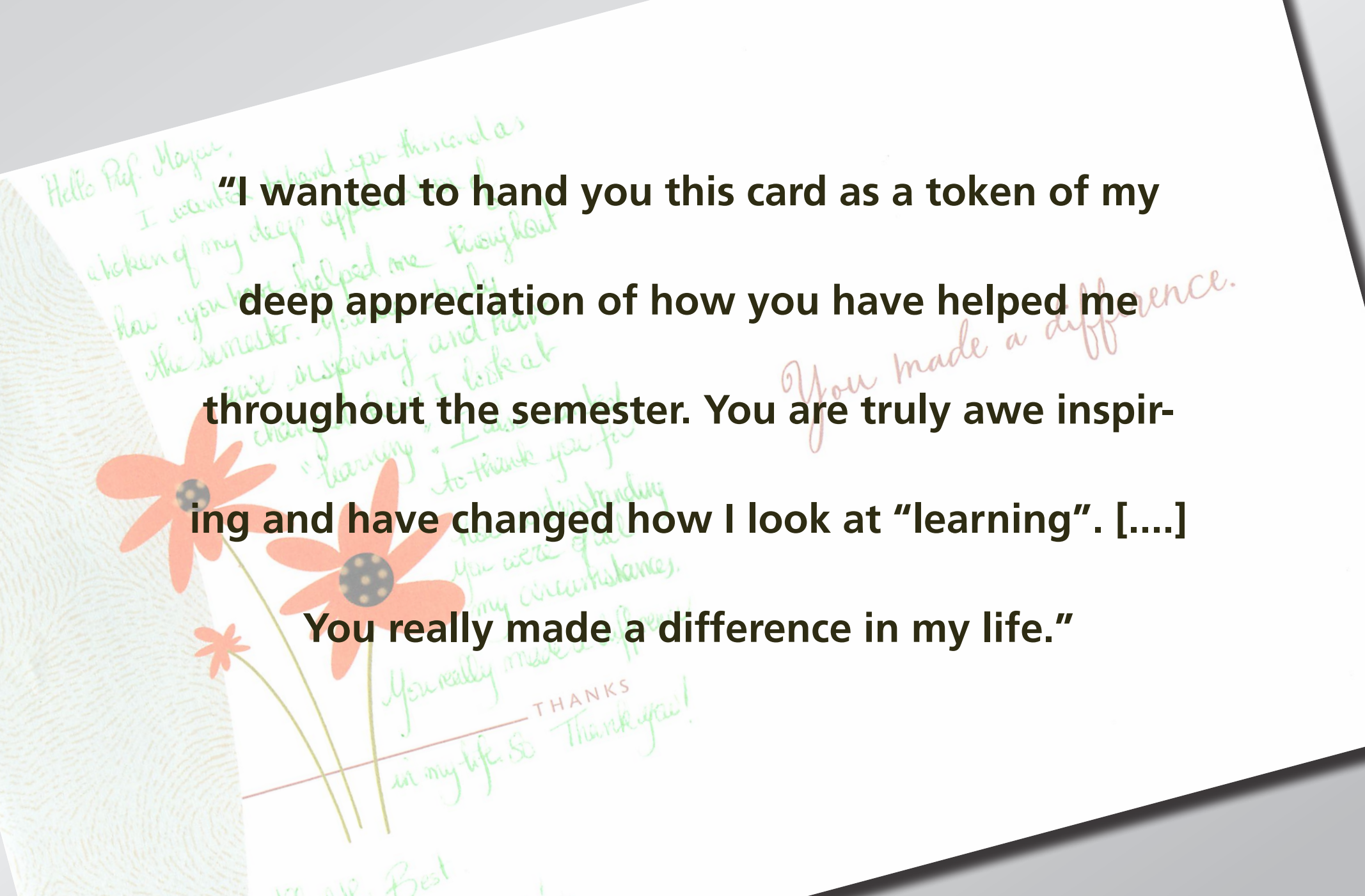
*You made a difference.*

*THANKS  
in my life. So Thank you!*

*Best*

# Student resistance

**"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."**



# Student resistance

**and don't forget...**

# Student resistance

**and don't forget...**

**PI leads to better learning and retention!**

# Frequently Asked Questions

*“Why does it work?”*

# Why does it work?

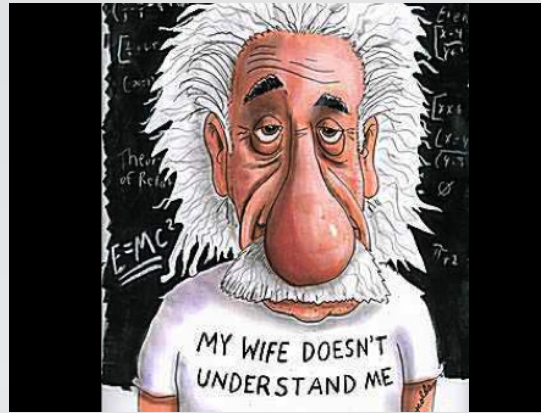
**discussion or more time to think?**

# Why does it work?

compare three activities



question



distract



question



# Why does it work?

compare three activities



question



reflect



question



# Why does it work?

compare three activities



question



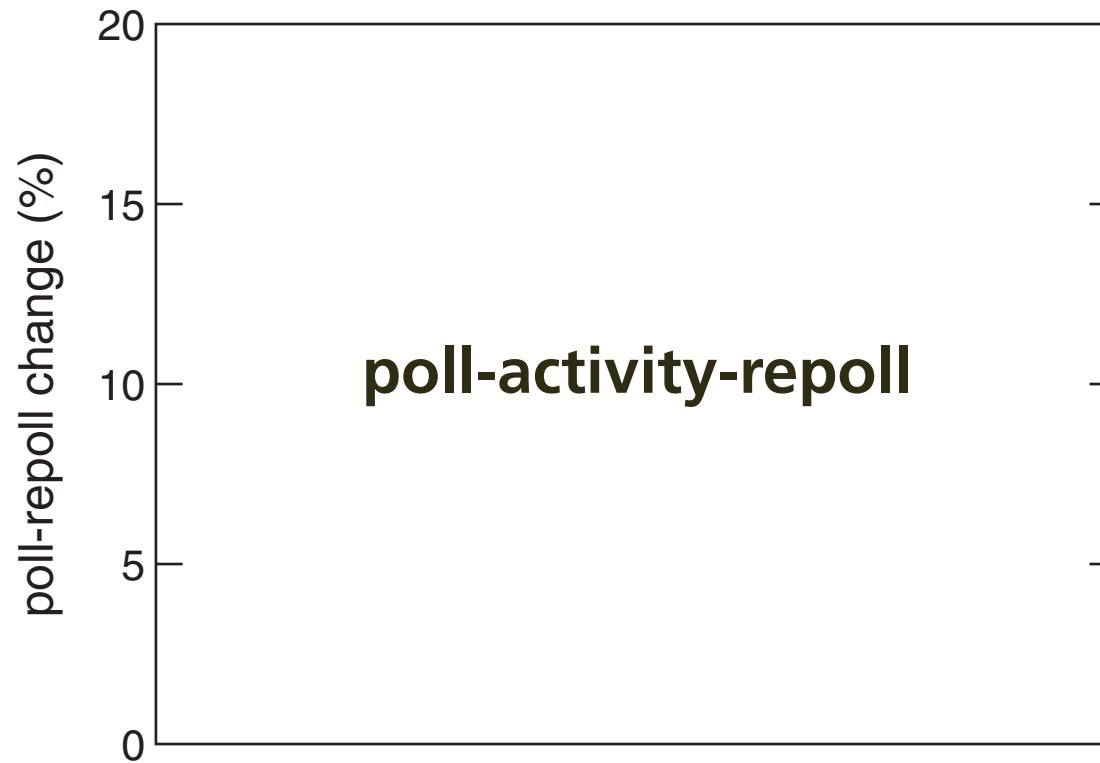
discuss



question

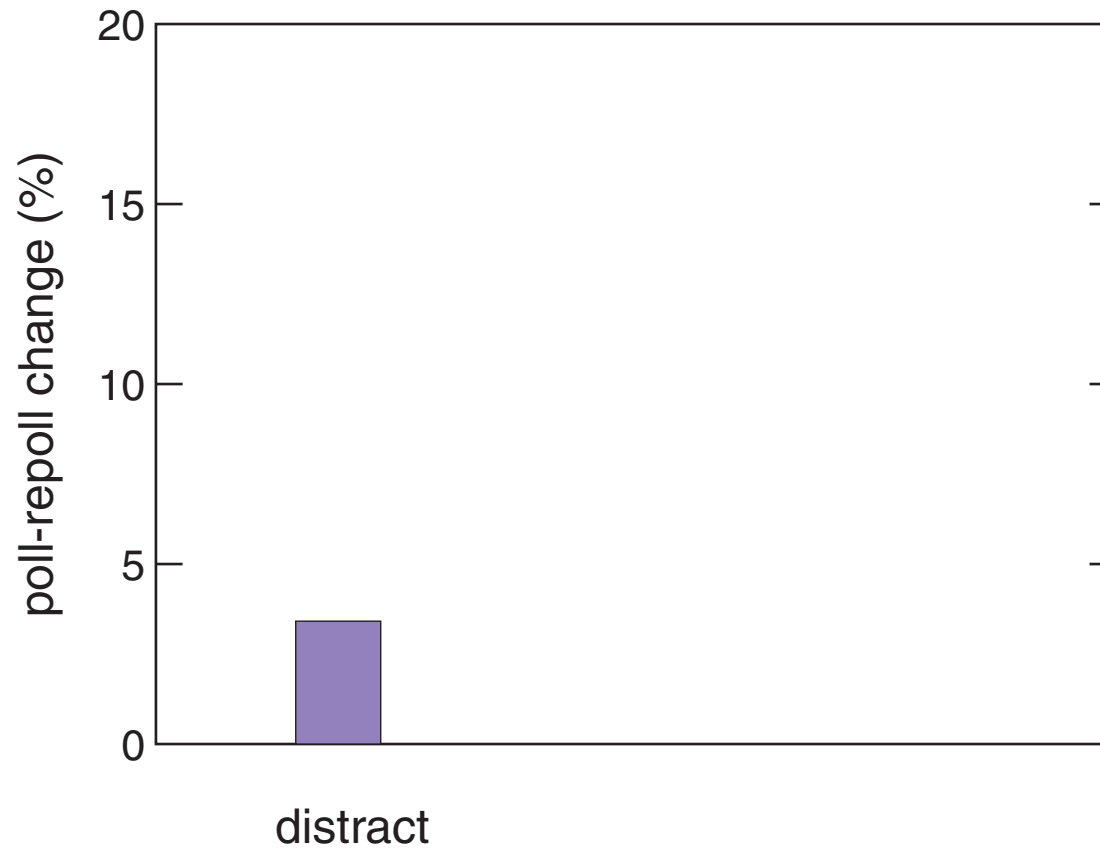
# Why does it work?

the importance of discussion



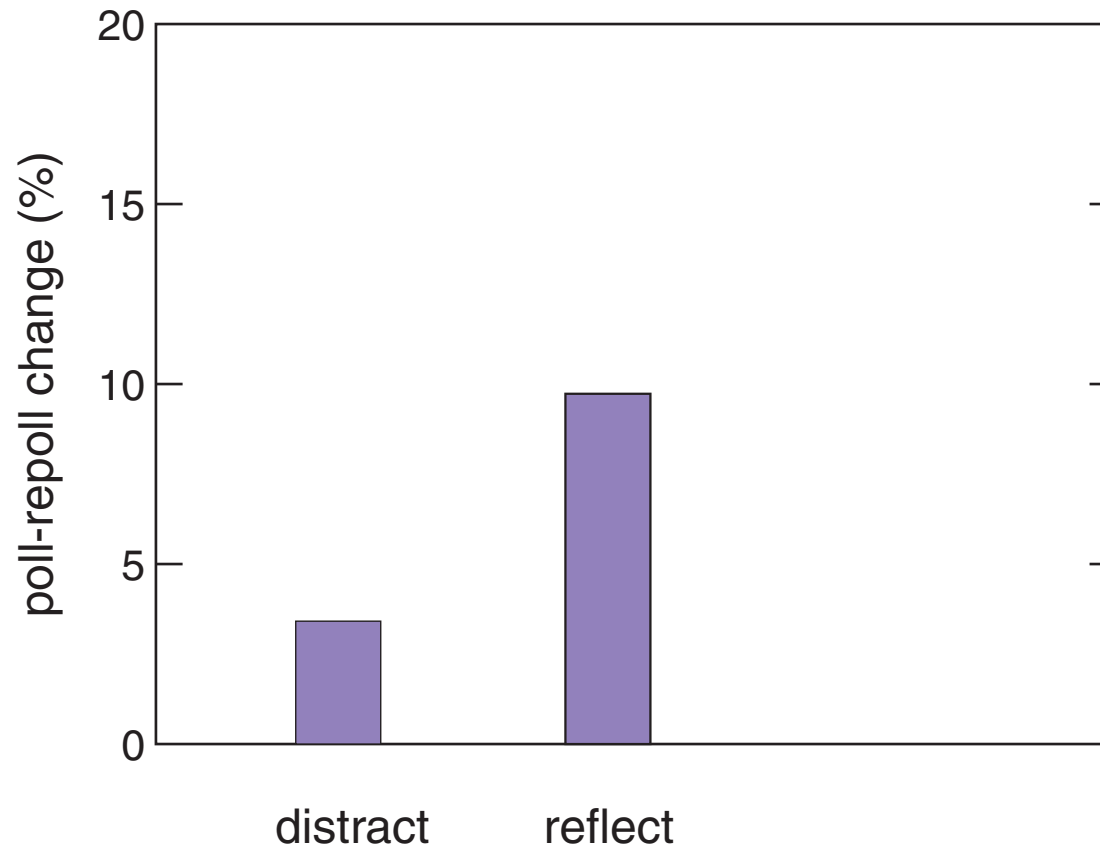
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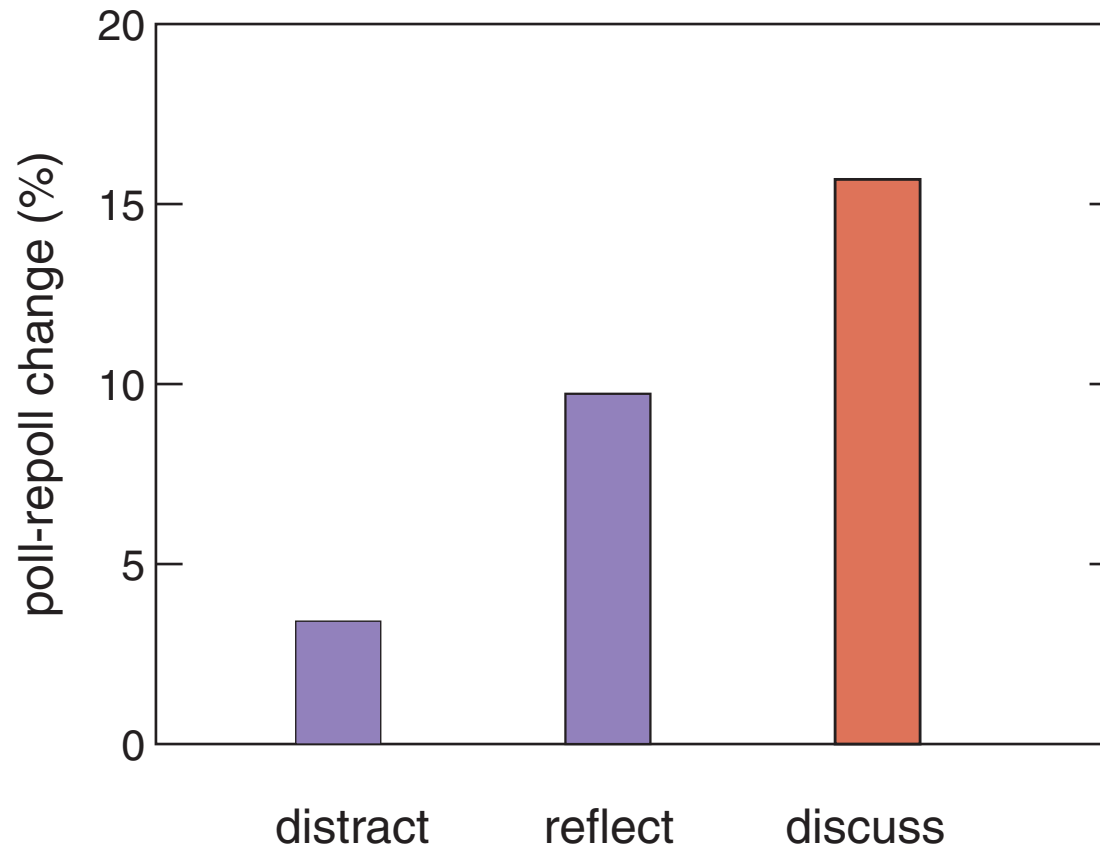
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the importance of discussion



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the importance of discussion





# Summary





# Summary

**PI easy to implement (and improves learning gains)**





# Summary

**PI easy to implement (and improves learning gains)**

**technology facilitates active engagement (but not required)**



**Funding:**

**National Science Foundation**

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**eric\_mazur**