

# What's up with women and physics?!



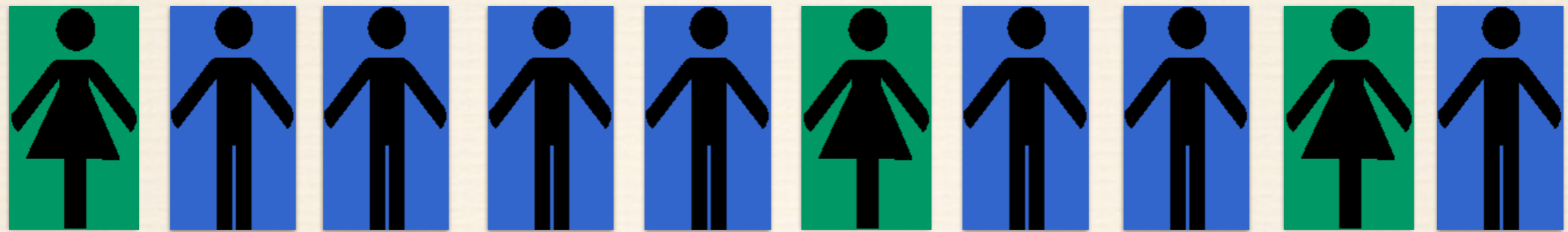
*Laura McCullough*  
*UW-Stout Physics Department*

October 2, 2014, UW-Eau Claire

# Personal Background

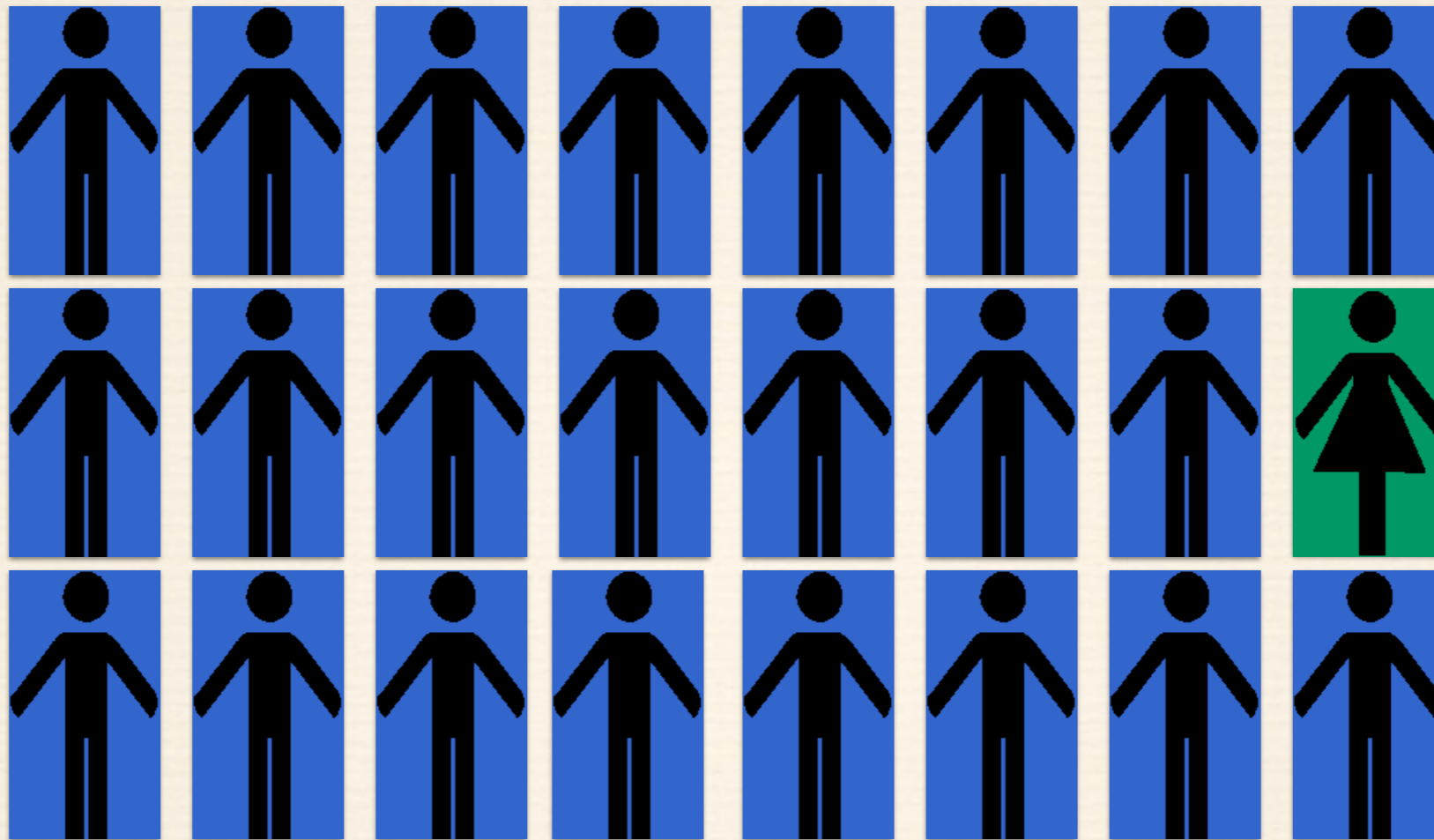


# Undergraduate Physics



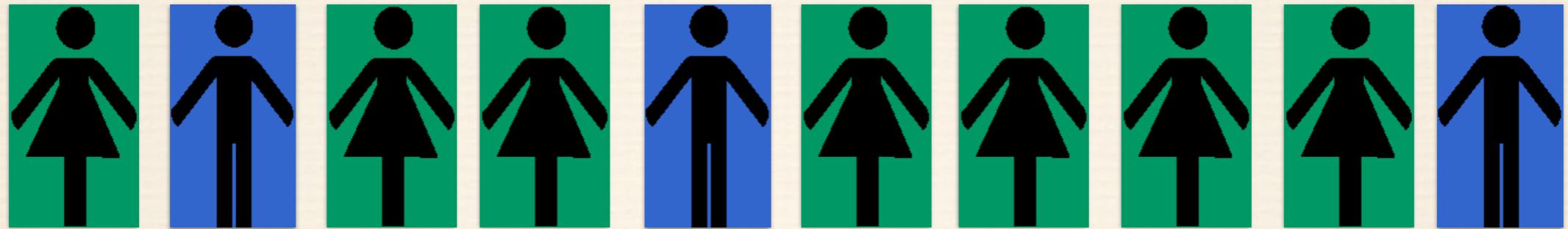
- ❖ Hamline University Physics B.A.
- ❖ Quantum physics taught by WHO?!

# Graduate Physics Program



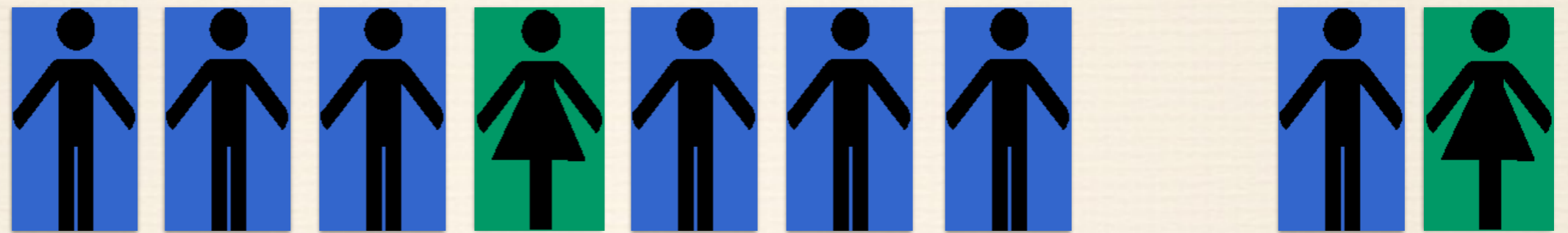
- ❖ Physics GRE
- ❖ University of Minnesota: little fish in big pond
- ❖ TA training

# Graduate Education Program



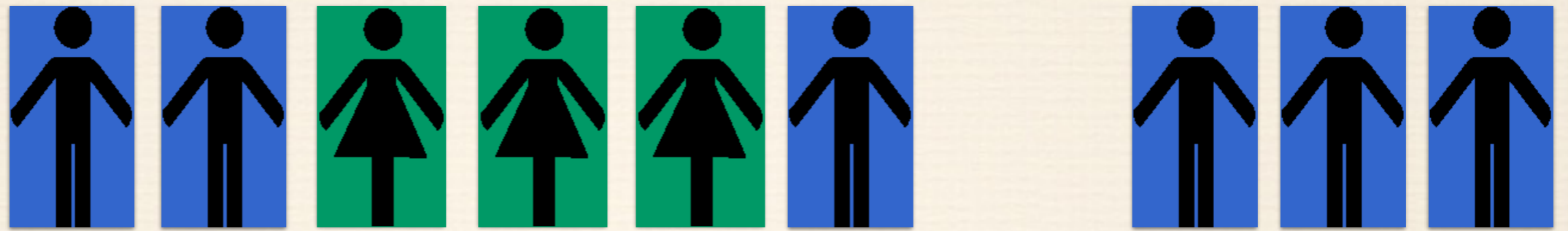
- ❖ Research group
- ❖ Department
- ❖ Research
- ❖ Teaching

# Physics Faculty Member



- ❖ UW-Stout
- ❖ First female faculty member in department
- ❖ Great department

# Today—UW-Stout Faculty



- ❖ Just finished 6.5 years as head of department
- ❖ Enjoying research, teaching, service
- ❖ Adore my job!

# The role of a professor

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- ❖ General role of faculty member:  
Teaching, Research, and Service

# My own research—current

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- ❖ National Science Foundation grant
- ❖ STEM students with disabilities
- ❖ Soft skills training

# Other current research

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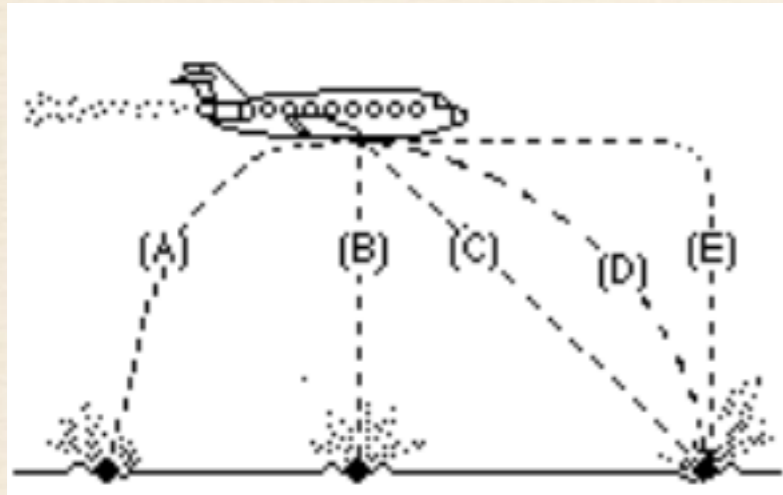
- ❖ Women's leadership in STEM departments and colleges (department chair/head, dean)

# Research on gender & test questions

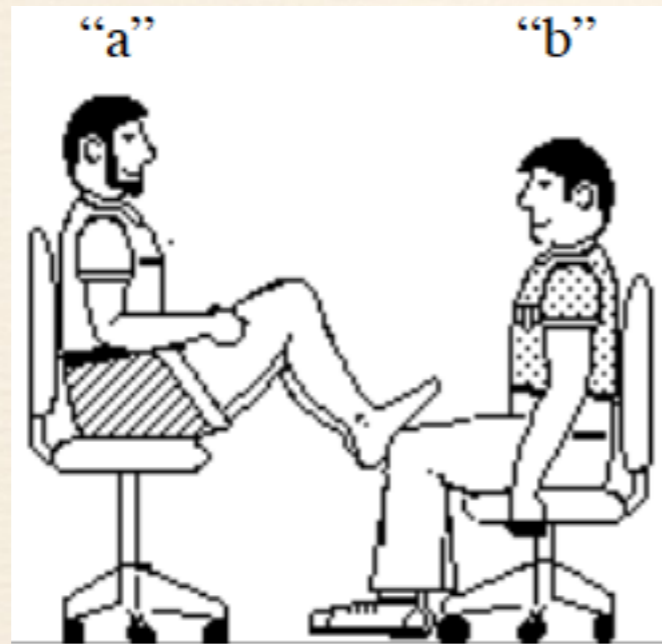
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- ❖ Force Concept Inventory
- ❖ 30 question multiple choice
- ❖ Conceptual introductory physics
- ❖ Wrong answers based on research on common misconceptions
- ❖ Used across the country (HS, 2-yr, 4-yr colleges & universities)
- ❖ Has gender gap in performance favoring males
- ❖ Background differences do not account for gap

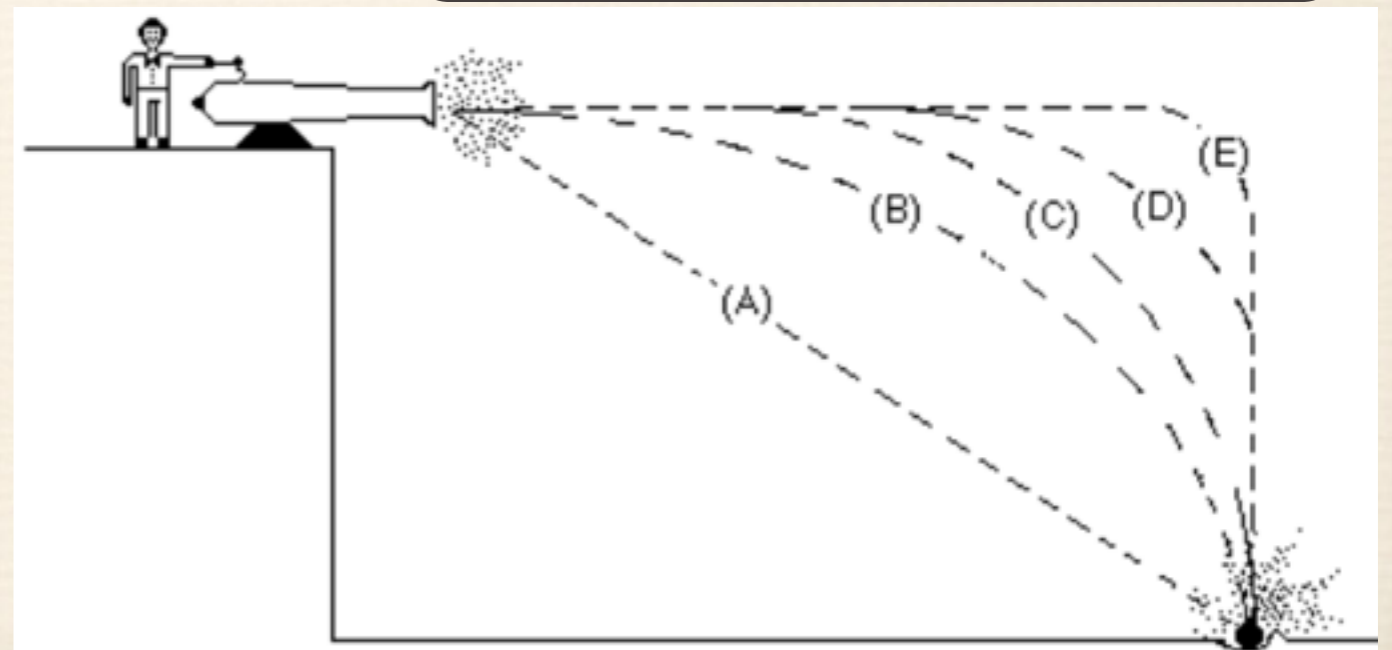
a large truck collides with...



a hockey puck sliding with constant speed...



a boy throws a steel ball..

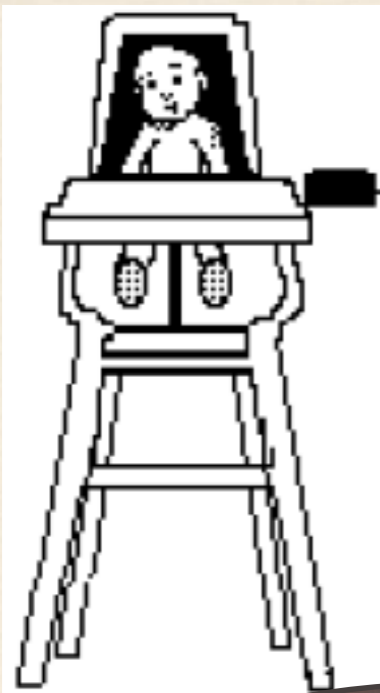


a boy swings on a rope...

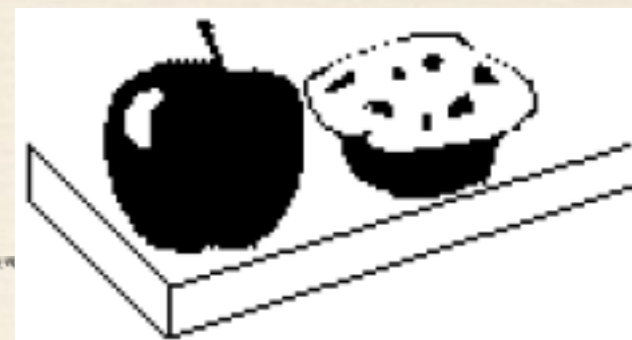
# Context and gender

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- ❖ Original FCI: stereotypically male contexts
- ❖ Do contexts play a role in gender gap?
- ❖ Revised FCI: stereotypically female contexts



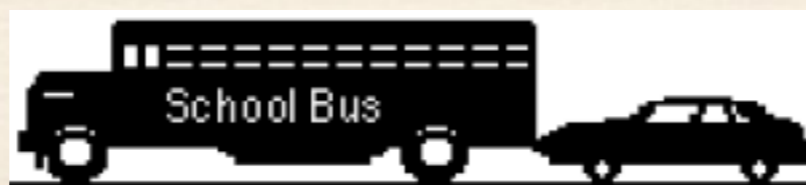
a very full shopping cart collides  
with...



a girl throws a teddy bear...



a pat of butter slides with  
constant speed...



# Original FCI vs. Revised FCI

Avg. % correct

	Original FCI	Revised FCI
Pre-instruction*	30.5 (N=283)	35.3 (N=225)
Post-instruction	46.1 (N=340)	43.9 (N=278)

# Original FCI vs. Revised FCI

Avg. % correct by gender

	Original FCI	Revised FCI
Women Pre-instruction*	23.5 (N=99)	29.4 (N=93)
Men Pre-instruction*	34.3 (N=184)	39.4 (N=132)
Women Post-instruction	35.6 (N=93)	38.0 (N=121)
Men Post-instruction	50.1 (N=247)	48.4 (N=157)

# Results

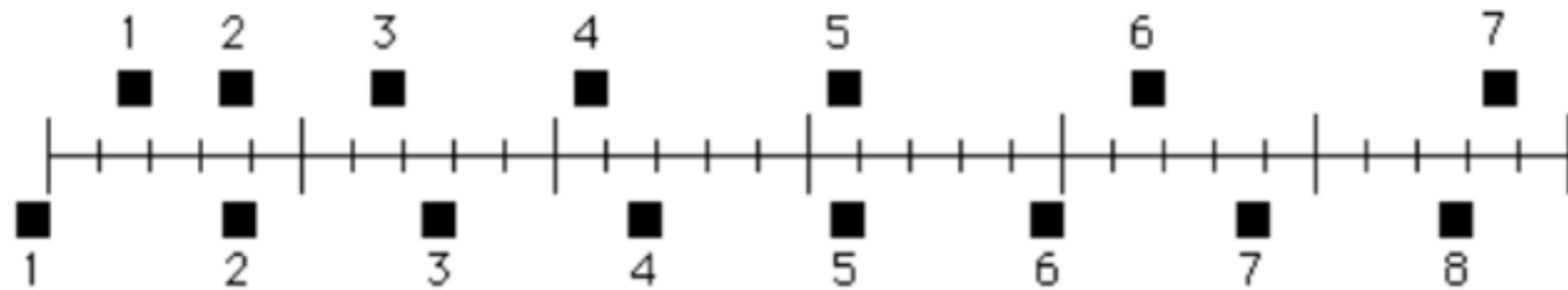
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- ❖ Overall no harm done with revision but no help either on post-test; pre-test shows improvement for both men and women
- ❖ Individual questions show large variety in patterns

# Question 19

Original  
version

19. The positions of two blocks at successive 0.20-second time intervals are represented by the numbered squares in the figure below. The blocks are moving toward the right.

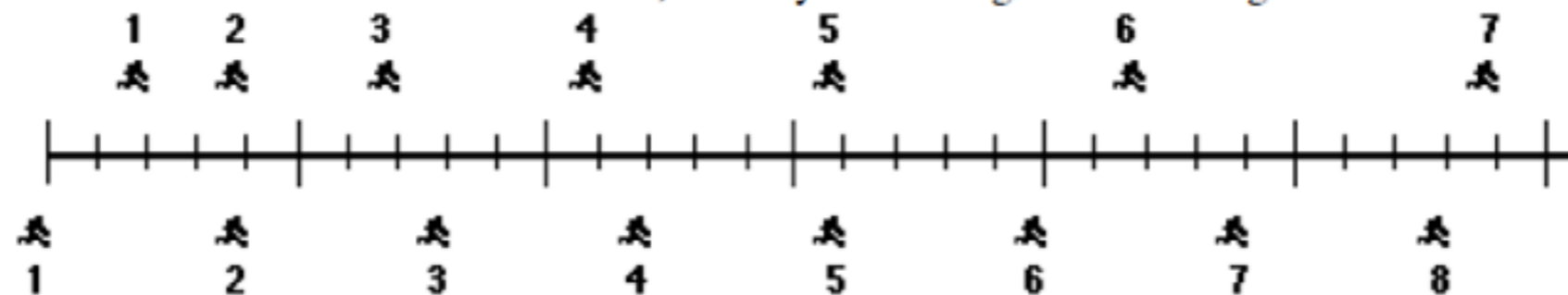


Do the blocks ever have the same speed?

- (A) No.
- (B) Yes, at instant 2.
- (C) Yes, at instant 5.
- (D) Yes, at instants 2 and 5.
- (E) Yes, at some time during the interval 3 to 4.

New  
version

19. The positions of two joggers, Ann and Pam, are shown below. The joggers are shown at successive 0.20-second time intervals, and they are moving towards the right.



Do the joggers ever have the same speed?

- (A) No.
- (B) Yes, at instant 2.
- (C) Yes, at instant 5.
- (D) Yes, at instants 2 and 5
- (E) Yes, at some time during the interval 3 to 4.

# Positive Changes

Avg. % correct on Q19

	Original FCI	Revised FCI
Women Pre-instruction*	32	48
Men Pre-instruction*	42	58
Women Post-instruction*	34	52
Men Post-instruction	50	61

# Question 4

## Original version

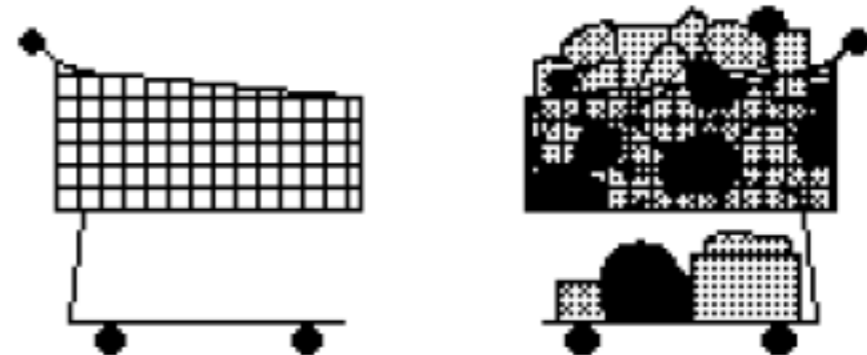
A large truck collides head-on with a small compact car. During the collision:

- (A) the truck exerts a greater amount of force on the car than the car exerts on the truck.
- (B) the car exerts a greater amount of force on the truck than the truck exerts on the car.
- (C) neither exerts a force on the other, the car gets smashed simply because it gets in the way of the truck.
- (D) the truck exerts a force on the car but the car does not exert a force on the truck.
- (E) the truck exerts the same amount of force on the car as the car exerts on the truck.

## New version

Imagine a head-on collision between a very full shopping cart and an empty cart. Both carts are moving very quickly. During the collision,

- (A) the full cart exerts a greater amount of force on the empty cart than the empty cart exerts on the full cart.
- (B) the empty cart exerts a greater amount of force on the full cart than the full cart exerts on the empty cart.
- (C) neither exerts a force on the other, the empty cart gets smashed simply because it gets in the way of the full cart.
- (D) the full cart exerts a force on the empty cart but the empty cart doesn't exert a force on the full cart.
- (E) the full cart exerts the same amount of force on the empty cart as the empty cart exerts on the full cart.



# Neutral Changes

Avg. % correct on Q4

	Original FCI	Revised FCI
Women Pre-instruction	16	12
Men Pre-instruction	15	18
Women Post-instruction	34	23
Men Post-instruction*	39	26

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- ❖ Others continuing this research even though I am focusing on something different now

# Research overall

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- ❖ So much fun! Explore whatever questions I want!

# Teaching overall

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- ❖ Exactly what I've wanted to do since I was 16!
- ❖ Students are awesome!

# Service overall

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- ❖ Part of the job that I love
- ❖ Different aspects: department head, committee work on campus, committee work for national organizations, community service

# I love my job!

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- ❖ Fulfilling
- ❖ Job that serves society--important to me
- ❖ Weird flexibility

# Being a woman in physics...

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- ❖ Affected my research questions
- ❖ Maybe affected my educational path
- ❖ Expanded awareness of issues with gender and physics
- ❖ Awareness of other minorities in physics too

# Top Five (Tongue-in-Cheek) Reasons It's Good To Be A Woman In Physics:

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5. Bad hair days are expected.
4. No one expects you to wear heels to set up lab equipment.
3. You can wear the same clothes every day and no one comments (lab coats rock!).
2. You have to know how to solve a Lagrangian, but you don't have to know how to cook and clean the bathroom.

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And the number one reason it's good to be a woman in physics:

1. There's never a line at the bathroom.

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❖ Thank you!