# Learning from animated video solutions: Does solving the problem matter?

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Physics Education Research
Physics in Engineering & LAS at Illinois

# Motivation and Background

- Goal: To help hard-working, but struggling students perform better on exams.

- Low performing students are often poor predictors of their exam preparation.
  - Often over-predict even after taking an exam (Kruger & Dunning, 1999; Rebello, 2012)

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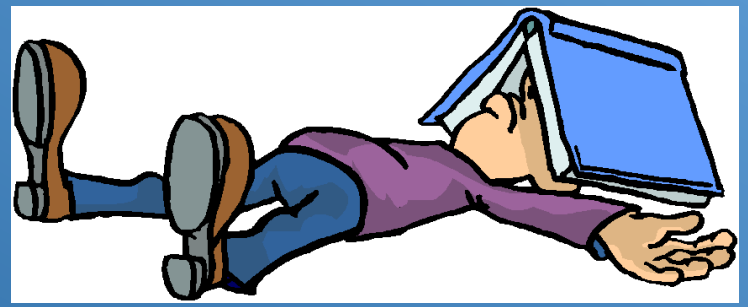
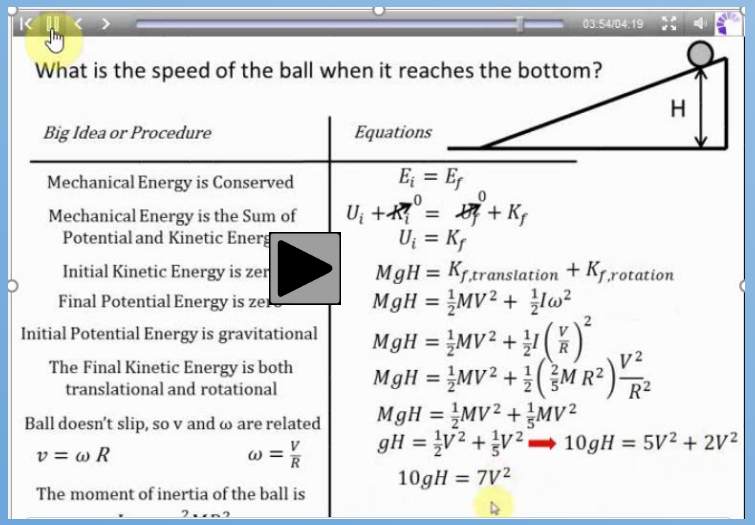
  (Kruger & Dunning, 1999; Rebello, 2012)

- This might result in insufficient and/or inefficient studying.






- Video solutions help low performing students improve their performance and become more metacognitively calibrated after solving similar problems.

  (Mestre, Morphew, & Gladding, 2015; 2016)

- Individuals often use fluency and familiarity with the material when making judgements of learning (JOLs).

  (Carpenter, et al., 2013; Feitcher, Benjamin, & Unsworth, 2016; Zaromb, Karpicke, & Roediger, 2010)

- The effect of viewing a solution video explaining a previously solved problem on metacognitive JOLs is unclear.

# Research Questions

**1) Does solving a problem before viewing a solution video affect how much students learn from the video solution?**

**2) Does solving a problem before viewing a solution video affect students' metacognition after viewing video solutions?**

# Participants and Study Design

- **Students who scored in the bottom third on the first and second midterm examination were invited to participate in the study.**

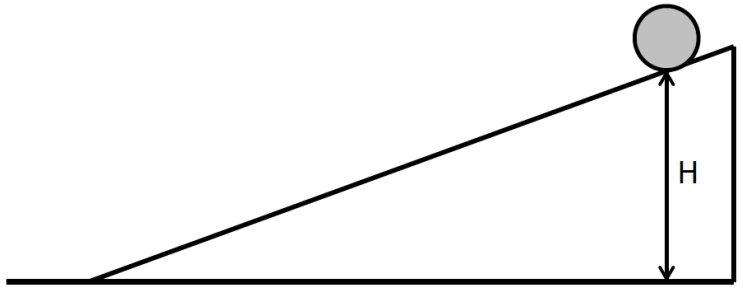
- **60 students completed both sessions.**
  - **Only students who completed both sessions are in included in the analyses.**

| SUNDAY | MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY | SATURDAY |
|---|---|---|---|---|---|---|
| | | | | | |  Session 1 |
|  Session 1 |  Session 2 |  Session 2 |  Exam 3 | | | |

# Intervention Design

# Pre Test (10 questions)

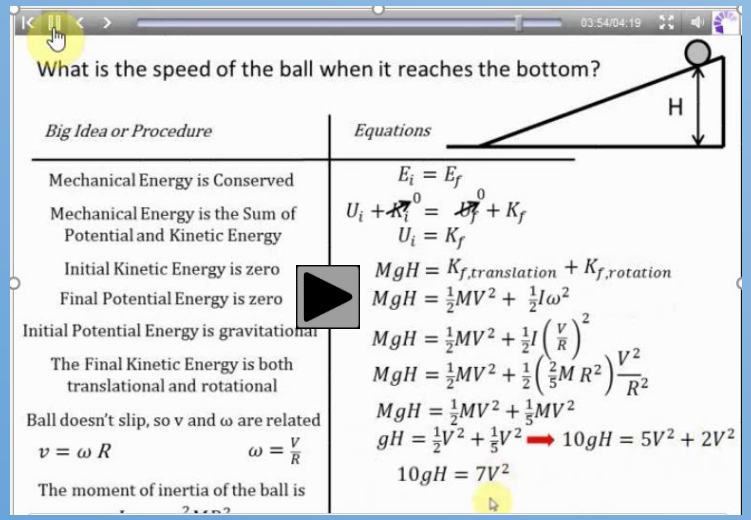
**5)** A solid ball of mass M = 0.38 kg and radius R = 0.22 m is released from rest at height H = 1.3 m on a rough inclined plane. What is the speed of the ball when it reaches the bottom?




Circle the number that represents how confident you are that your answer is correct

0% 25% 50% 75% 100%

# Video Solutions




If you were given 5 similar problems to solve, how many would you get correct?

# Post Test (18 questions)

**5) A solid ball of mass M=0.18 kg and radius R=0.06 m rolls without slipping along a horizontal floor with speed v= 1.4 m/s and then encounters a rough incline. At what height above the floor, H, does the ball come to rest on the incline?**


Circle the number that represents how confident you are that your answer is correct

0% 25% 50% 75% 100%

**6) If instead of a ball we had a disk with the same radius, mass, and speed moving toward the incline, how would the new height it reaches, $H_{new}$, compare to the height of the previous problem, H?**

a) $H_{new} = H$

b) $H_{new} > H$

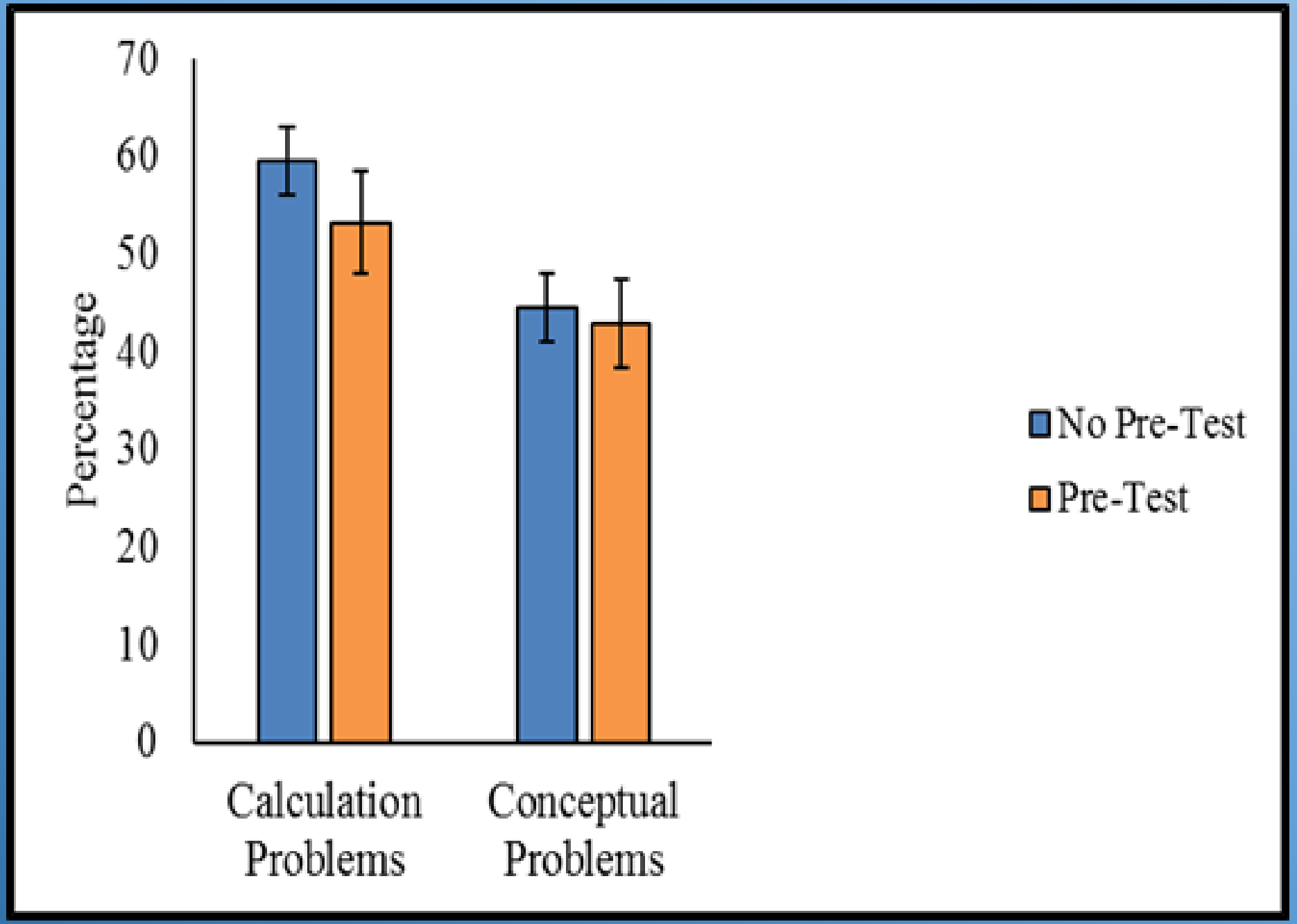
c) $H_{new} < H$

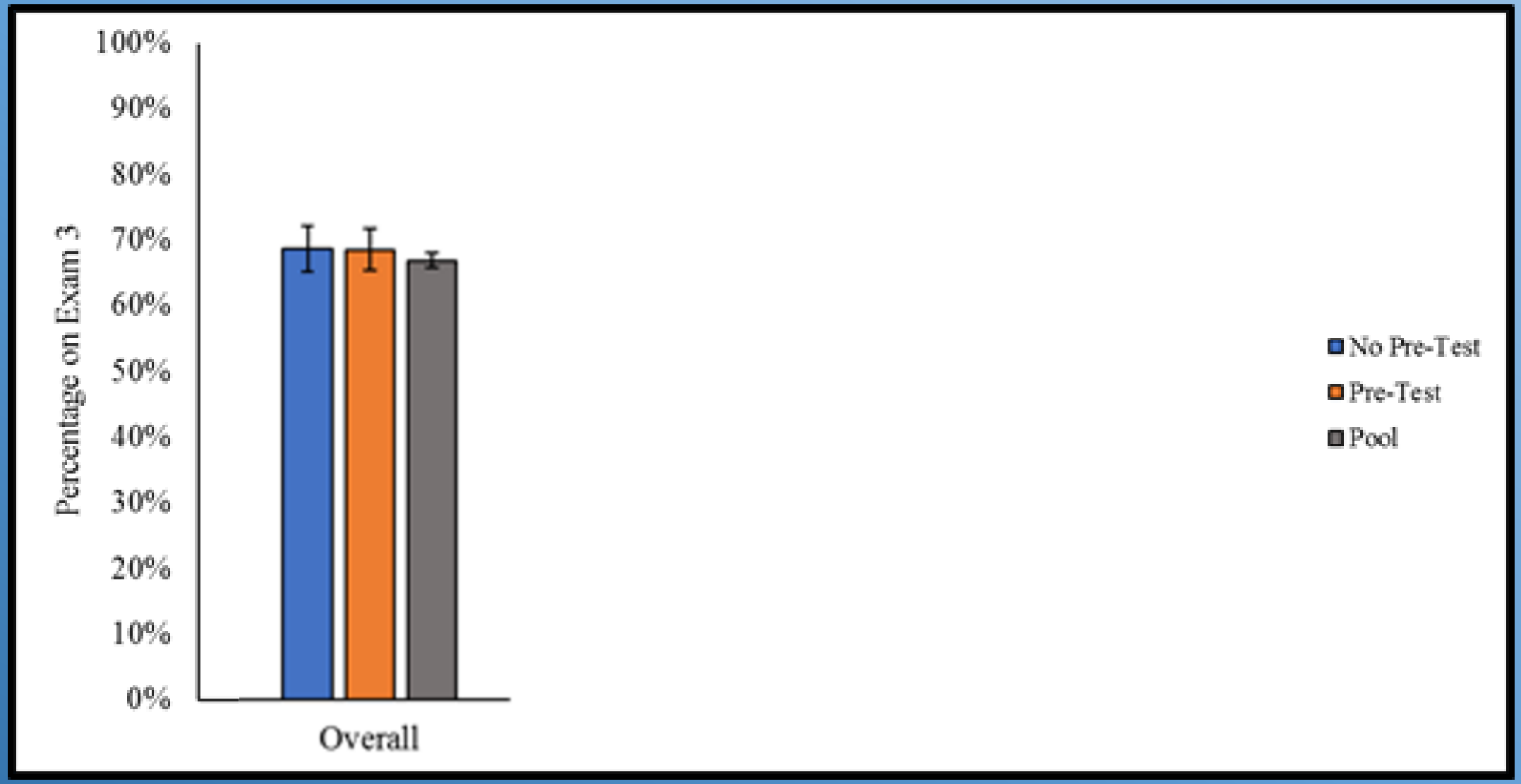
Explain your reasoning:

Circle the number that represents how confident you are that your answer is correct

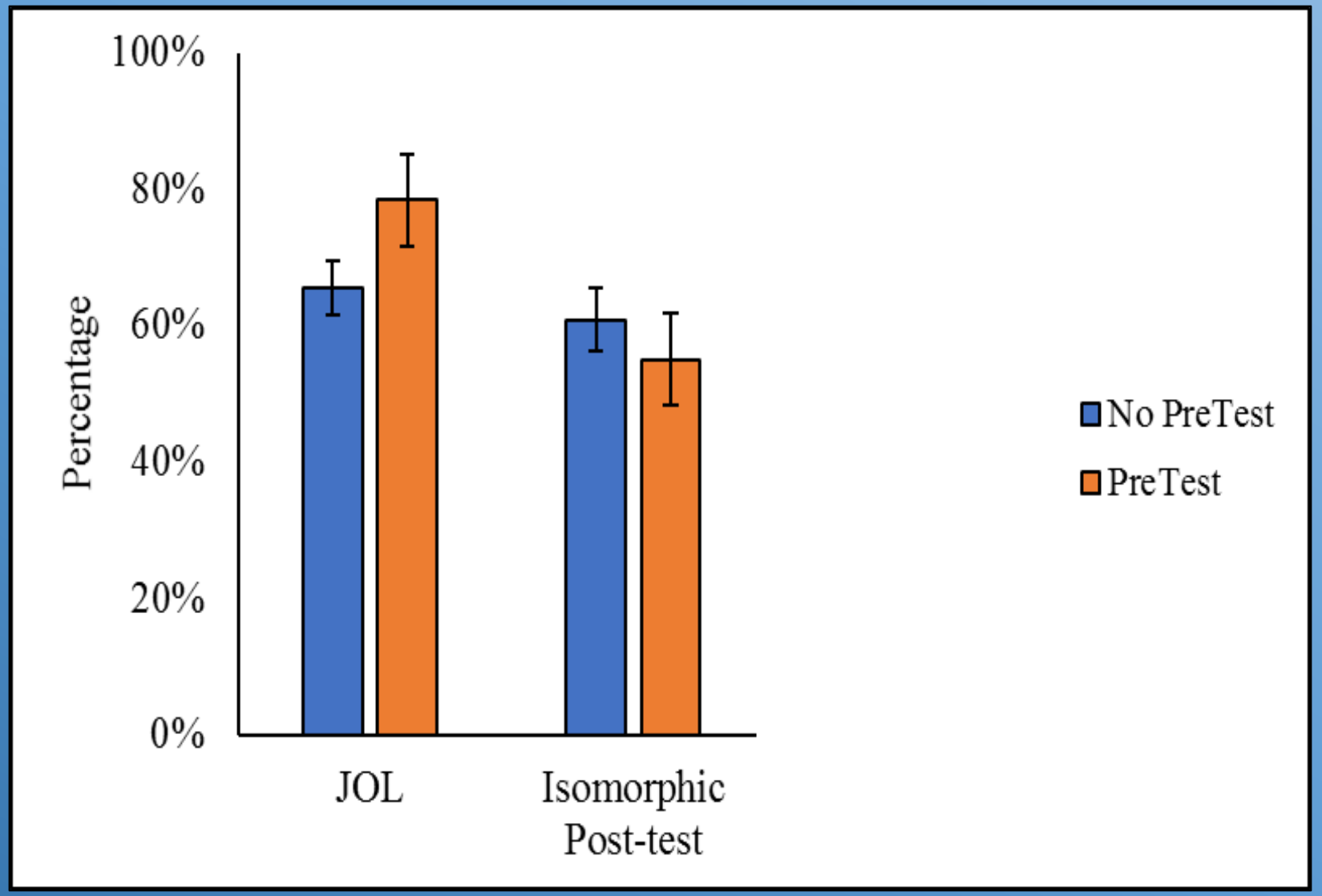
0% 25% 50% 75% 100%

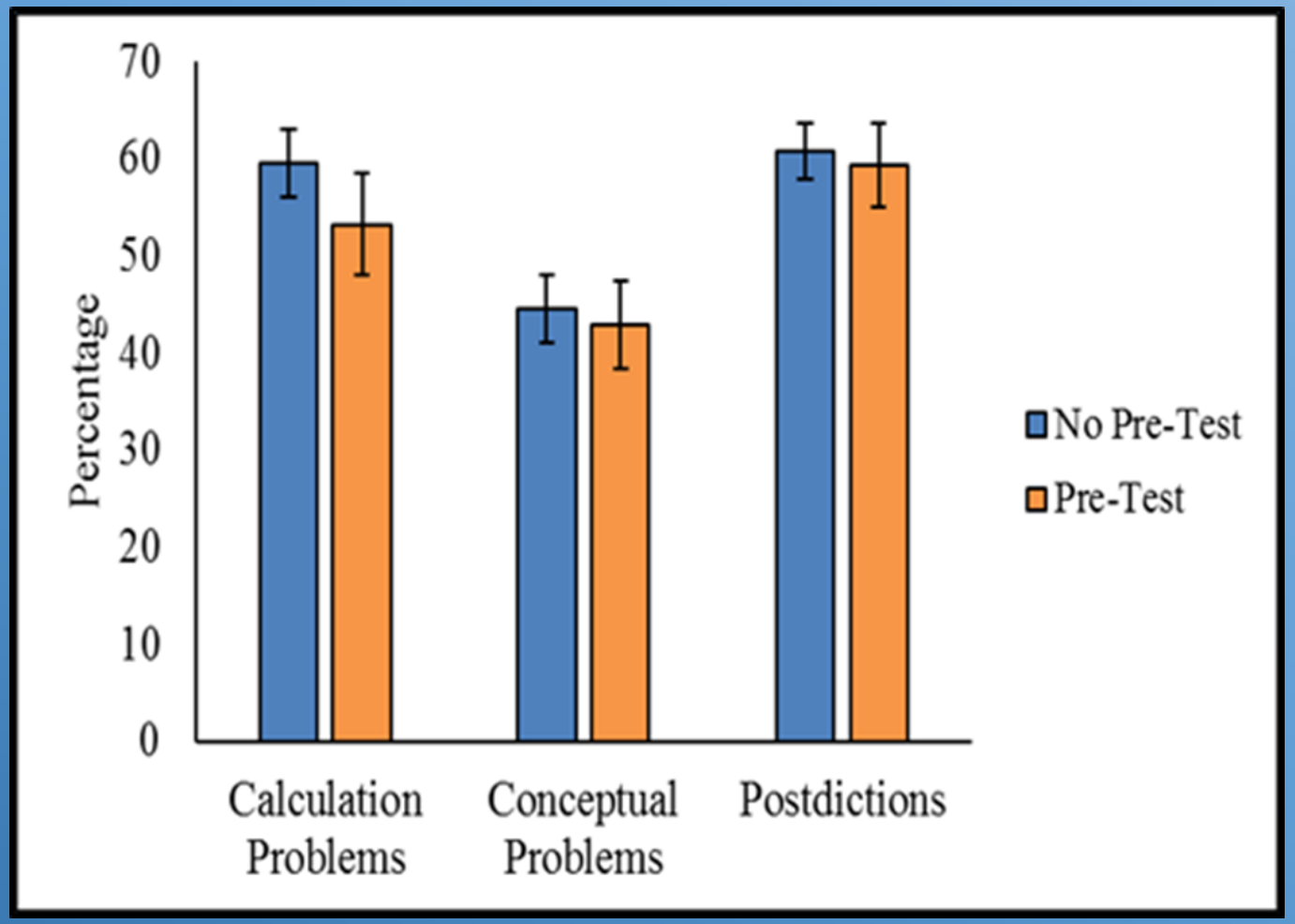
# Does completing the question before viewing the solution lead to greater learning?

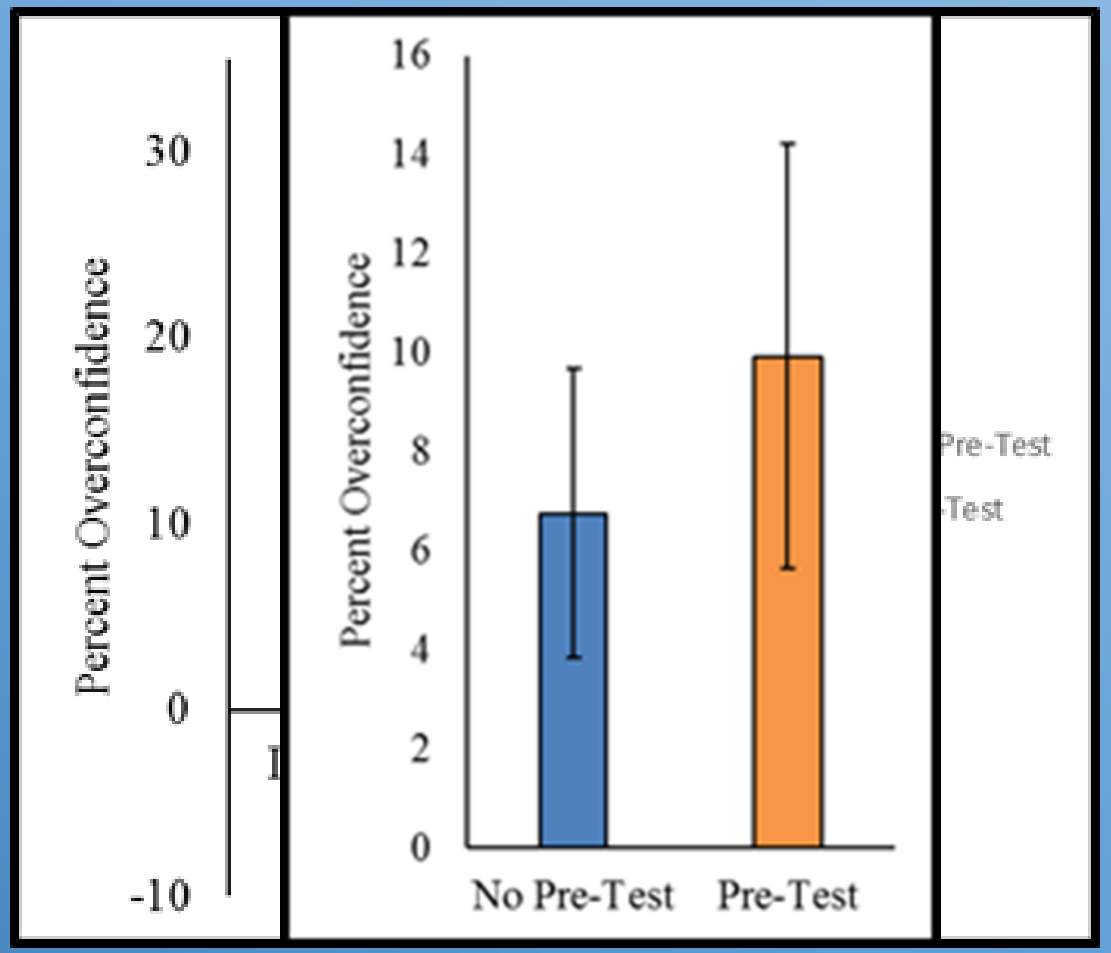

70
60
50
40
30
20
10
0
Percentage
Calculation Problems
Conceptual Problems
No Pre-Test
Pre-Test


100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percentage on Exam 3
Overall
No Pre-Test
Pre-Test
Pool

# Does completing the question before viewing the solution affect metacognitive accuracy?


100%
80%
60%
40%
20%
0%
Percentage
JOL
Isomorphic Post-test
No PreTest
PreTest


70
60
50
40
30
20
10
0
Percentage
Calculation Problems
Conceptual Problems
Postdictions
No Pre-Test
Pre-Test


30
20
10
0
-10
Percent Overconfidence
16
14
12
10
8
6
4
2
0
Percent Overconfidence
No Pre-Test
Pre-Test
Pre-Test
-Test

# Conclusions/Take-Away Messages

**1) Does completing a pre-test affect how much students learn from the video solution?**

**Answer: Not in this case. However there are many potential reasons.**

**Replicate with more simple/isomorphic problems.**

**2) Does completing a pre-test affect students' metacognition after viewing video solutions?**

**Answer: Yes and No. Increase in overconfidence.**

**Reduced when solve a new problem.**

**How does this affect study choices?**

# Questions?

For more information visit our PERC Poster

Or visit our website: go.illinois.edu/MorphewPER

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