



# Save Barbie



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Reading High School, Engineering Class

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## Unit Overview

**Topic:** Design and build a parachute that will slow Barbie's fall and allow her to land softly on the ground

### Standards:

- H.S. Forces and Interactions (HS-PS2-1)
- ONLS p330: Physical Science - Forces, Momentum and Motion

## Activity Implementation

**Main Idea:** Determine how surface area of parachute affects the air resistance and velocity of Barbie during her fall.

- Topic was introduced with fun video
- Team members were assigned tasks
- Team went to work designing and drop testing their parachutes



Figure 1: Activity Materials

## Student Work

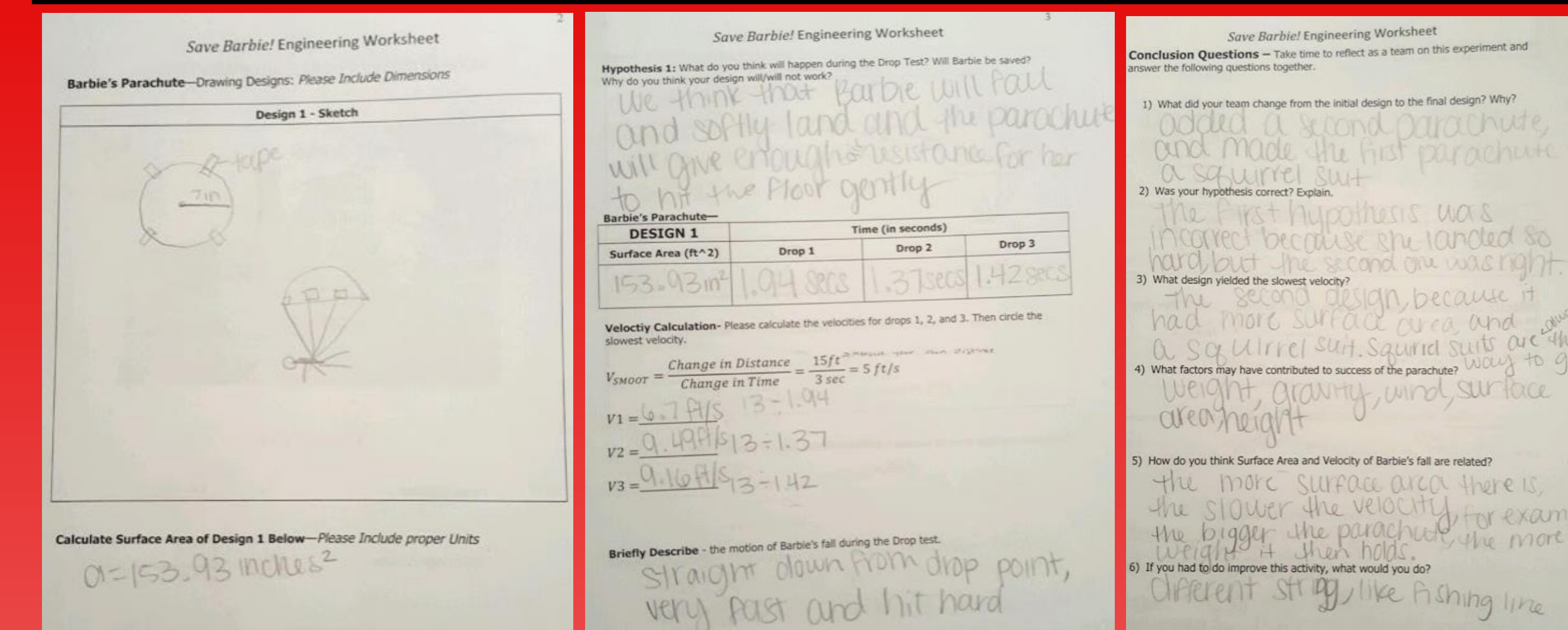


Figure 4: Student work from Save Barbie Engineering Activity Worksheet

## Activity Structure

**Title:** Save Barbie

### Guiding Questions:

- What factors are we dealing with? Which ones are constant & which change?
- Based on what we know and have learned, can we predict the performance of the initial design?
- What are the key features of the parachute design and why are they important?
- How does air resistance affect the parachute?
- What does this tell us about gravity, free fall, and air resistance?

### Objectives:

- Identify independent & dependent variables, and controls for the experiment
- Formulate a hypothesis
- Design, manufacture, & test 2 parachute designs
- Track Fall-Time with stopwatch and record data
- Summarize & share results
- Draw conclusions about the properties of air resistance

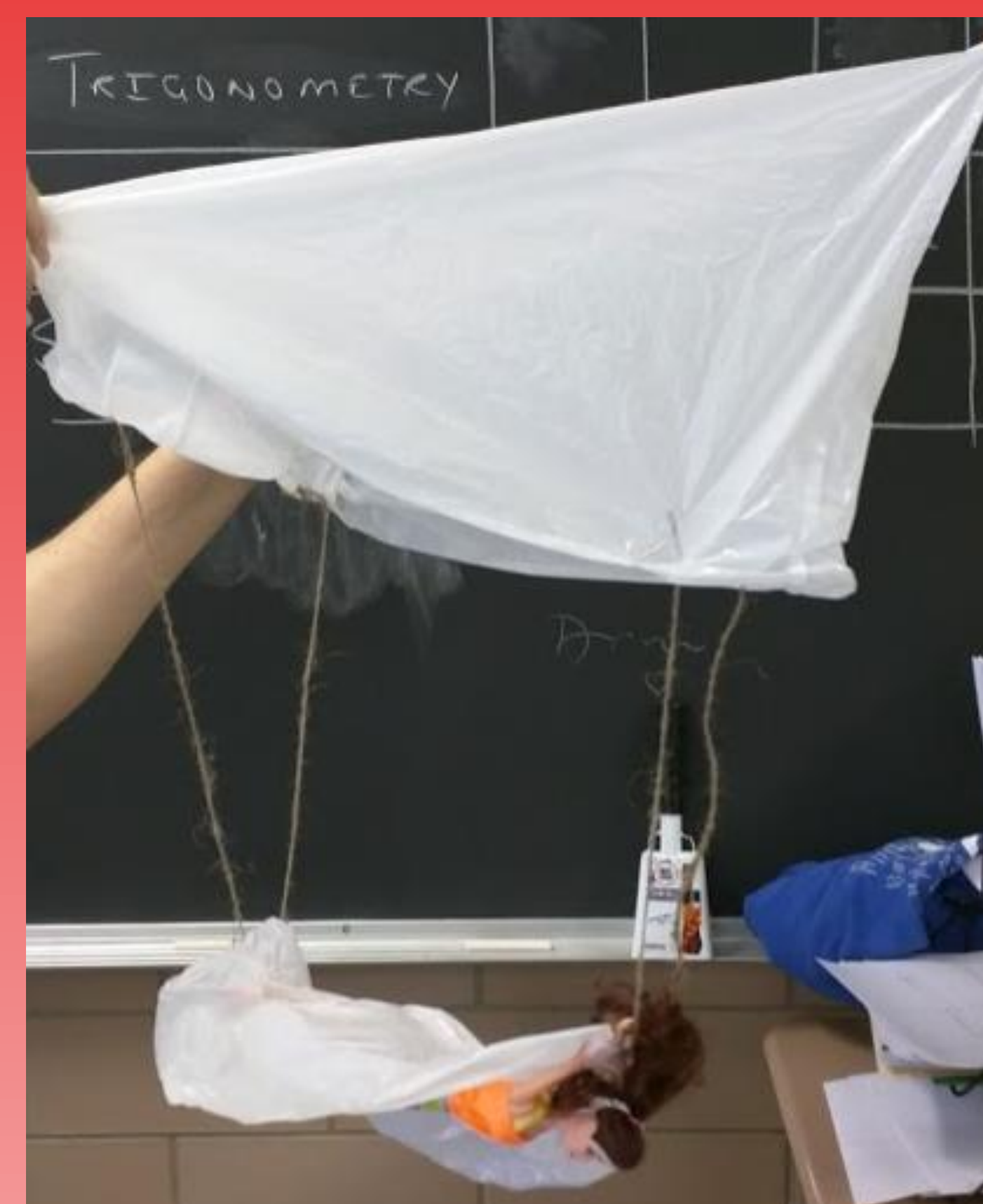


Figure 2: Student Parachute Design



Figure 3: Flying Squirrel Wing Design

## Engineering Design Process

Students worked to **identify** problem, **develop plan** & design, **test** design, **improve** & change design, **re-test**, record & **share results**

### ACS:

- **Applying** EDP to all problems to create solutions
- **Careers** in Military, Aircraft Safety, Engineering, Product Design, and Extreme Sports
- **Society** can benefit from the development of safer products and knowledge gained from the study of the human body during "free fall."

## Assessment Results: Impact on Student Learning

- Scores did not improve from Pre to Post Test
- Misconceptions about physics concepts revealed

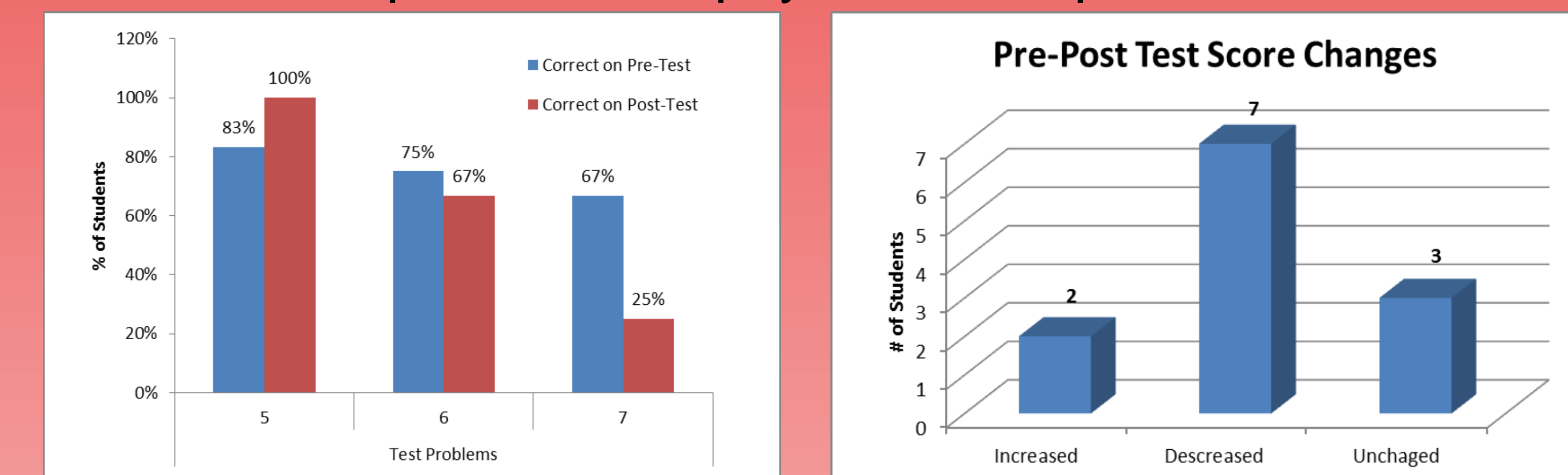


Figure 5: Pre and Post Test results indicate student scores did not improve

## Reflection and Conclusion

- Students challenged to think about gravity, free fall, air resistance, velocity, and surface area in a new way.
- Students concluded that when surface area increases the velocity decreases.
- Introduce Air Resistance and Gravity day before beginning activity in classroom
- More time for activity
- Improve & Clarify pre/post tests