G-TEAMS at Mountain View High School

Jennifer Hendryx, Mathias Reynolds

Who are we?

Jennifer Hendryx: Graduate student researching retinal oximetry in the College of Optical Sciences.

Matt Reynolds: Math teacher at Mountain View High school; teaches Alg. II, College Ready Math, and SpEd Alg. I.

Goals:

•To use Jennifer's practical experience as enrichment in Matt's classes

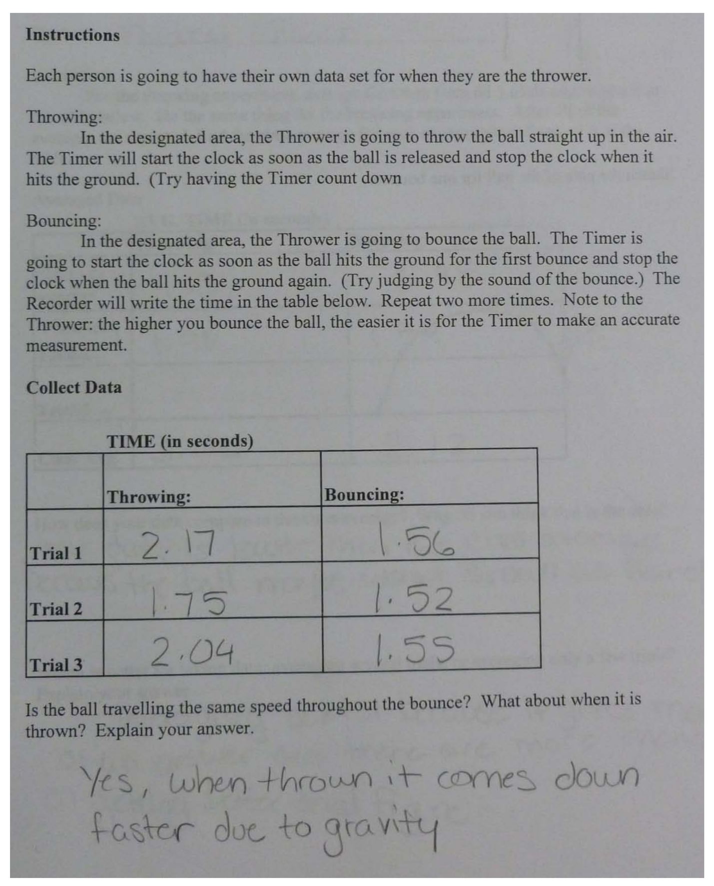
•To use Matt's teaching skills and techniques to improve Jennifer's technical communication skills

Quadratics: Fun with Gravity!

Students vertically bounced and threw tennis balls on their track, timing the ball's full trajectory. Using the gravity equation,

$$x = x_0 + v_0 \cdot t + \frac{1}{2} a \cdot t^2$$

students were able to calculate the maximum height they could bounce and throw a tennis ball, as well as it's initial velocity. They were then asked to make predictions about the trajectory using graphs of their equations.



Instructions

Each person is going to have their own data set for when they are the thrower.

Throwing:

In the designated area, the Thrower is going to throw the ball straight up in the air. The Timer will start the clock as soon as the ball is released and stop the clock when it hits the ground. (Try having the Timer count down

Bouncing:

In the designated area, the Thrower is going to bounce the ball. The Timer is going to start the clock as soon as the ball hits the ground for the first bounce and stop the clock when the ball hits the ground again. (Try judging by the sound of the bounce.) The Recorder will write the time in the table below. Repeat two more times. Note to the Thrower: the higher you bounce the ball, the easier it is for the Timer to make an accurate measurement.

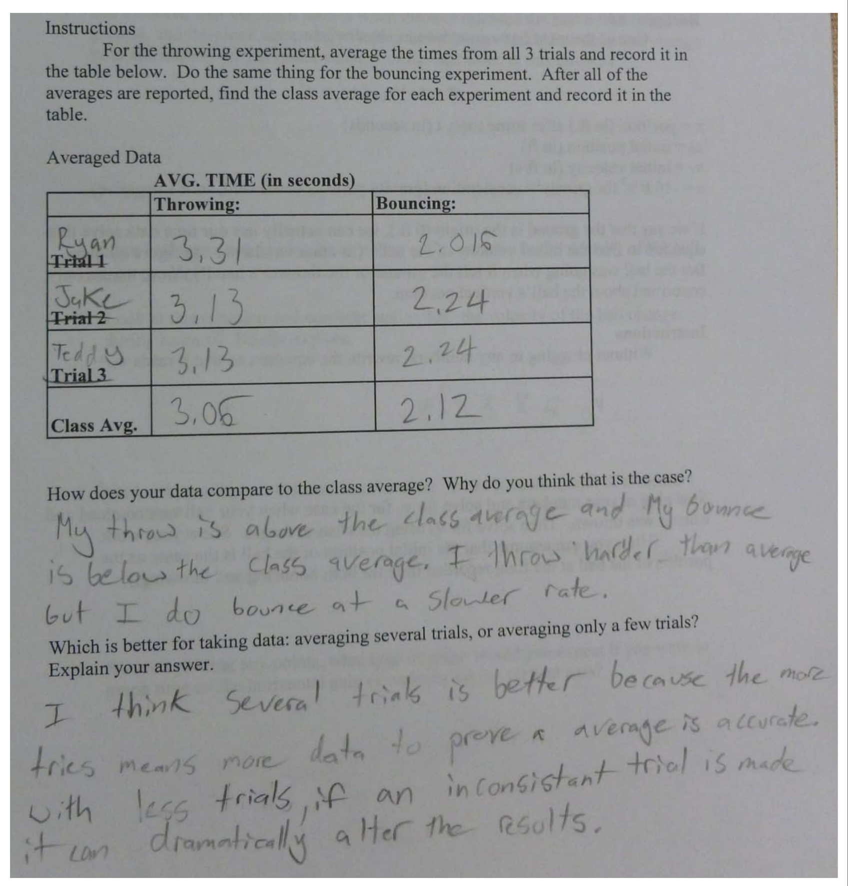
Collect Data

TIME (in seconds)

	Throwing:	**Bouncing:**
Trial 1	2.17	1.56
Trial 2	1.75	1.52
Trial 3	2.04	1.55

Is the ball travelling the same speed throughout the bounce? What about when it is thrown? Explain your answer.

Yes, when thrown it comes down faster due to gravity



Instructions

For the throwing experiment, average the times from all 3 trials and record it in the table below. Do the same thing for the bouncing experiment. After all of the averages are reported, find the class average for each experiment and record it in the table.

Averaged Data

AVG. TIME (in seconds)

	Throwing:	**Bouncing:**
Ryan ~~**Trial 1**~~	3.31	2.015
Jake ~~**Trial 2**~~	3.13	2.24
Teddy **Trial 3**	3.13	2.24
Class Avg.	3.06	2.12

How does your data compare to the class average? Why do you think that is the case?

My throw is above the class average and My bounce is below the class average. I throw harder than average but I do bounce at a slower rate.

Which is better for taking data: averaging several trials, or averaging only a few trials? Explain your answer.

I think several trials is better because the more tries means more data to prove a average is accurate. with less trials, if an inconsistant trial is made it can dramatically alter the results.

Asymptotes with Magnifying Glasses:

When considering the lens maker's equation,

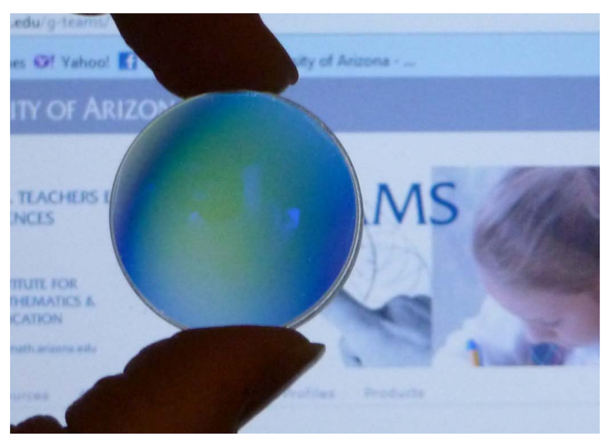
$$\frac{1}{image} + \frac{1}{object} = \frac{1}{f} \Rightarrow image = \frac{f \bullet object}{object - f}$$

(where image and object are distances from the lens and f is the focal length of the lens), there is an asymptote in the image location when the object is a focal length away from the lens. There is also a change in sign as the object crosses the focal length, which results in the image flipping up-side down.

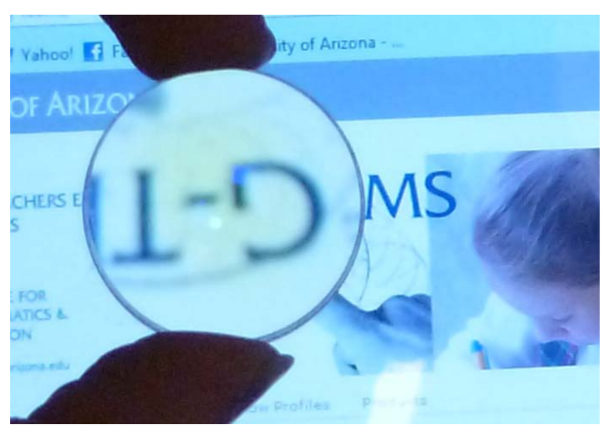
Using the equation and their understanding of end behavior, students were able to find the focal length of the lens and visually observe the asymptote in the image location.

*The optics of the eye make the object distance only approximately f when the asymptote is visible.

object distance < f



object distance = f (Asymptote)

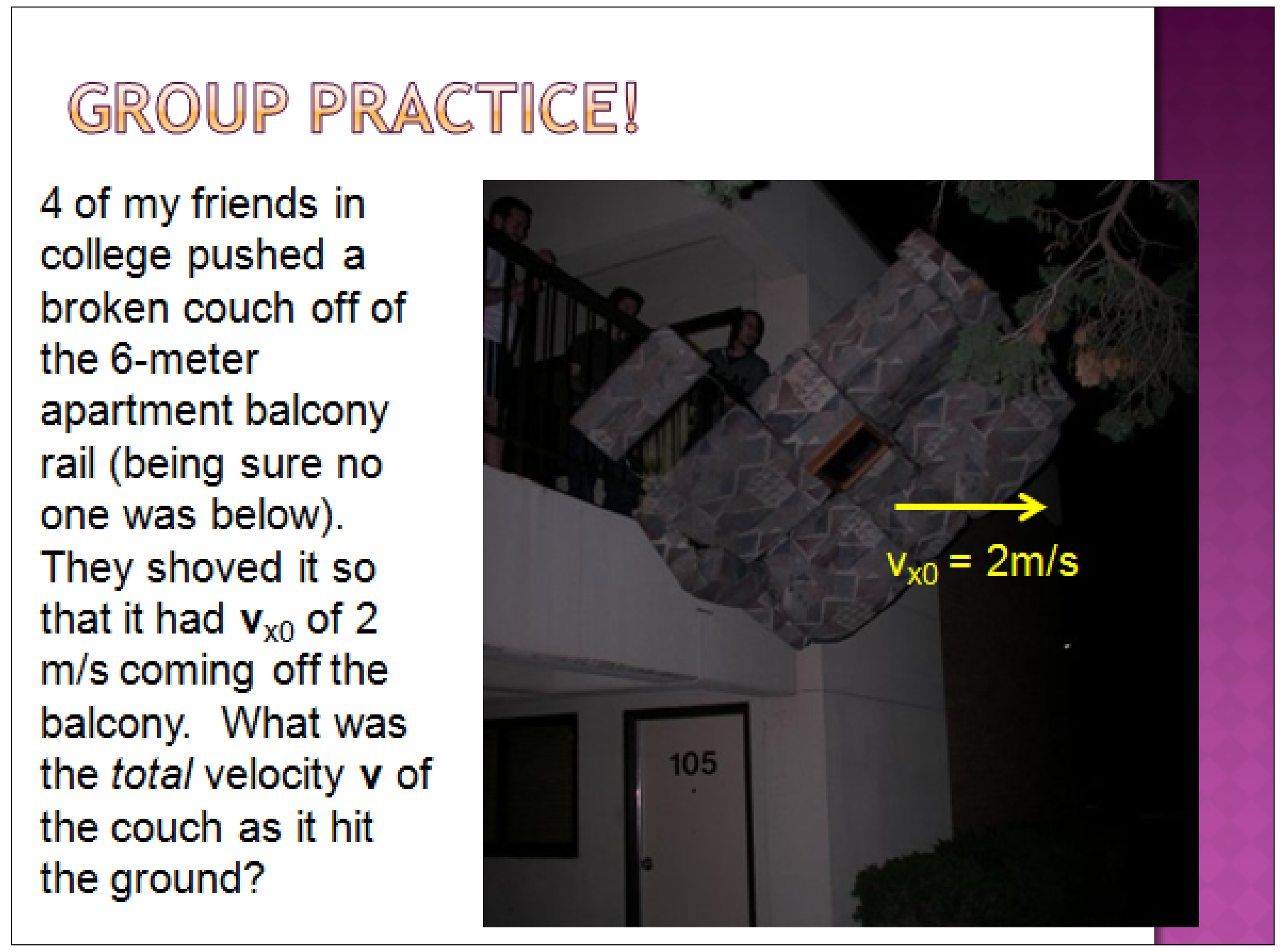


object distance > f

Physics with Academic Decathlon

With her background in physics, Jennifer has been able to participate in Mountain View's Ac Dec as the science coach. The competition covers a broad base of introductory physics, from motion and energy to electricity, magnetism, and optics.

Jennifer has designed and implemented all of the lessons, including demonstrations, animations, and group work. Recently the team placed 4th overall of 18 in the regional competition, placing 7th in science.



Future Projects

Jennifer and Matt are currently planning to use a laser shining into a sheet of Jell-O to demonstrate Snell's Law and total internal reflection as application of trigonometry. Jennifer will also extend this into Jell-O lenses for an optics activity for the Ac Dec students.