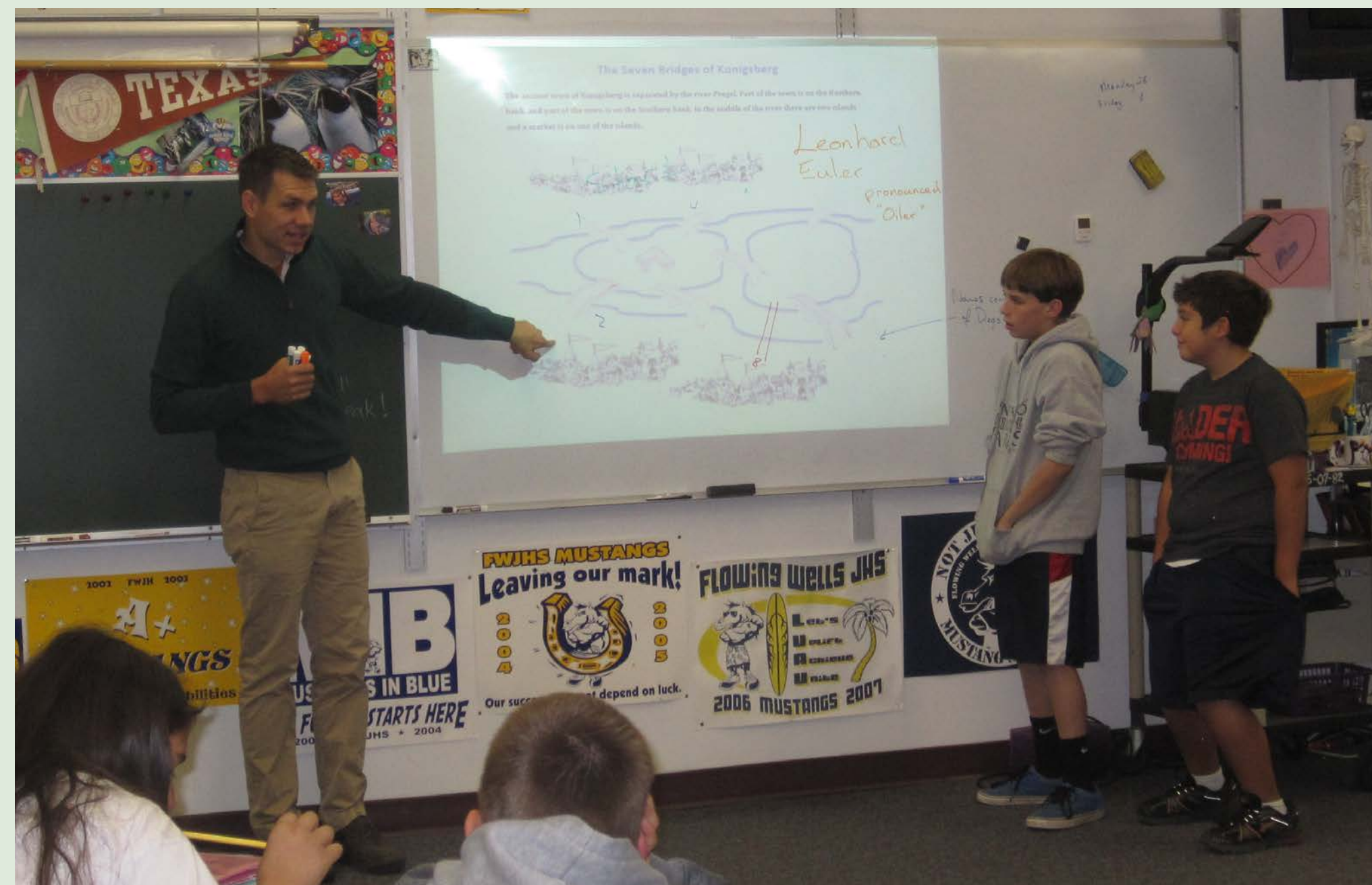


Who we are:

Hi, I'm Colin, a graduate student in the Program for Applied Math at the University of Arizona. I study fluid flow in porous media with specific applications to groundwater hydrology. When I'm not reading about math or thinking about math, I can usually be found hunched in a corner scribbling numbers on a napkin.

This year I have been working with Jennifer Thompson at Flowing Wells Junior High. Jen is a native Tucsonan and an avid Wildcat fan. Jen is also an excellent mathematician and a teacher with unlimited belief in her students.



"There will be no swimming in Königsberg!"

In-class Mathematics:

Stock Project Money often seems to be the best place to talk about number sense, so when a student asked Jen how the stock market worked, she jumped on the opportunity. In-depth word problems provide an excellent setting for operations of signed numbers, critical analysis of 'deceptive graphs', and a real-world use of scientific notation.

Students are also testing two trading strategies by investing a virtual \$2000 on the stock market. The first strategy is a buy-and-hold strategy where the winners are revealed in May. The second is a group investment club where students must learn to communicate and collaborate as they develop their financial portfolio.

(Let's hope the first two quarters of 2014 show as much growth as the last two quarters of 2013.)

In-class Mathematics:

If you ever see Colin hunched in a corner scribbling on a napkin, this is probably what he's scribbling about.

Non-Transitive Dice produce a game of "rock-paper-scissors" with the rules hardwired into simple probabilities on three die. The faces of relabeled so that blue is expected to beat yellow, which is expected to beat pink, which in turn, is expected to beat blue. Students learn to calculate simple probabilities using area models and use them to investigate the difference between experimental and theoretical probability.

A **stochastic SIR model** for disease transmission can be simulated by watching an infectious 'zero' propagate through the class. Each student begins with a secret number and at each turn randomly pairs up with another student multiplying the two secret numbers together and keeping the leading digit which becomes his/her new secret number. Students recognize the initial exponential growth and must then explain the logistic profile near saturation.

In subsequent games, students suggest additional parameters such as duration of illness, probability of recovery and possible immunity, to model different diseases like chickenpox or the Zombie Apocalypse.

The -Color Theorem forces students to distinguish between what they think and what they know. How many colors are required to paint the map of America?...and if you drew the map on a Mobius strip?

The 'Prisoner's Dilemma' presents the merits of abstraction when the game is taken out of context, played, and then applied to real-world situations. Students play the iterative version by showing blue or gold cards to each other at each turn. Strategies are developed, trust is built, shattered and then rebuilt, nash equilibrium is found (sometimes permanently), and personal goals must be set. Students then use the game to explain why your roommate never does the dishes, why some sports players can't resist PED's and even why classroom dynamics with a substitute teacher can be so antagonistic.

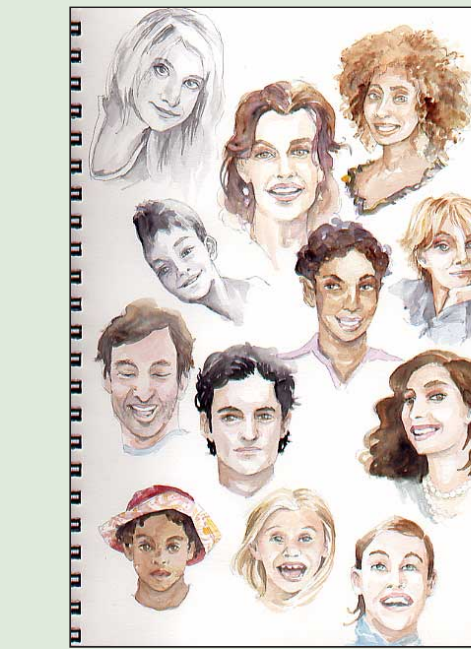
Two Examples

Count the letters in your name...



Is this a good predictor for the mean? What do we know about the MAD?

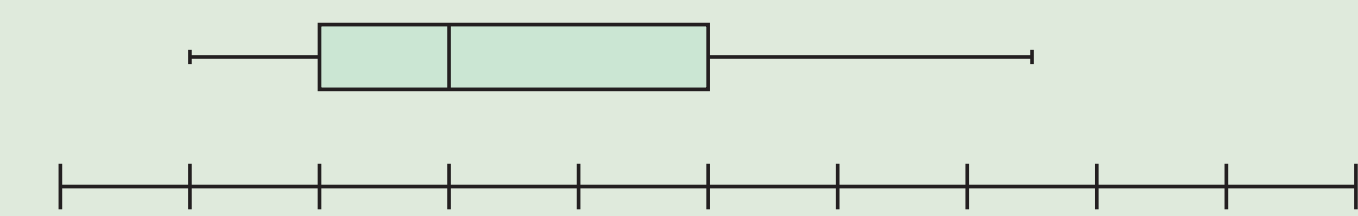
Find a bigger sample...



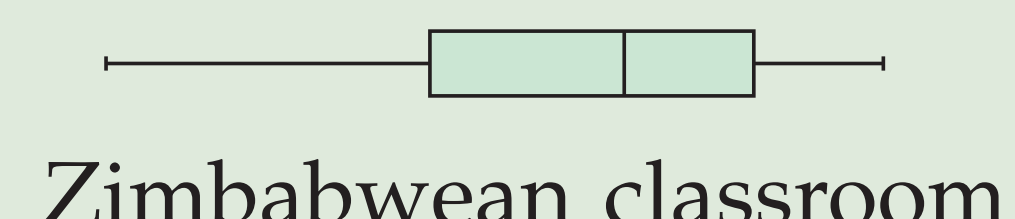
How confident are you that this is a better predictor?

Choose the right tool to visualize your data...

American classroom

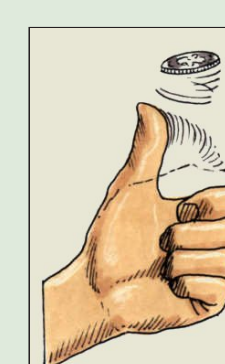
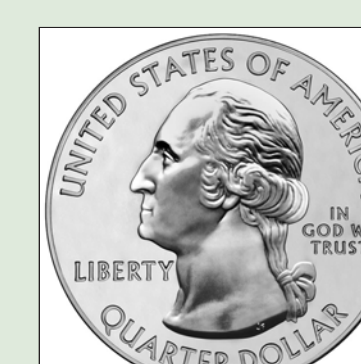


Zimbabwean classroom



...and compare it to a classlist from another country.

Best of Five!

-   Heads
-   Tails
-   Heads
-  But the coin is lost when the score is 2 - 1!
- 

What to do...?

Fifty - Fifty?

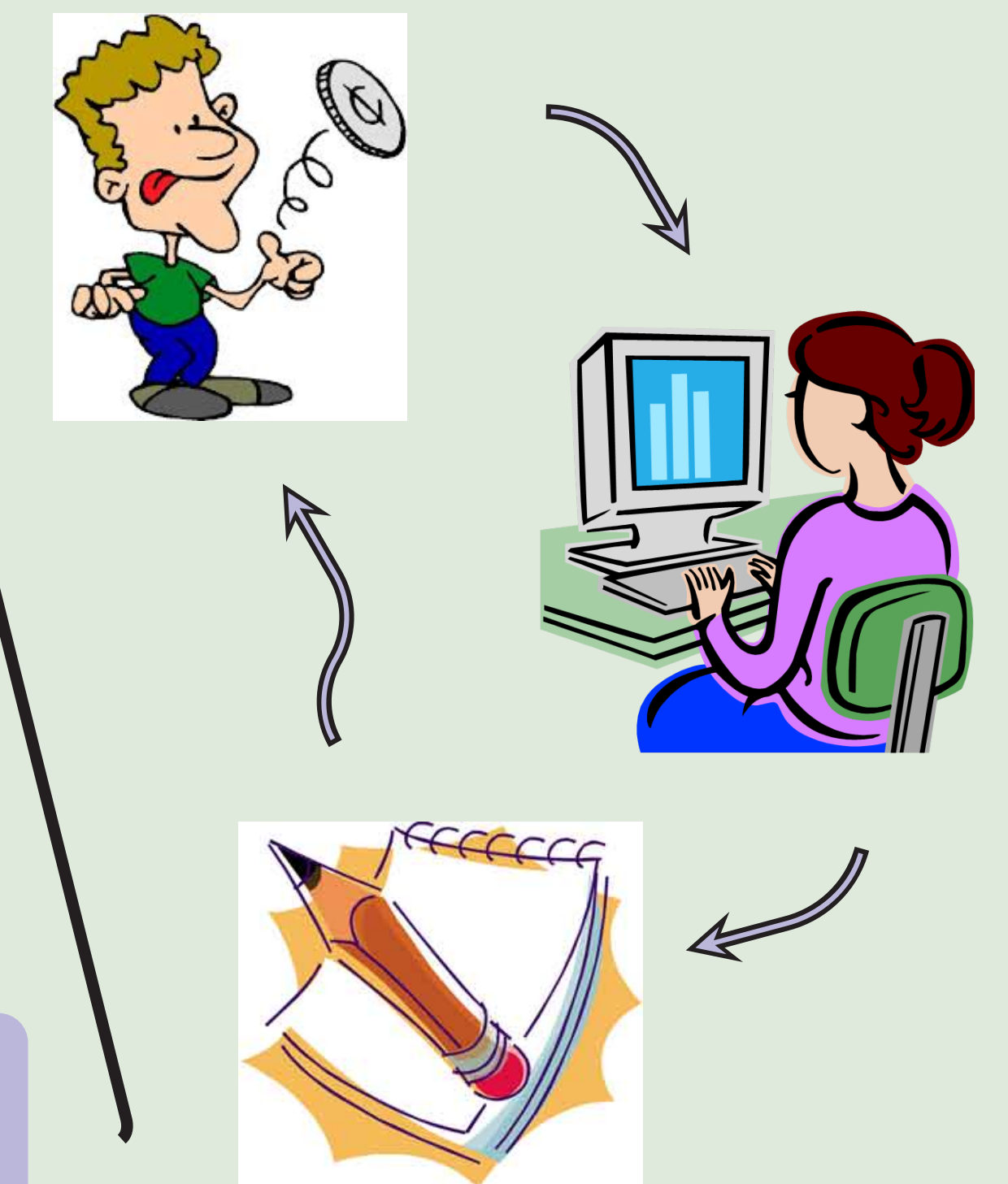
Will someone so close to winning settle for only half?

All - Nothing?

Will someone with still a chance of winning settle for nothing?

What does it mean to find a "mathematical solution"?

Pillars of Investigation:



What I've learned this year

Many of us love to do. This may be, in part, because we do 'doing' so well. We enthusiastically calculate and solve, and we love to explain what we already know. Thinking, on the other hand, can be foreign territory. Jen is teaching me to focus less on the doing, and to focus more on projecting an idea that needs to be digested, articulated, and questioned.

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