# G-TEAMS at City High School

Institute for Mathematics & Education

*Department of Mathematics, University of Arizona, Tucson, Arizona*

THE UNIVERSITY OF ARIZONA.

NSF

## David Love, PhD student in Applied Mathematics

I was born and raised in Tucson, AZ. I got my Bachelor's degree at the University of Arizona in Engineering Mathematics, and immediately came back to enroll in the Ph.D. Program in Applied Mathematics.

After graduating from Santa Rita High School, I had very little idea of what a mathematics degree could provide, or what mathematicians did. Soon after coming to the university, I discovered systems engineering, which mathematically studied complex decision making problems that came up in the operations of organizations.

My graduate research is in Stochastic Programming, which studies these same decision making problems, when some important information is unknown or random in nature. I have discovered that probability and statistics give us many valuable insights when our intuition fails utterly. I want to share some of these amazing facts with my students.

## Goals as a Team

Our team goal is to present mathematics as a human enterprise that we have engaged in since the dawn of civilization. As part of the Algebra II and Pre-Calculus curriculum during the fall semester, we included discussions of the origin and evolution of many topics. The spring semester Trigonometry classes will continue to look to history as a guide to teaching. Our spring semester statistics class will give students opportunities to study their own data sets, and help students use publicly available data to understand what is happening in society.

## Roz Wolfe, High School Mathematics Teacher

I was born in California but spent most of my childhood in the suburbs of Chicago, Illinois. I have a bachelor's degree in mathematics from Monmouth College, in Monmouth, Illinois. I hope to show my students the practical uses of mathematics and the beauty behind a lot of what is done in the field today.

## Student Responses

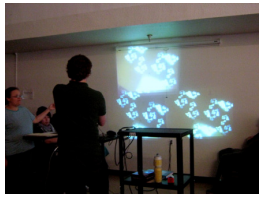
Student responses to David's work at City High School can be seen throughout the poster.

3. How has having a mathematician in the classroom changed your outlook on mathematics? That math is a whole different language it seems to me and this language makes life easier if you know it

4. Do you have a better idea of how mathematics can be used in a variety of ways in life?
I've been able to see what sort of professions would need the math I've found some day-to-day math, too.

3. How has having a mathematician in the classroom changed your outlook on mathematics?
It's shown me that there's always more than one way to solve a problem.

## Spontaneously Created Fractals



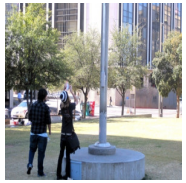


City High School has weekly Whole School Meetings, hosted by a different teacher each week. For our turn hosting, we used video feedback to create fractals on the school wall.

With the proper equipment, fractals can be easily created by feeding the output of a camera into three (or more) projectors, then pointing the camera at the image

During the presentations, volunteers were selected to make hand puppets in front of the projectors. These puppets created more fractals, some of which can be seen here.

## Place-Based Education



One tenet of City High School's mission is place based learning. We believe that the place in which math is done can expand subject understanding. For example, after a few weeks of trigonometry instruction we took our algebra 2 students outside to see why we learned trig in the first place. By using clinometers to measure the heights of buildings and objects students could associate the mathematics with the park near our school. Now when we do trig in class students begin to inquire as to how else the topic may be applied to the outside world.

5. How can you use the math you've learned in this classroom for life after high school?
The project on the whole school meeting room was good because I didn't think I could measure the room to figure out a number of seats for everyone and we did it and now I know how to do it which is really helpful in real life.

## Mathematics as Historical Enterprise

Since he began teaching, David has had an interest in the historical development of mathematics. Algebra has an extremely long intellectual history, dating back nearly to the dawn of civilization. Our literal notation, however, was largely finalized by Rene Descartes in the 16th Century. This year, we have tried to show students the historical methods for solving algebra problems, and comparing them to the methods taught today.

2. What moment in class has you been most excited about?
Also I like to see where problems originated (formulas broken down into it's original basics)

3. How has having a mathematician in the classroom changed your outlook on mathematics?
The picky way to do things but also the right way. Teachers might have done it wrong before. Also, they know more of the history

3. How has having a mathematician in the classroom changed your outlook on mathematics?
learning more about the history of math helps a greater perspective to what may at times seem tedious

## Statistics

Statistics is one of David's primary areas of research, so teaching this class during the spring semester is an exciting opportunity. David and Roz decided to teach the class through projects, giving the students the opportunity to collect and analyze their own data, and letting them take ownership of their learning. We believe that this has been met with considerable success.

1. What has been your favorite project in this class?
MY FAVOURITE PROJECT HAS BEEN THE STATISTICS ONE WE ARE CURRENTLY WORKING ON BECAUSE ALL OF OUR WORK IS VERY INDIVIDUAL, AND THAT REALLY MAKES ME FEEL LIKE I'M LEARNING.

I loved the project where we find statistics & uses graphs & functions (modeling techniques) I really understood them & I got to be creative.

4. Do you have a better idea of how mathematics can be used in a variety of ways in life?
I definitely understand statistics better. And I appreciate that there are people who are good at it and who enjoy studying it because it is certainly an important field

2. What moment in class has you been most excited about?
When we did all our data by hand, and when we did the same thing on the computer it was good to know the hand calculations closely matched the computers.