  

**Engaging Mathematics—Roosevelt University**

**Creating a Community of Practice that Engages Students in Mathematics through Meaningful Civic Applications**

As part of the NSF-funded Engaging Mathematics initiative, Roosevelt University reformed its College Algebra course. The new course, **College Algebra – Modeling the City**, addresses the issues of students’ attitude, behavior, and performance by creating a much more dynamic, relevant, and engaging course. Some aspects of the new course are a focus on issues and problems relating to the city of Chicago (Roosevelt’s home city), a flipped format, frequent feedback, and opportunities for student reflection and metacognition.

**Chicago:** New and reworked questions focused on Chicago. Some involved small changes such as using a local bicycle manufacturer in a cost, revenue, profit, and average cost problem and others dealt with more complex social issues such as an end of chapter Big Problems on Chicago’s homicide rate and the privatization of the Chicago Skyway. Each Big Problem also has an extra credit assignment in which students research and write about a Chicago based issue, such as the geographical, racial, and socio-economic disparities among the 700 deaths during the 1995 heat wave.

**Flipped format:** Students have a pre-class Learning Guide (online video, text, and PowerPoint) and Skills assignment covering basic skills and a post-class Problem Set covering more complex problems and applications of skills.

**Frequent Feedback**: Online homework with instant feedback and chance to redo problems, in-class group work, and daily in-class quizzes give students frequent and low stakes feedback on performance and progress.

**Reflection and Metacognition:** End of class check-in asks students to rate their understanding of the day’s concepts and skills, test corrections, and end of semester student generated study guides give students the opportunity to think about their learning process and improve as needed.

Students feedback from Student Assessment of Learning Gains (SALG) survey:

*“The big problems were very helpful in tying together ideas and thinking about math as a tool to solve real world problems instead of numbers on a page”*

*“I liked how we first encountered the new sections on our own and then we would go into class and expand on those concepts instead of the opposite.”*

*“I enjoyed the online learning and then doing the big problems in class. It helped me to take my own notes and participate more fully in my own education which helped to remember key ideas.”*

[**http://engagingmathematics.net**](http://engagingmathematics.net)

**Modeling Chicago’s Homicide Rate**

Examine how Chicago’s homicide rate has changed over time. What did you learn about homicide in Chicago by reading this graph? Does anything surprise you? How is this graph different from the graph of the number of homicides that we examined recently?

What type of model is this? What do the variables in the equation represent?

What is the rate of change (slope) of the model’s equation? What is the meaning of this rate of change?

Calculate the rate of change from 1870 to 2010 using the *given data*. Does this match the slope of the model?

According to the model, what would have been the homicide rate in 2010? Does it match the data? Does the model overestimate or underestimate the actual value? By how much?

According to the model, what will the homicide rate be in 2020? How accurate do you think this prediction will be?

Do you think a linear model is the best model for this data? Why or why not? For what range of years would a linear model be appropriate?

What type of equation would be appropriate for the years 1960 to 2010?

What type of model is this?

According to this model, what will the homicide rate be in 2010? Do you think this is a more accurate prediction than the one made with the linear model?

According to this model, when will the homicide rate be 5 homicides per 100,000 people?

Why do you get two answers? What do they mean in this context? Can you check the accuracy of one of these predictions?

Can the changes Chicago’s homicide rate be explained using only mathematics? What information would you need to help explain the changes in the rate?

**Extra Credit Assignment**—Research Chicago’s homicide rate. Report on explanations of the changes in the next class. Include evidence of your claims and site your sources. (Earn up to 2 points on Test 1 based on thoroughness, accuracy, and quality of writing)