**Lesson Title: “I Have a Dream.”**

**Unit Title: Functions to Model Relationships.**

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**Subject, Grade Level, and Date: Pre-Algebra, 8th Grade, and 4/5/2016.**

**Placement of Lesson in Sequence and Lesson Rationale:**

The lesson “I Have a Dream,” will coincide with the month of February during the middle school’s celebration of Black History Month. This is a Pre-Algebra class mid-way through the year. We have just recently finished a unit on linear functions and finding rate of change (slope). This modeling activity will use real world data and their knowledge history to compare two functions. The lesson should consist of two 50 minute class periods.

**Central Focus and Purpose:**

Through experiment in mathematics and culture we will explore data in a series of graphs and evaluate whether we as a society are any closer to equality in the time that has passed. Students create models of linear functions and learn to recognize nonlinear functions. They will find the slope of a linear function and evaluate what it means in terms of the economic, education, and social data in the interactive activity to determine whether we are any closer to equality.

**CCSS.MATH Content and Practice Standards:**

CCSS.Math: 8.F.B.4 – Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

CCSS.Math: 8.F.B.5 – Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

MP 4 – Model with mathematics.

**Prior Content Knowledge and Pre-Assessment:**

To date the students’ exposure to algebra has consisted of graphing, looking at equations for lines, and the y-intercept of a line by looking at a graph. All but two students are able to successfully find the y-intercept from a graphed line. Students also have some experience identifying different types of graphs.

**Learning Target(s) and Plan for Clarifying Intending Learning:**

Students will be able to calculate the rate of change and use the rate of change to interpret data in real-life graphs. Students will also be able to estimate a linear function over top of a graph that may not be perfectly linear.

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| **Strategy for using assessments to guide student learning:** | |
| * The teacher will observe groups and look for possible student misconceptions to assure students are understanding what a linear function is and how to find the slope and ensure there are no problems caused by students making assumptions. * Help students with defining their variables correctly and answering the questions asked of them. * The teacher will ask groups to present their ideas and interpretations of the data. Other groups will be asked to comment and make connections to the material. Students must demonstrate they constructed a linear equation, and solve for the slope of the line. * Formative assessment will be the teacher’s evaluation of the written responses that are submitted at the end of class as well as their observations during the assignment. Students must show critical thinking and math reasoning. They must show a linear equation and evaluation of the line for its slope. | |
| **Success Criteria:** (Criteria for interpreting student success of the learning target.) | **Plan for providing feedback and students’ monitoring of their own learning:** |
| There will be an answer key containing the correct answer to each rate of change depicted in the graphs worked out step by step. | Feedback will be given to students both formally and informally. Students will be given informal feedback if they ask questions about the question prompts, and will be provided more formal feedback when they get their papers back with a grade and comments on it. |

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| **Academic Language Demands:** | | |
| **Language Function:** | **Vocabulary & Symbols:** | **Secondary Language Demand:** |
| Students will be able to explain the relationship between the slope of a line and the steepness of the line and relationship between the slope of the line and the direction of the line on a graph.  Students will be able to discuss the relationship between the look of the graphs are they approximately linear, the slopes, and the y-intercepts in order to figure out the solution. | Linear equation, linear function, slope, rate of change, ratio, constant slope, and constant rate of change. | **Mathematical Precision:** Students must have one variable and at least one inequality sign in each equation.  **Syntax:** Students must have their slope written correctly and use correct math to graph and solve.  **Discourse:** The problem will be discussed as a whole class, students will identify rates of change in the information and write equations. |

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| **Language Support:** (Instructional and assessment strategies.) | | |
| **Language Instruction:** | **Guided Practice:** | **Independent Practice:** |
| Materials will be given out in different languages as applicable to the ELL students in the class. There will also be inclusions of different SES levels and a discussion of all civil rights issues (including those with Mexicans, Italians, etc.) that went along with the civil rights movement. | As students are working together, the ELL students will work with more strongly bilingual students in the classroom to decrease the language barrier. I will also be assisting them more closely to avoid any issues. | While working independently, the bilingual students will be assisting the ELL students. These students will have specialized worksheets with more of a wide net of cultures to investigate. |

**Differentiation, Cultural Responsiveness, and Accommodation for Individual Differences:**

Students who struggle with some of the concepts will be support their peers as they work in   
groups together. Additional assistance will be provided as needed or requested by students. The materials provided will help students to visualize mathematical concepts.

* ELL Students – Optional individual instruction given via classroom paraprofessional in Spanish. If neither option is available written instructions in dual languages as well as dual language student assistance when available.
* Autism/ADHD/Anxiety – High functioning student per IEP requests preferred group seating away from the louder students due to sensory overload. Individual instruction regarding “message” as it is an abstract concept. Extra time to complete tasks.

**Materials – Instructional and Technological Needs**:

For this assignment we will be using the classroom computer and projector to view short videos as well as read an article as a class. Worksheets for every student to complete (plus a few additional), calculators, pencil, and erasers. Students will be able to use the graphing calculator with the help of the teacher to find a line of best fit when appropriate to check their models.

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| **Instructional Plan** (detailed explanation for thing the lesson) | | |
| **Pacing** | **Teacher Activities** | **Student Activities** |
| 10 minutes. | Engage - Entire class discussion: This lesson plan uses the graphs as a modeling tool of real world data. They are provided to the students that highlight the relative inequality in health, education, and economics between African Americans and white Americans, a full 50 years after Dr. Martin Luther King, Jr's famous “I Have a Dream” speech. | Many students will know of Dr. King and his iconic speech, many will not know as much about the other historic events that encompass the civil rights struggle. This lesson provides an opportunity for students to learn more about the context, people, and issues behind the graphs themselves. Students will have a brief discussion of their current knowledge of the civil rights movement and what they believe they will see within the data provided given their current understanding of graphing, and linear equations. |
| 15 minutes. | Explore - Entire class viewing: Facilitate viewing of the video while handing out to students in small groups copies of the worksheet including graphs to interpret, calculators and pencils as needed.  “What story do the graphs tell about growth of social equality?” After viewing instruct students to complete the 1st question on the worksheet provided. | During this time students will be viewing a short video of [Martin Luther King Jr.](https://youtu.be/n82rgdbM9G4) and reading the [A Half-Century After the March on Washington, Would King Be Satisfied?](http://ww2.kqed.org/lowdown/2015/01/16/50-years-later-many-of-the-march-on-washingtons-goals-remain-elusive/) Article will remain on screen for students to use as reference as needed or students will receive printed version as requested.  Students will complete the 1st question on worksheet provided by giving a short story about social equality based on the information learned from the graph. |
| 25 minutes. | Explain - Entire class lecture: To transition into the mathematics portion of the lesson plan. The teacher will give a short lesson on slope and the rate of change. Discuss the formula to find rate of change: y2-y1/x2-x1. Model an example for students using two given points on a graph.  Instructions on how to fit a line to one graph as example. What makes a good fit? Assist in the comprehension and describe how to analyze if it is a good fit. For the same graph complete an example of finding the slope of the line. | Students will be taking notes to assist in their evaluation of the question prompts as well as interpreting the data graphs.  To assist in learning for all students, the lecture will be reinforced with the following videos: [Graph Shop](https://youtu.be/TTYKcHJyLN4) and [Finding the Slope](https://youtu.be/81SseQCpGws).  Remind them that these graphs are our models of real world data. What are the variables being compared? How are we comparing them? |

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| Day Two:  25  minutes. | Elaborate: Initiate small group working with the following leading questions. Make sure to observe/assess students within the small group classroom structure make notes on students’ progress and assist when/where needed:   * What are our variables? Describe the overall trend in the data. * Is the trend increasing or not increasing? * Is the structure linear or nonlinear? * Where do you believe this data comes from? | In small groups, have students construct answers to the worksheet:   * What story do the graphs tell about growth of social equality? * Calculate the rate of change for each function during each decade (or periods of extreme change). * Use the rate of change (slope) to explain how living, economic, or social conditions measurably changed from decade to decade.   Within the small groups students will also be analyzing their linear model again the models that their peers created to get a better understanding for how to create an accurate linear model.  To ensure all students understand materials the teacher is available for direct assistance one to one assistance to clarify misconceptions. Groups who finish early will be available for peer tutoring to ensure all students success. |
| 20 minutes.  5  minutes. | Evaluate: Entire class!  Have each group decide upon a speaker and explain their evaluations of the graphs and questions asked of them.  During the last 5 minutes of class have each person right down on their worksheet one math concept they really understood today and how they feel they can help create equality among the middle school. | Each group uses the correct reasoning and communication skills:   1. What is their supporting evidence from their analysis of the findings? 2. Variables are defined. 3. Does the graph represent something approximately linear or is it non-linear? 4. Logical argument as to why they believe their finding are correct. |