**Lesson Title:** Scatter Plots, Correlations, and Linear Regression

**Unit Title:** Linear Equations and Graphing

**Teacher Candidate:** Janina Flanagan

**Subject, Grade Level, and Date:** Algebra 1, 9th grade, October 23rd, 2015

**Placement of Lesson in Sequence**

This lesson on scatter plots and correlation is the final lesson in a Unit focusing on writing, graphing, and manipulating linear functions. Students have mastered graphing linear functions and manipulating linear functions. Students will use the knowledge that they have of the slope of a linear function to associate correlation to a set of data. Students will make connections between scatter plots, linear functions, and their application to real life scenarios.

**Central Focus and Essential Questions**

The central focus of this final lesson is to enable students to continue building their knowledge of linear functions and how they are relevant to real world events. Using the information learned in previous lessons about linear equations, students will discover correlations among a data set and how the slope is related to correlation. The lesson will begin by defining the objective for the day and then the terminology needed for the day’s lesson. Guided instruction will be conducted throughout the lesson as the students work through three different given data sets compiled from a real world situation. Students will be asked to plot the points of each data set on a graph, labeling the x and y axis in according to the data (a separate graph should be created for each set of data). After plotting the points onto the three graphs, students will be asked to make conjectures concerning the patterns they see in the relationships of the plotted points. The students will then dive into finding the regression line as well as the correlation coefficient using a graphing calculator. This last step will be demonstrated and facilitated by the teacher in front of the class as a whole and together with the students before the students are asked to complete the talks individually.

**Content Standards**

CCSS.Math.Content.HSS.ID.A.1
Represent data with plots on the real number line (dot plots, histograms, and box plots)

CCSS.Math.Content.HSS.ID.B.6
Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

CCSS.Math.Content.HSS.ID.B.6.c
Fit a linear function for a scatter plot that suggests a linear association.

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| **Learning Outcomes** | **Assessment** |
| Students will be able to:* Identify and interpret date from a chart or table.
* Plot points onto a graph using the given data.
* Recognize and identify negative and positive correlations.
* Use a graphing calculator to find a linear equation for data.
 | Formative Assessment: * Teacher will actively engage with students throughout the graphing of points, and will assess and guide student learning by asking questions about the process of analyzing data and graphs in relation to correlation.
* Students will be assessed on their ability to follow along on their calculators by providing the equation they find of the line of best fit for each graph of plotted points.

Summative Assessment:* Students will be assessed on the accurateness of the graphs they create (ie. Correct labels of x and y coordinates, points plotted correctly, etc.), and the equations for the line of best fit which will be written down and turned in for grading at the end of class.
* Students will express in writing what the patterns of each graph mean (ie. Correlation, positive, negative, etc.) and what information they used to come to their conclusions.
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| **Learning Targets** | **Student Voice** |
| * I can take data from a real world situation, express the data graphically, and make conclusions about the data based on the patterns seen in the graph.
* I can determine if the patterns found from the graphs serve as a correlation and if there is a correlation, I can determine if it is negative or positive.
* I can take a data set and input the values into a graphing calculator to find a linear equation that best fits the data.
 | * Students will have to express in writing their conjectures about the correlation of each data set, as well as how they came to their conclusions.
* Students will consistently be asked to explain their thought process verbally to the teacher and class concerning the current activity or problem.
* Misconceptions will be realized and corrected by the teacher through individual and class discussion.
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**Prior Content Knowledge and Pre-Assessment**

Students have prior knowledge of:

* Using graphing calculators.
* A basic knowledge of plotting individual points.
* Units and how to determine units on a graph

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| **Academic Language Demands** |
| **Vocabulary & Symbols** | **Language Functions** | **Precision, Syntax & Discourse** |
| * Scatter Plot
* Correlation Coefficient
* Positive Correlation
* Negative Correlation
* Regression Line
 | * Students will be able to identify a scatter plot and the data set that it represents.
* Students will be able to explain the rationale behind why they believe each graph is representing either a positive or negative correlation.
* Students will be able to use a graphing calculator to find a regression line for each created scatter plot and the data the graph represents.
 | **Mathematical Precision:** Students must show ample understanding of correlation and regression lines by identifying positive and negative correlation and explaining their understanding in writing. Also, students will show their mastery of the content by making conjectures of what the regression line might be, and then finding the exact linear equation of the regression line for each graph.**Syntax:** Students will be required to use correct labeling of x and y axis in relation to data sets. Students will also have to express their understanding of positive and negative correlation, regression lines, and the correlation coefficient.**Discourse:** Students will have to use correct mathematical language throughout the lesson, just as they have throughout the unit, when participating in class discussions and completing the worksheet. |

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| **Language Target** | **Language Support**  | **Assessment of Language Target** |
| Using the appropriate mathematical language, students will be able to express their observations and predictions concerning correlation as well as regression lines. Also, students will need to correctly label each graph with the correct mathematical units before plotting points from the data set. | Correctly use and explain each new terminology of the day’s lesson. Help students make connections between correlation and slope, and how they relate linear equations as well as the given data sets. | Students are required to write their understanding periodically in the worksheet. Students are expected and required to use correct terminology when discussing their predictions and conclusions in their answers on paper and verbally throughout the lesson. |

**Lesson Rationale (Connection to previous instruction and Objective Standards)**

In previous lessons in the unit “Linear Equations and Graphing” students have mastered identifying different parts of a linear equation, understanding how those parts transcribe graphically, and the roles that each variable (x,y) plays in determining the path of a line. Students have seen and understand how to create an equation from real life circumstances and produce a linear representation graphically of the equation. Students will now begin with a series of points found from a two variable data set from a real world situation and turn the data into points on a graph, use the visual representation that the graph provides to realize the correlation between both variables, and work to find a equation that best describes the relationship of the given data set.

**Differentiation, Cultural Responsiveness and/or Accommodation for Individual Differences**

In order to accommodate individual learning differences of students, each student will complete his or her own work, however students are encouraged to discuss struggles, conjectures, and conclusions among themselves and with the teacher. Students will have ample amount of time to ask questions and receive one-on-one help from the teacher during each stage of the lesson. Also, before moving on to the next stage of the lesson, the teacher will help students go through their answers and in this way discover and correct misconceptions throughout the class.

**Materials – Instructional and Technological Needs (attach worksheets used)**

* Graphing calculators for all students
* Straight edges for all students
* Doc Camera
* Worksheet (See Attachment)

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| **Teaching & Instructional Activities** |
| **Time** | **Teacher Activity** | **Student Activity** | **Purpose** |
| 10 min | Teacher discusses new terminology and explains the planned activities for the day. | Students should take notes of objective, new terminology, and take this time to express any knows confusion from previous lessons.  | Help students understand the objective of the day’s lesson and prepare them for upcoming content and expectations. |
| 20 min | * Teacher hands out worksheets and begins discussion on how to approach each data set in relation to the corresponding empty graph.
* Teacher begins discussion on correlation and what the students see in each graph in relation to the correlation of points.
 | Students should complete their own individual worksheets, but should utilize being able to discuss problems with the teacher and their classmates.  | * To ensure all students begin the worksheet with a strong knowledge of what they are expected to do with the given data.
* To start the discussion of the new terminology and facilitate the student’s exploration of slope and correlation.
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| 20 min | Teacher demonstrates for the students on the graphing calculator using the Doc Camera how to use the calculator to find the correlation coefficient as well as the linear function that best represents the data. | Students should follow along on their own graphing calculator all the steps the teacher goes through to find the correlation coefficient and the equation for the regression line. After the teacher walks through the first data set, the students should find the regression line and correlation coefficient of the remaining two data sets in the remaining class time. | Introduce students to a new (to their knowledge) use of the graphing calculator and demonstrate step by step how to find the desired equations and coefficients. |