KENAN FELLOWS PROGRAM
FOR TEACHER LEADERSHIP

Let's Move

This two day lesson provides an introduction into a unit about Scatter plots and Lines of Best Fit. It is designed for a Math 1 course, but could be modified for other Math or Technology courses as well.

By the end of the unit, the students will have gone through the Engineering Design Process. However, in these introductory lessons, they will not have completed the whole process.

Packet Contents

Lesson Plan Tags

Check the standards that are met in your lesson plan, check all that apply.

☒Middle School ☒High School ☐6th Grade Science ☐7th Grade Science
☐8th Grade Science ☐Middle School Math ☐Middle School CTE

☐Biology ☐Chemistry ☐Physics ☐Energy Harvesting ☐Anatomy
☐Other High School Science ☒High School Math
☐HS Family and Consumer Science ☐HS BFIT ☐HS Marketing & Entrepreneurship
☐Agriculture ☒HS Technology ☐Trade & Industrial ☐Health Science

Introduction

Analytics are everywhere! Businesses use analytics to provide important decisions about customers, location, and many other factors. In fact, grocery stores use their loyalty programs to track customer spending and keep a demographic profile. They even put more expensive items at eye level so that you will be more likely to purchase them!

In this introductory lesson of a unit, students will start to use the Engineering Design Process to decide where Twitter should relocate in North Carolina. In the unit, they will use statistics for three quantitative factors that they research on their own for three different cities in North Carolina. They will use Microsoft Excel to graph the data points, calculate a line of best fit, and a correlation coefficient. They will also have to explain what the slope, y-intercept, and correlation coefficient mean in context for each of the cities. They will also predict the factors out in 5 and 10 years. I usually give students choice in this matter for the factors, but some examples are: life expectancy, median household income, birth rate, death rate, crime rate, etc. From there, the unit wraps up with a sales pitch where each group of students comes together to state where Twitter should relocate and why. This sales pitch is supposed to be presented to the Human Resources Department at Twitter.

Curriculum Alignment

This lesson is designed for a Math 1 course, but could be altered for other courses.

High School Mathematics Common Core State Standards:

Functions:

- F-IF.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.
- F-IF.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.

Statistics and Probability:

- S-ID.5 Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.
- S-ID.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear and exponential models. b. Informally assess the fit of a function by plotting and analyzing residuals. c. Fit a linear function for a scatter plot that suggests a linear association.

Objectives

By the end of the lesson, students will:

- Determine qualitative and quantitative factors that Twitter or other companies could use to determine where employees would want to live.

Time & Location

9-11 - 60 minute class periods or 6-7- 90 minute blocks.

The first 60 minute period could be in the classroom. The second through eighth and 11th 60 minute period could be done in the classroom with laptop carts or any device that connects to the internet. You could also make arrangements to go to a computer lab. Access to a printer would be preferred. If you choose to have students present the 9th 60 minute period, you just need to be in a classroom setting. If you want them to put the videos on YouTube, I have used iPad carts to do this or if you have a strong enough WiFi signal at school, students could upload it using their personal devices.

Teacher Materials

- Let's Move Worksheet and Rubrics
- Whiteboard
- Dry Erase Marker
- Classroom set of technology that uses the internet and access to Microsoft Excel (I personally would NOT use Google Sheets)
- Projector (a way to project a computer or laptop)
- Computer/Laptop
- Microsoft Excel Directions
- Example of Scatter plots and tables for Charlotte, NC (can be used to show students what you are looking for). The 3 factors used were population, median household income adjusted for inflation, and murders per 100,000 people. Click on the different tables at the bottom to see the data tables and corresponding scatterplots with lines of best fit. *Download the file to see the scatter plots.
- Example of a filled out Line of Best Fit Student Sheet (You may give this to students as an example of what theirs should look like)
- Paragraph Example for Charlotte's population (You may give this to students as an example of what theirs should look like)
- Speakers- To project a YouTube video example of a debate presentation / a slideshow/ paper slide example
- A YouTube Account (A school-related google account is an automatic YouTube account. Just log into YouTube using that same account)-- this is only if you want students to upload their videos to YouTube. I would NOT use a personal YouTube or Google Account.
- Printer paper (in case students want to make paper slide videos)
- Markers
- Colored Pencils
- Reflection Sheet

Student Materials

- Let's Move Worksheet and Rubrics
- Writing utensil
- Pencil
- USB Flash Drive
- TI-83 or 84 Plus Graphing Calculators
- Microsoft Excel Directions
- TI-83 or 84 Plus Directions for Scatter Plots
- Line of Best Fit Student Sheet - each group needs 9 (one for each city and factor)
- Markers
- Colored Pencils
- Reflection Sheet

Safety

Safety in this case would be to remind students of appropriate internet use. The teacher needs to make sure they have completed the Common Sense internet training prior to this activity. Make sure you have appropriate consequences in place and they are communicated to students. Discussion with administration before doing these lessons is always recommended.

Student Prior Knowledge

Before this lesson, students should have an understanding of Linear Functions, how to find the slope of a line between 2 points, what the y-intercept is, and what the slope and y-intercept mean in a real-life context.

Students also should know the difference between categorical and quantitative data.

Teacher Preparations

Read through the Let's Move worksheet, have an idea of qualitative and quantitative factors a company might use to determine if they should relocate to a city-- some examples are: median household income, crime rate, population, population density, temperature (if they use the same month each year), birth rate, death rate, and life

expectancy. Also, make sure to reserve a computer lab or laptop carts for these two lessons. If you end up doing the unit, you will most likely need the computers or laptops for about 2 weeks in a row.

Activities

Day 1 of 60 minute period:

1. **Introduce the idea of the Engineering Design Process and compare it to the project (5-7 minutes)**
   The teacher will (TEACHER): Project a picture of the Engineering Design Process. Read through and discuss the various steps.
   Suggested Script: *"Projected is the Engineering Design Process. It is very similar to the Scientific Method. It is an iterative or cyclical process. It can never end. You start off by asking yourself what are the problems-- what are we trying to address? In this case of the upcoming project, we are looking at where should Twitter relocate its employees. We need to know our constraints-- we are limited by time, the amount and types of data we have, the fact in the project we are limited to North Carolina, and that we are only looking at a linear fit for the data. As a group you will then brainstorm or come with three different factors for three different cities in North Carolina-- life expectancy, population density, birth rates, death rates, life expectancy, median household income, etc. The factors have to be the same for each of the three cities. So, if you choose life expectancy, population density, and median household income for one city, it must be the same three for the other two cities so that you can compare them. In looking up the data and deciding your factors, you are making a plan. You will put the data into Microsoft Excel to make a scatter plot and line of best fit for each of the three factors for the three cities-- this will be a total of 9 scatter plots. After the data is collected, you will create the graphs, interpret them, and see if anything can be improved. You can go back and plan, brainstorm, and create over and over again if needed. You are ultimately deciding based on the graphs and information where Twitter should relocate and why. From there, you will create a presentation, that will be placed on YouTube of where Twitter should relocate and why."*

2. **Allow students to make their own groups of 3-4 (5 minutes)**

TEACHER: Allow the students to break up into groups of 3-4. Remind students that this is a major assignment and that they should choose to work with people that they like but that they also can get the work done with. (Giving them choice is an important part of the Engineering Design Process. I would only speak up if you know a group will not work together at all.)
STUDENTS: Find other students to work with in these groups.
***Note: DO NOT ALLOW ANY STUDENTS TO WORK ALONE! There is a lot of work to do on this project and any student I have had that started working alone got way too overwhelmed in the middle of the project.**

3. **Introduce the Let's Move Project to the students. (5-10 minutes)**
TEACHER: Pass out the Let's Move Project worksheets to the students.
The students will (STUDENTS): **Students will have already picked their groups of 3-4 ahead of time. I suggest doing this the day before.** They will read through the directions and rubric, and make notes as a group of where they have questions. After about 5-7 minutes, have the class come back together.
TEACHER: Take any questions students may have about the project, what it entails, the timeline, etc.
STUDENTS: Follow along, ask questions for clarification if needed.

4. **Brainstorming as a class (5-10 minutes)**
TEACHER: Facilitate a discussion with the class about what a company will look for when wanting to relocate.
Suggested Script: *"I have already mentioned some of these factors, but what are some things that your family or a company would look for when wanting to move or relocate?"*
STUDENTS: Participate by raising hands and providing suggestions.
TEACHER: Ask students whether each of the traits are qualitative or quantitative. Make sure to ask the question, if you are going to graph the data using a scatter plot, does it have to be qualitative or quantitative? (The answer is quantitative in order to get a linear regression or line of best fit for the data. Note: Also a great time to reinforce the difference between qualitative and quantitative. This is especially valuable if students struggle with the distinction.)
STUDENTS: Continue to participate in the discussion and take notes if needed.
TEACHER: Let students know that Twitter only wants to locate to a city in North Carolina. Create a list of major cities in North Carolina (Charlotte,

Raleigh, Durham, Greensboro, Asheville, Wilmington, Greensboro, Chapel Hill, Winston-Salem, Fayetteville, High Point, Boone).
(It might be beneficial to pull up and project a map of North Carolina or borrow a textbook from a colleague)
STUDENTS: Share their ideas of what major cities there are in North Carolina. Once you see that students generally understand what quantitative variables they could research to put on a scatter plot for this project, and they know the major cities in North Carolina, you can move on to the next step.

5. **Start the Research Process. (30 minutes)**
   TEACHER: Call the students back together and either take them to a computer lab or pass out laptops. Let students know that they need 10 data points for each of the 3 factors. The data for the 3 factors must be available for the cities they select.
   STUDENTS: Research quantitative factors for their three cities. Students will work together to decide what their factors are.
   **Sometimes this can take a while. Students might get frustrated because there might not be enough data out there.

6. **Clean-up/Log off (5 minutes)**
   TEACHER: Ask for student attention and ask for students to either log off computers or to turn in the laptops. The teacher will remind students that if they have not found information for their factors, that it is due by the end of the next class. It is suggested to talk as a group outside of to see what can be found. Some factors like population density might be available for one or two cities but not a third. There might have to be changes in cities or factors in order for students to get enough information.
   STUDENTS: Turn in laptops and/or log off computers. The students will talk with their group about who will look up what information for homework, if needed.

Day 2 of 60 minute period

1. **Remind students of task at hand (5-10 minutes)**
   TEACHER: Remind students that they need to have the same 3 factors for each of the 3 cities due at the end of the period today. They also need 10 data points for the cities. They can write this on paper in table groups.

STUDENTS: Ask questions for further clarification.

2. **Research Time (40 minutes)**
   TEACHER: Circulate to ensure that students are in their groups. Provide suggestions of statistics that can easily be found for cities (population, population density, crime rate (but each group needs to pick the same crime if it is a specific one), literacy rate, median household income, etc.) if necessary.
   STUDENTS: Continue to work and make sure they have 3 different tables for each of their 3 different cities due by the end of the class period.

3. **Clean-up, Log off, and Turn in Tables (5-10 minutes)**
   TEACHER: Get the students attention, have the students turn in their tables in a designated area. The teacher can decide to give the students the opportunity to finish it for homework or not.
   STUDENTS: Turn in their tables.
   TEACHER: Have the students log off their laptops/computer and clean-up any areas.
   Before next class, make sure to look over the data values to see if students have 10 data points per factor for each of the three cities. Leave feedback on the tables, if necessary. For example, are units listed, are there enough data points, did each group turn in 9 tables, were the factors the same for each of the three cities?

Day 3 of 60 minute period:

1. **Pass out Microsoft Excel directions (5-7 minutes)**
   TEACHER: Get the students attention, let the students know they will be taking their tables that will be passed back shortly with feedback. The instructions are for making scatter plots, lines of best fit, and regression analysis in Microsoft Excel. Students should try to do this on their own without your help. They can use YouTube as another resource to help them. You may want to project or show them the scatter plots for Charlotte, NC as an example of what they are to do. (You might have to download the file to see the scatter plots)

2. **Pass back tables of data sets to groups (5 minutes)**
   TEACHER: Get the students attention, pass back the tables to the groups. Tell them to look over them and let you know if they have questions. Circulate to

groups to see if they have questions. Any groups that are missing information, make sure they know that it is due as soon as possible and that they are behind.
STUDENTS: Ask questions for clarification, if needed.

3. Students take data sets/tables to make scatter plots with lines of best fit. (35-40 minutes)

TEACHER: Circulate the classroom to make sure students are on task and are trying their best to make the data sets. You can bring the scatter plot examples for Charlotte, NC to show.
STUDENTS: Use the Microsoft Excel instructions and Excel to create scatter plots and lines of best fit for each of the 3 factors for the 3 cities (a total of 9 graphs).
*They will most likely want to print them, so they can either send them to you to be printed later or be in a computer lab with a printer.

4. Clean-up, Log off, and Turn in Graphs (5-10 minutes)

TEACHER: Get the students attention, have the students turn in their graphs in a designated area, whether it is e-mailing it to you or printing to give to you. The teacher can decide to give the students the opportunity to finish it for homework or not.
STUDENTS: Turn in their graphs either electronically or via paper.
TEACHER: Have the students log off their laptops/computer and clean-up any areas.
Before next class, make sure to look over the scatterplots and lines of best fit. Leave feedback on the graphs, if necessary. For example, are axes labeled, is there a title, is there a line of best fit, an R-squared value, is a trendline drawn on the scatter plot.

Day 4 of 60 minute period:

1. Passback charts to groups (5 minutes)

TEACHER: Get the students attention, pass back the charts to the groups. Tell them to look over them and let you know if they have questions. Circulate to groups to see if they have questions. Any groups that are missing information, make sure they know that it is due as soon as possible and that they are behind.

STUDENTS: Ask questions for clarification, if needed.

2. Students may revise scatter plots with lines of best fit. (10 minutes)

TEACHER: Circulate the classroom to make sure students are on task and are trying their best to edit the data sets. You can bring the scatter plot examples for Charlotte, NC to show.

STUDENTS: Use the Microsoft Excel instructions and Excel to create scatter plots and lines of best fit for each of the 3 factors for the 3 cities (a total of 9 graphs).

*They will most likely want to print them, so they can either send them to you to be printed later or be in a computer lab with a printer.

3. Students will learn how to make scatter plots and find lines of best fit on a TI-83 or 84 calculator. (35 minutes)

TEACHER: Ask for the attention of the students. Pass out the Scatterplot and Line of Best fit directions for TI-83 or TI-84 calculator and Line of Best fit student sheet- there should be 9 sheets per group.

Suggested script: "*It is extremely important that you understand how to use your calculator to find a line of best fit. This is the tool that you will most likely have more access to in school and can be used on a written assessment. Today, you need to work together in your groups to learn how to use the calculator. Once, you have done that, you will need to write down the line of best fit for each of the cities, project for 5-10 years out. Fill out the sheets as you go for each city and factor. You may use the instructions I am passing out or YouTube to figure out how to do a scatter plot and line of best fit on your calculator. At the end of the period, each group will turn in all 9 sheets.*"

*Note: You may want to show them the example of the line of best fit student sheet so they know what it should look like when it is filled out.

STUDENTS: Use the worksheet provided plus YouTube to put the data values into the calculators to get a line of best fit, correlation coefficient (r-squared value), and then predict for 5 and 10 years out.

4. Clean-up, Log off, and Turn in Line of Best Fit Sheets (5-10 minutes)

TEACHER: Get the students attention, have the students turn in their Line of Best Fit student sheet in a designated area. The teacher can decide to give the students the opportunity to finish it for homework or not.

STUDENTS: Turn in their Line of Best fit sheets (9 total per group).
TEACHER: Have the students log off their laptops/computer, return calculators if necessary, and clean-up any areas.
Before next class, make sure to look over the line of best fit student sheets just to make sure students look to be on the right track. Leave any notes or comments if students are not on the right track.

Day 5 of 60 minute period:

1. **Pass back Line of Best Fit Sheets and any Scatter Plots (5 minutes)**

TEACHER: Get the students attention, pass back the charts and/or line of best fit sheets to the groups. Tell them to look over them and let you know if they have questions. Circulate to groups to see if they have questions. Any groups that are missing information, make sure they know that it is due as soon as possible and that they are behind.
STUDENTS: Ask questions for clarification, if needed.

2. **Explanation of Paragraphs (5-10 minutes)**
TEACHER: Introduce the idea of paragraph explanations.
Suggested Script: "*Today, you are going to use your Line of Best Fit sheets to type up paragraphs for each factor and city-- a total of 9 paragraphs per group. You will need to make sure you are writing with correct grammar, punctuation, and in complete sentences. You will state the factor and city, the line of best fit, what the slope and y-intercept are for the line of best, what they mean in context, what the correlation coefficient was for the line of best fit and does that make the correlation a strong or weak one. You will also state your 5 and 10 year predictions. Basically, you are taking your line of best fit sheets and putting it into sentences. Are there any questions before you begin?*"
*Note: You can show them the Paragraph Example for Charlotte's Population for clarification.
STUDENTS: Ask questions for clarification, if needed.

3. Students type up paragraphs (35 minutes)
TEACHER: Circulate the classroom to make sure students are on task and are trying their best to write decent paragraphs.
STUDENTS: Using either Google Docs or Microsoft Word, students type up their paragraphs.

*They will most likely want to print them, so they can either send them to you to be printed later or be in a computer lab with a printer. You may also specify if you want them turned in a different way.

4. Clean-up, Log off, and Turn in Line of Best Fit Sheets (5-10 minutes)
TEACHER: Get the students attention, have the students turn in their paragraphs in a designated area. The teacher can decide to give the students the opportunity to finish it for homework or not.
STUDENTS: Turn in their paragraphs (9 total per group).
TEACHER: Have the students log off their laptops/computer, return calculators if necessary, and clean-up any areas.
Before next class, make sure to look over the paragraphs. Feel free to make edits and look to see if students can interpret their findings.

Day 6 of 60 minute period:

1. **Pass back the paragraphs (5 minutes)**
   TEACHER: Get the students attention, pass back the paragraphs to the groups. Tell them to look over them and let you know if they have questions. Circulate to groups to see if they have questions. Any groups that are missing information, make sure they know that it is due as soon as possible and that they are behind.
   STUDENTS: Ask questions for clarification, if needed.

   2. Using the data, students need to decide where Twitter should relocate to and why (15 minutes)
   TEACHER: Get the students attention, have them pull out their scatter plots, paragraphs, and any other materials they might want to help them with an argument.
   Suggested script: *"Now, that you have collected your evidence, as a group, you guys need to decide where Twitter should relocate to. It should be based off of the data collected not because you like a particular city better. For example, I could say, 'Twitter should relocate to Raleigh because it had the lowest crime rate in comparison to Greensboro and Charlotte. It also had a population between those two so it is city that is not too large nor too small.' Pull out your*

scatter plots for each city and factor, compare them, and decide which city Twitter should relocate based on your evidence. You have 10 minutes. Make sure you can explain it to your class or myself."

As students are working, feel free to circulate to see if students are on task and are truly using their data for the argument.

STUDENTS: Pull out their scatter plots and lay them out to compare them. They will compare in their groups and come up with a decision as to why their group should relocate to that city and why.

3. Get the group back together to watch examples of their product (10 minutes)

TEACHER: Get the students attention.

Suggested script: "*Remember your final project will be a presentation (whether you choose to put it on YouTube or they present to the class). It can be in the form of a rap, debate, public service announcement, slide show. YOu may use any visual aids- signs, brochures, etc. A script is definitely needed and will be due at the end of day 8-- typed. You can also use qualitative or categorical data to help with your argument. For example, if you wanted to say Charlotte was the best city, you use the data you found plus you could add that they have the Carolina Panthers football team and the Hornets NBA team as well in your presentation. Here is an example of a debate for a couple of years ago. The students used key points on note cards to help them as they went.*"

Project YouTube video of the Luzzi Triplets Debating. Notice that the students presented their points back and forth, but came up with their final argument as to why a certain city was the best.

Project the YouTube paper slide video. In this video, it is very straight to the point and uses visuals to help their argument.

Suggested Script: "*Now that you have seen two different examples of two different types of presentations, it is your job the next two days to write a script AND practice that script to be recorded via YouTube or presented to the class.*"

STUDENTS: Students watch videos and ask questions at the end, if needed.

4. Students work on script (20 minutes)

TEACHER: Circulate the classroom. See how students are doing with writing their script. Try to answer any particular questions they may have.
STUDENTS: Work on typing their script and practice their script, if they finish.
**Starting tomorrow, I would have coloring supplies and printer paper available in case a group wants to make visuals or a paper slide video.

5. Clean-up and Log off (5-10 minutes)
TEACHER: Have the students log off their laptops/computer, return calculators if necessary, and clean-up any areas.
STUDENTS: Students will log off, return laptops and calculators if needed.

Days 7 and 8 of 60 minute period:

1. **Remind students of task at hand. (5 minutes)**
   TEACHER: Get the classes attention. Remind the students that they have these two days to work and then they will either be recording this via YouTube or presenting it to the class. Their scripts need to be typed up and a copy for the teacher to be turned at the end of day 8. They will need copies for themselves. They need to make sure they practice their presentations as well because on Day 9, presentations will start or YouTube videos will be recorded.
   STUDENTS: Ask questions for clarification, if needed.

   2. Students work on script and/or practice script (45-50 minutes)
   TEACHER: Circulate classroom. Offer to read scripts to provide feedback and make sure arguments are well read. Offer suggestions about presentations or videos like, who is recording the video, make sure they are looking at the audience or camera when speaking, etc.
   STUDENTS: Type up scripts, edit them if needed, make any slides with coloring supplies, and practice scripts.

   3. Clean-up, Log off, and turn in copy of script on Day 8 (5-10 minutes)
   TEACHER: Have the students log off their laptops/computer, return coloring supplies, and clean-up any areas. If it is Day 8, a copy of the script should be handed to you from each group.

STUDENTS: Students will log off, return laptops and coloring supplies if needed. They will make sure to turn in a copy of their script to the teacher at the end of day 8.

Day(s) 9 (and possible 10):

****I put an optional 10th day here in case presentations take too long or there are hiccups with the technology uploading to YouTube**

1. **Students either present or record their video (50 minutes)**
   **If recording video, they will need open spaces to go do this that are quiet and it could be hard to monitor them. Tell them they only get 10 minutes to record for each group so that they focus. You then have to select the video, log in to your YouTube account, name it and post it. This could take some time though.
   TEACHER: If students are presenting, take a copy of the rubric and grade the presentation as they go. If they are recording video, have a couple of places students can go that you can monitor them nearby to record. They get 10 minutes per group and then they will return to you so that you can post it on YouTube. If students are waiting for an empty room, they can practice their presentations and fill out a reflection sheet (I usually assign this as homework when the unit is complete).
   STUDENTS: Students will use their script to either present to the class (and I would have students grade each other if they are presenting) or record their video in the camera section of a device. They will come find the teacher when they are done recording so that it can be properly uploaded to YouTube. When finished, they can work on the reflection sheet and/or watch other student videos for critique.
2. **Clean-up (5-10 minutes)**
   TEACHER: Have the students return devices, any rubrics, and reflection sheets if you had them grade each other.
   STUDENTS: Students will return devices, any rubrics, or reflection sheets.

Day 11 (Optional)-- 30 minutes:

Making QR Codes for the YouTube videos.

I did this and put all of their paragraphs, worksheets, scripts, graphs, data sets, on a poster. I had parents walk around with iPads with the QR Code Reader app to watch student videos on a parent open house night.

Directions:

1. Have students log in to a computer-- one person per group.
2. Have them go to YouTube and find your YouTube channel. I would suggest doing this yourself before class starts.
3. Have them click on their particular video.
4. Copy the hyperlink at the top.
5. Go to a QR Generator website (my favorite is www.qrstuff.com).
6. Paste the hyperlink in the selected spot.
7. Print the QR Code. **Make sure they print one at a time otherwise it will be hard to determine whose QR Code is whose. They should also write their group members names on the paper, just in case.
8. They log off the computer.

Assessments

At the end of Day 2:

The assessment in this portion is whether or not students get 3 tables of 10 data points or more for the three factors for 3 cities. This is a checkpoint for the unit and helps with the brainstorming part of the Engineering Design Process.

At the end of Day 3:

The assessment in this portion is whether or not students can make scatter plots with lines of best fit for their 3 factors and 3 cities (a total of 9 graphs). This is a checkpoint for the unit and is part of the planning part of the Engineering Design Process.

At the end of Day 4:

If any students wants you to re-look at any of the scatter plots, this would be the day they could turn it in for feedback. The assessment in this portion is whether or not students can make scatter plots and find lines of best fit for their 3 factors and 3 cities on a TI-83 or TI-84 calculator. This is a checkpoint for the unit and is part of the planning part of the Engineering Design Process.

At the end of Day 5:

The assessment in this portion is the paragraphs students turn in. You want to make sure they can interpret what the line of best fit means and the correlation coefficient

in context. This is a checkpoint for the unit and is part of the planning part of the Engineering Design Process.

At the end of Day 8:
The assessment in this portion is the script. I collect this so that when I grade presentations or videos, I have something to reference.

At the end of Day 9 or 10:
The assessments in this portion is the presentation or YouTube video and reflection. This is the create and improve part of the Engineering Design Process.

At the end of Day 11:
The assessment in this portion is the QR Code. This is a just checkpoint and completely optional.

Critical Vocabulary

Categorical/qualitative data- data that can be described through categories and not through values (examples: gender, religious preference, favorite color)
Quantitative Data- data that can be expressed as a number (examples: age, number of hours spent studying, mass of an object)
Function- a relation where each input (or x) has exactly one output (or y)
Linear Function- a function that creates a straight line. Most linear functions are in slope-intercept form or y=mx+b, where m is the slope and b is the y-intercept.
Correlation Coefficient- the r-value of the linear regression on a scatter plot. The value is between -1 and 1. The closer the value is to -1 or 1, the stronger the correlation it is. If the r-value is negative or positive, that tells you whether there is a positive or negative correlation. If the r-value is close to 0, then there is no correlation between the data.
Interpolation- to estimate a value inside the values given by using a linear regression.
Extrapolation- to estimate a value that is outside the values given by using a linear regression.
Scatter plot- a graph of plotted points that show the relationship between two sets of data.

Rate of Change/Slope- the ratio between the change of one variable over the change of another variable, the measure of the steepness of a line
Y-Intercept- The point where the graph crosses the y or vertical axis.

Comments/Modifications

A reflection can be added afterwards to see if students enjoyed the process and if there should be any changes in place for the future.
The presentations can be done to the whole class where the classmates grade each other if you do not want them to post via YouTube. You could also add in a part of the presentation rubric where the students grade each other.

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