



NCEA Math Lesson Plan

Grade: 9-12

Subject: Algebra 1

Domain:

Statistics

Topic:

Modeling, Sequences, and/or Statistics

Standard Number(s) and Description:

S.ID.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

S.ID.6.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, quadratic, and exponential models.

S.ID.6.B - Informally assess the fit of a function by plotting and analyzing residuals.

S.ID.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

S.ID.8 Compute (using technology) and interpret the correlation coefficient of a linear fit.

F.LE.1 Distinguish between situations that can be modeled with linear functions and with exponential functions.

Vocabulary to be Highlighted:

Scatter plot, regression line, correlation coefficient, youth unemployment

Mathematical Practices (#):

1. Make sense of problems and persevere in solving them.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.

Essential Question:

What trend exists for the youth unemployment rate in the United States and around the world?

Materials/Tools (include technology):

Graph paper

Graphing calculator

Internet access (if students are going to look up the data on their own)

Connections to Other Math Domains:

Connections to Other Subject Areas:

Sociology
Economics

Catholic Identity Component:

Pope Francis recently said, "The most serious of the evils that afflict the world these days are youth unemployment and the loneliness of the old." In this lesson, students will further explore the problem of youth unemployment rates in the United States and in the world. Students will additionally study the reason Pope Francis called youth unemployment a "most serious evil" by synthesizing the information contained in Catholic Social Teaching #5 (The Dignity of Work and The Rights of Workers).

Resources (attachments):

Video of Pope Francis describing the youth unemployment problem:

<https://www.youtube.com/watch?v=Q6aGIeCf214>

Y-Chart (youth unemployment in Italy):

http://ycharts.com/indicators/italy_youth_unemployment_rate_lfs

The World Bank (youth unemployment by country):

<http://data.worldbank.org/indicator/SL.UEM.1524.ZS>

Video on youth unemployment crisis in Italy:

<http://www.presstv.ir/detail/2014/04/12/358293/imf-warns-about-italy-unemployment/>

Video on Catholic Social Teaching from Father Rocky:

<https://www.youtube.com/watch?v=CkO1NyFtdUM>

Catholic Social Teachings on Work:

<http://www.usccb.org/beliefs-and-teachings/what-we-believe/catholic-social-teaching/the-dignity-of-work-and-the-rights-of-workers.cfm>

Activities/Timeline:

Entry Activity: Discrepant event: Display a picture of Pope Francis on the board with the following statement written on the board for students to answer as they enter the classroom: "Pope Francis recently said that the most serious of the evils that afflict the world these days are _____ and _____." Students may either fill in the blanks on a piece of paper handed to them as they enter the room, or answer more collaboratively as a class. Either way, it would be good to hear several students' responses to this writing prompt.

Lesson Description: Students will complete an entry activity at the beginning of class that serves as a discrepant event because most students will answer with "abortion, suicide, poverty, racism, etc." Because the answers are "youth unemployment" and "loneliness of the old," the students will experience surprise at the actual answers, which will then generate interest in the day's lesson.

Provide direct instruction on scatter plots and the terminology contained in this mathematical topic such as regression line and correlation coefficient.

Next, ask students to explore the youth unemployment rate for Italy (Pope Francis's "home" country - technically Vatican City). If students have their own computers, they need only be supplied with the link to Y-Charts, which tabulates Italy's youth unemployment rate for any

period. The period students should focus on is from 2008 to the current year so that they can see the effects of the global recession, which surfaced in 2008. If it is more feasible to have students sharing a computer, that is an acceptable option as well. The important component is that the students are the ones collecting the data so they can begin to develop sound research skills.

Once the students find and record the youth unemployment rates, they can create a scatter plot using paper and pencil methods on graph paper or technology (Microsoft Excel, a graphing calculator, or similar technology). The key points of emphasis are that students label axes, provide units, and create a title for the scatter plot.

After the students complete the scatter plot, they can construct the trend line by hand or by using technology. Check for understanding by asking students to interpret the meaning of the slope in the context of the problem (youth unemployment rate increase per year).

Use technology to calculate the correlation coefficient, in order to speed up the process. The students will discover a correlation coefficient of approximately 0.98, which will then provide an opportunity to check for understanding as to the importance of this value (covered during direct instruction).

The next component of the lesson is to watch a 2 min 25 sec video of a news report that explains why high youth unemployment is a problem. Take this time to pre-assess students as to why they think youth unemployment is a problem.

Next, have students explore the Catholic Church's teaching on why work is considered good. A 70-second video clip from a talk by Father Rocky at the University of Wisconsin describes this Catholic Social Teaching (The Dignity of Work and the Rights of Workers).

In order to increase relevance to the students, they should repeat the scatter plot/regression line/correlation coefficient process with data from the United States and then a country of their choosing. (Note - not all countries have linear data so be prepared to discuss low correlation coefficients).

Give students independent practice on interpreting the slope of a regression line in the context of the problem. Provide students with four different trend lines for a variety of scatter plots (miles traveled in car vs. month; plant height vs. day; cost of admission vs. group size; etc.). Have students interpret, in words and using appropriate units, the slope of the trend line. It will be helpful to walk around the room to check for understanding.

Closure: Pass out a sheet of paper with this quote from John Paul II's encyclical "*Laborem Exercens*" (On Human Work) from 1981. John Paul II said, "Work is a good thing for man-a good thing for his humanity-because through work man not only transforms nature, adapting it to his own needs, but he also achieves fulfillment as a human being and indeed, in a sense, becomes 'more a human being.'" Have students respond to this 120-second writing prompt: "If John Paul II were alive today, would he think that youth are able to achieve fulfillment and become more human beings in today's world? Please explain your answer."

Modifications/Differentiation:

Visual accommodations: Give students who are not able to see the board a handout of Pope Francis' quote during the entry activity. Provide a copy of the notes on scatter plots.

Auditory accommodation: If a class webpage or an online class (Moodle, Edmodo, etc.) exists, post the link to the videos so students may listen with headphones or at home on their own.

Provide a transcript of the videos before class or turn on closed captioning.

Physical accommodation: If a student cannot graph with graph paper and use a ruler, pair students with another student who may assist them in this task.

Differentiation: During the independent practice, provide students who need additional rigor with scatter plots that have axes that increase by a value other than one unit. For example, give students a scatter plot of plant height vs. time but the y-axis scale is 5 and the x-axis scale is 10.

Formative Assessment (what to look for, how/when to look):

The lesson concludes with a formative assessment on the students' ability to connect the data from the lesson with Catholic Social Teaching. If time permits, substitute a lengthier assessment on the math of the lesson or save it for the following class period after students have been provided the opportunity to better synthesize the information on their homework.

Summative Assessment: