



You're the Network

Data Analysis



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Grade Level	8th Grade	Time Frame	1-2 class period(s)
Subject	Mathematics		
Course	Pre-Algebra		

Essential Question

How can statistics be used to make decisions?

Summary

Students will use data to create scatterplots, draw lines of best fit, and discuss trends found in television show ratings and viewership. Students will calculate range, mean, mode, and median from a given set of data. Students will also interpret data to discuss how decisions are made using statistics and how the inclusion or exclusion of outliers may affect the interpretation of data.

Snapshot

Engage

Students find the math used in Hans Rosling's video titled: "200 countries, 200 years, 4 minutes – The Joy of Stats". Students will graph, using a scatterplot, the scores for each episode (3 seasons) for the TV show *Teen Wolf*. Students draw a line of best fit and discuss trends.

Explore

Students graph, using a scatterplot, the scores for each episode (3 seasons) for the TV show *Teen Wolf*. Students draw a line of best fit and discuss trends.

Explain

Students look at graphs for the following TV shows: *Heroes*, *Sopranos*, and *American Idol* and discuss trends as well as outliers.

Extend

Students make two graphs of the average season scores for the TV show *Community*—one that includes season four and one without season four, which help them see the impact of outlier data. Students investigate differences in qualitative and quantitative perspectives by comparing viewership ratings and scores.

Evaluate

Students generate a claim about the relationship between US state income versus life expectancy by state and will provide evidence to justify or revise their claim.

Standards

Oklahoma Academic Standards for Mathematics (Grade 8)

PA.D.1.1: Describe the impact that inserting or deleting a data point has on the mean and the median of a data set. Know how to create data displays using a spreadsheet and use a calculator to examine this impact.

PA.D.1.2: Explain how outliers affect measures of central tendency.

PA.D.1.3: Collect, display and interpret data using scatterplots. Use the shape of the scatterplot to informally estimate a line of best fit, make statements about average rate of change, and make predictions about values not in the original data set. Use appropriate titles, labels and units.

Attachments

- [Community - Outliers Students Copy - Spanish.docx](#)
- [Community - Outliers Students Copy.docx](#)
- [Community Data - Spanish.xlsx](#)
- [Community Data.xlsx](#)
- [Life Expectancy vs Income - Spanish.docx](#)
- [Life Expectancy vs Income.docx](#)
- [TV Show Stats.pptx](#)
- [Teen Wolf Through the Seasons - student - Spanish.docx](#)
- [Teen Wolf Through the Seasons - student.docx](#)
- [U.S.-Income vs. Life - Spanish.xlsx](#)
- [U.S.-Income vs. Life.xlsx](#)
- [Viewership for Community - Spanish.xlsx](#)
- [Viewership for Community.xlsx](#)

Materials

- Graph paper (at least two pages per student)
- Teen Wolf: Through the Seasons handout (attached; one per student)
- Calculator (at least one per group)
- Ruler (one per student)
- String, scissors, tape (optional)
- TV show scores slides (attached)
- Community - Outliers handout (one per student)
- Life Expectancy vs. Income handout (one per student)
- U.S. Income vs. Life handout (one per student)
- Student devices with internet access

Engage

Ask students to generate a list of the ways they think math might be used to make decisions.

Record and display these ideas while they are speaking. Student responses may include: Figuring out the percent off on a sale, counting back change, building things, to help coach in sports by keeping stats, for science projects.

Show students Hans Rosling's video, "[200 countries, 200 years, 4 minutes – The Joy of Stats](https://www.youtube.com/watch?v=jbkSRLYSojo)".

Embedded video

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

Ask students to discuss with their [Elbow Partner](#) how math was demonstrated in the video.

Sample Student Responses

- Using a graph (X-Y axis) to show how wealth and health are related.
- Showed the effects of the Industrial Revolution and WWI on wealth and health.
- It also showed how countries differ from one another and how places within a country differed.
- They used a scatterplot to determine a trend.

Have students form larger groups of 4-5 students and share ideas. Using a round-robin strategy, have each group share their best answer with the whole class. Tell students that answers cannot be repeated, so if another group shares their answer then they need to share a different idea.

Sample Student Responses

- The speaker defined the Y and X-axis variables.
- The variables are quantitative (numbers).
- The countries lifespan and income were plotted on a graph to form a scatterplot.
- The speaker shows how these variables have changed throughout the years.
- The Y-axis variable is lifespan with a range of 25 years to 75 years.
- The X-axis variable is income with a range of \$400 to \$40,000.
- The relationship shown was direct and linear.
- Poor and sick was located on the bottom left of the graph, whereas rich and healthy was located on the top right of the graph.
- The size of the point on the scatterplot was related to population size of the country.
- The industrial revolution was a major factor for countries becoming richer and healthier, moving up and to the right. World War I and Spanish Flu epidemic caused some countries to move down the Y-axis.
- The video used math to show changes in lifespan and income of countries from 1810 to 2009.

Explore

Assign or arrange students in groups of two or three.

Instruct students to mathematically analyze [data](#) from the TV show *Teen Wolf*.

Give each student a copy of the handout titled: **Teen Wolf Through the Seasons** and a blank piece of graph paper. The handout is provided along with a teacher copy when you download the lesson.

Teacher's Note

Students may need assistance doing calculations and drawing lines of best fit. Make sure students scale the Y-axis of their graphs the same way.

Have students share their responses to the summary questions. As they share their responses, instruct them to include a justification (support) for their answers using graphs, lines of best fit, and calculations.

Explain

Using the slides provided with the lesson conduct a whole-class discussion.

Look in the presenter's notes for leading questions to help focus your discussion.

This discussion considers three other television series that have trends different from what students explored with *Teen Wolf*.

- 1st show: *Heroes*, shows a decreasing trend in quality (**slide 2**) as well as quantity (**slide 3**). On **slide 4** there is a snapshot of two informational texts where the creator addresses the decrease in quality.
- 2nd show (**slide 5**) is the *Sopranos* and this discussion has obvious outlier data and this should be the focus of the discussion.
- 3rd show (**slide 6**), *American Idol*, shows an overall increasing trend but the quality of season 12 does not match this trend. **Slide 7** shows snapshots of changes made to the show between season 12 and season 13. This is an opportunity to discuss how changes in cast may affect the quality of a show. The last **slide (8)** shows how the quantity (viewership) of *American Idol* has decreased over the seasons, so while the quality trend is increasing the viewership is decreasing.

Preface the next portion of the lesson by telling students they are going to investigate how the inclusion/exclusion of outliers affects the interpretation of data.

Extend

Pass out the **Community - Outliers** handout to the students. The sheet provides the scores for each episode from Season 1–Season 5. In part I, have students plot each episode and draw a line of best fit for this data.

Teacher's Note

Students will be looking at the TV show *Community*. After Season 3 aired, NBC fired the show's creator, Dan Harmon, only to rehire him after Season 4. There is a distinct difference between the rankings of Seasons 1, 2, 3 and 5 compared to Season 4. This will give students an opportunity to analyze how an outlier can affect overall data.

Explain to the students that the creator of the show was fired for Season 4 and rehired back for Season 5. Have them draw a new line of best fit that excludes Season 4 (Outlier).

Ask students to discuss the difference that Season 4 makes on the overall rankings of the show and have them discuss other situations in which an outlier may affect the overall average.

Sample Student Responses

- When the creator of the show was fired people ranked the show lower than when he was there.
- The show had done better with him than without him.
- When you take out Season 4 the average reviews of the show are much higher than when you count it.
- Other times an outlier may affect an overall average could be like if Kevin Durant scored 50 points in three games and 0 in the fourth game his average would be 37.5 points for those four games. Or if three kids score 100% on a test and one kid gets a zero the outlier drops the average to 75%.

Teacher's Note

Have students compare the viewership ratings of the show (quantitative data) with the scores of the show (qualitative data). Explain to students that the ratings are the actual number of viewers watching each episode whereas the scores are a measure of how the viewers felt about each episode.

Instruct students to look at the overall number of viewers for each episode. Allow students to compare the scatterplot for this data compared to the scatterplot they created for scores of the show.

Instruct students to answer questions on this handout.

Evaluate

Hand out the **Life Expectancy vs. Income** handout.

Ask students to write a claim as to what they think the relationship is between the money a person earns and how long they live. Ask students to give two supporting thoughts that support their initial claim.

Student responses may include: I think that the more a person makes the longer they probably live. People who make more money can afford to go to the Doctor more often than people who make less money. People who make less money can't afford to eat as well as people who make more money. Hand out copies of the data sheet ("U.S. Income vs. Life"). Have them use the data and look for evidence that supports or refutes their initial claim.

Provide students the opportunity to revise their claim in light of their analysis of the data but require students to provide evidence from the data to support their new claim.

Resources

- Rosling, H. *200 countries, 200 years, 4 minutes – The Joy of Stats* [Video]. YouTube. <https://www.youtube.com/watch?v=jbkSRLYSojo>
- Wu, Kevin. Graph TV. <http://graphtv.kevininformatics.com/>
- Davis, Jeff. *Teen Wolf* (2011 TV Series). Copyright 2016 Viacom International Inc. MTV and all related titles and logos are trademarks of Viacom International Inc.
- Kring, Tim. *Heroes* (TV Series). Copyright 2010 NBC Universal.
- Chase, David. *Sopranos*, Copyright 1997-2007, Home Box Office, Inc. Syndicated to A&E Networks a joint venture between Hearst and Disney-ABC Television Group, a unit of the Disney Media Networks subsidiary of The Walt Disney Company.
- Fuller, Simon. *American Idol* (2002-2016) Distributed by FremantleMedia North America Syndicated to Fox Broadcasting Company.
- Harmon, Dan. *Community* (TV Series). Copyright 2009-2011 NBC Universal.
- K20 Center. (n.d.). Elbow Partners. Strategies. <https://learn.k20center.ou.edu/strategy/116>