

**Tales from the Chihuahuan Desert:
Borderlands Narratives about Identity and Binationalism**

National Endowment for the Humanities and The University of Texas at El Paso
2017 Summer Institute for Secondary School Teachers (Grades 6th–12th)

Instructional Lesson Plan: Amy Bean

1. Title and Author of Lesson Plan

Data Analysis through Scatter Plots

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Amy Bean teaches seventh and eighth grade mathematics in a Chicago Public School. Previously, she has worked at schools in Massachusetts, New Orleans, New Mexico, and Chile. Amy looks forward to returning to school in the fall with more informed perspectives on borderlands narratives, identities, and Mexican and American binationalism. She can be reached at amyabean@gmail.com

2. Content or Subject Areas with Keywords

Mathematics Grade 8

Keywords: bivariate data, scatter plot, scatter plots, positive association, negative association, clusters, outliers, line of best fit, trend line, slope, rate, immigration, mathematics, grade 8

3. Grade Levels and Time Required

Grade 8

Time Required: Four 45-minute class periods

4. Instructional Objectives and Student Learning

Student-friendly Learning Objectives:

- Days 1, 2, 3, and 4: Identify positive and negative association within a scatter plot, as well as clusters and outliers within the scatter plot
- Days 1, 2, 3 and 4: Explain what a scatter plot is showing as it relates to life outside of the classroom

- Days 2 and 4: Create a scatter plot using bivariate data.
- Days 3 and 4: Estimate a trend line (line of best fit) for the data shown on a scatter plot, and write the equation of that line in slope-intercept form. Explain what the slope (m) means in terms of the data shown.

Overarching Common Core Goal: Investigate patterns of association in bivariate data.

CCSS.MATH.CONTENT.8.SP.A.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.

CCSS.MATH.CONTENT.8.SP.A.2 Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.

CCSS.MATH.CONTENT.8.SP.A.3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.

CCSS.MATH.CONTENT.8.SP.A.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?

Standards are taken from Common Core Grade 8 Mathematics Standards, found here:
<http://www.corestandards.org/Math/Content/8/introduction/>

5. Guiding Questions

- Who is coming to the United States as an immigrant? Where are they coming from? How has this changed over time?
- How does the way data is presented affect the way people understand it?

- How can I create and use a scatter plot? How can I identify positive association, negative association, clusters, and outliers to communicate information about a situation outside of my math class?
- What does data show me about immigration?
- Which is my “x” data for a chart like this (a scatter plot) and which is my “y” data? Why?

6. Materials and Resources

Required materials

- 1) Paper (preferably graph paper)
- 2) Pencils
- 3) Ability to project a video for the class to watch, also to play Kahoot with students
- 4) Access to computers or other devices for use of IXL
- 5) Data about immigration - linked in the Works Cited section, or teacher may locate their own data from a credible source
- 6) Example project created by teacher to model expectations for students

Optional materials

- 1) Printed data for students to interact with instead of looking at online sources

7. Introduction

In this lesson, students will examine immigration data. After learning about bivariate data, scatter plots, and how to interpret scatter plots, students will create their own scatter plot and share a brief analysis with the class. A goal of the lessons is for students to recognize that they can understand and learn from data more impactfully by changing the format in which the data is presented. Students will explore the concept of immigration through the lens of data analysis.

8. Instructional and Lesson Activities (ENGAGE, EXPLORE, EXPLAIN)

Lesson 1 Procedure (Day 1)

- 1) Opening Activity/Hook (5 minutes): Show students a video of world immigration flows (Youtube: “All the World’s Immigration Visualized in One Map”: <https://www.youtube.com/watch?v=bHhkYNxt10Q>
 - a) Watch once, then prepare students for a brief discussion/reaction to the video by having them rewatch the first 8 seconds and asking them to try to notice at least one thing to share with a partner afterwards

- b) Partner share, followed by whole group share about what they noticed in the first 8 seconds of the video
 - c) If time, continue re-watching and pause the video at other sections, such as when it focuses in on only a certain country or region. Possible questions to ask:
 - i) What patterns or trends do you notice by focusing on only one area?
 - ii) What could you guess about the immigration in this area based on what we see?
 - iii) What do you think the red and blue dots mean? The yellow?
- 2) Informative Lesson (15 minutes): Introduce learning goals and important mathematical concepts
- a) Today our goals are to explain what a scatter plot is showing as it relates to life outside of the classroom. We will identify positive and negative association within a scatter plot, as well as clusters and outliers.
 - b) Important vocabulary: bivariate data, scatter plot, positive association, negative association, cluster, outlier
 - c) Bivariate data
 - i) What is it? Any guesses? (Suggest breaking up the word bivariate)
 - ii) What are some examples in life outside of math class? I think you will be able to tell me after we explore this through a Kahoot
 - iii) It's fine if students have no idea, this is just to get the students thinking and access prior knowledge if possible - the vocabulary term "bivariate data" will be taught later in the lesson
 - d) Begin Kahoot: <https://create.kahoot.it/share/scatter-plot-analysis/915d0388-46ef-4766-ab71-11ce97f07248>
 - e) First five questions of the Kahoot do not award points to students and have the maximum time allotment (120 seconds). This is meant to allow time for the teacher to lead the class in a "what does this scatter plot tell us?" brief analysis, to discuss each answer choice, and to come to a class consensus about the problem.
- 3) Whole class practice/reinforcement/clarification time (10 minutes)
- a) Continue the rest of the Kahoot, teaching the concepts of positive association, negative association, outliers and clusters during the activity.
 - b) Be sure to pause during or after each question to allow for student questions and clarifications.
- 4) Debrief/Predictions to tie this to immigration (5 minutes)
- a) Now that you have more information, let's revisit the question: what is bivariate data?

- i) Take student guesses and then teach the concept that bivariate data is data involving two, usually related, variables
 - ii) Give examples of bivariate data from the Kahoot or from student input, or both
- 5) Practice time (10 minutes)
- a) Students work on skill "[CC.15 Identify trends with scatter plots](#)" on IXL
 - b) Teacher uses the "Real Time" tool under "Analytics" in the teacher IXL account - this helps the teacher see, in real time, how students are progressing. If teacher notices one or more students stuck on the same concept, the teacher can pull those students for small group work or intervene individually for more support.

Lesson 2 Part One Procedure (Day 2)

- 1) Opening Activity/Hook (2 to 5 minutes): Word association - what words do you think of when you hear the word "Immigration"? Write for a minute, then share with a partner, and with the class. If time, let students know that we'll be looking at immigration data today and ask them what kind of information they think we will learn.
- 2) Informative Lesson (15 minutes): Introduce learning goals and important mathematical concepts
 - a) Today our goal is to create a scatter plot using bivariate data related to immigration.
 - b) Important vocabulary: bivariate data, scatter plot, scatter plots, positive association, negative association, clusters, outliers, immigration
 - c) How to create your scatter plot and an example online and on paper (prepared ahead of time)
 - i) On paper: graph paper
 - ii) Online: Scatter plot generator
<http://www.alcula.com/calculators/statistics/scatter-plot/>
 - d) Show examples (paper and online)
 - e) Students explore the data and see what interests them most (See Section 14 of this lesson plan set for links to possible immigration data that could be used)
- 3) Individual work time (10 minutes)
 - a) Students create their scatter plot
- 4) Debrief/clarification (5 minutes)
 - a) What kind of information can we get from data?
 - b) How does the way data is presented help us to understand it?

- i) For example, we saw data in charts, scatter plots and other formats. What was easiest for you to make sense of? Why?
 - ii) What data helps us see positive or negative association the best? Why?
 - iii) Who is coming to the U.S. as an immigrant? Where are they coming from? Has this changed over time?
- 5) Continued work time (10 minutes)
 - a) Students who finish early may start another scatter plot or practice concepts listed in Section 9 of this lesson plan set.

Lesson 2 Part Two Procedure (Day 3)

- 1) Opening Activity/Hook (5 minutes): Look at and discuss a set of data that has been particularly challenging for students to interpret during these lessons, if any. Otherwise, choose a set of data to look at and have students locate an outlier, a cluster, and the positive/negative/neutral association on the scatter plot of that data.
- 2) Informative Lesson (15 minutes): Introduce learning goals and important mathematical concepts
 - a) Today our goal is to create a scatter plot using bivariate data related to immigration. You will also estimate a trend line (line of best fit) for the data shown on a scatter plot, and write the equation of that line in slope-intercept form. ($y = mx + b$) Finally, you will explain what the slope (m) means in terms of the data shown.
 - b) Important vocabulary: bivariate data, scatter plot, scatter plots, positive association, negative association, clusters, outliers, line of best fit, trend line, slope, rate, immigration
 - c) Show data and demonstrate estimating the line of best fit, or trend line. Have students determine the equation of the line and discuss what the slope means in the context of the scatter plot situation. Continue with examples until students are ready to try it out on their own.
- 3) Individual work time (10 minutes)
 - a) Line of best fit practice on IXL: [DD.9 Scatter plots: line of best fit](#)
 - b) Teacher uses the “Real Time” tool under “Analytics” in the teacher IXL account - this helps the teacher see, in real time, how students are progressing. If teacher notices one or more students stuck on the same concept, the teacher can pull those students for small group work or intervene individually for more support.
- 4) Debrief/clarification (5 minutes)

- a) Review more challenging concepts, such as determining the equation of the line or verbalizing what the slope of a line of best fit means in the context of the situation
- 5) Continued work time (10 minutes)
 - a) Students continue to practice skills related to scatter plots:
 - i) Graphing a line of best fit
 - ii) Determining the equation of a line of best fit
 - iii) Explaining what a line of best fit's slope means
 - iv) Determining outliers in a scatter plot
 - v) Determining a cluster on a scatter plot

Lesson 2 Part Three Procedure (Day 4)

- 1) Opening Activity/Hook (5 minutes): Revisit the model of the scatter plot and review grading requirements:
 - a) Final product - Create a scatter plot using data related to immigration. Present your data both as a scatter plot and as a table. Write a 1-2 sentence analysis in which you comment on positive association, negative association, clusters and outliers, as applicable. Graph a line of best fit, or trend line, and write the equation for this line. Explain, in terms of the situation, what the slope of your line means. Be prepared to share with a partner, group, or class.
- 2) Informative Lesson (10 minutes): Introduce learning goals and important mathematical concepts
 - a) Today our goal is to review and practice what you have learned over the past few days. You will apply concepts you have learned to your scatter plot and share with the class. As a reminder, these concepts were:
 - i) Days 1, 2, 3, and 4: Identify positive and negative association within a scatter plot, as well as clusters and outliers within the scatter plot
 - ii) Days 1, 2, 3 and 4: Explain what a scatter plot is showing as it relates to life outside of the classroom
 - iii) Days 2 and 4: Create a scatter plot using bivariate data.
 - iv) Days 3 and 4: Estimate a trend line (line of best fit) for the data shown on a scatter plot, and write the equation of that line in slope-intercept form. Explain what the slope (m) means in terms of the data shown.
 - b) Important vocabulary: bivariate data, scatter plot, scatter plots, positive association, negative association, clusters, outliers, line of best fit, trend line, slope, rate, immigration

- c) Set the goal for student work time: be ready to show and explain your scatter plot to a classmate and/or the class. Use the rubric to help you complete the full task.
- 3) Individual work time (10 minutes)
 - a) Students make finishing touches on their scatter plots and include the information related to what we have learned. Teacher circulates to support.
- 4) Pair Share (5 minutes)
 - a) In pairs, partners share their work - 1 1/2 minutes per partner, then 2 minutes for questions/dicussion/suggestions within the pairing
- 5) Class share (5 minutes)
 - a) Student volunteers share their scatter plots using the document camera or projector, giving a brief summary of the data pictured and a brief analysis
- 6) Debrief (5 minutes)
 - a) What did you learn from looking at this immigration data?
 - b) How does knowing different ways of presenting data (tables, graphs, scatter plots, etc.) help you to better understand it?

9. EXTEND/ELABORATE: Additional Learning

For extra support with the concept of outliers, outliers in scatter plots, and line of best fit in scatter plots, there are four practice skills available on IXL**:

- [DD.6 Identify an outlier](#)
- [DD.7 Identify an outlier and describe the effect of removing it](#)
- [DD.8 Outliers in scatter plots](#)
- [DD.9 Scatter plots: line of best fit](#)

For extra challenge and practice with scatter plots, students can work on predicting what would happen in a scatter plot using this IXL skill:

- [CC.16 Make predictions with scatter plots](#)

**If your school does not have an IXL membership, your students can still use IXL for free, though they will reach a limit of the number of questions they are able to complete per day. Whole class work followed by individual or partner work can help to extend the number of practice problems with immediate feedback that your students are exposed to.

If there was more time for this content, and if students are emotionally mature enough to deal with data related to serious/difficult topics, classes could analyze data about

migrant deaths and observe how the numbers changed during/after various government policies.

To expand learning, students could make a more formal presentation about their findings to peers in small groups, or to the whole class.

10. EVALUATE: Assessment

Summative assessment:

Create a scatter plot using data related to immigration. You may choose immigration data the interests you, but you must include the following requirements:

- Present your data both as a scatter plot and as a table.
- Write a 1-2 sentence analysis in which you comment on positive association, negative association, or neutral/no association in your scatter plot.
- Write a 1-2 sentence analysis in which you comment on clusters and outliers in your scatter plot, as applicable.
- Graph a line of best fit, or trend line, and write the equation for this line. Explain, in terms of the situation, what the slope of your line means.

Be prepared to share with a partner, group, or class. Use the grading checklist to help yourself be successful.

Possible Grading Checklist

Scatter Plot Project Goals	Points Possible	Points earned
Scatter Plot has a title	1	
X and Y axis are labeled with the variables explained on each one (example: you may label “time” on one axis and “number of people in millions” on the other axis, if that is what your data is about)	2	

X and Y axis are legibly labeled with appropriate numbers to display the data	2	
Data is also presented in a table	2	
Data in table matches data in scatter plot	5	
Line of best fit is attempted	2	
Line of best fit is accurately identified with an equation in the slope-intercept form ($y = mx + b$)	5	
Sentence or two to explain what the slope of your line of best fit means as it relates to the situation/information you have in your scatter plot	2	
Sentence or two explaining positive/negative/neutral association	5	
Sentence or two explaining a cluster and/or outlier seen in the data	5	
Total Score:		

11. Accommodations and Modifications

- Student choice allowed for data selection, as well as data presentation (paper or computer)
- Interactive practice included to allow students immediate feedback and help to determine areas of misunderstanding with student learning
- Directions given verbally as well as in writing

- Students asked to summarize directions in their own words to ensure student understanding, and to serve as a peer model for explaining what students need to do
- Teacher and student modeling of expectations used (including a model of the final product)
- Grading rubric used to make grading process transparent
- Individual and small group support provided
- Various modes of interacting with the concepts are used
- Project can be modified to fit with a student's IEP or other learning needs
- Emphasis on vocabulary and explanation of data to make meaning of the mathematical concepts

12. College and Career Readiness (optional)

13. Additional Resources

Bigelow, Bill. *The Line Between Us: Teaching about the Border and Mexican Immigration*. A Rethinking Schools Publication, 2006.

"Whose Community is this? The Mathematics of Neighborhood Displacement" by Eric "Rico" Gutstein - starting on page 197 of "Rethinking Ethnic Studies" by Rethinking Schools, edited by R. Tolteka Cuauhtin, Miguel Zavala, Christine Sleeter, and Wayne Au.

David Taylor - Tucson-based photographer focusing on the U.S.-Mexico border, former and present day

Regan, Margaret. *The Death of Josseline: Immigration Stories from the Arizona Borderlands*. Beacon Press, Boston, MA, 2010.

Regan, Margaret. *Detained and Deported: Stories of Immigrant Families Under Fire*. Beacon Press, Boston, MA, 2016.

Luiselli, Valeria. *Tell Me How It Ends: An Essay in Forty Questions*. Coffee House Press, Minneapolis, MN, 2017.

incompetech.com - graph paper templates and other math-related templates, free and printable

Urrea, Luís Alberto. *The Devil's Highway: A True Story*. New York : Back Bay Books, 2005.

Dunn, Timothy. *The Militarization of the U.S-Mexico Border, 1978-1992: Low-Intensity Conflict Doctrine Comes Home*. University of Texas at Austin, 1996.

Dunn, Timothy. *Blockading the Border and Human Rights: The El Paso Operation that Remade Immigration Enforcement*. University of Texas Press, 2010.

Moskowitz, Peter. *How to Kill a City: Gentrification, Inequality, and the Fight for the Neighborhood*. Bold Type Books, 2018.

Lalami, Laila. "The Border is all around us, and it's growing." *New York Times Magazine*. April 25, 2017. Link: <https://www.nytimes.com/2017/04/25/magazine/the-border-is-all-around-us-and-its-growing.html>

Bejarano, Dr. Cynthia. *¿Qué Onda?: Urban Youth Culture and Border Identity*. University of Arizona Press, 2007.

Map of child detention centers as of July 2019: freedomforimmigrants.org - scroll down to "Interactive Map"

100 Mile Border Zone - <https://www.aclu.org/know-your-rights-100-mile-border-zone>

14. References (or Works Cited)

Sources consulted for immigration data:

- <https://www.dhs.gov/immigration-statistics>
- <https://www.dhs.gov/immigration-statistics/yearbook>
- <https://www.dhs.gov/immigration-statistics/visualization/2017>
- <https://www.pewresearch.org/fact-tank/2019/06/28/what-we-know-about-illegal-immigration-from-mexico/>
- <https://www.pewresearch.org/fact-tank/2019/06/17/key-findings-about-u-s-immigrants/>
- <https://www.cbp.gov/newsroom/stats/sw-border-migration>
- <https://www.adl.org/resources/fact-sheets/myths-and-facts-about-immigrants-and-immigration-en-espanol>
- <https://www.cnn.com/2013/11/06/us/immigration-statistics-fast-facts/index.html>
- <https://www.bbc.com/mundo/noticias-internacional-46384408>

Math is fun Scatter Plot informational page: <https://www.mathsisfun.com/data/scatter-xy-plots.html>

Definition for bivariate data: <https://www.mathsisfun.com/definitions/bivariate-data.html>

100 mile border zone: <https://www.aclu.org/other/constitution-100-mile-border-zone>

Video about bivariate data from Khan Academy:

<https://www.khanacademy.org/math/ap-statistics/bivariate-data-ap/scatterplots-correlation/v/bivariate-relationship-linearity-strength-and-direction>

Guide for families in supporting student learning with this mathematical topic:

<https://connectedmath.msu.edu/families/helping-with-math/cmp3-grade-8/>

Map of world immigration: <https://www.youtube.com/watch?v=bHhkYNxt10Q>

Immigration Animation: <https://www.youtube.com/watch?v=RnIOyTXReto>

More information about the immigration animation: <http://metrocosm.com/global-immigration-map/>

Freedom for Immigrants: <https://www.freedomforimmigrants.org/>

Kahoot activity is from a public Kahoot posted by user “[leighstallworth](#),” which can be found at: <https://create.kahoot.it/share/scatter-plots/93a69c11-9cb6-43f0-8b1d-d9df50354960>

15. Reflection

When we visited Cinco Puntos Press in El Paso, the founders expressed a sentiment of wanting the books they publish to have meaning - to “engage readers around the world and to give a taste of where we live.” This struck me as a math teacher because my goal is for students to use math to make meaning of the world around them and to understand how to use math in their lives, rather than only memorizing formulas and procedures. Many times during the institute, I found connections to the math classroom in ways that I can’t wait to implement. These two weeks in the borderlands has helped me to build background knowledge about borders and borderlands, as well as create a more informed understanding of what is currently happening in this region.

Taking “the facts” at face value is a dangerous game. We heard from a wide array of participants in the borderlands narrative here in El Paso and the surrounding area. If we had taken everyone’s stance as the absolute truth, we would have walked out of these two weeks confused and ultimately uninformed. Instead, we were able to analyze, digging deeper into what we read, heard, saw and experienced. This style of learning has challenged and engaged me within the group during our institute. I hope to bring it home to Chicago as my students begin unpacking the math related to immigration. Creating space to connect the humanities with other disciplines is essential for student growth and development as critical thinkers in their worlds.