DATA & DISTRICTS: GERRYMANDERING & BIG DATA IN AMERICAN DEMOCRACY

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Affiliation & Location	We are high school teachers in rural Missouri at the Kirksville R-III School District. This project was developed with support from the Data Science Department at Truman State University.
Abstract of Lesson	This is a lesson that looks at the intersection between the constitutional principle of apportionment, partisan gerrymandering, and data science. Students will develop an understanding of the intersection of data and public policy while engaging with a real world issue.
Learning Objectives	Students will: • Develop an understanding of the process of redistricting and gerrymandering. • Recognize ways in which data science and public policy intersect. • Consider the ways that data scientists might engage with the redistricting process and the ethical questions they should consider. • Process and analyze datasets and data visualizations in order to make public policy recommendations in written and oral forms.
Grade Levels	This lesson was created with high school government and statistics classes in mind, but could be applied to courses like U.S. History and Contemporary Issues.
Time	4, 50 minute class periods
Resources Needed	• A laptop, chromebook, or computer for each student (mouse suggested for ease of data manipulation on chromebooks) • A computer & projector for display • Internet access for engaging with resources • Digital student handouts (Day 1, Day 2, Day 3 & 4)
Apps/Websites Needed	Students will need access to this interactive map for day 3 & 4 activities.
Data Sources	Data comes from the U.S. Census Bureau's Redistricting Dataset, Map data comes from Living Atlas map files on Esri ArcGIS.

data.truman.edu
 THINK LIKE A DATA SCIENTIST.

What do you notice? · · · What do you wonder? · What questions do you have?

DAY 1: AN INTRODUCTION TO APPORTIONMENT & GERRYMANDERING

Part I: Proportional Representation

Instructors should share Digital Handout #1 via their learning management system. Have a copy made for each student to work with.

Begin by reading the excerpt from the U.S. constitution discussing representation in the U.S. House.

With students, define the following key terms: census, apportionment, and redistricting.

After terms have been defined and discussed, have students open the map of congressional districts. Have them find their house district on the map. Compare the geographic area of your district to that of other districts in the state. Have students consider the reasons for the size disparities. Review the concept of proportional representation.

Have students begin by opening the Dataset of the Number of Seats in the U.S. House of Representatives and consider the following questions:

1. What happens to the number of representatives over time?
    a. Be prepared to discuss the The Permanent Apportionment Act of 1929 which locked in the total number of seats in the House of Representatives at 435.
2. How does proportional representation of citizens change in the U.S. House over time?
    a. Students should be able to identify that the number of citizens per representative has increased immensely since the ratification of the Constitution. This can lead to a discussion of whether or not this adversely impacts representation.
3. How many representatives would it take to return to the proportional representation of the first congress?
    a. This can lead to a discussion of the impracticality of retaining the proportional representation of the Founding Era and can serve to illustrate the transformation of the American population since that time.

Present students with Data Visualization #1 and Data Visualization #2 to consider how these changes and patterns are easier to see when graphed as opposed to when displayed only in numeric form.

Part II:Gerrymandering

As a class, watch the "Gerrymandering Explained Video". Afterwards, match the definitions to the terms in the dropdown menu.

Next, have students listen to the 6 minute clip on "Prison Gerrymandering" and respond to the following prompt: What is the argument that critics of "Prison Gerrymandering" make about prison populations being used to shift proportional representation? Based on your view, is it reasonable to consider this a form of gerrymandering?

Have students read the article on the natural geographic sorting of political ideologies and respond to the prompt: How does the natural sorting of voters with certain partisan preferences affect apportionment even when no partisan gerrymandering is present? How might this make partisan gerrymandering easier to accomplish?

Have students read the arguments about the potential harms of gerrymandering and match the term in the dropdown to the argument.

Students should play the gerrymandering simulation game and try to apply the different approaches they have learned.

Have students write a response to the lesson's essential question: Should addressing gerrymandering be a priority issue for American voters?

DAY 2: BIG DATA & GERRYMANDERING

Instructors should share [Digital Handout #2](#) via their learning management system. Have a copy made for each student to work with.

Begin with the hook, by having students play the "Gerrymandering Mini Golf" game from the Washington Post and answering the associated questions. *This activity does require signing up for a free account, so if you don't want to have students all create accounts, this could be done as a class on the board.*

Next, students should work their way through the resources provided in the handout and answer the associated questions. Class should be concluded with a discussion of how students responded, with special attention being paid to the following prompts: *How has big data impacted gerrymandering? What ethical considerations should data scientists be taking into account when working on projects like redistricting? What variables that people could access data about do you believe could be used as indicators of political tendencies?*

DAYS 3 & 4: DIY DATA-MANDERING

Students will be divided into groups and provided with Digital Handout #3, which contains instructions for creating a congressional map and resources for accomplishing the task. There are six redistricting challenges that you can assign to the different groups, we have included 2 paths towards maps that we believe could lead to discussions of creating nonpartisan districts (this can be used to have students analyze and discuss what constitutes "fairness" in the scope of elections and public policy), 4 paths toward partisan gerrymanders which can be used to lead students to consider the ways that maps can be made using data to diminish or maximize the electoral voice of certain citizens at the expense of others.

Once they have completed their maps, compare the different maps students generated and have groups explain their approaches and discuss the real world implications of this type of data use.

After the class discussion, have students write a letter to their state representative about the issue of data and gerrymandering as it relates to their own state and how they believe the state legislature should address redistricting in future years. *(If you actually intend for students to send their letters, we recommend carving out some additional time to include a lesson on persuasive writing and civil discourse when writing to elected officials.)*

Handouts that will need to be printed:
A map of Missouri School Districts
A map of Missouri's current U.S. Congressional Districts

If you have interest in adding another day to the process, an optional day between days 2 & 3 can also be used to take the data set (or even look at an uncleaned data set for your state) and introduce students to skills such as filtering data, cleaning data, making decisions about which data to keep and which data to ignore, etc.