Mathematics in a Social Justice World: A Statistical Reasoning Unit Investigating
Modern-Day School Segregation
HNRS 4990
Honors Project
Fall 2020
Zoe Alberts
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Honors Project Proposal
Mathematics in a Social Justice World: A Series of Lesson Plans

Research Questions

Education in the United States is constantly changing in order to best serve the students. It is important for educators of each subject, language arts, social studies, science, and mathematics, to dive deep into the content. As opposed to focusing on the memorization of large amounts of seemingly unrelated facts, promoting “depth over breadth” can help students better understand the bigger concepts (Massell, 1994). Along with this deeper focus, the current educational system is incorporating more interdisciplinary curricula (Goodwin & Koirala, 2002). Making connections between two or more content areas can help students link in-school activities with real-world concepts (Massell, 1994). Connections between language arts and social studies have become much more evident, as well as mathematics and science and mathematics; however, the integration of mathematics and social studies is not as popular. How would this combination work in a classroom, specifically in a middle school setting? This project will investigate the importance of integrating social studies and social justice principles into a typical middle school mathematics curriculum. What research has already been conducted in order to support this combination? It is not only necessary to research the importance of this integration, but also what specific topics would translate best in this situation. In a middle school setting, what social justice concepts would reach all students as well as promote mathematical reasoning?

Literature Review

In the 1980s, mathematics education went through a major reform. Led by the National Council of Teachers of Mathematics (NCTM), mathematics shifted from “emphasizing the needs of the college-bound student toward a concern for the mathematical literacy of all students (Massell, 1994, p. 120).” Previous to this change, the United States was competing with the Soviet Union throughout the Cold War which urged Congress to create a future generation full of mathematicians and scientists (Massell, 1994). This approach was catered towards college-bound students specifically. However, when the NCTM stepped in, mathematical standards were then altered to apply to all students (Massell, 1994). Their underlying philosophy was rooted in the idea that students “more effectively learn mathematical reasoning and abstract concepts when tackling numerical, spatial, and data-related concepts in a real-life context rather than through the memorization of abstract formulas and theories (Massell, 1994, p. 121).” By specifically incorporating social studies and social justice principles in the mathematics classroom, it can give an answer to the question, “when am I ever going to use this (Johnson, 2011, p. 175)?” For this project, “social justice” will be defined as “justice that is attainable in all facets of society (Johnson, 2011, p. 175).” While the majority was on the same page for the educational reform, there were more questions that still needed to be asked.
The cross between mathematics and social justice principles was rather supported by the masses; however, the questions “how” and “when” the content was going to be taught were heavily debated (Massell, 1994). Some believed in a teacher-centered classroom where students would be expected to recite and memorize the mathematical rules, while others believed in a more student-centered classroom where the students would engage in “constructing and solving problems to learn mathematical reasoning (Massell, 1994, p. 122).” The NCTM decided that the later would be more effective and ruled that “thinking mathematically involves looking for connections, and making connections builds mathematical understanding (Goodwin & Koirala, 2002, p. 86).” The big question that is still very true today is, how are educators supposed to be able to have enough time to properly make those connections while statewide and local tests are so heavily emphasized?

When implementing social justice principles into a mathematics lesson, it is important to pick an issue that relates to the students interests (Goodwin & Koirala, 2002). This way it will not only motivate the students to get more involved in the information, but also understand why the underlying mathematical concept is important and can help shape their view of the world (Goodwin & Koirala, 2002). The mathematical concepts being taught are not changing, instead it is the delivery that is being manipulated. As opposed to drill and practice exercises, “social justice activities help students appreciate the connection of mathematics to their lives (Goodwin & Koirala, 2002, p. 90).” Creating these activities for a mathematics classroom can not only help prepare students for standardized testing, but also help them make sense of the world around them mathematically.

**Proposed “Activity”**

This project will be a collection of original mathematics lesson plans with corresponding social justice activities for middle school students. Taking the research described in the literature review, these lesson plans will connect a mathematical concept(s) with various social justice principles so that middle school students would be able to better appreciate the connection of mathematics to their individual lives. The collection of mathematics lesson plans will span over one year of middle school. The lesson plans will follow the Bowling Green State University Middle Childhood Education lesson plan template in order to create consistency. In order to determine which social justice principles should be incorporated into these lessons, more extensive research will be done, specifically looking into the Ohio standards for social studies to see what middle childhood concepts could be pulled.

**Methodology & Expected Results and/or Potential Conclusions**

In order to create these deeper level mathematics/social justice lesson plans, they need to be backed by research. While an initial Internet search may be helpful to find a starting point, it is important that the pedagogical research backing these plans are from peer reviewed, scholarly articles. This research does not only include the specifics on the importance of interdisciplinary
curricula, but also on the best teaching practices as well. During the research process that initially took place for the HNRS 4980 course, there was not any specific restriction on the date of publication for the research. It was helpful to be able to read about the foundation of the mathematics education reform led by NCTM. Moving forward, since the majority of the research will pertain to more specifics on mathematical concepts, social justice issues, and best teaching practices, it would be beneficial for all research to be published within the last ten years. Once this research has been collected, analyzed, and sorted through, it all needs to be organized into specific lesson plans. The mathematical concepts will come from the state of Ohio's mathematics state standards for a middle level grade. These concepts will then be connected with a social justice activity. The social justice activity will stem from the research as well as the state of Ohio’s social studies state standards for a middle level grade. At the end of HNRS 4990, this project will consist of a collection of mathematics lesson plans with corresponding social justice activities. These lesson plans will be backed by research.
References


Koirala, H. P., & Goodwin, P. M. (2002). Middle-Level Students Learn Mathematics Using the U.S. Map. Mathematics Teaching in the Middle School, 8(02), 86–90.

Annotated Bibliography

Mathematics in a Social Justice World: A Series of Lesson Plans


Johnson focuses on the importance of implementing social justice principles in a mathematics classroom as well as defines social justice in general terms. Article touches on the frustrations educators may have trying to create these activities and changing them every year. Johnson gives an example activity titled the “South Central” activity which has students using estimation, rations, area, circles, and problem solving in order to look at the amount of movie theaters, community centers, and liquor stores in various towns on a map. Highlights the importance of these subjects crossing with the outcome being students having the ability to them see the connection between their life and the mathematical concepts learned in school.


Koirala and Goodwin use the majority of the article going into detail about a five day activity used with fifth and sixth grade students combining the mathematical concepts estimation, rounding, decimals, fractions, ratios, percentages, and graphing, with maps and geography. Touched on how Alaska is drawn to a different scale compared to the rest of the states because if they were all to use the same scale, the map would look completely different. It was important to note that Koirala and Goodwin commented that it was encouraged for students to not worry about the correct answer as much and to focus more on exploration and mathematical reasoning. After the five day lesson, it was concluded that the middle school students all enjoyed the activity and could understand the link between mathematics and the real world.


Massell goes into deep detail on comparing the mathematical education reform led by the National Council of Teachers of Mathematics (NCTM) with the social studies reform led by the state of California during the 1980s. Mathematics education went from memorization and creating college-bound mathematicians and scientists, to a student-centered classroom that allows all students to be able to engage in problem solving. Social studies education went from “expanding environments,” meaning starting
with what a student is familiar with and moving out to the unfamiliar (which would allow
next to no time for history), to “here, there, and then,” design, meaning starting with a
students immediate world, expanding to new places, and then going back in time to create
connections. Both the NCTM and the state of California “pushed the envelope”
successfully and created new standards for us to follow.

Exploration Integrating Mathematics and Social Studies. *The Mathematics Teacher*,
*94*(08), 660–671.

Wilkins and Hicks explains the importance of integrating mathematics and social studies
through an activity that will help students learn about the different map projections. The
way a map looks has an enormous influence on the way we view the world, however, each
map projection is a bit different. Trying to translate the Earth (a sphere) onto a flat piece of
paper means that there will never be a flat map that is completely accurate. While this
article does not give much information over the importance of combining the two subjects,
it uses the activity with the different map projections as an example to show the
connection between mathematics and social studies.
Statistical Reasoning Unit Plan Investigating Modern-Day School Segregation
Honors Project

General Information

Name: Zoe Alberts
School: Toledo School for the Arts
Grade: 7th

Approximate number of minutes per lesson/period: 55 minutes

General topic summary:

It is no secret that our daily lives are full of mathematical concepts and skills. Taking it one step further, many social justice issues are rooted in mathematical research and data. This idea should be the center of the mathematics classroom. According to Crystal Watson, a math teacher from Cincinnati City Schools District, we need to incorporate these social issues into the classroom because the “lack of opportunity to explore, learn, and master mathematical concepts keep out students, families, and communities oppressed (Watson, 2020)”. This is a fully functional, ready to use, digital mini unit over 7th grade statistical reasoning using the GAISE Model to investigate the topic of modern-day school segregation, fueled by the essential question, “do all students in America receive the same quality of education?” The mathematical standard motivating this unit is 7.SP.2 “broaden statistical reasoning by using the GAISE Model.” The four steps of statistical reasoning are (1) formulate a question, (2) collect data, (3) analyze the data, and (4) interpret results. The summative assessment for the unit asks the students to follow the 4 steps of statistical reasoning while investigating data from the ProPublica “Miseducation” database to research modern-day school segregation. Each lesson requires the students to work on one of the 4 steps through a variety of whole class, small group, and independent work.
### General Outline of the Unit

<table>
<thead>
<tr>
<th>DAY</th>
<th>STANDARDS</th>
<th>OBJECTIVES</th>
<th>LESSON DESCRIPTION</th>
<th>ASSESSMENTS</th>
</tr>
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</table>
| 1   | **7.SP.2** Broaden statistical reasoning by using the GAISE model:  
  **a. Formulate Questions:** Recognize and formulate a statistical question as one that anticipates variability and can be answered with quantitative data. For example, “How do the heights of seventh graders compare to the heights of eighth graders?” (GAISE Model, step 1)  
  **SMP 1:** Make sense of problems and persevere in solving them.  
  **SMP 3:** Construct viable arguments and critique the reasoning of others.  
  **SMP 6:** Attend to precision. | Students will be able to distinguish a statistical question from a non-statistical question.  
Students will be able to create a comparative statistical question. | **Engage**  
- “If America Were a Village” problem of the day.  
**Body**  
- What is statistics?  
- Learn difference between population, census, and sample.  
- Step 1: Formulate Questions- practice this skill with an activity.  
- Tie in weekly reading over Brown V. Board.  
  What statistics can we pull from this reading?  
  What statistical questions can we create from this reading?  
**Closure**  
- Exit ticket identifying statistical questions. | - Formative Assessment: as the students share their answers and thoughts during the problem of the day.  
- Formative Assessment: Observation of students working on formulating questions activity.  
- Formative Assessment: exit ticket identifying statistical questions. |
| 2   | **7.SP.2** Broaden statistical reasoning by using the GAISE model: | Students will be able to design a collection method to answer a | **Engage**  
- “If America Were a Village” problem of the day | - Formative Assessment: problem of the day |
b. Collect Data: Design and use a plan to collect appropriate data to answer a statistical question. (GAISE Model, step 2)

SMP 2: Reason abstractly and quantitatively.

SMP 3: Construct viable arguments and critique the reasoning of others.

Comparative statistical question.

Students will be able to collect accurate statistical data to answer a comparative statistical question.

day (review statistical questions)

Body
- Watch “How Black High School Students Are Hurt by Modern-Day Segregation” video.
- What do you notice, what do you wonder?
- Refer back to weekly reading statistics, how are these statistics, what do you notice, what do you wonder?
- Categorical vs numerical data.
- There are many ways to accurately collect statistical data, sample surveys, comparative experiments, and research.
- Direct to ProPublica website for data collection activity.

Closure
- Sketchbook journal entry over 3 things the student learned, 2 things they found interesting/upsetting.

reviewing the previous lessons topic.

- Formative Assessment: observation of students working on data collection activity.

- Formative Assessment: sketchbook journal entry.
| 3 | **7.SP.2** Broaden statistical reasoning by using the GAISE model:  
**Analyze Data:** Select appropriate graphical methods and numerical measures to analyze data by displaying variability within a group, comparing individual to individual, and comparing individual to group. (GAISE Model, step 3)  
**SMP 3:** Construct viable arguments and critique the reasoning of others.  
**SMP 4:** Model with mathematics.  
**SMP 6:** Attend to precision. | Students will be able to use properties of distributions (center, spread, shape) as tools to analyze data. Students will be able to summarize numerical data sets using created histograms. Students will be able to compare data on histograms individual to individual as well as individual to group. | **Engage**  
- Get in groups to learn about properties of distributions.  
**Body**  
- Learn and practice with center, spread, and shape via a gallery walk.  
- Learn what a histogram is and how to create one.  
- Create histograms using data from ProPublica.  
- Compare data from ProPublica using histograms.  
**Closure**  
- Class review via Zoom whiteboard, “brain dump.” | - Formative Assessment: gallery walk to share the key vocabulary terms of the properties of distributions.  
- Formative Assessment: observation of students working on ProPublica histogram activity.  
- Formative Assessment: class “brain dump” closure. |
|---|---|---|---|
| 4 | **7.SP.2** Broaden statistical reasoning by using the GAISE model:  
**Analyze Data:** Select appropriate graphical methods and numerical measures to analyze data by displaying | Students will be able to summarize numerical data sets using created boxplots and five number summaries. | **Engage**  
- Histogram problem of the day.  
**Body** | - Formative Assessment: histogram review problem of the day. |
variability within a group, comparing individual to individual, and comparing individual to group. (GAISE Model, step 3)

**SMP 3:** Construct viable arguments and critique the reasoning of others.

**SMP 4:** Model with mathematics.

**SMP 6:** Attend to precision.

Students will be able to compare data on boxplots individual to individual as well as individual to group.

- Learn what a boxplot and five number summary is and how to create one.
- Create boxplots and five number summaries using ProPublica.
- Compare data from ProPublica using boxplots and five number summaries.

**Closure**
- Class compare and contrast histograms and boxplots.

- Formative Assessment: observation of students working on ProPublica boxplot and five number summary activity.
- Formative Assessment: class compare and contrast closure.

| 5 | 7.SP.2 Broaden statistical reasoning by using the GAISE model: 
**d. Interpret Results:** Draw logical conclusions and make generalizations from the data based on the original question. (GAISE Model, step 4) |
|---|---|
| 7.SP.2 | Engage
- Boxplot and five number summary problem of the day. |
| 1 | Body
- Class works together to draw conclusions and make generalizations over a set of data. 
- Students work on a mini project that requires them to use all 4 steps of the GAISE Model to gather statistical data over a |

- Formative Assessment: observation of students working on mini project.
| 6 | **7.SP.2** Broaden statistical reasoning by using the GAISE model:  
   **d. Interpret Results:** Draw logical conclusions and make generalizations from the data based on the original question. (GAISE Model, step 4)  
   **SMP 2:** Reason abstractly and quantitatively.  
   **SMP 3:** Construct viable arguments and critique the reasoning of others.  
   **SMP 8:** Look for and express regularity in repeated reasoning. | Students will be able to draw logical conclusions from the data based on the original statistical question.  
Students will be able to make generalizations from the data based on the original statistical question. | **Engage**  
- Finish up projects  
**Body**  
- In groups, share your results from the mini project.  
- What overall themes have we found?  
- Watch “How These Black Students Fought Modern-Day Segregation” video.  
- What did you notice, what did you wonder?  
- What can we DO? How can we be civically engaged and create change besides voting?  
**Closure**  
- Articulate and Reflect. | - Formative Assessment: observation of students discussing in groups and sharing with the whole class.  
- Formative Assessment: articulate and reflect questions.  
- Summative Assessment: mini project. |
| -What are the consequences of NOT knowing about modern-day school segregation? |
| -What are the consequences of not knowing the math in a real world context? |
| -Do all children in America receive the same quality of education? |
Bibliography

**Sources Used Throughout Unit**


**Lesson One Resources**


**Lesson Two Resources**

NowThis News. (2019, January 23). *How Black High School Students Are Hurt by Modern-Day Segregation | NowThis* [Video]. YouTube. https://www.youtube.com/watch?v=od3s3lZWbWM&t=2s
Lesson Three Resources

https://www.youtube.com/watch?v=RWP2q4wyRds

Lesson Four Resources

https://www.onlinemathlearning.com/box-plot.html

Chang, A. (2018, March 5). *The data proves that school segregation is getting worse.* Vox.  

https://www.youtube.com/watch?v=tpToLyZibKM

Lesson Five Resources

Project day

Lesson Six Resources

NowThis News. (2019, May 14). *How These Black Students Fought Modern-Day Segregation* | NowThis [Video]. YouTube.  
https://www.youtube.com/watch?v=o8sr8cNsx
### Candidate Name: Zoe Alberts

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<th><strong>Date:</strong></th>
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<tr>
<th><strong>Central Focus/Concept, Essential Question, or Summary/Rational:</strong></th>
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</table>

**Essential Question:** Do all children in America receive the same quality of education? Support your answer with mathematical reasoning.

**Summary:** In order to cement the importance of mathematics and just how empowering it is in our daily lives, this unit has students review and build upon their previous understanding of statistical reasoning and uses these mathematical tools to begin to unpack modern-day school segregation and its negative lasting effects. In lesson 1 of 6, students are reintroduced to statistics and the 4 steps of statistical reasoning. Lesson 1 focuses on formulating questions. The lesson starts off with a statistical problem of the day from the book, “If America Were a Village” by David J. Smith to get the students thinking. It then leads into a video to jog students’ memories of what exactly statistics are and how they are related to the world around us. The students will participate in a brief Frayer Model vocabulary activity to learn the terms population, census, and sample. Afterwards, the class will work together to learn how to formulate questions, as well as taking it a step further on formulating COMPARATIVE statistical questions. Towards the end of the lesson, the teacher will refer to the weekly reading that was over Brown v. Board for the students to learn the basics of the case, as well as pull some statistical data from the reading to directly relate it to the mathematical content. The class will wrap up with a simple Google Form exit ticket to get students to distinguish which questions are statistical questions as well as to create one comparative statistical question.

<table>
<thead>
<tr>
<th><strong>Common Core or Ohio’s New Learning Standards/Practices Addressed in Lesson:</strong></th>
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**7.SP.2** Broaden statistical reasoning by using the GAISE model:

**a. Formulate Questions:** Recognize and formulate a statistical question as one that anticipates variability and can be answered with quantitative data. For example, “How do the heights of seventh graders compare to the heights of eighth graders?” (GAISE Model, step 1)

**SMP 1:** Make sense of problems and persevere in solving them.

**SMP 3:** Construct viable arguments and critique the reasoning of others.

**SMP 6:** Attend to precision.
### Learning Objectives/Targets & Assessments:

<table>
<thead>
<tr>
<th>Objective</th>
<th>Assessment/Evaluation</th>
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<tbody>
<tr>
<td>Students will be able to distinguish a statistical question from a non-statistical question.</td>
<td>In class activity/ exit ticket</td>
</tr>
<tr>
<td>Students will be able to create a comparative statistical question.</td>
<td>In class activity</td>
</tr>
</tbody>
</table>

### Academic Language:

<table>
<thead>
<tr>
<th>Language function for which students will be responsible: (Should match verb/s in lesson objectives.)</th>
<th>Task requiring this function: (Task should match language function.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distinguish</td>
<td>In class activity/ exit ticket</td>
</tr>
<tr>
<td>Create</td>
<td>In class activity</td>
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### Academic Language (continued):

<table>
<thead>
<tr>
<th>Vocabulary/Symbols</th>
<th>Instructional Strategy Used to Support Language Mastery</th>
</tr>
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<tbody>
<tr>
<td>Statistics</td>
<td>Video, vocabulary term from weekly vocabulary assignment in sketchbook</td>
</tr>
<tr>
<td>Comparative statistical question</td>
<td>Direct definition discussed in class, vocabulary term from weekly vocabulary assignment in sketchbook</td>
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<tr>
<td>Population</td>
<td>Frayer Model, vocabulary term from weekly vocabulary assignment in sketchbook</td>
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<tr>
<td>Census</td>
<td>Frayer Model, vocabulary term from weekly vocabulary assignment in sketchbook</td>
</tr>
<tr>
<td>Sample</td>
<td>Frayer Model, vocabulary term from weekly vocabulary assignment in sketchbook</td>
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### Differentiated Instructional Strategies/Universal Design for Learning:

<table>
<thead>
<tr>
<th>Strategy</th>
<th>For which groups or individuals?</th>
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</thead>
<tbody>
<tr>
<td>Group Discussion</td>
<td>Interpersonal learners</td>
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</table>
Lesson Plan Template

**Video**
- Visual learners, Auditory learners, Struggling readers

**Vocabulary Frayer Model**
- Visual learners, Struggling readers

**Lesson Materials/Resources:**
- Zoom link - online learning
- Student iPad
- Schoology access
- Weekly reading - linked in lesson 1 materials
- List of vocabulary terms - linked in lesson 1 materials
- Frayer Model - linked in lesson 1 materials
- Frayer Model Reading Source - linked in lesson 1 materials
- Video, “What is Statistics” - linked in lesson 1 presentation and linked here [https://www.youtube.com/watch?reload=9&v=7hzDFkJcROE](https://www.youtube.com/watch?reload=9&v=7hzDFkJcROE)
- Formulating statistical questions activity - linked in lesson 1 presentation
- Google Form exit ticket - linked in lesson 1 materials
- Lesson 1 presentation - linked in lesson 1 materials

**Lesson Procedures**

**I. Motivation/Readiness/Engagement:**

<table>
<thead>
<tr>
<th>Allotted Time: 10-12 mins</th>
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- As students are logging into the Zoom call, have the Problem of the Day (PoD) displayed.
  - PoD can be found in the lesson 1 presentation.
- Once it is 8:05 AM (the official start of class), remind the students of the daily expectations of online learning.
  - Write down the PoD in your sketchbook and show your work.
  - Turn your video camera on to get attendance points - if you cannot show your video private message with teacher.
- Set timer to 3 minutes for students to independently work on this problem.
  - During this time, take attendance.
- Once the 3 minutes is up, ask if anyone needs any more independent time.
  - If needed, give an additional 1-2 minutes.
- Send students into **breakout rooms** (group discussion) to discuss the PoD and their problem solving strategies for 2-3 minutes.
  - During this time, teacher will pop in and out of breakout rooms to aid students.
- Once everyone comes back to the main room, review the PoD.
  - First, have all students use their annotation tools and write either the answer they got anonymously, or put a question mark if they were confused.
II. **Body of Lesson: Explore/Explain/Extend**  

**Allotted Time:** 35-40 mins  

- Teacher shares screen and computer sound to **share video** “What is Statistics.”  
  - Students are told the term “statistics” is a part of their weekly vocabulary assignment. While watching the video, the students should use the time to write in the vocabulary section of their sketchbooks the term “statistics” as well as what it is.  
- After the video, go back to the PoD in the lesson 1 presentation.  
  - This question asked you to analyze a statistic. How is this PoD a statistic?  
- Transition: before we can review and expand our knowledge on statistical reasoning from the previous year, there are some vocabulary words we need to learn first. **Frayer Model activity.** (10 minutes of worktime given in class)  
  - Students will use the Frayer Model Reading Source to complete the three Frayer Models. Students have the choice to either, complete these virtually and submit on Schoology (but then have to write down the vocabulary terms in their sketchbook for the weekly vocabulary), OR they can draw out the Frayer Models in their sketchbook for their weekly vocabulary and turn in a picture of this activity.  
  - Remind students how to fill out a Frayer Model.  
  - After the 10 minutes, whatever the students had not yet completed will be homework to finish outside of class.  
- Transition: The first of 4 steps of statistical reasoning is to formulate a question.  
  - **Who remembers what a statistical question is?** Discuss what students may remember from the previous year. Using the lesson 1 presentation, build upon that knowledge to talk about comparative statistical questions (have students write down this term for the weekly vocabulary assignment in their sketchbook).  
  - In class activity of formulating questions done as a whole group, linked in lesson 1 presentation.  
  - **If we refer to our weekly reading, what statistics can we pull from it? What statistical questions can we create from this reading? What is this reading about?**  
    - Portions of the weekly reading will be posted in the presentation for students who have not yet completed it. Encourage students to complete the reading by Wednesdays class to get a better understand of what we are going to be talking about.
III. Lesson Closure:

- Share Google Form exit ticket with students to complete.
  - Google Form asks students to distinguish which questions are statistical questions as well as create a COMPARATIVE statistical question.
  - Once the students submit their Google Form, they can check out with teacher to confirm it has been submitted.
- Remind students to…
  - Complete Frayer Model activity if it was not completed in class.
  - Complete Weekly Reading for next class.

IV. Enrichment/Extension:

- If time allows, have students break into small groups to formulate their own comparative statistical questions over various topics. Have the students come back and share their favorite questions that were created.
Candidate Name: Zoe Alberts
Date: Wednesday
Subject: Math
Grade: 7th
Unit/Lesson Topic: Statistics and Probability, GAISE Model/ Collect Data
Day # 2 of 6
CMT’s initials indicating approval of plans: # of Students: 20

Central Focus/Concept, Essential Question, or Summary/Rational:

**Essential Question:** Do all children in America receive the same quality of education? Support your answer with mathematical reasoning.

**Summary:** In order to cement the importance of mathematics and just how empowering it is in our daily lives, this unit has students review and build upon their previous understanding of statistical reasoning and uses these mathematical tools to begin to unpack modern-day school segregation and its negative lasting effects. Lesson 2 focuses on designing a plan to collect data as well as actually collecting the data needed to answer a statistical, specifically a comparative statistical question. The class starts off with a problem of the day (PoD) using facts from the book, “If America Were a Village” by David J. Smith to get the students thinking. This question specifically reviews statistical questions. After the PoD, the students will watch a case study type of video about a group of students who worked to bring light to the fact that they were attending a racially segregated school. This video should upset the students in a way to spark their engagement and make them want to take action. We will debrief the video by asking questions such as what did you notice? What did you wonder? How do statistics play into this? How can we help shed light on this topic with math? That will lead us into a mini lesson over 2 new vocabulary words categorical data and numerical data, as well as different ways mathematicians can collect data. Students will then work on a data collecting activity using the ProPublica “Miseducation” database. Our closing activity will be a good time for students to reflect on the information that they collected today using their sketchbooks.

Common Core or Ohio’s New Learning Standards/Practices Addressed in Lesson:

7.SP.2 Broaden statistical reasoning by using the GAISE model:

b. Collect Data: Design and use a plan to collect appropriate data to answer a statistical question. (GAISE Model, step 2)

SMP 2: Reason abstractly and quantitatively.

SMP 3: Construct viable arguments and critique the reasoning of others.
### Learning Objectives/Targets & Assessments:

<table>
<thead>
<tr>
<th>Objective</th>
<th>Assessment/Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students will be able to design a collection method to answer a comparative statistical question.</td>
<td>In class activity</td>
</tr>
<tr>
<td>Students will be able to collect accurate statistical data to answer a comparative statistical question.</td>
<td>In class activity</td>
</tr>
</tbody>
</table>

### Academic Language:

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<tr>
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<tbody>
<tr>
<td>Design</td>
<td>In class activity</td>
</tr>
<tr>
<td>Collect</td>
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### Academic Language (continued):

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<th>Instructional Strategy Used to Support Language Mastery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Categorical Data</td>
<td>In class discussion/ vocabulary term from weekly vocabulary assignment in sketchbook</td>
</tr>
<tr>
<td>Numerical Data</td>
<td>In class discussion/ vocabulary term from weekly vocabulary assignment in sketchbook</td>
</tr>
</tbody>
</table>

### Differentiated Instructional Strategies/Universal Design for Learning:

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<th>Strategy</th>
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</tr>
<tr>
<td>Journal Entry</td>
<td>Intrapersonal learners</td>
</tr>
</tbody>
</table>
Lesson Materials/Resources:

- Zoom link - online learning
- Student iPad
- Schoology access
- Weekly reading - linked in lesson 2 materials
- List of vocabulary terms - linked in lesson 2 materials
- Lesson 2 presentation - linked in lesson 2 materials
- Video “How Black High School Students Are Hurt by Modern-Day Segregation” linked in lesson 2 presentation and here: https://www.youtube.com/watch?v=od3s3lZWbWM&t=2s
- Link out to ProPublica for a brief tutorial - linked in lesson 2 presentation
- Collecting Data activity - linked in lesson 2 materials

Lesson Procedures

V. Motivation/Readiness/Engagement: Allotted Time: 10-12 mins

- As students are logging into the Zoom call, have the Problem of the Day (PoD) displayed.
  - PoD can be found in the lesson 2 presentation.
- Once it is 8:05 AM (the official start of class), remind the students of the daily expectations of online learning.
  - Write down the PoD in your sketchbook and show your work.
  - Turn your video camera on to get attendance points - if you cannot show your video private message with teacher.
- Set timer to 3 minutes for students to independently work on this problem.
  - During this time, take attendance.
- Once the 3 minutes are up, ask if anyone needs any more independent time.
  - If needed, give an additional 1-2 minutes.
- Send students into breakout rooms (group discussion) to discuss the PoD and their problem solving strategies for 2-3 minutes.
  - During this time, teacher will pop in and out of breakout rooms to aid students.
- Once everyone comes back to the main room, review the PoD.
  - First, have all students use their annotation tools and write either the answer they got anonymously, or put a question mark if they were confused.
- Once teacher gathers data on where the students are with the question, teacher will erase board and then ask for a few students to share their work. Teacher will review student work with class.

VI. Body of Lesson: Explore/Explain/Extend Allotted Time: 35-40 mins

- Share brief history with students. Remind students of Brown v. Board of Education from the weekly reading. What do they remember, have they talked about this case in
other classes, what did the case do? Then ask, do you think this type of segregation is still happening today?

- Teacher shares screen and computer sound to share video “How Black High School Students Are Hurt by Modern-Day Segregation.”
  - During the video, students should jot down things that they notice and questions that they may have.
  - After the video, have a class discussion. What did you notice? What did you wonder? How can statistics play a role in this?
  - Reference back to the Weekly Reading and the statistics we pulled from last class. How do these statistics support what we just watched? How does the math help emphasize the tragedy? Can we collect our own data on this topic?

- Mini lesson over new material
  - Categorical vs numerical data (vocabulary words from the weekly vocabulary assignment. Encourage students to write these down in their vocabulary section of their sketchbooks)
  - Many different ways to accurately collect statistical data, sample surveys, comparative experiments, and research.

- In class data collection activity
  - While teaching is sharing screen, navigate to the ProPublica “Miseducation” database linked in the lesson 2 presentation. Give students a brief tutorial on how to use the website to collect their own data and what the different buttons mean.
  - Students are given 20 minutes to complete the data collection activity that can be found in the lesson 2 materials. Students will be given the option to work in groups or work alone. The students working in groups will not be able to pick their own groups, but can be sent out into breakout rooms to work together. This activity gets the students familiar with using the ProPublica “Miseducation” database as well as teaches the students how to collect researched data.
  - Teacher will be available to help students either (a) through the private chat, (b) in a breakout room, or (c) unmuting and sharing with the entire class.

VII. Lesson Closure: Allotted Time: 5-7 mins

- With about 5 minutes remaining of class, ask students to return to the Zoom call to get the closing activity.
  - If students did not finish the entire activity, that is okay. Request that no matter how much the students got done, they turn it in to the Schoology drop box so the teacher can see what the students may have struggled with and which students may not have been paying attention. Encourage students to complete the activity as homework.

- Sketchbook journal entry closure
As a closing activity, have the students open up their sketchbooks and write down 3 things they have learned today (either in class, from the video, or from the ProPublica database), 2 things they found interesting/upsetting, and 1 question they still have.

Students will be instructed to include this in the pictures they take and submit of the notes and vocabulary the write in their sketchbooks for their weekly sketchbook grade.

- As the students finish up, remind them...
  - Read the Weekly Reading if they have not yet already.
  - Add to their Weekly Vocabulary list in their sketchbook if they missed the opportunity in class.
  - Encourage students to complete what they may have missed on the Data Collection activity.

VIII. Enrichment/Extension:

- If time allows, go over the Data Collection activity as a whole class to make sure all students are on the same page.
**Central Focus/Concept, Essential Question, or Summary/Rational:**

**Essential Question:** Do all children in America receive the same quality of education? Support your answer with mathematical reasoning.

**Summary:** In order to cement the importance of mathematics and just how empowering it is in our daily lives, this unit has students review and build upon their previous understanding of statistical reasoning and uses these mathematical tools to begin to unpack modern-day school segregation and its negative lasting effects. Lesson 3 is the first day dedicated to analyzing the data using properties of distributions as well as comparing data using histograms. The lesson starts out without a Problem of the Day (PoD), but instead jumps right into the first activity. The students are split into three groups and each group is responsible to becoming experts on their one property of distribution. The students will then make a post as a group on a Padlet slide to allow the students to participate in a virtual gallery walk. Once the students come back together in the main group, at least one student from each group should share what they found. After the gallery walk, the students will watch a brief video over an introduction to histograms and how to create one. The class will than participate in an “I do, We do, You do” style of activity to help the students learn how to create histograms while also being able to dive back into the research done by ProPublica over modern-day school segregation. This activity helps the students be able to visually see how the data from Toledo City School District breaks down using the demographic data, number of students labeled gifted/talented, and number of out-of-school suspensions. This data uses math to show how all students may not be receiving the same type of education in one school district, let alone in the entire country (referring back to the EQ). The lesson ends with a “brain dump” where the students will annotate on an empty whiteboard all of the new information they learned throughout the week.

**Common Core or Ohio’s New Learning Standards/Practices Addressed in Lesson:**

- **7.SP.2** Broaden statistical reasoning by using the GAISE model:
  **Analyze Data:** Select appropriate graphical methods and numerical measures to analyze data by displaying variability within a group, comparing individual to individual, and comparing individual to group. (GAISE Model, step 3)

- **SMP 3:** Construct viable arguments and critique the reasoning of others.

- **SMP 4:** Model with mathematics.

- **SMP 6:** Attend to precision.
### Learning Objectives/Targets & Assessments:

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<tbody>
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<td>Students will be able to use properties of distributions (center, spread, shape) as tools to analyze data.</td>
<td>Gallery walk group activity</td>
</tr>
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<td>Students will be able to summarize numerical data sets using created histograms.</td>
<td>In class activity</td>
</tr>
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<td>Gallery walk group activity</td>
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</tr>
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<td>Gallery walk group activity</td>
</tr>
<tr>
<td>Shape</td>
<td>Gallery walk group activity</td>
</tr>
<tr>
<td>Spread</td>
<td>Gallery walk group activity</td>
</tr>
<tr>
<td>Histogram</td>
<td>In class activity</td>
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Lesson Materials/Resources:
- Zoom link- online learning
- Student iPad
- Schoology access
- Weekly reading- linked in lesson 3 materials
- List of vocabulary terms- linked in lesson 3 materials
- Lesson 3 presentation- linked in lesson 3 materials
- Gallery walk activity- linked in lesson 3 materials
- Gallery walk activity sources- linked in lesson 3 materials
- Histogram Tutorial video- linked in lesson 3 presentation and here https://www.youtube.com/watch?v=RWP2q4wyRds
- Histogram in class activity- linked in lesson 3 materials
- Histogram in class activity data source- linked in lesson 3 materials

Lesson Procedures

IX. Motivation/Readiness/Engagement: Allotted Time: 3-5 mins
- As students are logging into the Zoom call, have the lesson 3 presentation displayed on the screen.
- Once it is 8:05 AM (the official start of class), remind the students of the daily expectations of online learning.
  - Turn your video camera on to get attendance points- if you cannot show your video private message with teacher.
- Explain that there will be no PoD for the day. Instead we will work on the Gallery Walk activity to help learn the new vocabulary words for the lesson.
  - Direct the students to logging into Schoology and downloading the activity into Notability so they can easily edit and take notes.

X. Body of Lesson: Explore/Explain/Extend Allotted Time: 40-45 mins
- Gallery Walk Activity
Students will be sent out into breakout rooms to complete the activity. While in these rooms, the students are expected to learn what their assigned vocabulary term means (using the gallery walk activity sources) and create some sort of post on the shared Padlet wall for others to learn more about the term.

Students will get 7 minutes in these breakout rooms. During this time, teacher is popping in and out of the rooms offering support, answering questions, and taking attendance.

After the 7 minutes are up, the teacher will bring everyone back to the main group. The teacher will ask for at least 1 student from each group to share their vocabulary term and what they posted.

During this time, the students are encouraged to write these definitions down in their sketchbooks for the Weekly Vocabulary assignment.

- **Histogram Tutorial - Video**
  - Play times 0:00-4:20 on video “Introduction to Histograms.” This video defines histograms for the students as well as explains how to create one using a set of data.

- **Histogram Activity (I Do, We Do, You Do)**
  - Students are instructed to download the Histogram Activity and correlating data sheet into Notability and split screen their iPads to follow along with what the teacher is doing.
  - The teacher will walk the students through the first question on the activity to take the data in the chart and turn it into a histogram.
  - Take time to analyze the data, does is the shape of the graph, the center, and the spread.
  - The class will then create the counterpart histogram together and then answer the comparison questions.
  - The students will then be sent off either to work in groups or to work alone creating histograms for the remainder of class. If students have questions, they can ask for help via either (a) through the private chat, (b) in a breakout room, or (c) unmuting and sharing with the entire class.

**XI. Lesson Closure:**

- During the last 5 minutes of class, direct all of the students back to the Zoom call. As a closure, the teacher will share the whiteboard teacher on Zoom and ask students to “brain dump,” meaning annotate on the screen the things they have been learning all throughout the week.

- Remind the students to…
  - Submit their sketchbook photos to the Schoology drop box
  - Submit their vocabulary photos to the Schoology drop box
  - Finish the Histogram Activity if they did not finish in class
Complete the Weekly Reading if it had not yet been done.

XII. Enrichment/Extension:

- Spend time going through the ProPublica “Miseducation” database and begin collecting data that students can turn into histograms.
Candidate Name: Zoe Alberts
Date: Monday
Subject: Math
Grade: 7th
Unit/Lesson Topic: Statistics and Probability, GAISE Model/Analyze the Data
Day # 4 of 6
CMT’s initials indicating approval of plans: # of Students: 20

Central Focus/Concept, Essential Question, or Summary/Rational:

**Essential Question:** Do all children in America receive the same quality of education? Support your answer with mathematical reasoning.

**Summary:** In order to cement the importance of mathematics and just how empowering it is in our daily lives, this unit has students review and build upon their previous understanding of statistical reasoning and uses these mathematical tools to begin to unpack modern-day school segregation and its negative lasting effects. Lesson 4 is the second day dedicated to analyzing the data using properties’ of distributions as well as comparing data using boxplots and 5 number summaries. The lesson will start off with a Problem of the Day (PoD) to review histograms with the students. After the PoD, the teacher will go over guided notes in the form of a graphic organizer for students to learn how boxplots look as well what numbers are incorporated in a 5 number summary. In order to cement these new concepts in the students’ minds, as well as let the students hear it from a new source, the teacher will share a short tutorial over the topic. The class will participate in an “I do, We do, You do” activity using the same data sheet from the previous lesson (this way students can compare and contrast the different graphs illustrating the same information in the next lesson). This activity helps the students be able to visually see how the data from Toledo City School District breaks down using the demographic data, number of students labeled gifted/talented, and number of out-of-school suspensions. This data uses math to show how all students may not be receiving the same type of education in one school district, let alone in the entire country (referring back to the EQ). For the lesson closure, the students will be asked to reflect on the two graphs and share what they notice about them.

Common Core or Ohio’s New Learning Standards/Practices Addressed in Lesson:

7.SP.2 Broaden statistical reasoning by using the GAISE model:

**Analyze Data:** Select appropriate graphical methods and numerical measures to analyze data by displaying variability within a group, comparing individual to individual, and comparing individual to group. (GAISE Model, step 3)

**SMP 3:** Construct viable arguments and critique the reasoning of others.

**SMP 4:** Model with mathematics.

**SMP 6:** Attend to precision.
Learning Objectives/Targets & Assessments:

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<tbody>
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<td>Students will be able to summarize numerical data sets using created boxplots and five number summaries.</td>
<td>In class activity</td>
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</thead>
<tbody>
<tr>
<td>Boxplot</td>
<td>In class activity</td>
</tr>
<tr>
<td>Minimum</td>
<td>In class notes/ In class activity</td>
</tr>
<tr>
<td>Lower Quartile</td>
<td>In class notes/ In class activity</td>
</tr>
<tr>
<td>Median</td>
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</tr>
<tr>
<td>Upper Quartile</td>
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Lesson Plan Template

**Lesson Materials/Resources:**
- Zoom link- online learning
- Student iPad
- Schoology access
- Weekly reading- linked in lesson 4 materials
- List of vocabulary terms- linked in lesson 4 materials
- Lesson 4 presentation- linked in lesson 4 materials
- Boxplot and 5 Number Summary Guided Notes- linked in lesson 4 materials
- Boxplot Tutorial video- linked in lesson 4 presentation and here
  https://www.youtube.com/watch?v=tpToLyZibKM (only time 0:00-3:06)
- Boxplot in class activity- linked in lesson 4 materials
- Boxplot in class activity data source- linked in lesson 4 materials

**Lesson Procedures**

**XIII. Motivation/Readiness/Engagement:**

- As students are logging into the Zoom call, have the Problem of the Day (PoD) displayed.
  - PoD can be found in the lesson 4 presentation.
- Once it is 8:05 AM (the official start of class), remind the students of the daily expectations of online learning.
  - Write down the PoD in your sketchbook and show your work.
  - Turn your video camera on to get attendance points- if you cannot show your video private message with teacher.
- Set timer to 3 minutes for students to independently work on this problem.
  - During this time, take attendance.
- Once the 3 minutes are up, ask if anyone needs any more independent time.
  - If needed, give an additional 1-2 minutes.
- Send students into **breakout rooms** (**group discussion**) to discuss the PoD and their problem solving strategies for 2-3 minutes.
  - During this time, teacher will pop in and out of breakout rooms to aid students.
- Once everyone comes back to the main room, review the PoD.
  - First, have all students use their annotation tools and write either the answer they got anonymously, or put a question mark if they were confused.
• Once teacher gathers data on where the students are with the question, teacher will erase board and then ask for a few students to share their work. Teacher will review student work with class.

XIV. Body of Lesson: Explore/Explain/Extend  
Allotted Time: 35-40 Mins

• Direct students to download the “5 Number Summary and Boxplot Guided Notes” from Schoology and upload them into Notability.
  o Share with students that these guided notes will also cover the weekly vocabulary words. They can either draw out the guided notes in their sketchbook, or fill it out now in Notability and copy the definitions in their sketchbook later in the week.
  o Go over the notes using the lesson 4 presentation.

• Once notes are over, teacher will share screen and computer sound to share a video going over the vocabulary terms as well as how to create a boxplot in order to cement the idea in the students mind.

• After the video, the teacher will direct the students to download the “Boxplot Activity” and the “Boxplot Activity Data Sheet” from Schoology and download them into Notability. Students will be told to split screen their iPads to follow along with what the teacher is doing. (I do, We do, You do)
  o NOTE: The data sheet is the same data sheet. This is on purpose!
  o The teacher will walk the students through the first question on the activity to take the data in the chart and turn it into a boxplot.
  o Take time to analyze the data, does is the shape of the graph, the center, and the spread.
  o The class will then create the counterpart boxplot together and then answer the comparison questions.
  o The students will then be sent off either to work in groups or to work alone creating boxplot for the remainder of class. If students have questions, they can ask for help via either (a) through the private chat, (b) in a breakout room, or (c) unmuting and sharing with the entire class.

XV. Lesson Closure:  
Allotted Time: 5-7 Mins

• During the last 5 minutes of class, direct all of the students back to the Zoom call. As a closure, the teacher will facilitate a class discussion comparing and contrasting histograms and boxplots.
  o Based on this lesson and the previous lesson on histograms, ask students to share what they noticed about the two types of graphs.

• Remind students to…
  o Read the weekly reading- the students do not need to read the entire article, instead just skim and pull out some of the math concepts mentioned to bring back to class.
o Write down any missed weekly vocabulary in students sketchbook
o Finish the Boxplot Activity if they did not finish in class.

XVI. **Enrichment/Extension:**

- Spend time going through the ProPublica “Miseducation” database and begin collecting data that students can turn into histograms.
Candidate Name: Zoe Alberts

Date: Wednesday

Subject: Math

Grade: 7th

Unit/Lesson Topic: Statistics and Probability, GAISE Model/ Draw Conclusions

Day # 5 of 6

CMT’s initials indicating approval of plans: # of Students: 20

Central Focus/Concept, Essential Question, or Summary/Rational:

**Essential Question:** Do all children in America receive the same quality of education? Support your answer with mathematical reasoning.

**Summary:** In order to cement the importance of mathematics and just how empowering it is in our daily lives, this unit has students review and build upon their previous understanding of statistical reasoning and uses these mathematical tools to begin to unpack modern-day school segregation and its negative lasting effects. Lesson 5 focuses on drawing conclusions and making generalizations based on the data from steps 1-3 of the GAISE Model. Class starts off with a Problem of the Day (PoD) reviewing boxplots as well as properties of distribution. Building off of the PoD, students will participate in a think/pair/share activity that requires them to look at the data and graphs from the weekly reading and draw their own conclusions/make generalizations. These are skills that should have been taught in previous classes, but these are both very important skills to have. Data is surrounding our students in their everyday lives (on TV, all over their social media, on build boards and posters, etc.), meaning it is essential that they are able to understand what the data is telling them. After this activity, the students will be introduced to the Statistical Reasoning Mini Project which requires them to follow all 4 steps of Statistical Reasoning while investigating more data about modern-day school segregation in order to be able to answer the EQ. As a closure, the students will answer a Zoom poll asking where they are with the project by the end of the class period. Depending on the majority of the students answers, lesson 6 will either proceed as originally intended, or lesson 6 will turn into a work day, pushing the content to lesson 7.

Common Core or Ohio’s New Learning Standards/Practices Addressed in Lesson:

7.SP.2 Broaden statistical reasoning by using the GAISE model:

**d. Interpret Results:** Draw logical conclusions and make generalizations from the data based on the original question. (GAISE Model, step 4)

**SMP 2:** Reason abstractly and quantitatively.

**SMP 3:** Construct viable arguments and critique the reasoning of others.

**SMP 8:** Look for and express regularity in repeated reasoning.
**Learning Objectives/Targets & Assessments:**

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<tr>
<td>Students will be able to draw logical conclusions from the data based on the original statistical question.</td>
<td>Think/Pair/Share, Mini project (summative assessment)</td>
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<th>Task requiring this function: (Task should match language function.)</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Think/Pair/Share, Mini project</td>
</tr>
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<td>Make generalizations</td>
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</tr>
</tbody>
</table>

**Academic Language (continued):**

<table>
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<tr>
<th>Vocabulary/Symbols</th>
<th>Instructional Strategy Used to Support Language Mastery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generalizations</td>
<td>Think/Pair/Share</td>
</tr>
<tr>
<td>Conclusions</td>
<td>Think/Pair/Share</td>
</tr>
</tbody>
</table>

**Differentiated Instructional Strategies/Universal Design for Learning:**

<table>
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<th>Strategy</th>
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<tbody>
<tr>
<td>Group Discussion</td>
<td>Interpersonal learners</td>
</tr>
<tr>
<td>Think/Pair/Share</td>
<td>Intrapersonal learners, Interpersonal learners</td>
</tr>
</tbody>
</table>

**Lesson Materials/Resources:**

- Zoom link- online learning
- Student iPad
- Schoology access
- Weekly reading- linked in lesson 5 materials
- List of vocabulary terms- linked in lesson 5 materials
Lesson Procedures

XVII. Motivation/Readiness/Engagement:  
Allotted Time:  10-12 Mins

- As students are logging into the Zoom call, have the Problem of the Day (PoD) displayed.
  - PoD can be found in the lesson 5 presentation.
- Once it is 8:05 AM (the official start of class), remind the students of the daily expectations of online learning.
  - Write down the PoD in your sketchbook and show your work.
  - Turn your video camera on to get attendance points - if you cannot show your video private message with teacher.
- Set timer to 3 minutes for students to independently work on this problem.
  - During this time, take attendance.
- Once the 3 minutes are up, ask if anyone needs any more independent time.
  - If needed, give an additional 1-2 minutes.
- Send students into **breakout rooms (group discussion)** to discuss the PoD and their problem solving strategies for 2-3 minutes.
  - During this time, teacher will pop in and out of breakout rooms to aid students.
- Once everyone comes back to the main room, review the PoD.
  - First, have all students use their annotation tools and write either the answer they got anonymously, or put a question mark if they were confused.
- Once teacher gathers data on where the students are with the question, teacher will erase board and then ask for a few students to share their work. Teacher will review student work with class.

XVIII. Body of Lesson: Explore/Explain/Extend  
Allotted Time:  40-45 Mins

- **Think/Pair/Share Activity**
  - In order to review the skills of drawing conclusions and making generalizations, students will participate in a think/pair/share activity where they practice these skills using data and charts from the weekly reading.
  - Teacher will demonstrate these skills (encouraging using vocabulary from the unit such as center, spread, shape, median, minimum, and maximum) with the first graph so students know what is expected of them.
  - For the next set of data, students will be given 1-2 minutes to reflect independently before they go into breakout rooms with another student to share their thoughts for 2-3 minutes.
The class will then come back together and share whole group. Repeat this process for each set of data in the lesson 5 presentation.

- Students have now officially completed all 4 statistical reasoning steps! Review the 4 steps with the students using the lesson 5 presentation.
- Introduce the mini project.
  - For the rest of the class period as well as for the first chunk of the next lesson (and more if necessary, be flexible) students will be working with partners or by themselves to complete the summative mini project assessment. This assessment requires the students to participate in the statistical reasoning process while continuing their investigation into modern-day school segregation to answer the EQ.
  - Direct students to download “Statistical Reasoning Mini Project” off of Schoology and upload it into Notability. Students are also encouraged to download “Statistical Reasoning Mini Project Example Assessment” so they can view an example to aid their thinking.
  - Introduce mini-project with students as well as what the example looks like so they have a structure to base their project off of. Share with students they will have the rest of the class period to work on this and ask questions. They will also have a portion of Lesson 6 to finish it up as well.
  - The students will then be sent off either to work with partners or to work alone for the remainder of class. If students have questions, they can ask for help via either (a) through the private chat, (b) in a breakout room, or (c) unmuting and sharing with the entire class.

XIX. Lesson Closure:  Allotted Time:  1-3 Mins

- At 8:58 AM, direct students back to the Zoom screen for the Zoom poll as closure.
  - Project the Zoom poll asking students to indicate where they currently are with the project (options include, just about done, halfway, and not close).
  - Use this poll to base lesson 6 off of. If the majority of students still need a lot of time to complete this mini project, reshape lesson 6 to give class time needed and then create a lesson 7 where students share their projects and we reflect on conclusions as a whole group as well as what we can do to help.
- Remind students...
  - Complete the weekly reading if they have not yet already.
  - Get caught up with weekly vocabulary terms.

XX. Enrichment/Extension:

- More time for students to work on mini project.
Candidate Name: Zoe Alberts

Date: Friday

Subject: Math

Grade: 7th

Unit/Lesson Topic: Statistics and Probability, GAISE Model/ Draw Conclusions

Day # 6 of 6

CMT’s initials indicating approval of plans: # of Students: 20

Central Focus/Concept, Essential Question, or Summary/Rational:

**Essential Question:** Do all children in America receive the same quality of education? Support your answer with mathematical reasoning.

**Summary:** In order to cement the importance of mathematics and just how empowering it is in our daily lives, this unit has students review and build upon their previous understanding of statistical reasoning and uses these mathematical tools to begin to unpack modern-day school segregation and its negative lasting effects. Lesson 6 focuses on drawing conclusions and making generalizations based on the data from steps 1-3 of the GAISE Model. Taking it a step further than lesson 5, this lesson gets students looking at the big picture, what does ALL of this data tell us in relation to our EQ? As soon as students log in for class, they are set to begin working on where they left off with their projects. If it appears as though students need more time, this class period will become dedicated to work time, pushing the presentations and reflection discussion to lesson 7. If students are putting the finishing touches on their projects and are ready to present, they will follow this lesson plan. Groups and individuals will share their projects and graphs, sharing with the class the generalization and conclusion they made. This will lead into a whole class discussion on overall themes we saw with the data. Teacher will then share the part two video, (the first part of the video series was played during lesson 2) to show what students did when they decided to act on their segregated school district. This video is meant to inspire the students, to show them that anyone, regardless of age, can become empowered and can make a difference. This will lead into a conversation on HOW students can make a difference in their communities (besides voting). The conversation will end with an “articulate and reflect” period. This is when the students and class will be able to reflect on the EQ, as well as questions like “what are the consequences of NOT knowing about modern-day school segregation,” and “what are the consequences of not knowing the math in a real world context?”

Common Core or Ohio's New Learning Standards/Practices Addressed in Lesson:

- **7.SP.2** Broaden statistical reasoning by using the GAISE model:
  - **d. Interpret Results:** Draw logical conclusions and make generalizations from the data based on the original question. (GAISE Model, step 4)

- **SMP 2:** Reason abstractly and quantitatively.

- **SMP 3:** Construct viable arguments and critique the reasoning of others.
SMP 8: Look for and express regularity in repeated reasoning.

### Learning Objectives/Targets & Assessments:

<table>
<thead>
<tr>
<th>Objective</th>
<th>Assessment/Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students will be able to draw logical conclusions from the data based on the original statistical question.</td>
<td>Mini Project (Summative Assessment)</td>
</tr>
<tr>
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<tbody>
<tr>
<td>No new vocabulary</td>
<td>Present mini projects, building on previous vocabulary</td>
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### Differentiated Instructional Strategies/Universal Design for Learning:

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</tr>
<tr>
<td>Video</td>
<td>Visual learners, Auditory learners, Struggling readers</td>
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### Lesson Materials/Resources:

- Zoom link- online learning
- Student iPad
- Schoology access
- Weekly reading- linked in lesson 6 materials
Lesson Plan Template

- List of vocabulary terms- linked in lesson 6 materials
- Lesson 6 presentation- linked in lesson 6 materials
- Statistical Reasoning Mini Project (description, project template, graphing template, checklist, and rubric)- linked in lesson 6 materials
- Statistical Reasoning Mini Project Example Assessment- linked in lesson 6 materials
- “How These Black Students Fought Modern-Day Segregation” video- Linked in lesson 6 presentation and here: https://www.youtube.com/watch?v=o8sr8cxNsxc

Lesson Procedures

XXI. Motivation/Readiness/Engagement: Allotted Time: 3-5 Mins

- As students are logging into the Zoom call, have the lesson 6 presentation displayed on the screen.
- Once it is 8:05 AM (the official start of class), remind the students of the daily expectations of online learning.
  - Turn your video camera on to get attendance points- if you cannot show your video private message with teacher.
- Explain that there will be no PoD for the day. Instead we will work on finishing up the Statistical Reasoning Mini Projects.
- Direct the students to logging into Schoology and opening up where they left off in Notability.
- Send students to breakout rooms if they were working with a partner.

XXII. Body of Lesson: Explore/Explain/Extend Allotted Time: 35-40 Mins

- Allow time for students to work on finishing up their projects.
  - If students still need a lot of time, dedicate this class period to finishing the projects. Be available for a lot of direct support and check in with students to offer guidance. With this approach, push sharing the projects and the lasting impacts onto lesson 7.
  - If students need about 20 minutes to wrap up their thinking for their project, continue with the rest of this lesson plan.
- Group/Individual Presentations
  - Once all students have indicated that they have completed their project, select 3-4 volunteers to share their process. Suggest students share their screen with their projects pulled up so they can easily refer to it when needed. These can be very informal and prompted presentations.
- Overall conclusions, answer the essential question via a group discussion.
  - Nationally, White students are more likely to be enrolled in AP courses or be considered gifted – ProPublica “Miseducation” database
Nationally, Black students get more punishments, both out-of-school suspensions and expulsions (school-to-prison pipeline) - ProPublica “Miseducation” database

- “How These Black Students Fought Modern-Day Segregation” video - linked in lesson 6 presentation.
  - What did you notice? What did you wonder?
  - What can we do NOW?
  - How can we be civically active besides voting?

XXIII. Lesson Closure: Allotted Time: 7-10 Mins

- Class discussion - Articulate and Reflect
  - What are the consequences of NOT knowing about modern-day school segregation?
  - What are the consequences of not knowing the math in a real world context?
  - Do all children in America receive the same quality of education?
- Remind the students to…
  - Submit their sketchbook photos to the Schoology drop box
  - Submit their vocabulary photos to the Schoology drop box
  - Complete the Weekly Reading if it had not yet been done.

XXIV. Enrichment/Extension:

- Depending on time, have more students present their projects. If students are feeling shy and don’t want to share, plan to elongate the articulate and reflect discussion at the end of class.
Lesson One Materials
Friday marks the 65th anniversary of the Supreme Court’s landmark decision in *Brown v. Board of Education*, the unanimous ruling that outlawed racial segregation in public schools as a violation of the equal protection clause of the 14th Amendment.

In the ruling, the court emphasized that education was “perhaps the most important function of state and local governments” and that school desegregation was necessary for the integration of our society as a whole.

In *the years that followed*, federal judges held hundreds of desegregation hearings; the National Guard was deployed to protect nine black students integrating Central High in Little Rock, Arkansas; tens of thousands marched on Washington in support of integration; and Congress passed the Civil Rights and Voting Rights acts.

But our schools, in recent years, have become re-segregated. And it’s not just hurting students of color. *The research is clear that it’s hurting all of us.*

Our *Teaching Tolerance* team found that “the average black student attended a school that was 48.8 percent black and 27.6 percent white. On the flip side, the average white student attended a school that was 72.5 percent white and only 8.3 percent black.”

In Tuscaloosa, Alabama, Nikole Hannah-Jones reported for *ProPublica* that “1 in 3 black students attends a school that looks as if *Brown v. Board of Education* never happened.”
In Charlottesville, Virginia, railroad tracks literally divide the city, with three predominantly white schools in the north and three predominantly black schools in the south.

In Mississippi, inadequate funding and inferior educational opportunities in predominantly black schools have created a racial achievement gap.

But segregation isn’t unique to the South.

A coalition of civil rights groups and students are suing the state of New Jersey over policies that require most children to attend their neighborhood schools, which has resulted in extreme racial and economic segregation. The suit argues that this segregation hurts the academic performance and personal development of all students in the public school system and perpetuates preexisting societal prejudices.

Richard Rothstein, author of The Color of Law, spoke with our team about the issue. “Schools are more segregated today than at any time in the last 45 years. The reason that they’re more segregated is because the neighborhoods in which they’re located are segregated.”

But the impacts of residential segregation are compounded by other factors.

In New York City, 40 percent of kindergartners do not attend their local elementary school. The city has a vast network of private schools, and public school students gain admittance to schools based on performance. As a result, children are stratified by factors such as race, class and economic opportunity from an early age.

The children attending the city’s public schools are 41 percent Latino, 27 percent black and 16 percent Asian. Yet New York City’s public schools are the most segregated in the country.

Despite these troubling trends, the Trump administration has aggressively rolled back Obama-era policies designed to increase diversity in classrooms and on campuses; delayed the implementation of rules that would address racial disparities in school placement; and dismissed more than 1,200 civil rights investigations started under the Obama administration.

We cannot continue to accept the low standard of desegregation, where our classrooms and communities simply cease to be entirely homogeneous.
The antithesis of segregation isn't desegregation, it's integration. We must create classrooms and communities that proportionately reflect the makeup of our society – and ensure equal access to opportunity for all, regardless of race or class.

We need to invest, equitably, in our public schools; end discriminatory housing policies that exclude low-income and minority families from certain communities and neighborhoods; and prioritize programs that promote diversity in our schools.

Segregation didn’t happen accidentally. We must pursue integration with the same intentionality.

SPLC’s Weekend Reads are a weekly summary of the most important reporting and commentary from around the country on civil rights, economic and racial inequity, and hate and extremism. Sign up to receive Weekend Reads every Saturday morning.

* * *
Weekly Vocabulary
These are key vocabulary terms we will reference in class. If you miss the definition in class, research the term and define them in your sketchbook. As a reminder, your weekly vocabulary assignment is due Friday by 11:59 PM.

Lesson 1
Statistics
Comparative Statistical Question
Population
Census
Sample

Lesson 2
Categorical Data
Numerical Data

Lesson 3
Center
Spread
Shape
Histogram
Welcome to class!

Statistical Reasoning
Step 1: Formulate Question
Problem of the Day

There are more than 306 million Americans in the U.S. today (2009). We have reduced this huge number to a village of 100. That means that each person in the village represents 3.06 million people, or 1% of the total population. Calculate the actual number of people from the facts listed in the book below.

The Many Races that Make-Up America
75 people in the village would be White
12 people in the village would be Black
1 person in the village would be Native American
4 people in the village would be Asian
8 people in the village would be another race or multiple
Space to work out the PoD

There are more than 306 million Americans in the U.S. today (2009).

The Many Races that Make-Up America
- 75 people in the village would be White
- 12 people in the village would be Black
- 1 person in the village would be Native American
- 4 people in the village would be Asian
- 8 people in the village would be another race or multiple
What is Statistics?
Frayer Model Vocabulary Activity
Statistical Questioning Discussion

- Do you remember what a statistical question is?
  
  A statistical question is one that can be answered by collecting data and where there will be variability in that data.

  Variability means a lack of consistency.

Let's practice identifying statistical questions!
Are these examples of statistical questions?

How old are you?

How old are the students in Mr. H's class?

Do dogs run faster than cats?

Does it rain more in Seattle than Singapore?

What color is Sara's dress?

What is your favorite holiday?

How many clubs are the students in Ms. F's class apart of?

How many books do the students of TSA read per month?
What are Comparative Statistical Questions?

Comparative statistical questions are statistical questions that ask you to compare two sets of data.

Some examples include...

How does the number of books each student read in Mrs. T's class compare to the number of books each student read in Mr. W's class?

How does the number of clubs offered at TSA compare to the number of clubs offered at Waite High School in Toledo?

How does the number of Black Friday shoppers in the city of Perrysburg compare to the number of Black Friday shoppers in the city of Toledo?
Weekly Reading- Brown v. Board of Education

What is Brown v. Board of Education?

A Supreme Court case that ruled that it is illegal to have racially segregated public schools.

But lately, schools have been re-segregated, and it is hurting all of us!

So, what does this have to do about statistics?

EVERYTHING!
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The children attending the city’s public schools are 41 percent Latino, 27 percent black and 16 percent Asian. Yet New York City’s public schools are the most segregated in the country.
Exit Ticket- Google Form

You can find the Google Form exit ticket here:
https://docs.google.com/forms/d/e/1FAIpQLSdlMablMCfrqtPdDUzu1wG4IvemcX5J6rOuLUL123RfdMhDGIw/viewform?usp=sf_link

Don’t Forget:
- Finish your Frayer Model Vocabulary Activity if you did not finish in class
- Write down your vocabulary in your sketchbook
- Read the Weekly Reading for Wednesday to get a better idea of what modern day school segregation looks like
Frayer Model Vocabulary Activity

Directions: Use the Frayer Models below to define the words (1) population, (2) census, and (3) sample. Use the Frayer Model Reading Source to help you fill in the boxes. As a reminder, these words are also on your weekly vocabulary list. You can either write directly on these Frayer Models using Notability and then write the definitions in your sketchbook OR you can draw out these Frayer Models in your sketchbook, take a picture of your sketchbook page, and turn it into the assignment page on Schoology. Whatever you do not finish in class will be homework.

Source: https://buildingmathematicians.wordpress.com/tag/frayer-model/
Frayer Model

Definition

Characteristics / Draw

Examples

Non-Examples

Source: https://buildingmathematicians.wordpress.com/tag/frayer-model/
Frayer Model

Definition

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Examples

Non-Examples

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Lesson 1

Frayer Model Reading Source

Directions: Use the definitions below to help you fill out the Frayer Model Vocabulary Activity.

Definition of Population

The whole group that is being studied.

Example: you ask 100 randomly chosen people at a football match what their main job is. Your sample is 100, but the population is all the people at that match.

Definition of Census

Collection of data from a whole population rather than just a sample.

Example: doing a survey of travel time by ...
... asking everyone at school is a census (of the school).
... but asking only 50 randomly chosen people is a sample.

Many Countries do a regular census. It is really a big deal because they try to collect data about everyone.

Source: https://www.mathsisfun.com/
A selection taken from a larger group (the "population") that will, hopefully, let you find out things about the larger group.

Samples should be chosen randomly.

Example: you ask 100 randomly chosen people at a football match what their main job is. Your sample is the 100, while the population is all the people at that match.

Source: https://www.mathsisfun.com/
Your Information

Before you complete your exit ticket, please fill out your information below.
* Required

1. Name (first and last) *

2. TSA email *

Statistical or Not

Read the questions below, then determine if the questions are examples of statistical questions or not.

3. What time did the students in Mr. B's class wake up this morning? *

   Mark only one oval.
   - Statistical Question
   - Not a Statistical Question

4. What did Malik eat for lunch yesterday? *

   Mark only one oval.
   - Statistical Question
   - Not a Statistical Question
5. How do the heights of the students in Mr. L's class compare to the heights of the students in Ms. J's class? *

*Mark only one oval.*

☐ Statistical Question
☐ Not a Statistical Question

6. How tall is Janet? *

*Mark only one oval.*

☐ Statistical Question
☐ Not a Statistical Question

Create Your Own

In the space below, create your own COMPARATIVE statistical question. As a reminder, comparative statistical questions are questions that ask you to compare two sets of data.

7. Write your COMPARATIVE statistical question below. *

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Reflect
8. Do you have any comments or questions you want to share with Ms. Alberts?


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Google Forms
Lesson Two Materials
Weekend Read: Brown v. Board of Education and modern-day segregation

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Census
Sample

Lesson 2
Categorical Data
Numerical Data

Lesson 3
Center
Spread
Shape
Histogram
Welcome to Class!

Lesson 2-6
Data Collection
Problem of the Day

Where do we live?

<table>
<thead>
<tr>
<th>Year</th>
<th>City</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>1920</td>
<td>51</td>
<td>49</td>
</tr>
<tr>
<td>1940</td>
<td>56</td>
<td>44</td>
</tr>
<tr>
<td>1960</td>
<td>70</td>
<td>30</td>
</tr>
<tr>
<td>Today</td>
<td>80</td>
<td>20</td>
</tr>
</tbody>
</table>

Write one statistical question based off of the data from “If America Were a Village.”
How Black Students are Hurt by Modern-Day Segregation

Reports
Discuss the Video

- What did you notice? What did you wonder?
- How can statistics play a role in this?
- How can we help shed light on this topic with math?
Refer back to the Weekly Reading

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- How do these statistics support what we just watched?
- How does math help emphasize this tragedy?
- Can we collect our own data on this topic?
Weekly Vocabulary Alert!

- **Categorical Data:** Data that can be divided into specific groups (colors, food, sports, etc).

- **Numerical Data:** Data that is measurable (weight, amount, height, etc).
Different ways to collect data

**Sample Surveys**
A study done on a subset of a population (a sample) in order to make generalizations about the entire population.

**Comparative Experiments**
An experiment of comparison that uses two or more treatments or chance to collect data.

**Research**
Collecting data that already exists to organize and analyze it in a new way.
ProPublica - Miseducation
Closure

Sketchbook Journal Entry:

- 3 pieces of information you learned today (from the video, the presentation, or the activity).
- 2 pieces of information that interested/upset you.
- 1 question you have.
Step 2: Data Collection Activity

Directions: Using the ProPublica “Miseducation” database (found here: https://projects.propublica.org/miseducation/) read each step carefully and answer all parts of the question. At the end of the period, turn in whatever you have gotten done to the Schoology drop box so Ms. Alberts can see how far you got. Complete the rest of the activity for homework.

Step 1: Click the tabs “Opportunity,” “Discipline,” Segregation” and “Achievement Gap” and answer these two questions: What do you notice” What do you wonder?

Step 2: Scroll down to “All States” and select “Ohio.” Skim through the data and write down the following statistics…

- Ohio’s composition (percentage) of Black, White, and all Other (Hispanic, Asian, and Two or More Races) students.
- Ohio’s composition (percentage) of Black, White, and all Other (Hispanic, Asian, and Two or More Races) students considered Gifted and Talented.
- Ohio’s composition (percentage) of Black, White, and all Other (Hispanic, Asian, and Two or More Races) students who have received an Out-of-School Suspension.
**Step 3:** Click the search box labeled “find a school district in Ohio” and search “Columbus City School District.” Scroll through the schools until you find “Clinton Elementary School.” Write down the following statistics…

- Clinton Elementary’s composition (percentage) of Black, White, and all Other (Hispanic, Asian, and Two or More Races) students.

- Clinton Elementary’s composition (percentage) of Black, White, and all Other (Hispanic, Asian, and Two or More Races) students considered Gifted and Talented.

- Clinton Elementary’s composition (percentage) of Black, White, and all Other (Hispanic, Asian, and Two or More Races) students who have received an Out-of-School Suspension.

**Step 4:** Go back to the “Columbus City School District” page and select “North Linden Elementary School” which is only 9 minutes away from “Clinton Elementary School.” Write down the following statistics…

- North Linden Elementary’s composition (percentage) of Black, White, and all Other (Hispanic, Asian, and Two or More Races) students.

- North Linden Elementary’s composition (percentage) of Black, White, and all Other (Hispanic, Asian, and Two or More Races) students considered Gifted and Talented.
● North Linden Elementary’s composition (percentage) of Black, White, and all Other (Hispanic, Asian, and Two or More Races) students who have received an Out-of-School Suspension.

**Step 5:** When you are comparing the 2 schools, what do you notice? What do you wonder?

**Step 6 Extension:** Read this article (https://stories.usatodaynetwork.com/linden/math-problem-linden-kids-arent-going-linden-schools/) titled “Math Problem- Most Linden kids aren’t going to Linden schools.” Write down a few notes from the reading. How does this reading match with your statistics found?
Lesson Three Materials
Friday marks the 65th anniversary of the Supreme Court’s landmark decision in *Brown v. Board of Education*, the unanimous ruling that outlawed racial segregation in public schools as a violation of the equal protection clause of the 14th Amendment.

In the ruling, the court emphasized that education was “perhaps the most important function of state and local governments” and that school desegregation was necessary for the integration of our society as a whole.

In the years that followed, federal judges held hundreds of desegregation hearings; the National Guard was deployed to protect nine black students integrating Central High in Little Rock, Arkansas; tens of thousands marched on Washington in support of integration; and Congress passed the Civil Rights and Voting Rights acts.

But our schools, in recent years, have become re-segregated. And it’s not just hurting students of color. The research is clear that it’s hurting all of us.

Our Teaching Tolerance team found that “the average black student attended a school that was 48.8 percent black and 27.6 percent white. On the flip side, the average white student attended a school that was 72.5 percent white and only 8.3 percent black.”

In Tuscaloosa, Alabama, Nikole Hannah-Jones reported for ProPublica that “1 in 3 black students attends a school that looks as if Brown v. Board of Education never happened.”
In Charlottesville, Virginia, railroad tracks literally divide the city, with three predominantly white schools in the north and three predominantly black schools in the south.

In Mississippi, inadequate funding and inferior educational opportunities in predominantly black schools have created a racial achievement gap.

But segregation isn’t unique to the South.

A coalition of civil rights groups and students are suing the state of New Jersey over policies that require most children to attend their neighborhood schools, which has resulted in extreme racial and economic segregation. The suit argues that this segregation hurts the academic performance and personal development of all students in the public school system and perpetuates preexisting societal prejudices.

Richard Rothstein, author of The Color of Law, spoke with our team about the issue. “Schools are more segregated today than at any time in the last 45 years. The reason that they’re more segregated is because the neighborhoods in which they’re located are segregated.”

But the impacts of residential segregation are compounded by other factors.

In New York City, 40 percent of kindergartners do not attend their local elementary school. The city has a vast network of private schools, and public school students gain admittance to schools based on performance. As a result, children are stratified by factors such as race, class and economic opportunity from an early age.

The children attending the city’s public schools are 41 percent Latino, 27 percent black and 16 percent Asian. Yet New York City’s public schools are the most segregated in the country.

Despite these troubling trends, the Trump administration has aggressively rolled back Obama-era policies designed to increase diversity in classrooms and on campuses; delayed the implementation of rules that would address racial disparities in school placement; and dismissed more than 1,200 civil rights investigations started under the Obama administration.

We cannot continue to accept the low standard of desegregation, where our classrooms and communities simply cease to be entirely homogeneous.
The antithesis of segregation isn’t desegregation, it’s integration. We must create classrooms and communities that proportionately reflect the makeup of our society – and ensure equal access to opportunity for all, regardless of race or class.

We need to invest, equitably, in our public schools; end discriminatory housing policies that exclude low-income and minority families from certain communities and neighborhoods; and prioritize programs that promote diversity in our schools.

Segregation didn’t happen accidentally. We must pursue integration with the same intentionality.

SPLC’s Weekend Reads are a weekly summary of the most important reporting and commentary from around the country on civil rights, economic and racial inequity, and hate and extremism. Sign up to receive Weekend Reads every Saturday morning.

* * *
Weekly Vocabulary

These are key vocabulary terms we will reference in class. If you miss the definition in class, research the term and define them in your sketchbook. As a reminder, your weekly vocabulary assignment is due Friday by 11:59 PM.

Lesson 1
Statistics
Comparative Statistical Question
Population
Census
Sample

Lesson 2
Categorical Data
Numerical Data

Lesson 3
Center
Spread
Shape
Histogram
Welcome to Class!
Lesson 3-6
Analyze Data
No PoD!

✗ Write in your sketchbook we are not doing a PoD for the day.
✗ Instead, we will do a Gallery Walk Activity
✗ Download “Gallery Walk Activity” and “Gallery Walk Activity Source” in Notability
**Gallery Walk Activity**

- In groups, use the source to help you learn all you can about your assigned vocabulary word. Become an expert on your word!
- Post your word, a strong definition, and a representative image on the Padlet link.
- When we come back as a group, at least 1 person per group will share with the class.
### Gallery Walk Activity - Groups

<table>
<thead>
<tr>
<th>Center</th>
<th>Spread</th>
<th>Shape</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student A</td>
<td>Student B</td>
<td>Student C</td>
</tr>
<tr>
<td>Student D</td>
<td>Student E</td>
<td>Student F</td>
</tr>
<tr>
<td>Student G</td>
<td>Student H</td>
<td>Student I</td>
</tr>
</tbody>
</table>
If there are no breaks in the data, then normally the last data value of a bin is first value in the next bin.
Histogram Activity

- Download “Histogram Activity” and “Histogram Activity Data Sheet”
- We will do the first question together
Lesson Closure- Brain Dump!
Gallery Walk
Step 3. Analyze the Data Vocabulary

Directions: While in your groups, you will spend time becoming an expert in your property of distribution. Use the “Gallery Walk Activity Sources” to start your research, but feel free to do more research outside of those. Create a strong understanding of your vocabulary word as well as find (or create) some sort of image to go along with it. When your group is ready, follow the link below to the Padlet page and post your findings. Get ready to share when we come back to the main group!

The vocabulary term my group got is ________________________________.

Use the space below to jot down some notes or create a sketch to help define your vocabulary word.

Once your group is ready to post, follow this link to the Padlet:
https://padlet.com/zoealberts_za/btc1lnf2pw7u8liy
Center, Shape, & Spread

Center, shape, and spread are all words that describe what a particular graph looks like.

Center

When we talk about center, shape, or spread, we are talking about the distribution of the data, or how the data is spread across the graph. The center of a distribution gives you exactly what it sounds like. It tells you the center or median of the data.

When you look at a graph, it will be the value where approximately half of your data is on one side and the rest of your data is on the other side.
The median point of your data set is the middle number if you were to put your data in ascending order. Let’s say we are taking surveys of different groups of people and their donut eating habits. For the first group of people, we have this graph. We see that our center is 5 because half of the people are to the left and the other half are to the right.

Another way to describe the center is to take the mean or average of all your data. When you describe your center in terms of mean and median, you might find that they are slightly different. Your mean might be more or less than your median. We will discuss what skewed means in just a little bit, but as far as the center is concerned, if your graph is skewed, then you will want to use the median as your center.
Shape
Depending on the group of people we survey about their donut eating habits, we will get different sets of data. When graphed, we can get different looking graphs. We use shape to describe the different types of graphs we will see. There are four different ways in which we can describe a graph's shape.

1. We can say a graph is symmetric if the left and right sides of the graph are mirror images of each other. This graph, for example, is symmetric because the left side is a mirror image of the right side. We see that at either end of the distribution, only 1 person chooses to eat 3 donuts and 7 donuts. Going closer to the center, we see that 2 persons choose to eat 4 donuts and 6 donuts. They are mirror images of each other.
2. Sometimes, our graph will look like a rollercoaster and will have a **number of peaks**, or areas where the graph is higher than the surrounding areas. If there is only one peak, then we call it **unimodal distribution**. If this one peak occurs at the center of the graph, it is also called **bell-shaped**. Doesn't this look like a bell? If it has two peaks, then we will call it a **bimodal distribution**. (Note: The term “bimodal” alone literally means two modes, and the term “unimodal” alone literally means one mode. When describing the shape, you must use the word distribution after bimodal/unimodal every time.)
3. If our graph has more data on one side rather than the other, we call it **skewed**. If there are more to the right, we call it **skewed left**. For our donuts eaten survey, this would mean that more people choose to eat more donuts and fewer people choose to eat just a few. If our graph has more data to the left, then we would say that our graph is **skewed right**. For our donuts survey, it would mean that more people prefer to eat fewer donuts. A good way to remember this is to view the graph as a slide. If you slide down to the right, then it is skewed right and if you slide down to the left, then it is skewed left.
Boxplots often provide information about the shape of a data set. The examples below show some common patterns.

Each of the above boxplots illustrates a different skewness pattern. If most of the observations are concentrated on the low end of the scale, the distribution is skewed right; and vice versa. If a distribution is symmetric, the observations will be evenly split at the median, as shown above in the middle figure.

4. If our survey of people's donut eating habits showed that for each amount of donuts eaten, the same number of people would choose that amount, then our graph will look flat all across the top, then we call it uniform. A uniform shape has no peaks nor is it skewed.

**Spread**

A measure of spread, sometimes also called a measure of dispersion, is used to describe the variability in a sample or population. It is usually used in conjunction with a measure of central tendency, such as the mean or median, to provide an overall description of a set of data.

There are many reasons why the measure of the spread of data values is important, but one of the main reasons regards its relationship with measures of central tendency. A measure of spread gives us an idea of how well the mean, for example, represents the data. If the spread of values in the data set is large, the mean is not as representative of the data as if the spread of data is small. This is because a large spread indicates that there are probably large differences between individual scores. Additionally, in research, it is often seen as positive if there is little variation in each data group.

We will be looking at two measures of spread: range and quartiles.

The **range** is the difference between the highest and lowest scores in a data set and is the simplest measure of spread. So we calculate range as:

**Range** = maximum value - minimum value

Whilst using the range as a measure of spread is limited, it does set the boundaries of the scores. This can be useful if you are measuring a variable that has either a critical low or high threshold (or both) that should not be crossed. The range will instantly inform you whether at least one value broke these critical thresholds. In addition, the range can be used to detect any errors when entering data. For example, if you have recorded the age of school children in your study and your range is 7 to 123 years old, you know you have made a mistake!

**Quartiles** tell us about the spread of a data set by breaking the data set into quarters, just like the median breaks it in half. **Quartiles** are a useful measure of spread because they are much less affected by outliers or a skewed data set than mean. For this reason, quartiles are often reported along with the median as the best choice of measure of spread and central tendency, respectively, when dealing with skewed and/or data with outliers. A common way of expressing quartiles is as an interquartile range. The interquartile range describes the difference between the third quartile (Q3) and the first quartile (Q1), telling us about the range of the middle half of the scores in the distribution.

**Interquartile range** = Q3 - Q1
Using Histograms

Step 3. Analyze the Data

The attached table highlights demographic data for Toledo City Public Schools (the entire district) as well as for several individual schools within the district. In each case, the data is given as though the school/district is a village of 100 people. Note: to keep the data more manageable, we will focus on the two largest groups in the district, Black, non-Hispanic, and White, non-Hispanic. Note: Other includes, Hispanic, Asian or Pacific Islander, American Indian or Alaskan Native, and Multiracial.

1. Create 2 histograms (one for Black data and one for White data) using the information from the “school composition” columns of the data table.

Graph 1: _______________________

List out the data numbers here:_______________________________________________
________________________________________________________________________
Lesson 3

Graph 2: _______________________

List out the data numbers here:_______________________________________________
________________________________________________________________________
________________________________________________________________________

### Frequency Table

<table>
<thead>
<tr>
<th>Range of Data</th>
<th>Tally Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-9</td>
<td></td>
</tr>
<tr>
<td>10-19</td>
<td></td>
</tr>
<tr>
<td>20-29</td>
<td></td>
</tr>
<tr>
<td>30-39</td>
<td></td>
</tr>
<tr>
<td>40-49</td>
<td></td>
</tr>
<tr>
<td>50-59</td>
<td></td>
</tr>
<tr>
<td>60-69</td>
<td></td>
</tr>
<tr>
<td>70-79</td>
<td></td>
</tr>
<tr>
<td>80-89</td>
<td></td>
</tr>
<tr>
<td>90-100</td>
<td></td>
</tr>
</tbody>
</table>

**Analyze:** Compare the two histograms, what do you see? What are the graphs telling you?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
2. Create 2 histograms (one for Black data and one for White data) using the information from one of the categories on the data sheet (either “Enrolled in Gifted/Talented” or “Out-of-School Suspension”).

The histograms I am going to create are based off of the information from the __________________________________________ category.

Graph 1: _______________________

List out the data numbers here: __________________________________________

<table>
<thead>
<tr>
<th>Range of Data</th>
<th>Tally Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-9</td>
<td></td>
</tr>
<tr>
<td>10-19</td>
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<tr>
<td>20-29</td>
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<td>30-39</td>
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<td>40-49</td>
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<td>50-59</td>
<td></td>
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<tr>
<td>60-69</td>
<td></td>
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<tr>
<td>70-79</td>
<td></td>
</tr>
<tr>
<td>80-89</td>
<td></td>
</tr>
<tr>
<td>90-100</td>
<td></td>
</tr>
</tbody>
</table>
Lesson 3

Graph 2: _______________________

List out the data numbers here: ______________________________________________________

Analyze: Compare the two histograms, what do you see? What are the graphs telling you?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Using Histograms- Toledo City Schools District Data
From ProPublica, “Miseducation” Database

In each case, the data is given as though the school/district is a village of 100 people.

Note: to keep the data more manageable, we will focus on the two largest groups in the district, Black and White.

Note: Other includes, Hispanic, Asian or Pacific Islander, American Indian or Alaskan Native, and Multiracial.

<table>
<thead>
<tr>
<th>School Composition</th>
<th>Enrolled in Gifted/Talented</th>
<th>Out -of-School Suspensions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Black</td>
<td>White</td>
</tr>
<tr>
<td>Toledo City School District</td>
<td>42</td>
<td>38</td>
</tr>
<tr>
<td>Arlington Elementary</td>
<td>29</td>
<td>43</td>
</tr>
<tr>
<td>Beverly Elementary</td>
<td>11</td>
<td>67</td>
</tr>
<tr>
<td>Burroughs Elementary</td>
<td>24</td>
<td>47</td>
</tr>
<tr>
<td>DeVeaux Elementary</td>
<td>33</td>
<td>47</td>
</tr>
<tr>
<td>Whittier Elementary</td>
<td>32</td>
<td>41</td>
</tr>
<tr>
<td>Elmhurst Elementary</td>
<td>12</td>
<td>72</td>
</tr>
<tr>
<td>Toledo Technology Academy High School</td>
<td>20</td>
<td>67</td>
</tr>
<tr>
<td>Bowsher High School</td>
<td>41</td>
<td>42</td>
</tr>
<tr>
<td>Jesup W. Scott High School</td>
<td>92</td>
<td>3</td>
</tr>
<tr>
<td>Rogers High School</td>
<td>69</td>
<td>21</td>
</tr>
<tr>
<td>Start High School</td>
<td>44</td>
<td>42</td>
</tr>
<tr>
<td>Woodward High School</td>
<td>62</td>
<td>24</td>
</tr>
</tbody>
</table>

Source: ProPublica “Miseducation” Database- [https://projects.propublica.org/miseducation/](https://projects.propublica.org/miseducation/)
Lesson Four Materials
The data proves that school segregation is getting worse

This is ultimately a disagreement over how we talk about school segregation.

By Alvin Chang | @alv9n | alvin@vox.com | Mar 5, 2018, 1:50pm EST

The predominant narrative among education activists is that school segregation has gotten worse in the past several decades. It’s an argument backed by data — one I’ve stressed in my own work. And earlier this year, a New York Times op-ed also made this argument and cited that same data.

But there’s now a handful of pundits pushing back on this notion, like the National Review’s Robert VerBruggen. In response to the Times piece, he wrote that changing demographics makes the data misleading — and that ultimately, “we’re not going in reverse” when it comes to segregation. Prominent journalists, like New York magazine’s Jonathan Chait and my colleague Matt Yglesias, shared VerBruggen’s post on Twitter.

The National Review piece isn’t coming out of the blue. The idea that changing demographics — the US becoming less white — makes it harder to integrate schools is something that has picked up steam in recent years. In Connecticut, Gov. Dannel Malloy has pushed for more leniency in standards set by a court-ordered desegregation case.

So how could two sides look at the data and come to two different conclusions about school segregation trends?

On the surface, this is an argument about how we measure school segregation trends. But ultimately, it’s a disagreement over how we should be thinking about school segregation.

**Is school segregation not actually getting worse? It depends on how you measure it.**

The core disagreement comes down to federal government data that was highlighted by the UCLA Civil Rights Project on the 60th anniversary of Brown v. Board of Education, the Supreme Court case that ruled segregated schools were unconstitutional.

The data shows that black students in the South are less likely to attend a school that is majority white than about 50 years ago:

National Review’s VerBruggen sees this chart and argues that a smaller portion of black students are attending majority-white schools because the US is just less white than it was 40 or 50 years ago:

**Percentage of nonwhite people in the US**

National Review’s VerBruggen is arguing this is why black students are attending fewer majority-white schools.

<table>
<thead>
<tr>
<th>Year</th>
<th>Minority</th>
<th>White</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>36%</td>
<td>64%</td>
</tr>
<tr>
<td>1970</td>
<td>17%</td>
<td>83%</td>
</tr>
</tbody>
</table>

Both arguments are the products of some messy data work.
On one hand, if we’re measuring segregation by how many children attend majority-white schools, then it’s worth acknowledging that white people are now a smaller percentage of the US population. This is something I’ve admittedly left out of my work when presenting this data.

On the other hand, VerBruggen uses this flaw to argue that school segregation actually isn’t getting worse — even though it’s virtually impossible to make this argument from this data alone. VerBruggen does cite a study by Stanford sociologist Sean Reardon and USC sociologist Ann Owens that says school segregation hasn’t changed that much in the past few decades. But Reardon and Owens specifically write that there are two ways they measure segregation:

1. Exposure or isolation, which looks at whether students attend schools with a high or low proportion of a given racial group
2. Unevenness, which measures how evenly distributed students of a given racial group are

Reardon and Owens write, “The debate about whether the last two decades can be characterized as a period of resegregation largely hinges on whether one uses exposure or unevenness measures of segregation.”

The VerBruggen argument adopts the “unevenness” frame: School segregation hasn’t gotten worse because students are just as unevenly distributed now as they were in the 1980s.

Reardon and Owens give this example:

... Consider a school district in which 90% of students are black. If all schools in the district had enrollments that were 90% black, we would have low unevenness but high black isolation (or, equivalently, low black-white exposure) because the average black student would attend a predominantly black school. Conversely, in a school district with very few black students, isolation might be low even if students were very unevenly distributed by race.
But if you care about more equity in education, this is an odd argument. It’s essentially saying: Hey, we haven’t made school segregation worse — and it’s because of Asian and Hispanic immigrants.

This leads to the reason why people who care about equity balance it with the other measure: isolation.

A reason to measure racial isolation, not just unevenness

Let’s just state this for the record: Racial segregation in schools was caused by white America’s policies that kept schools and neighborhoods white-only. For black families, this meant their country engineered for them a second-class experience — one that put them in poor, segregated ghettos and poor, segregated schools.

And that’s not getting better. Black children are now more likely to grow up in poor neighborhoods than they were 50 years ago.
The data proves that school segregation is getting worse - Vox

[Image]

The neighborhoods where kids grow up, then and now

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>High or medium poverty</td>
<td>62%</td>
<td></td>
</tr>
<tr>
<td>Black kids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White kids</td>
<td>4%</td>
<td></td>
</tr>
</tbody>
</table>

Data from Neighborhoods and the Black-White Mobility Gap, by Patrick Sharkey. *High poverty is neighborhoods where the poverty rate is 30%+. Medium poverty is neighborhoods where the poverty rate is 20% to 30%.

This is important because a large body of research shows that growing up in heavily segregated, poor neighborhoods affects everything from your education level, your future earnings, and your happiness to your health and, ultimately, your life span.

But in many of these areas, where you live determines where you go to school. So when we see students who are racially isolated, it’s describing both underlying residential segregation and how little school districts do to ameliorate that segregation.

As it turns out, things have been getting worse since the 1980s when we look at segregation using this isolation frame:
Percentage of black students in schools that are 90 to 100% minority

Data from the US Department of Education's National Center for Education Statistics and Office of Civil Rights.

As Reardon and Owens point out, indices of exposure show black-white segregation have actually gotten worse since the 1970s:

**How the black-white exposure index changed in the last 50 years**

This has caused a growing number of our schools to be predominantly black or Hispanic with a higher concentration of students in poverty:
This isn't even considering the growing charter school movement. An increasing number of charter schools are high-poverty and are predominantly black or Hispanic. Meanwhile, a growing number of charter schools are also low-poverty and predominantly white and Asian:
So, yes, there is a portion of America that is getting more diverse. And overall, the "unevenness" measure of segregation shows we’re racially distributing students about as well as we were a few decades ago.

But we are also increasingly isolating the most vulnerable students in America. Things haven’t been steady; they are getting worse.

**Focusing on what’s holding steady pushes a misleading narrative**

VerBruggen is pushing back against a narrative that most experts agree with, which says that America went through a period of desegregation from the 1950s through the 1980s but then backslid in the decades since. VerBruggen is arguing that as immigration policies have diversified America in recent decades, our schools diversified as well.

But [research](https://www.vox.com/2018/3/5/17080218/school-segregation-getting-worse-data) by Cornell sociologist Daniel Lichter shows that segregation between white families and nonwhite families has actually changed very little since the 1980s. In fact,
while segregation within cities has gotten slightly better, segregation between municipalities has gotten worse.

In other words, there is probably less segregation within the neighborhoods of your town. But there is probably more segregation in comparing your town and a neighboring one.

So if broader segregation has increased, it might be reflected in our schools, as school attendance zones are often drawn based on where you live.

This is partially what has entrenched the heavily segregated school attendance zones in virtually every American city:
But school boards can draw school attendance boundaries to lessen that segregation — to send kids to less racially segregated schools. We don’t have to send kids to the nearest school, especially because it ends up recreating the underlying residential segregation:
But most school districts don’t do anything to ameliorate this situation. We continue to recreate the residential segregation. (Here’s an interactive that lets you look up your own district.)
How much school districts use attendance zones to lessen or worsen racial segregation

This looks at how American school districts with at least five primary schools exacerbate or ameliorate the underlying neighborhood segregation.

Data from research by Tomas E. Monarrez, a PhD candidate at the University of California, Berkeley.

* Monarrez plotted out the percentage of black and Hispanic residents for each school attendance zone and compared it to the percentage of black and Hispanic residents in each “neighborhood,” which are borders drawn based on the scenario that everyone attends the nearest elementary school. He then figured out the slope of that line, and subtracted that slope from 1. If the number if positive, it ameliorates segregation. If it’s negative, it exacerbates it.

In addition, research from Southern Methodist University’s Meredith Richards shows that when neighborhoods don’t experience much demographic change, they tend to draw school attendance zones that resegregate. Also, when neighborhoods experience a lot of demographic change, they defensively draw attendance zones that further segregate:
So let’s rehash here:

- We are increasingly isolating poor black and Hispanic children in segregated schools, both public and charter.
- Residential segregation between cities is getting worse, and the Supreme Court in the 1974 case *Milliken v. Bradley* said surrounding cities could not be forced into school integration plans.
- Meanwhile, segregation within cities is about the same as in the 1980s. It’s still extremely high.
- School districts are doing very little to ameliorate that segregation.
And when neighborhoods don’t change or drastically change, school districts actually tend to make even more segregative attendance zones.

Yes, we can find metrics that show school segregation isn’t getting worse; we can find metrics that show our schools are not any more segregated now than they were 30 years ago. These metrics are important, and they describe significant ways our schools are changing.

And, to be fair, VerBruggen writes in his piece that “this doesn’t mean that this country’s racial problems are over or that there’s nothing we can do to spur further integration.”

But using those metrics to paint a picture in which school segregation isn’t getting worse misses the point of why we talk about school segregation. The American education system has vestiges of engineered inequities, and those inequities have created unequal opportunities for a huge chunk of black Americans. When we query the data using this framework, the answer is clear: We are going in reverse.

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The data proves that school segregation is getting worse - Vox

Weekly Vocabulary

These are key vocabulary terms we will reference in class. If you miss the definition in class, research the term and define them in your sketchbook. As a reminder, your weekly vocabulary assignment is due Friday by 11:59 PM.

Lesson 4
Boxplot
Minimum
Lower Quartile
Median
Upper Quartile
Maximum

Lesson 5
No new vocabulary, woo!

Lesson 6
No new vocabulary, woo!
Welcome to Class!
Lesson 4–6
Analyze Data
Problem of the Day

Using the histogram below, describe its properties of distribution (center, spread, shape). Can you create a story for what this data may represent?
5 Number Summary and Boxplot Guided Notes

✘ Download these guided notes from Schoology and upload them into Notability.
✘ NOTE: Your weekly vocabulary words appear on this. You may want to keep your sketchbook handy to write them down!
Boxplots and 5 number summaries explained in a different way...
Boxplot Activity

✘ Download “Boxplot Activity” and “Boxplot Activity Data Sheet” from Schoology and upload into Notability.
✘ We will do the first question together
Lesson Closure– Compare and Contrast

What differences do you see between a histogram and a boxplot?

What similarities do you see between a histogram and a boxplot?

Do you think there would be some data better displayed with one over the other?
Boxplots and 5 Number Summaries
Guided Notes

A boxplot is _________________________________.

In order to create a boxplot, I need to create a 5 Number Summary. This summary consists of the ______________, ______________, ________________, ________________, and ________________.

Label and define the different parts of the 5 number summary represented on the boxplot.

Source: [https://www.onlinemathlearning.com/box-plot.html](https://www.onlinemathlearning.com/box-plot.html)
Let’s Practice!

Construct a boxplot for the following data:
12, 5, 22, 30, 7, 36, 14, 42, 15, 53, 25

Step 1: Arrange the data in ascending order

Step 2: Find the median, lower quartile, and upper quartile
- Median:
- Lower quartile:
- Upper quartile:

Step 3: Draw a number line that will include the smallest and the largest data points.

Source: https://www.onlinemathlearning.com/box-plot.html
Step 4: Draw three vertical lines, one at the lower quartile, median, and upper quartile. Join those lines to create a box.

Step 5: Draw two more vertical lines, one at the minimum and one at the maximum. Connect these vertical lines with a horizontal line from the box you created in step 4.

Source: https://www.onlinemathlearning.com/box-plot.html
Using Boxplots
Step 3. Analyze the Data

The attached table highlights demographic data for Toledo City Public Schools (the entire district) as well as for several individual schools within the district. In each case, the data is given as though the school/district is a village of 100 people. **Note:** to keep the data more manageable, we will focus on the two largest groups in the district, Black, non-Hispanic, and White, non-Hispanic.
**Note:** Other includes, Hispanic, Asian or Pacific Islander, American Indian or Alaskan Native, and Multiracial.

1. Create 2 boxplots (one for Black data and one for White data) using the information from the “school composition” columns of the data table.

   Graph 1: _______________________

   List out the data numbers here: ____________________________________________

   _______________________________________________________________________

   ________________________________________________________________

<table>
<thead>
<tr>
<th>5 Number Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
</tr>
<tr>
<td>Lower Quartile</td>
</tr>
<tr>
<td>Median</td>
</tr>
<tr>
<td>Upper Quartile</td>
</tr>
<tr>
<td>Maximum</td>
</tr>
</tbody>
</table>
Lesson 4

Graph 2: _______________________

List out the data numbers here: ____________________________________________

________________________________________________________________________

<table>
<thead>
<tr>
<th>5 Number Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
</tr>
<tr>
<td>Lower Quartile</td>
</tr>
<tr>
<td>Median</td>
</tr>
<tr>
<td>Upper Quartile</td>
</tr>
<tr>
<td>Maximum</td>
</tr>
</tbody>
</table>

Analyze: Compare the two boxplots, what do you see? What are the graphs telling you?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
2. Create 2 boxplots (one for Black data and one for White data) using the information from one of the categories on the data sheet (either “Enrolled in Gifted/Talented” or “Out-of-School Suspension”).

The boxplots I am going to create are based off of the information from the ________________________ category.

Graph 1: _______________________

List out the data numbers here: ____________________________________________________

<table>
<thead>
<tr>
<th>5 Number Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
</tr>
<tr>
<td>Lower Quartile</td>
</tr>
<tr>
<td>Median</td>
</tr>
<tr>
<td>Upper Quartile</td>
</tr>
<tr>
<td>Maximum</td>
</tr>
</tbody>
</table>
Lesson 4

Graph 2: _______________________

List out the data numbers here: _____________________________________________
________________________________________________________________________
________________________________________________________________________

5 Number Summary

<table>
<thead>
<tr>
<th>Minimum</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Quartile</td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td></td>
</tr>
<tr>
<td>Upper Quartile</td>
<td></td>
</tr>
<tr>
<td>Maximum</td>
<td></td>
</tr>
</tbody>
</table>

Analyze: Compare the two boxplots, what do you see? What are the graphs telling you?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Using Boxplots- Toledo City Schools District Data  
From ProPublica, “Miseducation” Database

In each case, the data is given as though the school/district is a village of 100 people.  
**Note:** to keep the data more manageable, we will focus on the two largest groups in the district, Black and White.  
**Note:** Other includes, Hispanic, Asian or Pacific Islander, American Indian or Alaskan Native, and Multiracial.

<table>
<thead>
<tr>
<th>School Composition</th>
<th>Enrolled in Gifted/Talented</th>
<th>Out-of-School Suspensions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Black</td>
<td>White</td>
</tr>
<tr>
<td>Toledo City School District</td>
<td>42</td>
<td>38</td>
</tr>
<tr>
<td>Arlington Elementary</td>
<td>29</td>
<td>43</td>
</tr>
<tr>
<td>Beverly Elementary</td>
<td>11</td>
<td>67</td>
</tr>
<tr>
<td>Burroughs Elementary</td>
<td>24</td>
<td>47</td>
</tr>
<tr>
<td>DeVeaux Elementary</td>
<td>33</td>
<td>47</td>
</tr>
<tr>
<td>Whittier Elementary</td>
<td>32</td>
<td>41</td>
</tr>
<tr>
<td>Elmhurst Elementary</td>
<td>12</td>
<td>72</td>
</tr>
<tr>
<td>Toledo Technology Academy High School</td>
<td>20</td>
<td>67</td>
</tr>
<tr>
<td>Bowsher High School</td>
<td>41</td>
<td>42</td>
</tr>
<tr>
<td>Jesup W. Scott High School</td>
<td>92</td>
<td>3</td>
</tr>
<tr>
<td>Rogers High School</td>
<td>69</td>
<td>21</td>
</tr>
<tr>
<td>Start High School</td>
<td>44</td>
<td>42</td>
</tr>
<tr>
<td>Woodward High School</td>
<td>62</td>
<td>24</td>
</tr>
</tbody>
</table>

Source: ProPublica “Miseducation” Database- [https://projects.propublica.org/miseducation/](https://projects.propublica.org/miseducation/)
Lesson Five Materials
The data proves that school segregation is getting worse

This is ultimately a disagreement over how we talk about school segregation.

By Alvin Chang | @alv9n | alvin@vox.com | Mar 5, 2018, 1:50pm EST

The predominant narrative among education activists is that school segregation has gotten worse in the past several decades. It’s an argument backed by data — one I’ve stressed in my own work. And earlier this year, a New York Times op-ed also made this argument and cited that same data.

But there’s now a handful of pundits pushing back on this notion, like the National Review’s Robert VerBruggen. In response to the Times piece, he wrote that changing demographics makes the data misleading — and that ultimately, “we’re not going in reverse” when it comes to segregation. Prominent journalists, like New York magazine’s Jonathan Chait and my colleague Matt Yglesias, shared VerBruggen’s post on Twitter.

The National Review piece isn’t coming out of the blue. The idea that changing demographics — the US becoming less white — makes it harder to integrate schools is something that has picked up steam in recent years. In Connecticut, Gov. Dannel Malloy has pushed for more leniency in standards set by a court-ordered desegregation case.

So how could two sides look at the data and come to two different conclusions about school segregation trends?

On the surface, this is an argument about how we measure school segregation trends. But ultimately, it’s a disagreement over how we should be thinking about school segregation.

Is school segregation not actually getting worse? It depends on how you measure it.

The core disagreement comes down to federal government data that was highlighted by the UCLA Civil Rights Project on the 60th anniversary of Brown v. Board of Education, the Supreme Court case that ruled segregated schools were unconstitutional.

The data shows that black students in the South are less likely to attend a school that is majority white than about 50 years ago:
National Review’s VerBruggen sees this chart and argues that a smaller portion of black students are attending majority-white schools because the US is just less white than it was 40 or 50 years ago:

Both arguments are the products of some messy data work.
On one hand, if we’re measuring segregation by how many children attend majority-white schools, then it’s worth acknowledging that white people are now a smaller percentage of the US population. This is something I’ve admittedly left out of my work when presenting this data.

On the other hand, VerBruggen uses this flaw to argue that school segregation actually isn’t getting worse — even though it’s virtually impossible to make this argument from this data alone. VerBruggen does cite a study by Stanford sociologist Sean Reardon and USC sociologist Ann Owens that says school segregation hasn’t changed that much in the past few decades. But Reardon and Owens specifically write that there are two ways they measure segregation:

1. Exposure or isolation, which looks at whether students attend schools with a high or low proportion of a given racial group
2. Unevenness, which measures how evenly distributed students of a given racial group are

Reardon and Owens write, “The debate about whether the last two decades can be characterized as a period of resegregation largely hinges on whether one uses exposure or unevenness measures of segregation.”

The VerBruggen argument adopts the “unevenness” frame: School segregation hasn’t gotten worse because students are just as unevenly distributed now as they were in the 1980s.

Reardon and Owens give this example:

... Consider a school district in which 90% of students are black. If all schools in the district had enrollments that were 90% black, we would have low unevenness but high black isolation (or, equivalently, low black-white exposure) because the average black student would attend a predominantly black school. Conversely, in a school district with very few black students, isolation might be low even if students were very unevenly distributed by race.
These schools are very even, but there is a high level of isolation.

![Schools with high isolation](image1)

These schools are uneven, but there is lower level of isolation.

![Schools with low isolation](image2)

But if you care about more equity in education, this is an odd argument. It’s essentially saying: Hey, we haven’t made school segregation worse — and it’s because of Asian and Hispanic immigrants.

This leads to the reason why people who care about equity balance it with the other measure: isolation.

**A reason to measure racial isolation, not just unevenness**

Let’s just state this for the record: Racial segregation in schools was caused by white America’s policies that kept schools and neighborhoods white-only. For black families, this meant their country engineered for them a second-class experience — one that put them in poor, segregated ghettos and poor, segregated schools.

And that’s not getting better. Black children are now more likely to grow up in poor neighborhoods than they were 50 years ago.
The neighborhoods where kids grow up, then and now

<table>
<thead>
<tr>
<th></th>
<th>KIDS BORN BETWEEN...</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Black kids</td>
<td>High or medium poverty</td>
<td>62%</td>
</tr>
<tr>
<td>White kids</td>
<td>4%</td>
<td></td>
</tr>
</tbody>
</table>

Data from Neighborhoods and the Black-White Mobility Gap, by Patrick Sharkey. *High poverty is neighborhoods where the poverty rate is 30%+. Medium poverty is neighborhoods where the poverty rate is 20% to 30%.

This is important because a large body of research shows that growing up in heavily segregated, poor neighborhoods affects everything from your education level, your future earnings, and your happiness to your health and, ultimately, your life span.

But in many of these areas, where you live determines where you go to school. So when we see students who are racially isolated, it’s describing both underlying residential segregation and how little school districts do to ameliorate that segregation.

As it turns out, things have been getting worse since the 1980s when we look at segregation using this isolation frame:
The data proves that school segregation is getting worse - Vox

Percentage of black students in schools that are 90 to 100% minority

South

Border

Northeast

Midwest

West

Data from the US Department of Education's National Center for Education Statistics and Office of Civil Rights.
As Reardon and Owens point out, indices of exposure show black-white segregation have actually gotten worse since the 1970s:

**How the black-white exposure index changed in the last 50 years**

This has caused a growing number of our schools to be predominantly black or Hispanic with a higher concentration of students in poverty:
This isn't even considering the growing charter school movement. An increasing number of charter schools are high-poverty and are predominantly black or Hispanic. Meanwhile, a growing number of charter schools are also low-poverty and predominantly white and Asian:
The data proves that school segregation is getting worse - Vox

So, yes, there is a portion of America that is getting more diverse. And overall, the “unevenness” measure of segregation shows we’re racially distributing students about as well as we were a few decades ago.

But we are also increasingly isolating the most vulnerable students in America. Things haven’t been steady; they are getting worse.

**Focusing on what’s holding steady pushes a misleading narrative**

VerBruggen is pushing back against a narrative that most experts agree with, which says that America went through a period of desegregation from the 1950s through the 1980s but then backslid in the decades since. VerBruggen is arguing that as immigration policies have diversified America in recent decades, our schools diversified as well.

But research by Cornell sociologist Daniel Lichter shows that segregation between white families and nonwhite families has actually changed very little since the 1980s. In fact,
while segregation within cities has gotten slightly better, segregation between municipalities has gotten worse.

In other words, there is probably less segregation within the neighborhoods of your town. But there is probably more segregation in comparing your town and a neighboring one.

So if broader segregation has increased, it might be reflected in our schools, as school attendance zones are often drawn based on where you live.

This is partially what has entrenched the heavily segregated school attendance zones in virtually every American city:
The data proves that school segregation is getting worse - Vox

But school boards can draw school attendance boundaries to lessen that segregation — to send kids to less racially segregated schools. We don’t have to send kids to the nearest school, especially because it ends up recreating the underlying residential segregation:
The data proves that school segregation is getting worse - Vox

If kids go to the **nearest school**, it would recreate the underlying residential segregation.

But most school districts don’t do anything to ameliorate this situation. We continue to recreate the residential segregation. (Here’s an interactive that lets you **look up your own district**.)
How much school districts use attendance zones to lessen or worsen racial segregation

This looks at how American school districts with at least five primary schools exacerbate or ameliorate the underlying neighborhood segregation.

In addition, research from Southern Methodist University’s Meredith Richards shows that when neighborhoods don’t experience much demographic change, they tend to draw school attendance zones that resegregate. Also, when neighborhoods experience a lot of demographic change, they defensively draw attendance zones that further segregate:
So let’s rehash here:

- We are increasingly isolating poor black and Hispanic children in segregated schools, both public and charter.
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• And when neighborhoods don’t change or drastically change, school districts actually tend to make even more segregative attendance zones.

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But using those metrics to paint a picture in which school segregation isn’t getting worse misses the point of why we talk about school segregation. The American education system has vestiges of engineered inequities, and those inequities have created unequal opportunities for a huge chunk of black Americans. When we query the data using this framework, the answer is clear: We are going in reverse.

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Median
Upper Quartile
Maximum

Lesson 5
No new vocabulary, woo!

Lesson 6
No new vocabulary, woo!
Welcome to Class
Lesson 5-6
Interpret Results
Using the boxplot below, describe its properties of distribution (center, spread, shape). Can you create a story for what this data may represent?
Think/Pair/Share Activity

Percentage of black students in the South who attend schools that are at least 50 percent white

Brown v. Board integrates schools

Data from the National Center for Education Statistics, via UCLA’s Civil Rights Project
Think/Pair/Share Activity
Think/Pair/Share Activity

More and more poor, predominantly minority schools

- **10%** High poverty and 75 to 100% black or Hispanic
- **12%** Low poverty and 0 to 25% black or Hispanic
- **14%** All others

Data from a 2018 United States Government Accountability Office report. High poverty is a school where more than 75 percent of students qualify for free or reduced-cost lunch; low poverty is a school where less than 25 percent qualify.
Statistical Reasoning Mini Project!
Zoom Poll

How far have you gotten in your Mini Project? Be honest. If you need more time, I can give you more class time!
Statistical Reasoning Mini Project
Description of Assessment

We have spent the last week and a half learning the 4 steps of statistical reasoning. As a reminder, these steps are…

**Step 1.** Formulate the Question  
**Step 2.** Collect Data to Answer the Question  
**Step 3.** Analyze the Data  
**Step 4.** Interpret Results

Over this time, we have also been investigating the topic of modern-day school segregation to answer our unit question, “do all students in America receive the same quality of education?” This project will ask you to use the statistical reasoning steps to collect and analyze more data so we will be better prepared to answer our unit question.

Review the rubric and checklist for this mini project and use your notes and sketchbook to complete the project. As of right now, this project will be due during class on Friday, but I am willing to be flexible. If you need more time, talk with me during class.
### Statistical Reasoning Mini Project Checklist
Complete this checklist when you are “done” with your project

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I have created a <strong>comparative</strong> statistical question that pertains to the topic of modern-day school segregation. <em>If time allowed, I have gotten my statistical question checked by Ms. Alberts (Step 1)</em></td>
</tr>
<tr>
<td>2</td>
<td>I have created some type of table to collect and organize the data I need to accurately answer my statistical question. <em>(Step 2)</em></td>
</tr>
<tr>
<td>3</td>
<td>I have created 1 histogram and 1 boxplot for each appropriate data set. <em>(Step 3)</em></td>
</tr>
<tr>
<td>3</td>
<td>I have used the included blank histogram and boxplot templates to keep the graphs consistent. <em>(Step 3)</em></td>
</tr>
<tr>
<td>4</td>
<td>I have created a written response reflecting on the properties of distribution for the graphs I created. <em>(Step 4)</em></td>
</tr>
<tr>
<td>4</td>
<td>My written response on properties of distribution includes (1) center, (2) spread, and (3) shape. <em>(Step 4)</em></td>
</tr>
<tr>
<td>4</td>
<td>I have created a written response creating at least one generalization and one conclusion based on the graphs I created. <em>(Step 4)</em></td>
</tr>
</tbody>
</table>

If you are not able to check off **EVERY** single box, you are not done. Go back to your project and make the appropriate changes. If you are stuck or need help, ask Ms. Alberts.
Statistical Reasoning Mini Project- Rubric

Before you submit your worksheet to the Schoology dropbox, make sure you check over your answers and review the rubric to make sure you have met all of the requirements.

**Student Name:________________________**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>5 Points</th>
<th>3 Points</th>
<th>1 Point</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Comparative Statistical Question</strong></td>
<td>Student correctly created a comparative statistical question.</td>
<td>Student created a statistical question, but it is not comparative.</td>
<td>Student did not correctly create a statistical question nor is it comparative.</td>
<td>___/5</td>
</tr>
<tr>
<td><strong>Data Collection</strong></td>
<td>Student correctly used the ProPublica database to create a table of accurate data.</td>
<td>Student either correctly used the ProPublica database or correctly created a table of data.</td>
<td>Student did not correctly use the ProPublica database and did not create a table of data.</td>
<td>___/5</td>
</tr>
<tr>
<td><strong>Graph Creation</strong></td>
<td>Student correctly created histograms/boxplots and created the correct amount to accurately represent data.</td>
<td>Student either correctly created histograms/boxplots or created the correct amount to accurately represent data.</td>
<td>Student did not correctly create histograms/boxplots and did not create the correct amount to accurately represent data.</td>
<td>___/5</td>
</tr>
<tr>
<td><strong>Properties of Distribution</strong></td>
<td>Student correctly interpreted their graphs using all three properties of distribution.</td>
<td>Student missed 1-2 properties of distribution in their written interpretation of their results.</td>
<td>Student did not mention any of the properties of distribution in their written interpretation of their results</td>
<td>___/5</td>
</tr>
<tr>
<td><strong>Generalizations and Conclusions</strong></td>
<td>Student correctly interpreted their graphs mentioning at least one generalization and one conclusion.</td>
<td>Student correctly interpreted their graphs mentioning either one generalization OR one conclusion.</td>
<td>Student did not mention at least one generalization or one conclusion in their written interpretation of their results</td>
<td>___/5</td>
</tr>
</tbody>
</table>

**Total Score:** ___/25

**Notes/Comments:**
Statistical Reasoning Mini Project

**Directions:** Follow the prompts below as you follow the 4 steps of statistical reasoning in order to investigate the data surrounding modern-day school segregation. Use the ProPublica “Miseducation” database we reviewed in class for all data collection.

**Step 1: Formulate a Question**

There are many different comparative statistical questions you could ask pertaining to the ProPublica “Miseducation” database. Some examples of these comparative questions we have asked in class are “how does the percentage of out-of-school suspensions for Black students compare to the percentage of out-of-school suspensions for White students in the Toledo City School District,” and “how does the demographic percentage of students considered gifted/talented in the Toledo City School District compare to the demographic percentage of students considered gifted/talented in the Cleveland City School District?” Formulate your own comparative statistical question you are curious about and write it on the line below.

____________________________________________________________________________________________________________

____________________________________________________________________________________________________________

**Step 2: Collect Data to Answer the Question**

One way we can collect statistical data is through research. Using the ProPublica “Miseducation” database from class (found here: [https://projects.propublica.org/miseducation/](https://projects.propublica.org/miseducation/)) record the information you need in order to continue to step 3. I suggest you create a labeled table (similar to the one from the histogram/boxplot data sheet) to keep your data accurate and organized. Review the sample assessment if you are struggling to find a way to organize your data.
Statistical Reasoning Mini Project

**Step 3: Analyze the Data**

Now that you have collected all of your data, you need to turn it into a graph so it will be easier to analyze. For this step, you need to create a histogram and a boxplot for every appropriate set of data you have collected. For example, if your statistical question is “how does the percentage of out-of-school suspensions for Black students compare to the percentage of out-of-school suspensions for White students in the Toledo City School District,” you would create 1 histogram and 1 boxplot to represent the data you collected on the Black students as well as 1 histogram and 1 boxplot to represent the data on the White students. If your statistical question is “how does the demographic percentage of students considered gifted/talented in the Toledo City School District compare to the demographic percentage of students considered gifted/talented in the Cleveland City School District?” you would create 1 histogram and 1 boxplot to represent the data you collected on Black students in Toledo, 1 histogram and 1 boxplot to represent the data you collected on White students in Toledo, 1 histogram and 1 boxplot to represent the data you collected on Black students in Cleveland, and 1 histogram and 1 boxplot to represent the data you collected on White students in Cleveland.

Use the included blank templates for histograms and boxplots to graph your data on.

**Step 4: Interpret Results**

On the lines below, write about the distribution properties you saw in your graphs. Make sure you mention all properties of distribution (center, spread, and shape).

____________________________________________________________________________________________________________

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Statistical Reasoning Mini Project

On the lines below, write about your generalizations and conclusions you have created based on your statistical question and the graphs you created. Be sure to mention at least 1 generalization and 1 conclusion.
Histogram Template
Representing: ________________________________

List out the data numbers here:_______________________________________________
________________________________________________________________________

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Representing: ________________________________

List out the data numbers here: ________________________________________

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[Graph of Frequency Table]
Representing: ________________________________

List out the data numbers here:_______________________________________________
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<table>
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Boxplot Template

Representing: ________________________________

List out the data numbers here: ______________________________________________________
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<td>Median</td>
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<td>Upper Quartile</td>
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<tr>
<td>Upper Quartile</td>
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<tr>
<td>Maximum</td>
</tr>
</tbody>
</table>
Statistical Reasoning Mini Project

**Directions:** Follow the prompts below as you follow the 4 steps of statistical reasoning in order to investigate the data surrounding modern-day school segregation. Use the ProPublica “Miseducation” database we reviewed in class for all data collection.

**Step 1: Formulate a Question**

There are many different comparative statistical questions you could ask pertaining to the ProPublica “Miseducation” database. Some examples of these comparative questions we have asked in class are “how does the percentage of out-of-school suspensions for Black students compare to the percentage of out-of-school suspensions for White students in the Toledo City School District,” and “how does the demographic percentage of students considered gifted/talented in the Toledo City School District compare to the demographic percentage of students considered gifted/talented in the Cleveland City School District?” Formulate your own comparative statistical question you are curious about and write it on the line below.

How does the percentage of out-of-school suspensions for Black students in the Toledo City School District compare to the demographic percentage of Black students enrolled in the Toledo City School District?
Step 2: Collect Data to Answer the Question

One way we can collect statistical data is through research. Using the ProPublica “Miseducation” database from class (found here: https://projects.propublica.org/miseducation/) record the information you need in order to continue to step 3. I suggest you create a labeled table (similar to the one from the histogram/boxplot data sheet) to keep your data accurate and organized. Review the sample assessment if you are struggling to find a way to organize your data.

<table>
<thead>
<tr>
<th>School Composition</th>
<th>Out-of-School Suspensions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Black</td>
</tr>
<tr>
<td>Toledo City School District</td>
<td>42</td>
</tr>
<tr>
<td>Arlington Elementary</td>
<td>29</td>
</tr>
<tr>
<td>Beverly Elementary</td>
<td>11</td>
</tr>
<tr>
<td>Burroughs Elementary</td>
<td>24</td>
</tr>
<tr>
<td>DeVeaux Elementary</td>
<td>33</td>
</tr>
<tr>
<td>Whittier Elementary</td>
<td>32</td>
</tr>
<tr>
<td>Elmhurst Elementary</td>
<td>12</td>
</tr>
<tr>
<td>Toledo Technology Academy High School</td>
<td>20</td>
</tr>
<tr>
<td>Bowsher High School</td>
<td>41</td>
</tr>
<tr>
<td>Jesup W. Scott High School</td>
<td>92</td>
</tr>
<tr>
<td>Rogers High School</td>
<td>69</td>
</tr>
<tr>
<td>Start High School</td>
<td>44</td>
</tr>
<tr>
<td>Woodward High School</td>
<td>62</td>
</tr>
</tbody>
</table>
Statistical Reasoning Mini Project

Step 3: Analyze the Data
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Use the included blank templates for histograms and boxplots to graph your data on.

See “Example- Templates” for the examples that correlate with this comparative statistical question.

Step 4: Interpret Results
On the lines below, write about the distribution properties you saw in your graphs. Make sure you mention all properties of distribution (center, spread, and shape).

In this space, I will reflect on the x amount of graphs I made and how they relate back to the statistical question I create. I will make sure to mention center, spread, and shape (all properties of distributions) as I reflect on my graphs.
Statistical Reasoning Mini Project

On the lines below, write about your generalizations and conclusions you have created based on your statistical question and the graphs you created. Be sure to mention at least 1 generalization and 1 conclusion.

In this space, I will reflect on the x amount of graphs I made and how they relate back to the statistical question I made. I will make sure to mention at least one generalization I have gathered from interpreting the graphs and analyzing their distribution properties, as well as at least one conclusion.
Histogram Template

Representing: Percentage of out-of-school suspensions for Black students in Toledo City School District

List out the data numbers here: 37, 35, 36, 55, 50, 25, 0, 54, 92, 79, 63, 74

| Frequency Table |
|-----------------|----------------|
| Range of Data   | Tally Marks    |
| 0-9             | ı              |
| 10-19           |                |
| 20-29           | ı              |
| 30-39           | ııı            |
| 40-49           |                |
| 50-59           | ııı            |
| 60-69           | ı              |
| 70-79           | ıı             |
| 80-89           |                |
| 90-100          | ı              |
Boxplot Template

Representing: **Percentage of out-of-school suspensions for Black students in Toledo City School District**

List out the data numbers here: **37, 35, 36, 55, 50, 25, 0, 54, 92, 79, 63, 74**

<table>
<thead>
<tr>
<th><strong>5 Number Summary</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
<td>0</td>
</tr>
<tr>
<td>Lower Quartile</td>
<td>35.5</td>
</tr>
<tr>
<td>Median</td>
<td>52</td>
</tr>
<tr>
<td>Upper Quartile</td>
<td>68.5</td>
</tr>
<tr>
<td>Maximum</td>
<td>92</td>
</tr>
</tbody>
</table>

![Boxplot Diagram]
Histogram Template

Representing: __Demographic percentage of Black students enrolled in the Toledo City School District______________________________

List out the data numbers here: __29, 11, 24, 33, 32, 12, 20, 41, 92, 69, 44, 62____

<table>
<thead>
<tr>
<th>Frequency Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range of Data</td>
</tr>
<tr>
<td>0-9</td>
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<td>70-79</td>
</tr>
<tr>
<td>80-89</td>
</tr>
<tr>
<td>90-100</td>
</tr>
</tbody>
</table>
Boxplot Template

Representing: __Demographic percentage of Black students enrolled in the Toledo City School District______________

List out the data numbers here: __29, 11, 24, 33, 32, 12, 20, 41, 92, 69, 44, 62______________________________

<table>
<thead>
<tr>
<th>5 Number Summary</th>
<th></th>
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<tbody>
<tr>
<td>Minimum</td>
<td>11</td>
</tr>
<tr>
<td>Lower Quartile</td>
<td>23</td>
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<tr>
<td>Median</td>
<td>32.5</td>
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<tr>
<td>Upper Quartile</td>
<td>48.5</td>
</tr>
<tr>
<td>Maximum</td>
<td>92</td>
</tr>
</tbody>
</table>
Lesson Six Materials
WELCOME TO
CLASS
LESSON 6-6
INTERPRET RESULTS
NO POD!

× Write in your sketchbook we are not doing a Problem of the Day today.
× Instead, we are going to jump right back into our Mini Projects. If you need more than 20 minutes left to finish, please check in with Ms. Alberts
PRESENTATIONS!
Overall Conclusions

× Nationally, White students are more likely to be enrolled in AP courses or be considered gifted—ProPublica “Miseducation” database
× Nationally, Black students get more punishments, both out-of-school suspensions and expulsions—ProPublica “Miseducation” database
× What else did you notice?
How These Black Students Fought Modern-Day Segregation

Reports
How to Be Civically Engaged (Besides Voting)

- Write letters to your local government officials
- Attend/organize protests
- Volunteer for local organizations
- Donate to charities
- Facilitate conversations in your community
- Get involved in local government

- What can we do in our school?
ARTICULATE AND REFLECT

× What are the consequences of NOT knowing about modern-day school segregation?
× What are the consequences of NOT knowing the math in a real world context?
× Do all children in America receive the same quality of education?
The data proves that school segregation is getting worse

This is ultimately a disagreement over how we talk about school segregation.

By Alvin Chang | @alv9n | alvin@vox.com | Mar 5, 2018, 1:50pm EST

The predominant narrative among education activists is that school segregation has gotten worse in the past several decades. It’s an argument backed by data — one I’ve stressed in my own work. And earlier this year, a New York Times op-ed also made this argument and cited that same data.

But there’s now a handful of pundits pushing back on this notion, like the National Review’s Robert VerBruggen. In response to the Times piece, he wrote that changing demographics makes the data misleading — and that ultimately, “we’re not going in reverse” when it comes to segregation. Prominent journalists, like New York magazine’s Jonathan Chait and my colleague Matt Yglesias, shared VerBruggen’s post on Twitter.

The National Review piece isn’t coming out of the blue. The idea that changing demographics — the US becoming less white — makes it harder to integrate schools is something that has picked up steam in recent years. In Connecticut, Gov. Dannel Malloy has pushed for more leniency in standards set by a court-ordered desegregation case.

So how could two sides look at the data and come to two different conclusions about school segregation trends?

On the surface, this is an argument about how we measure school segregation trends. But ultimately, it’s a disagreement over how we should be thinking about school segregation.

Is school segregation not actually getting worse? It depends on how you measure it.

The core disagreement comes down to federal government data that was highlighted by the UCLA Civil Rights Project on the 60th anniversary of Brown v. Board of Education, the Supreme Court case that ruled segregated schools were unconstitutional.

The data shows that black students in the South are less likely to attend a school that is majority white than about 50 years ago:
National Review’s VerBruggen sees this chart and argues that a smaller portion of black students are attending majority-white schools because the US is just less white than it was 40 or 50 years ago:

Both arguments are the products of some messy data work.
On one hand, if we’re measuring segregation by how many children attend majority-white schools, then it’s worth acknowledging that white people are now a smaller percentage of the US population. This is something I’ve admittedly left out of my work when presenting this data.

On the other hand, VerBruggen uses this flaw to argue that school segregation actually isn’t getting worse — even though it’s virtually impossible to make this argument from this data alone. VerBruggen does cite a study by Stanford sociologist Sean Reardon and USC sociologist Ann Owens that says school segregation hasn’t changed that much in the past few decades. But Reardon and Owens specifically write that there are two ways they measure segregation:

1. Exposure or isolation, which looks at whether students attend schools with a high or low proportion of a given racial group
2. Unevenness, which measures how evenly distributed students of a given racial group are

Reardon and Owens write, “The debate about whether the last two decades can be characterized as a period of resegregation largely hinges on whether one uses exposure or unevenness measures of segregation.”

The VerBruggen argument adopts the “unevenness” frame: School segregation hasn’t gotten worse because students are just as unevenly distributed now as they were in the 1980s.

Reardon and Owens give this example:

... Consider a school district in which 90% of students are black. If all schools in the district had enrollments that were 90% black, we would have low unevenness but high black isolation (or, equivalently, low black-white exposure) because the average black student would attend a predominantly black school. Conversely, in a school district with very few black students, isolation might be low even if students were very unevenly distributed by race.
These schools are very even, but there is a high level of isolation.

But if you care about more equity in education, this is an odd argument. It’s essentially saying: Hey, we haven’t made school segregation worse — and it’s because of Asian and Hispanic immigrants.

This leads to the reason why people who care about equity balance it with the other measure: isolation.

A reason to measure racial isolation, not just unevenness

Let’s just state this for the record: Racial segregation in schools was caused by white America’s policies that kept schools and neighborhoods white-only. For black families, this meant their country engineered for them a second-class experience — one that put them in poor, segregated ghettos and poor, segregated schools.

And that’s not getting better. Black children are now more likely to grow up in poor neighborhoods than they were 50 years ago.
The data proves that school segregation is getting worse - Vox

This is important because a large body of research shows that **growing up in heavily segregated, poor neighborhoods** affects everything from your education level, your future earnings, and your happiness to your health and, ultimately, your life span.

But in many of these areas, where you live determines where you go to school. So when we see students who are racially isolated, it’s describing both underlying residential segregation and how little school districts do to ameliorate that segregation.

As it turns out, things have been getting worse since the 1980s when we look at segregation using this isolation frame:
Percentage of black students in schools that are 90 to 100% minority

South

<table>
<thead>
<tr>
<th>Year</th>
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<td>2010</td>
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Border

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<td>2010</td>
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Northeast

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<tr>
<td>1968</td>
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Midwest

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<tr>
<td>1968</td>
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West

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Data from the US Department of Education's National Center for Education Statistics and Office of Civil Rights.
As Reardon and Owens point out, indices of exposure show black-white segregation have actually gotten worse since the 1970s:

How the black-white exposure index changed in the last 50 years

This has caused a growing number of our schools to be predominantly black or Hispanic with a higher concentration of students in poverty:
This isn’t even considering the growing charter school movement. An increasing number of charter schools are high-poverty and are predominantly black or Hispanic. Meanwhile, a growing number of charter schools are also low-poverty and predominantly white and Asian:
So, yes, there is a portion of America that is getting more diverse. And overall, the “unevenness” measure of segregation shows we’re racially distributing students about as well as we were a few decades ago.

But we are also increasingly isolating the most vulnerable students in America. Things haven’t been steady; they are getting worse.

**Focusing on what’s holding steady pushes a misleading narrative**

VerBruggen is pushing back against a narrative that most experts agree with, which says that America went through a period of desegregation from the 1950s through the 1980s but then backslid in the decades since. VerBruggen is arguing that as immigration policies have diversified America in recent decades, our schools diversified as well.

But **research** by Cornell sociologist Daniel Lichter shows that segregation between white families and nonwhite families has actually changed very little since the 1980s. In fact,
while segregation within cities has gotten slightly better, segregation *between* municipalities has gotten worse.

In other words, there is probably *less* segregation within the neighborhoods of your town. But there is probably *more* segregation in comparing your town and a neighboring one.

![Graph showing segregation changes](https://www.vox.com/2018/3/5/17080218/school-segregation-getting-worse-data)

So if broader segregation has increased, it might be reflected in our schools, as school attendance zones are often drawn based on where you live.

This is partially what has entrenched the heavily segregated school attendance zones in virtually every American city:
But school boards can draw school attendance boundaries to lessen that segregation — to send kids to less racially segregated schools. We don’t have to send kids to the nearest school, especially because it ends up recreating the underlying residential segregation:
If kids go to the nearest school, it would recreate the underlying residential segregation.

But it’s possible to gerrymander these zones to reduce segregation — or make it worse.

But most school districts don’t do anything to ameliorate this situation. We continue to recreate the residential segregation. (Here’s an interactive that lets you look up your own district.)
How much school districts use attendance zones to lessen or worsen racial segregation

This looks at how American school districts with at least five primary schools exacerbate or ameliorate the underlying neighborhood segregation.

![Graph showing how much school districts use attendance zones to lessen or worsen racial segregation.](https://www.vox.com/2018/3/5/17080218/school-segregation-getting-worse-data)

Data from research by Tomas E. Monarrez, a PhD candidate at the University of California, Berkeley.

* Monarrez plotted out the percentage of black and Hispanic residents for each school attendance zone and compared it to the percentage of black and Hispanic residents in each “neighborhood,” which are borders drawn based on the scenario that everyone attends the nearest elementary school. He then figured out the slope of that line, and subtracted that slope from 1. If the number if positive, it ameliorates segregation. If it’s negative, it exacerbates it.

In addition, research from Southern Methodist University’s Meredith Richards shows that when neighborhoods don’t experience much demographic change, they tend to draw school attendance zones that resegregate. Also, when neighborhoods experience a lot of demographic change, they defensively draw attendance zones that further segregate:
So let’s rehash here:

- We are increasingly isolating poor black and Hispanic children in segregated schools, both public and charter.
- Residential segregation between cities is getting worse, and the Supreme Court in the 1974 case *Milliken v. Bradley* said surrounding cities **could not be forced** into school integration plans.
- Meanwhile, segregation within cities is about the same as in the 1980s. It’s still extremely high.
- School districts are doing very little to ameliorate that segregation.
• And when neighborhoods don’t change or drastically change, school districts actually tend to make even more segregative attendance zones.

Yes, we can find metrics that show school segregation isn’t getting worse; we can find metrics that show our schools are not any more segregated now than they were 30 years ago. These metrics are important, and they describe significant ways our schools are changing.

And, to be fair, VerBruggen writes in his piece that “this doesn’t mean that this country’s racial problems are over or that there’s nothing we can do to spur further integration.”

But using those metrics to paint a picture in which school segregation isn’t getting worse misses the point of why we talk about school segregation. The American education system has vestiges of engineered inequities, and those inequities have created unequal opportunities for a huge chunk of black Americans. When we query the data using this framework, the answer is clear: We are going in reverse.

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Millions of people rely on Vox to understand how the policy decisions made in Washington, from health care to unemployment to housing, could impact their lives. Our work is well-sourced, research-driven, and in-depth. And that kind of work takes resources. Even after the economy recovers, advertising alone will never be enough to support it. If you have already made a contribution to Vox, thank you. If you haven’t, help us keep our journalism free for everyone by making a financial contribution today, from as little as $3.
Weekly Vocabulary

These are key vocabulary terms we will reference in class. If you miss the definition in class, research the term and define them in your sketchbook. As a reminder, your weekly vocabulary assignment is due Friday by 11:59 PM.

Lesson 4
Boxplot
Minimum
Lower Quartile
Median
Upper Quartile
Maximum

Lesson 5
No new vocabulary, woo!

Lesson 6
No new vocabulary, woo!
Statistical Reasoning Mini Project
Description of Assessment

We have spent the last week and a half learning the 4 steps of statistical reasoning. As a reminder, these steps are…

**Step 1.** Formulate the Question
**Step 2.** Collect Data to Answer the Question
**Step 3.** Analyze the Data
**Step 4.** Interpret Results

Over this time, we have also been investigating the topic of modern-day school segregation to answer our unit question, “do all students in America receive the same quality of education?” This project will ask you to use the statistical reasoning steps to collect and analyze more data so we will be better prepared to answer our unit question.

Review the rubric and checklist for this mini project and use your notes and sketchbook to complete the project. As of right now, this project will be due during class on Friday, but I am willing to be flexible. If you need more time, talk with me during class.
Statistical Reasoning Mini Project Checklist
Complete this checklist when you are “done” with your project

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I have created a comparative statistical question that pertains to the topic of modern-day school segregation. <em>If time allowed, I have gotten my statistical question checked by Ms. Alberts</em></td>
</tr>
<tr>
<td>2.</td>
<td>I have created some type of table to collect and organize the data I need to accurately answer my statistical question.</td>
</tr>
<tr>
<td>3.</td>
<td>I have created 1 histogram and 1 boxplot for each appropriate data set.</td>
</tr>
<tr>
<td>3.</td>
<td>I have used the included blank histogram and boxplot templates to keep the graphs consistent.</td>
</tr>
<tr>
<td>4.</td>
<td>I have created a written response reflecting on the properties of distribution for the graphs I created.</td>
</tr>
<tr>
<td>4.</td>
<td>My written response on properties of distribution includes (1) center, (2) spread, and (3) shape.</td>
</tr>
<tr>
<td>4.</td>
<td>I have created a written response creating at least one generalization and one conclusion based on the graphs I created.</td>
</tr>
</tbody>
</table>

If you are not able to check off EVERY single box, you are not done. Go back to your project and make the appropriate changes. If you are stuck or need help, ask Ms. Alberts
Before you submit your worksheet to the Schoology dropbox, make sure you check over your answers and review the rubric to make sure you have met all of the requirements.

**Student Name:** ________________________________

<table>
<thead>
<tr>
<th>Criteria</th>
<th>5 Points</th>
<th>3 Points</th>
<th>1 Point</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Comparative Statistical Question</strong></td>
<td>Student correctly created a comparative statistical question.</td>
<td>Student created a statistical question, but it is not comparative.</td>
<td>Student did not correctly create a statistical question nor is it comparative.</td>
<td>__/5</td>
</tr>
<tr>
<td><strong>Data Collection</strong></td>
<td>Student correctly used the ProPublica database to create a table of accurate data.</td>
<td>Student either correctly used the ProPublica database or correctly created a table of data.</td>
<td>Student did not correctly use the ProPublica database and did not create a table of data.</td>
<td>__/5</td>
</tr>
<tr>
<td><strong>Graph Creation</strong></td>
<td>Student correctly created histograms/boxplots and created the correct amount to accurately represent data.</td>
<td>Student either correctly created histograms/boxplots or created the correct amount to accurately represent data.</td>
<td>Student did not correctly create histograms/boxplots and did not create the correct amount to accurately represent data.</td>
<td>__/5</td>
</tr>
<tr>
<td><strong>Properties of Distribution</strong></td>
<td>Student correctly interpreted their graphs using all three properties of distribution.</td>
<td>Student missed 1-2 properties of distribution in their written interpretation of their results.</td>
<td>Student did not mention any of the properties of distribution in their written interpretation of their results</td>
<td>__/5</td>
</tr>
<tr>
<td><strong>Generalizations and Conclusions</strong></td>
<td>Student correctly interpreted their graphs mentioning at least one generalization and one conclusion.</td>
<td>Student correctly interpreted their graphs mentioning either one generalization OR one conclusion.</td>
<td>Student did not mention at least one generalization or one conclusion in their written interpretation of their results.</td>
<td>__/5</td>
</tr>
</tbody>
</table>

**Total Score:** ____/25

**Notes/Comments:**
Statistical Reasoning Mini Project

Directions: Follow the prompts below as you follow the 4 steps of statistical reasoning in order to investigate the data surrounding modern-day school segregation. Use the ProPublica “Miseducation” database we reviewed in class for all data collection.

Step 1: Formulate a Question
There are many different comparative statistical questions you could ask pertaining to the ProPublica “Miseducation” database. Some examples of these comparative questions we have asked in class are “how does the percentage of out-of-school suspensions for Black students compare to the percentage of out-of-school suspensions for White students in the Toledo City School District,” and “how does the demographic percentage of students considered gifted/talented in the Toledo City School District compare to the demographic percentage of students considered gifted/talented in the Cleveland City School District?” Formulate your own comparative statistical question you are curious about and write it on the line below.

____________________________________________________________________________________________________________
____________________________________________________________________________________________________________

Step 2: Collect Data to Answer the Question
One way we can collect statistical data is through research. Using the ProPublica “Miseducation” database from class (found here: [https://projects.propublica.org/miseducation/](https://projects.propublica.org/miseducation/)) record the information you need in order to continue to step 3. I suggest you create a labeled table (similar to the one from the histogram/boxplot data sheet) to keep your data accurate and organized. Review the sample assessment if you are struggling to find a way to organize your data.
Statistical Reasoning Mini Project

Step 3: Analyze the Data
Now that you have collected all of your data, you need to turn it into a graph so it will be easier to analyze. For this step, you need to create a histogram and a boxplot for every appropriate set of data you have collected. For example, if your statistical question is "how does the percentage of out-of-school suspensions for Black students compare to the percentage of out-of-school suspensions for White students in the Toledo City School District," you would create 1 histogram and 1 boxplot to represent the data you collected on the Black students as well as 1 histogram and 1 boxplot to represent the data on the White students. If your statistical question is "how does the demographic percentage of students considered gifted/talented in the Toledo City School District compare to the demographic percentage of students considered gifted/talented in the Cleveland City School District?" you would create 1 histogram and 1 boxplot to represent the data you collected on Black students in Toledo, 1 histogram and 1 boxplot to represent the data you collected on White students in Toledo, 1 histogram and 1 boxplot to represent the data you collected on Black students in Cleveland, and 1 histogram and 1 boxplot to represent the data you collected on White students in Cleveland.
Use the included blank templates for histograms and boxplots to graph your data on.

Step 4: Interpret Results
On the lines below, write about the distribution properties you saw in your graphs. Make sure you mention all properties of distribution (center, spread, and shape).
____________________________________________________________________________________________________________
____________________________________________________________________________________________________________
____________________________________________________________________________________________________________
____________________________________________________________________________________________________________
____________________________________________________________________________________________________________
____________________________________________________________________________________________________________
Statistical Reasoning Mini Project

On the lines below, write about your generalizations and conclusions you have created based on your statistical question and the graphs you created. Be sure to mention at least 1 generalization and 1 conclusion.
**Histogram Template**

Representing: ________________________________

List out the data numbers here:_______________________________________________
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</table>
Boxplot Template

Representing: ________________________________

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<td>Upper Quartile</td>
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<tr>
<td>Maximum</td>
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</tbody>
</table>
Representing: ____________________________________________

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______________________________________________________________________

<table>
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<td>Maximum</td>
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</table>
Statistical Reasoning Mini Project

**Directions:** Follow the prompts below as you follow the 4 steps of statistical reasoning in order to investigate the data surrounding modern-day school segregation. Use the ProPublica “Miseducation” database we reviewed in class for all data collection.

**Step 1: Formulate a Question**

There are many different comparative statistical questions you could ask pertaining to the ProPublica “Miseducation” database. Some examples of these comparative questions we have asked in class are “how does the percentage of out-of-school suspensions for Black students compare to the percentage of out-of-school suspensions for White students in the Toledo City School District,” and “how does the demographic percentage of students considered gifted/talented in the Toledo City School District compare to the demographic percentage of students considered gifted/talented in the Cleveland City School District?” Formulate your own comparative statistical question you are curious about and write it on the line below.

How does the percentage of out-of-school suspensions for Black students in the Toledo City School District compare to the demographic percentage of Black students enrolled in the Toledo City School District?
Statistical Reasoning Mini Project

**Step 2: Collect Data to Answer the Question**

One way we can collect statistical data is through research. Using the ProPublica “Miseducation” database from class (found here: [https://projects.propublica.org/miseducation/](https://projects.propublica.org/miseducation/)) record the information you need in order to continue to step 3. I suggest you create a labeled table (similar to the one from the histogram/boxplot data sheet) to keep your data accurate and organized. Review the sample assessment if you are struggling to find a way to organize your data.

<table>
<thead>
<tr>
<th>School Composition</th>
<th>Out-of-School Suspensions</th>
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<tbody>
<tr>
<td>Black</td>
<td>White</td>
</tr>
<tr>
<td>Toledo City School District</td>
<td>42</td>
</tr>
<tr>
<td>Arlington Elementary</td>
<td>29</td>
</tr>
<tr>
<td>Beverly Elementary</td>
<td>11</td>
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<tr>
<td>Burroughs Elementary</td>
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<tr>
<td>DeVeaux Elementary</td>
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<tr>
<td>Whittier Elementary</td>
<td>32</td>
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<tr>
<td>Elmhurst Elementary</td>
<td>12</td>
</tr>
<tr>
<td>Toledo Technology Academy High School</td>
<td>20</td>
</tr>
<tr>
<td>Bowsher High School</td>
<td>41</td>
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<tr>
<td>Jesup W. Scott High School</td>
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<tr>
<td>Rogers High School</td>
<td>69</td>
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<tr>
<td>Start High School</td>
<td>44</td>
</tr>
<tr>
<td>Woodward High School</td>
<td>62</td>
</tr>
</tbody>
</table>
Statistical Reasoning Mini Project

Step 3: Analyze the Data

Now that you have collected all of your data, you need to turn it into a graph so it will be easier to analyze. For this step, you need to create a histogram and a boxplot for every appropriate set of data you have collected. For example, if your statistical question is “how does the percentage of out-of-school suspensions for Black students compare to the percentage of out-of-school suspensions for White students in the Toledo City School District,” you would create 1 histogram and 1 boxplot to represent the data you collected on the Black students as well as 1 histogram and 1 boxplot to represent the data on the White students. If your statistical question is “how does the demographic percentage of students considered gifted/talented in the Toledo City School District compare to the demographic percentage of students considered gifted/talented in the Cleveland City School District?” you would create 1 histogram and 1 boxplot to represent the data you collected on Black students in Toledo, 1 histogram and 1 boxplot to represent the data you collected on White students in Toledo, 1 histogram and 1 boxplot to represent the data you collected on Black students in Cleveland, and 1 histogram and 1 boxplot to represent the data you collected on White students in Cleveland.

Use the included blank templates for histograms and boxplots to graph your data on.

See “Example- Templates” for the examples that correlate with this comparative statistical question.

Step 4: Interpret Results

On the lines below, write about the distribution properties you saw in your graphs. Make sure you mention all properties of distribution (center, spread, and shape).

In this space, I will reflect on the x amount of graphs I made and how they relate back to the statistical question I create. I will make sure to mention center, spread, and shape (all properties of distributions) as I reflect on my graphs.
Statistical Reasoning Mini Project

On the lines below, write about your generalizations and conclusions you have created based on your statistical question and the graphs you created. Be sure to mention at least 1 generalization and 1 conclusion.

In this space, I will reflect on the x amount of graphs I made and how they relate back to the statistical question I made. I will make sure to mention at least one generalization I have gathered from interpreting the graphs and analyzing their distribution properties, as well as at least one conclusion.
Histogram Template

Representing: Percentage of out-of-school suspensions for Black students in Toledo City School District

List out the data numbers here: 37, 35, 36, 55, 50, 25, 0, 54, 92, 79, 63, 74

<table>
<thead>
<tr>
<th>Frequency Table</th>
<th></th>
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<tbody>
<tr>
<td>Range of Data</td>
<td>Tally Marks</td>
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<td></td>
</tr>
<tr>
<td>90-100</td>
<td>I</td>
</tr>
</tbody>
</table>
Boxplot Template

Representing: __Percentage of out-of-school suspensions for Black students in Toledo City School District____________________

List out the data numbers here: __37, 35, 36, 55, 50, 25, 0, 54, 92, 79, 63, 74

<table>
<thead>
<tr>
<th>5 Number Summary</th>
<th></th>
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<tbody>
<tr>
<td>Minimum</td>
<td>0</td>
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<tr>
<td>Lower Quartile</td>
<td>35.5</td>
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<tr>
<td>Median</td>
<td>52</td>
</tr>
<tr>
<td>Upper Quartile</td>
<td>68.5</td>
</tr>
<tr>
<td>Maximum</td>
<td>92</td>
</tr>
</tbody>
</table>
Histogram Template

Representing: __Demographic percentage of Black students enrolled in the Toledo City School District__

List out the data numbers here: __29, 11, 24, 33, 32, 12, 20, 41, 92, 69, 44, 62__

<table>
<thead>
<tr>
<th>Frequency Table</th>
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</thead>
<tbody>
<tr>
<td>Range of Data</td>
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<td>0-9</td>
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<tr>
<td>90-100</td>
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</tbody>
</table>

![Histogram (Frequency Diagram)](image-url)
Boxplot Template

Representing: __Demographic percentage of Black students enrolled in the Toledo City School District________________

List out the data numbers here: __29, 11, 24, 33, 32, 12, 20, 41, 92, 69, 44, 62______________________________________________

<table>
<thead>
<tr>
<th>5 Number Summary</th>
<th></th>
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<tbody>
<tr>
<td>Minimum</td>
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<td>Lower Quartile</td>
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<td>Maximum</td>
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