

Note to Teacher:

The following lesson plan is part of the Project SCOPE (Security Clearance Overview and Preparation Education) curriculum. The plan focuses on Statistics content and learning objectives – it could be used as is for a Statistics-based unit in an Algebra II course or a non-AP Statistics course, or it can be modified to be included in an AP Statistics class. The goal of the lesson is to provide students a meaningful experience reading about an academic study that utilizes statistical techniques, while also providing information on real-world data and opportunities for students to engage in good decision making.

To assist you in preparing a pedagogically appropriate lesson for your students, sample questions, worksheets, activities and discussion points have been provided. Appendix G also provides ideas for converting this lesson to a virtual format for schools or classes that are fully online or have adopted a hybrid approach.

This plan can stand alone as a part of your course, or it can be used as part of a cross-disciplinary unit through collaboration with a corresponding teacher in one of the following subjects:

- Government class
- Language Arts class
- History class
- Curriculum related to:
 - Vetting scholarly sources
 - Ethics and codes of honor as they relate to plagiarism or internet piracy
 - Alcohol and drug use
 - Financial literacy
 - Systems-based inequality

Lesson Plan: Statistics and Scholarly Articles

Objective:

The objectives of this lesson relate to the following MD College and Career Ready Standards for Algebra II:

HSS.IC.B. Make inferences and justify conclusions from sample surveys, experiments and observational studies.

HSS.IC.B.3 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.

HSS.IC.B.6 Evaluate reports based on data.

Consider using this lesson in conjunction with [Gr. HS Unit: Inferences and Conclusions from Data](#) provided by MSDE for Algebra II teachers.

Opening

Good decision making is an essential part of achieving life goals. Yet personal responsibility, or “pulling yourself up by the bootstraps,” is rarely enough to overcome systemic obstacles. While this lesson focuses on specific standards for mathematical achievement, it is also designed to tie into the real-life consequences of decision making and structural inequality in the U.S.

In the opening activity, students react to a set of statements (see Appendix A) that relate to the data-based findings of the scholarly articles in the resources folder. The purpose of this activity is to pique student interest and tie these readings back to real-life scenarios. At the conclusion of the lesson, go back through the statements you used with students to see how their opinions and thoughts have changed.

Choose from the statements below based on which scholarly articles you will provide student groups to read in the I Do, We Do, You Do Assignment below. We recommend using the first two statements as they relate to decision making, which is the focus of the read-aloud, think-aloud I Do, We Do, You Do Activity.

For each statement, ask students to “agree” or “disagree.” Have them write a few bullet points or sentences supporting their opinion. Depending on the ground rules you have laid out for your class, you may ask students to share their opinions out loud. Be mindful that some students may come to the table with racist, sexist, classist, or other views rooted in common narratives related to inequality. You will need to decide whether you have set up the appropriate classroom environment to protect students with less privilege from the ill-informed opinions of their more privileged peers.

Focus Activity

The description below is a suggestion for how to group students. Feel free to adjust based on the needs of your classroom. This activity assumes that students have already studied Statistics vocabulary in prior lessons/units and presents these topics as a review/warm-up for the main lesson.

The worksheet in Appendix B provides a list of common statistical vocabulary and asks students to write their own definitions for these terms. While the list is by no means exhaustive, it includes a number of terms that your class may or may not have yet studied depending upon where you insert this lesson in your curriculum. The intention of the worksheet is to provide a list of terms that you can edit – by adding or deleting – to include only the terms most relevant to what your class has studied.

You may consider using the worksheet as a formative assessment, having students try to write their own definitions from memory and then providing feedback to them on it. Alternately, you could have students work individually on the sheet at first and then pair up to compare answers with a partner. Either way, you will likely want to use some portion of class time to review the vocabulary words.

I Do, We Do, You Do Activity and Assignment

The purpose of this activity is to help students understand how to read scholarly articles that describe surveys and randomized experiments. It begins with the teacher modeling their thought process through a read-aloud, think-aloud and then asks students to do the same while the teacher listens in and guides through questioning. The final portion of the activity asks students to read an entire article with a group and answer questions about it.

For further details on the read-aloud, think-aloud strategy, see Appendix C.

Once you have completed the I Do and We Do portions of the activity, divide the class into groups and have each group select a topic for the You Do portion:

- Alcohol and Drug Use
- Managing Finances
- Internet Piracy

- Plagiarism
- Criminal Justice

Based on the topic selected by each group, assign the group an article to read from the appropriate subfolder of the Statistics Resources folder, along with the assignment sheet and rubric in Appendix D.

Presentations

To close this lesson, ask each group to share a summary of what they read and the conclusions drawn from it. You may consider assessing students through a formal presentation, or you may choose to keep the presentations casual. Appendix E provides an assignment sheet and rubric should you choose to assess students through formal presentations.

As each group presents, you have an opportunity to tie their findings into real-world context through discussion with the class. Many of the articles present data that relates to the age group of your students. While good decision making and personal responsibility are an important part of the equation for individual students, these articles point to systemic forms of racism, class discrimination, sexism and other forms of inequality.

Closing Activity

Go back to the statements you used from Appendix A and have students again “agree” or “disagree,” writing brief bullets or statements as to why. Have students compare their answers from before and after to see if any of them have changed. Discuss what has changed and why.

Some students may feel disappointed in the findings of these studies or may feel that systemic injustice makes their individual choices and good decisions futile. Appendix F presents some talking points you can use to discuss this balance with students, as well as some further reading & resources for students looking to learn more.

Appendix A: Statements for Opening Activity

Statements:

- Individual decisions can impact an individual's life, the lives of others, and society at large.
- Adolescents and young adults make decisions based on peer pressure rather than their life goals.
- Drugs & Alcohol
 - The rate at which teens use drugs has declined over the past 5 years.
 - Most teens think it is ok to drive drunk.
 - Most teens think it is ok to drive high.
- Criminal Justice
 - The risk of being arrested for or convicted of a crime is higher if you are black.
 - The risk of being killed by a police officer is lower if you are white.
 - People of color tend to be more likely to be arrested or charged for a misdemeanor crime than whites.
- Finances and Wage Gaps
 - Women negotiate for a higher salary less frequently than men.
 - Adolescents and young adults don't negotiate for higher salaries or wages.
 - Negotiating for a higher wage at a entry level position leads to significant differences in earnings over one's lifetime.
 - The racial wealth gap is due to lower education and home ownership rates among people of color.
 - Poverty is most often due to laziness or lack of personal initiative.
- Internet Piracy
 - Student in higher socio-economic classes are more likely to pirate movies, music, and other media online.
 - There is a real detriment to industry when media is pirated online.
 - There are no victims when someone illegally downloads or streams a movie, music, or other media.
- Plagiarism
 - Using another's ideas without attribution breaks international standards for plagiarism.
 - Sharing answers with a friend via social media is a form of academic dishonesty.
 - High school and college students today understand what is and what is not cheating, plagiarism, or other forms of academic dishonesty.
- Social Media
 - Social media is an important tool to expand your professional network and find job opportunities.
 - Most employers screen candidates based on cybervetting: they will look at social media profiles, etc. to determine whether or not the candidate is a good fit.
 - The prevalence of "call-out culture" and "cancel culture" means that most people now know that they shouldn't post racist, homophobic, sexist, classist, or other offensive things on social media.

Appendix B: Vocabulary Worksheet

Name: _____

Date: _____

An important part of learning about Statistics is understanding the vocabulary used in this field. Write a definition for each term below in your own words.

Variable –

Categorical (qualitative) –

Quantitative –

Observational Study –

Simulation –

Experiment –

Lurking Variable –

Confounding –

Treatment –

Control –

Subjects –

Random Assignment –

Completely Randomized Design –

Randomized Block Design –

Matched Pairs Design –

Double Blind –

Placebo Effect –

Statistically Significant –

Replication –

Individuals or subjects –

Population –

Sample –

Sampling Frame –

Sampling Techniques –

Convenience Sample –

Voluntary Response –

Simple Random Sample –

Stratified Random Sample –

Cluster Sample –

Bias –

Undercoverage –

Nonresponse –

Response Bias –

Measures of Center –

Mean –

Median –

Mode –

Measures of Spread –

Standard Deviation –

Range –

Quartiles –

Interquartile Range –

Outlier –

Skew –

Five Number Summary –

Pie Chart –

Stem & Leaf Plot –

Dot Plot –

Frequency Distribution –

Time Plot –

Histogram –

Boxplot –

Modified Boxplot –

Appendix C: Read-Aloud, Think-Aloud Strategies

The purpose of a read-aloud, think-aloud is to model active reading techniques for students, which is particularly important for mathematics, as many students do not know how to read their textbook or other literature heavy with mathematics terminology or concepts.

Selecting the appropriate text for the read-aloud, think-aloud is incredibly important, as you will want to ensure that the text you choose is accessible to all students and lends itself easily to this activity. Sample readings have been provided in the read-aloud, think-aloud curriculum folder on the Project SCOPE website.

Use the following **Rules of Notice** and **Steps** as a guide for using this strategy in class. See additional strategies and worksheets for read-aloud, think-aloud activities in the curriculum folder on the Project SCOPE website.

Rules of Notice

Remember to notice and interpret the meaning of the following during a math-based read-aloud, think-aloud:

- Titles and section headings
- Questions posed to the reader
- Vocabulary terms
 - Definitions
 - Application in the reading
- Example problems
 - Typical setting/surrounding
 - Use of vocabulary terms
 - Steps to solve them
- Repetition and summaries
- Conclusions/Results

Steps

1. Introduce the assigned text and discuss the purpose of the Think-Aloud strategy. Develop the set of questions to support thinking aloud (see examples below).
 - What do I know about this topic?
 - What do I think I will learn about this topic?
 - Do I understand what I just read?
 - Do I have a clear picture in my head about this information?
 - What more can I do to understand this?
 - What were the most important points in this reading?
 - What new information did I learn?
 - How does it fit in with what I already know?
2. Read the selected passage aloud as the students read the same text silently. At certain points stop and "think-aloud" the answers to some of the pre-selected questions.
3. Demonstrate how good readers monitor their understanding by rereading a sentence, reading ahead to clarify, and/or looking for context clues. Students then learn to offer answers to the questions as the teacher leads the think-aloud.
4. Give students opportunities to practice the technique and offer structured feedback to students.

Appendix D: Statistics Assignment Sheet and Rubric for Scholarly Reading

Name: _____

Date: _____

Project Due Date: _____

1. Read through this entire assignment sheet and rubric with your group to ensure you understand the expectations for this project. Ask clarifying questions of each other and of your teacher!
2. Create a work plan with your group by breaking the project down into smaller chunks. By what date will you complete each stage of this project? What are the expectations of each group member? Submit your work plan to your teacher for approval.

Once you have read through the full assignment and have an approved work plan for your group, you should follow the next set of steps. **DO NOT** move on to the next steps until each group member fully understands the assignment and your work plan has been approved by your teacher.

3. You should read your assigned article all the way through a **MINIMUM** of three times. The terminology and language used can be dense, but this is often how scientists and researchers write. You should not expect to understand everything the first time through – only through multiple active reading sessions and discussion with your group will you reach your best understanding of this material. Start by reading actively reading the article assigned to your group. Write down questions or thoughts you have as you read.
4. Next, participate in a group read-aloud, think-aloud. Share the thoughts and questions you wrote down as you read.
5. Now, look at the questions below and see which of them you are already able to answer with your group. Discuss possible answers and write down what you know already from your first two reading sessions.

- Is this an observational study, a simulation, or an experiment?
- What question are researchers trying to answer?
- What is the variable studied? Is that variable qualitative or quantitative?
- What is the population?
- What is the sample and what sampling technique did researchers use to create it?
- What are some of the potential sources of bias? (This could be from the sampling technique or the design of the study/simulation/experiment.)
- What metrics or data descriptions are used? What do they tell us about the data?
 - Measures of center?
 - Measures of spread?
- What graphs/charts/tables/etc. are used to illustrate the data and what do they tell us? (Don't forget to discuss shape.)
- Is there a discussion of skew or outliers? If so, what does this tell us about the data?
- What conclusions does the study draw? How does the data back up those conclusions?
- Does the study introduce comparative statistics or discuss trends over time? If so, how do they help to understand the data presented and/or answer the question researchers posed?

6. Read the article again, specifically looking to answer the questions above. Take notes on the answers as you read and then meet with your group to discuss what everyone found. Come to a consensus on the answers for each question.

7. Write up formal answers for each question using the rubric on the next page as a guide.

	Content	Organization	Word Choice	Voice
4	Responses include consistent correct identification of relevant information from the article. Unnecessary information is not included.	The organizational strategy demonstrates evidence of planning and a logical progression of ideas. There is an effective introductory sentence, thoughtful transitions that convey a sense of wholeness, and an effective concluding sentence in the response.	Word choice is precise, effective, and includes specific vocabulary terms and phrases as appropriate.	The writer's voice (individual personality) is evident, compelling, and engaging. The writer has crafted unique responses to each question that do not heavily depend on the written language of the article. The writer provides clear and concise descriptions without relying too heavily on quotations or direct paraphrasing.
3	Responses include consistent correct identification of relevant information from the article.	The organizational strategy is apparent with a progression of ideas that allows the reader to move through the text without much confusion. The introductory sentence, concluding sentence, and transitions often work well.	Work choice is appropriate to the task and includes some specific vocabulary and phrases.	The writer's voice is present, but may not be particularly compelling. The writer has crafted unique responses to each question that do not heavily depend on the written language of the article. The writer provides clear and concise descriptions without relying too heavily on quotations or direct paraphrasing.
2	Responses include some correct and relevant information from the article, but answers also include unnecessary or incorrect information.	There is an attempt at organization, but there may be digressions, repetition, or contradictory information. The introductory sentence and concluding sentence are weak or may be missing; there is an occasional progression of ideas.	Word choice is limited, generic, and repetitive; vocabulary used may be inappropriate.	The writer's voice is weak. Much of the writing mimics that of the article described. Most of the writer's responses heavily depend on the written language of the article or rely on quotations and direct paraphrasing.
1	Responses often include incorrect and irrelevant information from the article.	The response lacks an identifiable organization strategy (random order). The text is confusing.	Words and phrases do not include reference to specific vocabulary terms.	The writer's voice is not evident. Most of the writing pulls direct phrases/language from the article with minimal/ineffective paraphrasing.

Appendix E: Assignment Sheet and Rubric for Formal Presentation

Name: _____

Date: _____

Presentation Date: _____

Your group will formally present what you have learned from the article you read, including the answers to the questions on the Scholarly Reading Assignment. Your presentation will be assessed according to the rubric on the next page.

You should include the following in your presentation:

- Answers to each of the questions from the Scholarly Reading Assignment
- Visual aids – you may use charts/graphs/other visual presentations of data from your article
- Full group participation – each group member needs to contribute to the presentation and no single group member should dominate the presentation
- A reflection on what you have learned from the article

	Explanation of Ideas & Information	Organization	Visual Aid	Eyes and Body	Voice
3	<p>Presents information, findings, arguments and supporting evidence clearly, concisely, and logically; audience can easily follow the line of reasoning.</p> <p>Clearly and completely addresses each of the questions from the written assignment.</p>	<p>Has a clear and interesting introduction and conclusion.</p> <p>Organizes time well; no part of the presentation is too short or too long.</p>	<p>Fonts are easy to read and point size varies appropriately for headings and text.</p> <p>Use of italics, bold, and indentations enhances readability. Text is appropriate in length and the layout is visually pleasing.</p> <p>Visuals are use appropriately and enhance viewers understanding of concept, ideas, and relationships.</p>	<p>Keeps eye contact with audience most of the time; only glances at notes or slides.</p> <p>Looks poised and confident.</p>	<p>Speaks clearly, not too quickly or slowly. Speaks loudly enough for everyone to hear; changes tone and pace to maintain interest.</p> <p>Rarely uses filler words; Uses specific vocabulary appropriately.</p>
2	<p>Presents information, findings, arguments and supporting evidence in a way that is not always clear, concise, and logical; line of reasoning is sometimes hard to follow.</p> <p>Attempts to clearly and completely address each of the questions from the written assignment, but does not fully succeed.</p>	<p>Has an introduction and conclusion.</p> <p>Generally times presentation well, but may spend too much or too little time on a topic, visual aid, or idea.</p>	<p>Sometimes the fonts are easy to read, but in a few places, the use of fonts, italics, bold, long paragraphs, color, or busy background detracts and does not enhance readability.</p> <p>Visuals are used to depict material.</p>	<p>Makes infrequent eye contact; reads notes or slides most of the time.</p> <p>Shows some poise and confidence (only a little fidgeting or nervous movement).</p>	<p>Speaks clearly and loudly most of the time, but may speak in a monotone.</p> <p>Occasionally uses filler words; Attempts to use specific vocabulary correctly, but is not always successful.</p>
1	<p>Does not present information, arguments, ideas, or findings clearly, concisely, and logically; argument lacks supporting evidence; audience cannot follow the line of reasoning.</p> <p>Does not clearly and completely address each of the questions from the written assignment.</p>	<p>Does not have an introduction and/or conclusion.</p> <p>Uses time poorly; the whole presentation, or a part of it, is too short or too long.</p>	<p>Overall readability is difficult with lengthy paragraphs, too many different fonts, dark or busy backgrounds, overuse of bold or italic text, or lack of appropriate indentations of text.</p> <p>Visuals seem unrelated to the topic/theme and do not enhance the overall concepts.</p>	<p>Does not look at audience; reads notes or slides.</p> <p>Lacks poise and confidences (fidgets, slouches, or appears nervous).</p>	<p>Mumbles or speaks too quickly or slowly to be understood.</p> <p>Frequently uses filler words like “uh, um, so,” and “like.” Does not use specific vocabulary or does so incorrectly.</p>

Appendix F: Talking Points on Personal Responsibility in the Face of Systemic Inequality

Talking Points:

- Think about the ways in which you experience privilege. Use your privilege to amplify and uplift the voices of those who do not have the same experiences as you.
- You are not a statistic. Knowing these statistics can help you to understand your path and the challenges you may have to face along it, which in turn will help you make well-informed decisions along the way.

Further reading you may suggest to students that will help expand their education on issues:

- Anti-Racism in Practice
 - Readings
 - [Teaching Tolerance](#)
 - [Understanding White Privilege](#)
 - [Anti-Racist Parenting Study](#)
 - [Countering the Discourse of Individualism](#)
 - [Using Oppression to Face Privilege](#)
 - [The Narrative of the Oppressed Muslim Woman](#)
 - [What's the Difference Between a Frat and A Gang?](#)
 - [killing rage](#), bell hooks
 - Videos
 - [Deconstructing White Privilege](#), Robin DiAngelo
 - [White Fragility](#), Robin DiAngelo
- Incarceration and Criminal Justice
 - [Mass Incarceration: The Whole Pie](#), Prison Policy Initiative
 - [The Sentencing Project](#)
 - [The Marshall Project](#)
 - [Equal Justice Initiative](#)
- Income Inequality
 - [Responding to Rising Inequality](#)
 - [Inequality.org](#)
- LGBTQ+
 - [Bathroom Inclusion Policies](#)
 - [The Trevor Project](#)
 - [Human Rights Campaign](#)
- Sexism & Feminism
 - [We Should All Be Feminists](#), Chimamanda Ngozi Adichie
 - [feminism is for everybody](#), bell hooks
 - [ain't i a woman?](#), bell hooks

Appendix G: Ideas for Converting this Plan to a Virtual Format

Many aspects of this plan can be done in a virtual format. Below is a breakdown of ideas activity by activity.

Opening Activity

- Have students provide responses via email or your online Content Management System (CMS). This allows student responses to be private to you and the student.

Focus Activity

- If your online platform allows for break-out rooms, split students into small groups by assigning each a break-out room. Students can then complete the activity together in real time.
- Alternately, have students complete the assignment individually and submit through your CMS as a formative assessment. This will allow you to provide feedback to students on their definitions.

I Do, We Do, You Do Activity

- For the initial read-aloud, record a video of you reading and sharing your thoughts. Assign this to students to view outside of synchronous class time. During synchronous class time, complete the activity by having students read and think-aloud.
- For the You Do portion of the activity, students can meet virtually with their group members to discuss their understanding of the article or continue to read-aloud, think-aloud.

Presentations

- Ask students to record a video for their presentation, which they can upload to your CMS or share via email. Think about the technology and capabilities this requires, as students would need to have the ability to splice video so each group member can participate.
- Alternately, have students present during a synchronous class meeting, using share-screen to provide visual aids. (You could frame this to students as they are designing their own webinar.)
- Tools for collaboration, video and presentation creation:
 - [Padlet](#)
 - [Prezi](#)
 - [Flipgrid](#)
 - [Toonly](#)
 - [Screencastify](#)

Closing Activity

- See notes for opening activity above.