High School Unit: How does scientific data influence the legislative process?

In this Lesson: Students will learn about the role of science in the legislative process. They will examine raw data and evaluate how that data is used to craft arguments. Finally, they will watch presentations created by science students about water quality solutions and decide which of these solutions would be the most successful.

Connections to Other Lessons: This lesson contains multiple opportunities for committee hearing simulations, harkening back to Lesson 5. It also connects to Lesson 2, as the students continue to evaluate and reevaluate various water quality solutions with the addition of new information and evidence. Ultimately, this lesson will help the students solidify which solutions they want to focus on for their civic solution plans.

Learning Objectives

- What does it mean to be a good critical reviewer?
- What makes an argument strong?
- How can looking at raw data tell us about an issue? What can it not tell us?
- How can data be misleading?
- What role do scientists play in the legislative process?
- Which water quality solutions are the most likely to be successful?

Summative Assessment Tasks/Rubrics:

Science Data Essay

Science Data Dialogue

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NGSS PE
Civics

- SS HS.1.1.c Analyze the functions of the United States government and its outcomes.
- SS HS.1.1.d Analyze the foundation, structures, and functions of local government and its outcomes.
- SS HS.1.1.e Analyze the foundation, structures, and functions of state government and its outcomes.
- SS HS.1.2.a Investigate how individuals and groups can effectively use the structure and functions of various levels of government to shape policy.
- SS HS.1.2.c Engage and reflect on participation in civic activities.
- SS HS.1.2.d Investigate an issue and communicate which level of government is most appropriate to utilize in addressing the issue.

Nebraska College and Career Ready Standards

- **D1.5.9-12** Determine the kinds of sources that will be helpful in answering compelling questions and supporting questions, taking into consideration multiple points of view represented in the sources, the types of sources available, and the potential uses of the sources.
- **D2.Civ.1.9-12** Distinguish the powers and responsibilities of local, state, tribal, national, and international civic and political institutions.
- **D2.Civ.7.9-12** Apply civic virtues and democratic principles when working with others.
- **D4.1.9-12** Construct arguments using precise and knowledgeable claims, with evidence from multiple sources, while acknowledging counterclaims and evidentiary weaknesses.
- **D4.4.9-12** Critique the use of claims and evidence in arguments for credibility.
- **D4.7.9-12** Assess options for individual and collective action to address local, regional, and global problems by engaging in self-reflection, strategy identification, and complex causal reasoning.

LEARNING PLAN SNAPSHOT

Part	Duration	Summary
1	5-10 minutes	Students will review what they learned about committee hearings in Lesson 5 and reflect on the role of scientists in the legislative process
2	5-15 minutes	Students will reflect on what it means to be both a good audience member and a good critical reviewer
3	45-60 minutes	Students will practice interpreting raw data and learn about ways that data can be presented in misleading ways
4	30-45 minutes	Students will define what a strong argument is based on examples and create a rubric to assess arguments
5	50-60 minutes	Students will collaboratively practice evaluating a science student's presentation about water quality solutions
6	50 - 150 minutes	Students will independently evaluate science students' presentations about water quality solutions

Time	Description of Activity	Formative Assessment Strategies + Additional Notes
Activity 1 *(5-10 minutes)*	**In order to complete this activity, the students will need to have completed Lesson 5* The teacher will ask the students to recall what they learned in Lesson 5 about committee hearings. The teacher will ask the students to list as many different types of testifiers as	

	they can (average citizens, lawmakers, *experts*, etc.). Then, the teacher will highlight scientists as testifiers and ask the students to write about the following question: **How do scientists contribute to the legislative process? What roles do they play?** The students will discuss their answers in pairs, and the teacher will listen for misconceptions to address later on in the lesson.	
Activity 2 *(5-15 minutes)*	The teacher will ask the students to reflect on this question and jot down some notes: **What does it mean to be a good audience member?** After a few minutes, the teacher will randomly call on students to share what they wrote. As the students share their ideas, the teacher (or a student) will write them down on a white board. The teacher should fill in any gaps in the students' knowledge. The final list may look something like this: 1. Looks at the person talking 2. Doesn't do anything else while the person is talking (i.e. homework) 3. Might take notes 4. Asks questions afterwards 5. Sits up straight 6. Doesn't make any distracting noises, and doesn't blurt out 7. Keeps a straight face Then, the teacher will ask the students to reflect on this question: What does it mean to be a good critical reviewer? Once again, the teacher will call on students to share what they wrote, and a list will be created that looks something like this: 1. Gives lots of feedback 2. Gives thoughtful feedback that is specific and features examples (not vague, such as "I like/dislike X" or "Good job!") 3. Points out both strengths and weaknesses 4. Gives feedback with the intention of helping the person, not tearing him/her down Students are likely to struggle more with this second question; the teacher may need to fill in more gaps. Finally, using these slides, the teacher will present a few scenarios to the students and ask them to come up with some good critical feedback.	To add an engaging twist to this activity, ask students to act out the scenarios featured in the slideshow (rather than just looking at the stock images).

Activity 3 *(45-60 minutes)*	In this activity, the students will explore the concept of bias in data presentation. First, the teacher will give the students this handout. The students will study the provided body of data, interpret it, and briefly explain how they would present it to an audience. The teacher may allow the students to work in pairs or small groups. After all of the students have finished filling out their handouts, the teacher will ask them to explain what they think "happened," according to the data provided on the handout. Many students may speculate that the fictional person purchased fewer items in October because the prices of the grocery items all increased. The teacher should take this opportunity to remind students that data can be interpreted many different ways, and that we can never assume that one thing is causing another (i.e. price hikes caused the person to buy fewer items) without more evidence. Another explanation for this body of data, for example, is that the person bought fewer items because he/she was trying to make healthier choices. This informal class discussion will serve as a segue into the second part of this activity: a presentation about spurious correlation and misleading data.	This activity offers opportunities for collaborating with a math teacher. **Extensions** The students can learn more about spurious correlations by independently exploring this fun website. The teacher may ask the students to design PSA posters that warn about misleading data. **Exit ticket: Why is it important to read graphs and charts carefully?**
Activity 4 *(30-45 minutes)*	In this activity, the students will decide what constitutes a strong argument within a presentation. First, the teacher will ask the students to individually define what a "strong" argument is. They should write down their definitions. The teacher may ask the students to share what they wrote with a partner. Then, the teacher will ask the students to examine some examples. The teacher will call on students to read one of these argument scripts aloud. Meanwhile, the rest of the class will take notes on the example arguments, focusing on what makes them weak and strong. Between each argument, the class will share what they like or do not like about the argument they just heard, and someone will record the main points on a white board. By the end of this activity, the class will have created lists of things that make arguments strong and weak. Using these lists, the students will create a rubric that they will use to evaluate science students' presentations about water quality in a subsequent activity.	If time allows, the teacher may ask the students to write and explain their own scripts of strong and weak arguments, rather than providing them. **Argument Rubric** A sample argument rubric can be accessed here. The teacher may choose to provide this rubric to the students in lieu of having them make their own. The teacher may also provide the students with just the criteria and ask them to determine what *weak* and *strong* look like for each criterion. Whether the teacher provides an argument rubric or has the students create their own, it may be used not only for activities within this lesson, but also for any activity that requires the students to evaluate arguments. In fact, it may be helpful to incorporate this rubric into many activities, so that the students are familiar with using it. The teacher can also choose to focus on one criterion at a time when breaking down an argument. For example, rather than asking the students to evaluate an argument using their entire argument rubric, the teacher may simply ask the students to evaluate how *biased* it is, or how *relevant* it is, etc. The teacher may be able to collaborate with other teachers to incorporate the argument rubric interdisciplinarily.
Activity 5 *(50-60 minutes)*	**This activity directly connects to Activity 7.* In this activity, the students will practice evaluating a science student's presentation about water quality. Throughout the activity, the students will fill out this handout.	**Presentations from Science Students** Both this activity and Activity 7 incorporate presentations about water quality solutions created by science students. These presentations may come from a variety of sources.

First, the students will watch a science student's presentation about a water quality solution. This presentation will be based on the student's own research, and it may be a live presentation or a video recording. The science student will state a claim, back it up with his or her own scientific research, and propose a solution to the problem(s).The teacher may ask the social studies students to take notes as they watch the presentation. If the presentation is in person, the social studies students may take a few minutes to ask questions at the end. The teacher should also remind the students to be good audience members, even if the presentation is not live.

Following the presentation, the students will fill out Part 1 of this handout as a class. The teacher will call on students to identify the argument(s) that the science student made, as well as the supporting evidence that was used.

Then, the students will individually fill out Part 2 of this handout. They will write a few sentences about their initial evaluation of the argument(s). Afterwards, the teacher may ask the students to share what they wrote with a partner while he/she walks around to assess their evaluation skills.

Next, the students will analyze the raw data that the science student used to make his/her conclusions and fill out Part 3 of this handout. The students may work individually or in small groups. After all of the students have finished, the whole class will go through this part of the handout together. The teacher will address any misconceptions.

Finally, the students will fill out Part 4 of this handout. Using their argument rubric (see Activity 5 for more details), they will write a paragraph or two evaluating the argument(s). Afterwards, the students may exchange and critique each other's evaluations. They may also share their evaluations with the class. Furthermore, the teacher may choose to collect the students' handouts and provide feedback.

The teacher should inform the students that this activity is meant to prepare them to follow the same steps in a future activity. In this activity, the students evaluate the same presentation as a class. In a future activity, the students will evaluate different presentations on their own.

Teachers within the same school or schools in the same city could collaborate for these activities. It may be possible for science students who are completing the science portion of this curriculum to deliver their presentations in person. However, the science students could also record their presentations for the social studies students to watch later, or send their posters and/or slideshows to the social studies students to examine. If the teacher has used this curriculum for multiple years, he/she may also have access to videos from previous years.

Depending on the group of students, it may not be wise to expose the science students to their criticisms without taking extra steps to ensure that no one's self-esteem will be damaged, especially if they deliver their presentations live. In some cases, it might be better if the social studies students do not know the science students personally. It may also be helpful if the teacher selected a few exemplary presentations to share with the social studies students. This way, while the science students will still be receiving critical feedback, they will benefit from knowing that they can be proud of the work they produced. Furthermore, some students will be more likely to accept criticism gracefully than others. Finally, it may be preferable to have the students watch the presentations as recorded videos, even in situations where live presentations would be possible.

Eventually, the feedback created by the social studies students may be shared with the science students, if the teachers involved feel that this would be beneficial to the science students. Also, the social studies students may add their evaluations of this presentation to a portfolio.

Committee Hearing Simulation

The teacher may choose to format this activity like a committee hearing simulation (similar to the one featured in Lesson 5). The social studies students will play the role of Nebraska senators, and the science student will serve as the testifier. The science student may or may not reference real legislation, but the social studies students will behave as if this is the case. The teacher may choose to have either the entire class or a select group of students act as senators in this simulation.

The testifier will have 3-5 minutes to propose solutions to water quality problems and back up their arguments with evidence. Meanwhile, the senators will take notes. Afterwards, the senators will be able to ask questions of the testifer (if the presentation is live). Finally, the senators will write an evaluation of the testifier's proposals, explaining whether they would vote for such policies or not, and why.

		Scaffolding If the teacher discovers that the entire class is struggling with one or more of the skills required for this activity, he/she may choose to walk the students through analyzing more presentations before releasing them into small groups in the next activity. If the teacher discovers that select students are struggling with one or more of the skills required for this activity, he/she may pay special attention to these students during the subsequent small group activity, or even create a group of struggling students to monitor.
Activity 6 *(50-150 minutes)*	**Activity 6 serves as a "practice round" for this activity.* The teacher will split the students into small groups and assign different science students' presentations to each group. Between watching each of their assigned presentations and asking the presenters questions (if applicable), the groups fill out a science presentation evaluation form for each, just like in the previous activity. The teacher may choose to make the students' forms accessible online, so that their classmates can easily view their work. During this activity, the teacher visits each group, making sure the students are on-task, answering their questions, and assessing their progress. The teacher should remind the students to be good audience members, even if the presentations are not live. Note: If the presentations are delivered in person, it may be helpful to send some groups to a different location. If this is not possible, it may be better for the students to watch video recordings of the presentations, even if the science students are available to deliver them in person. The teacher may also decide to have every student watch every presentation, though this will require more class time. After the small groups have watched all of their assigned presentations, the students will individually choose which presentation (of the ones they watched) was the "best." The teacher may ask the students to write a paragraph or two explaining their opinions, but he/she may also choose to use the students' reflections on this activity as a summative task (please see the "Summative Assessment Tasks" section above for more details about a summative essay). In addition, the teacher may use these reflections as a focal point for a summative dialogue (again, see the "Summative Assessment Tasks" section above for more details about a summative dialogue). If the teacher chooses to assign both a summative essay and a summative dialogue, the students could rewrite their essays following the dialogue to explain whether and how the dialogue reshaped their opinions.	**Presentations from Science Students** Both this activity and Activity 6 incorporate presentations about water quality solutions created by science students. These presentations may come from a variety of sources. Teachers within the same school or schools in the same city could collaborate for these activities. It may be possible for science students who are completing the science portion of this curriculum to deliver their presentations in person. However, the science students could also record their presentations for the social studies students to watch later, or send their posters and/or slideshows to the social studies students to examine. If the teacher has used this curriculum for multiple years, he/she may also have access to videos from previous years. Depending on the group of students, it may not be wise to expose the science students to their criticisms without taking extra steps to ensure that no one's self-esteem will be damaged, especially if they deliver their presentations live. In some cases, it might be better if the social studies students do not know the science students personally. It may also be helpful if the teacher selected a few exemplary presentations to share with the social studies students. This way, while the science students will still be receiving critical feedback, they will benefit from knowing that they can be proud of the work they produced. Furthermore, some students will be more likely to accept criticism gracefully than others. Finally, it may be preferable to have the students watch the presentations as recorded videos, even in situations where live presentations would be possible. Eventually, the feedback created by the social studies students may be shared with the science students, if the teachers involved feel that this would be beneficial to the science students. Also, the social studies students may add their evaluations of these presentations to a portfolio.

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The testifiers will each have 3-5 minutes to propose solutions to water quality problems and back up their arguments with evidence. Meanwhile, the senators will take notes. Afterwards, the senators will be able to ask questions of the testifers (if the presentations are live). Finally, the senators will write an evaluation of each testifier's proposals, explaining whether they would vote for such policies or not, and why.

If the class watches just a few presentations, it will be possible for them to all form the same Senate. However, if there are several presentations, the teacher may split the class up into multiple Senates that either take turns hearing from the same testifiers (like stations) or hear from different testifiers.

Scaffolding

If the teacher took note of which students are struggling during the previous activity, he/she may spend more time monitoring and assisting these students. Similarly, if the students are grouped by level of proficiency, the teacher may spend more time with groups of struggling students.

If the teacher can access the students' presentation evaluation forms online, the teacher can monitor their progress by referencing them. The teacher may choose to provide instant feedback to the students by leaving comments on their work or typing notes in a different color. The teacher may also clarify his/her expectations during this activity by highlighting a few excellent responses. Access an informal rubric here.

Exit Tickets

- **We are using these science students' data to help us choose a water quality solution to support. How else do you think their data might be used?**

		• **With the quest for the best water quality solution in mind, what research might these science students conduct in the future?**

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Spurious-correlations

Cherry-picking-fallacy-of-the-day

45083-misleading-gun-death-chart.html