

State of AWAREness

The Influence of Natural Hazards on Human Activity

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Grade Level	9th – 12th Grade	**Time Frame**	250-280 minutes
Subject	Science	**Duration**	5-6 class periods
Course	Earth Science, Environmental Science		

Essential Question

Why might people choose to live in places at high risk for severe weather events?

Summary

In this lesson, students make connections between severe weather events and human behavior. Students will play through AWARE: Advanced Weather Awareness & Response Education, a digital game-based learning (DGBL) module; explore population growth data; and research the economic sectors and natural resources in a select few states. Using their gameplay experiences, data, and research as evidence, students will construct an explanation for why people might choose to live in places at high risk for severe weather events.

Snapshot

Engage

Students make observations and ask questions about population growth and severe weather event data sets.

Explore

Students play the first three eras of AWARE. In groups, they collect data about an assigned state's natural resources and economy.

Explain

As a class, students discuss what they learned about severe weather and weather technology while playing AWARE. After groups share out their state data, the class identifies possible benefits of living in these states.

Extend

Students play the last two eras of AWARE. They determine what natural hazards would have the biggest impact on their assigned state's natural resources and economy, and how the technology they learned about in AWARE would be used to address those hazards.

Evaluate

Students create poster presentations of their conclusions and construct evidence-based explanations to answer the essential question.

Standards

ACT College and Career Readiness Standards - Science (6-12)

IOD304: Determine how the values of variables change as the value of another variable changes in a simple data presentation
IOD505: Analyze presented information when given new, simple information
EMI401: Determine which simple hypothesis, prediction, or conclusion is, or is not, consistent with a data presentation, model, or piece of information in text

Next Generation Science Standards (Grades 9, 10, 11, 12)

HS-ESS3-1: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

Attachments

- AWARE-Gameplay-Notes-State-of-AWAREness.pdf
- AWARE-Research-Notes-State-of-AWAREness.pdf
- AWARE_TeachersGuide 1.pdf
- Census-Data-State-of-AWAREness - Spanish.xlsx
- Census-Data-State-of-AWAREness.pdf
- Census-Data-State-of-AWAREness.xlsx
- Disaster-Data-State-of-AWAREness - Spanish.xlsx
- Disaster-Data-State-of-AWAREness.pdf
- Disaster-Data-State-of-AWAREness.xlsx
- I-Notice-I-Wonder-State-of-AWAREness - Spanish.docx
- I-Notice-I-Wonder-State-of-AWAREness - Spanish.pdf
- I-Notice-I-Wonder-State-of-AWAREness.docx
- I-Notice-I-Wonder-State-of-AWAREness.pdf
- Lesson-Slides-State-of-AWAREness.pptx

Materials

- Lesson Slides (attached)
- I Notice, I Wonder handout (attached; one copy per student)
- Census Data spreadsheet (attached; one copy per student)
- Disaster Data spreadsheet (attached; one copy per student)
- AWARE Gameplay Notes (attached; one copy per student)
- AWARE Research Notes (attached; one copy per student)
- Devices with internet access
- Chart paper (for posters)
- Markers, colored pencils, etc. (for posters)

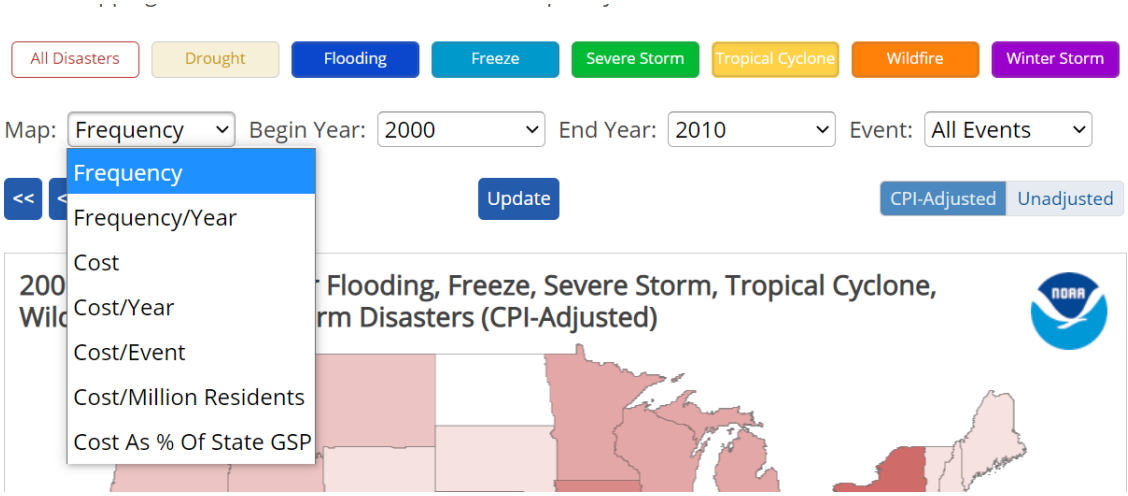
Engage

Introduce the lesson using **slide 2** from the attached **Lesson Slides**. Display **slide 3** to share the essential question with students. Display **slide 4** to review the lesson's learning objective.

Go to **slide 5** and pass out the attached **I Notice, I Wonder** handout to each student. Also provide each student with the attached **Census Data** spreadsheet or a printed copy of the data.

Have students access the following map online: "Billion-Dollar Weather and Climate Disasters." Students may explore the map data in a variety of ways, but it is recommended that they analyze it in blocks of time (e.g., 5–10 years) to more easily see large-scale changes over time.

Have students use the I Notice, I Wonder strategy to complete the handout as they identify patterns between and within each of the two data sets.



Screenshot of map data options.

Teacher's Note: Viewing and Collecting Data

By default, the map data displayed is the cost of all severe weather events over a given time range, so make sure students change it to frequency as a starting place. There are several other display options that students could explore.

Selecting a disaster type and then clicking "Update" will remove the selected disaster type from the data displayed on the map (for example, "Drought" has been removed in the screenshot above). In this way, students can look at disasters alone or in combination. Hovering over a state on the map will display the data for that state rather than the entire United States.

Selecting the "Time Series" tab at the top of the page provides a bar graph, organized by year, that shows the cost and frequency of the selected climate disaster(s) for a given state or region. Data is adjusted for inflation by default.

After allowing time for students to fill out the handout, have them share out some of the things they noticed and wondered.

Go to **slide 6** and remind students of the essential question. Ask students to share out possible reasons people would choose to live in a place that experiences severe weather events. Use their ideas to develop a class list and record this information in a public, accessible place so students can easily refer to it later.

Go to **slide 7**. As a class, ask students to categorize the ideas on the class list into three or four themes (e.g., employment opportunities, recreation, etc.) for use in the Explore investigation.

Explore

Teacher's Note

In order for your students to play AWARE, you'll need to set up a class in the K20 Center Game Portal ahead of time. Go to games.k20center.ou.edu and create an account. After you log in, you'll be able to create a class and invite students. For more information, refer to the Game Portal Guide in the Attachments section. If you experience any issues, go to games.k20center.ou.edu/support to contact user support. Further information can be found at the end in the AWARE Teacher's Guide in the Attachments section.

Display **slide 8** and inform students they are going to play Eras 1–3 of AWARE. Plan to give students 25–30 minutes to complete each era.

As they play, ask students to explore the Population and Economic overlays and keep track of any patterns they see on the attached **AWARE Gameplay Notes** handout. These overlays stay the same for an entire era, so the more eras of the game they complete, the more patterns they can observe. Students should also make a list of the kinds of technology they uncover during their "Research" in the game. Inform students they are going to use this information later in the lesson.

After students have played through Eras 1–3, split students into five groups. Have each group focus on one of the following states with the highest population growth since the 1980 census: Texas, Florida, California, North Carolina, and Georgia.

Teacher's Note: Grouping Considerations

If the class is too large for five groups of reasonable size, assign more than one group to each state as needed. Alternatively, you could extend the list to include additional states from the top 10: Arizona (6th), Washington (7th), Virginia (8th), Colorado (9th), and New York (10th).

Go to **slide 9**. In their groups, have students conduct brief research on their assigned state to identify its natural resources, major industries/economic sectors, and one or more themes from the Engage section that apply to the state. This research does not need to be an in-depth study of these concepts, just a basic overview or summary.

Explain

Display **slide 10**. As a class, have students discuss their gameplay experiences. Some questions include, but are not limited to:

- What patterns did you identify between the population and economic overlays?
- What did you notice about how technology changed between eras?
- How did the technology affect your ability to forecast, mitigate, and respond to severe weather events?

After discussing, go to **slide 11** and have groups share out their findings from their brief research. Record this information in a public, accessible place so students can easily refer to it later. If more than one group investigated each state, have additional groups add any new information that the other group(s) did not already share.

Once each group has shared, have a whole-class discussion about the similarities that students noticed among the different states. As a class, have students summarize the possible benefits of moving to these states.

Go to **slide 12** and revisit the essential question and themes list from the Engage section. Based on the class discussion of similarities, ask students whether they have any new ideas to add or changes to make to the list of themes that might explain why people would move to these states.

Extend

Display **slide 13**. Have students play Eras 4–5 of AWARE, continuing to keep notes on overlay patterns and technology.

After they complete the game, have students connect what they learned during gameplay to the research they conducted in the Explore section.

Teacher's Note: Emphasize Synthesis

The emphasis at this point is for students to synthesize the ideas that there are socioeconomic reasons people might move to these states and that they do so despite the risk of severe weather events. People use weather and climate technology to make living in these places safer by preventing and/or mitigating the effects of natural hazards.

Go to **slide 14** and pass out the attached **AWARE Research Notes** handout. Ask students to revisit the Billion-Dollar Weather and Climate Disasters map. Using the handout, the map, and the information provided in the "Events" tab, have students record their answers to the following questions about their group's assigned state:

1. Which types of severe weather have increased in frequency?
2. What were the specific impacts of these severe weather events?
3. Which natural resources, industries, etc. would be most affected by these severe weather events?

Go to **slide 15**. Have students in each group reference their AWARE Gameplay Notes to determine which technology they learned about is most relevant to their state's severe weather events.

Additionally, ask students to explain how this technology would be used to forecast, mitigate, and/or respond to the weather threat(s) and their effects. Inform students they are going to create a poster and present this information in the Evaluate activity.

Teacher's Note: Disaster Data

Consider providing students with the attached **Disaster Data** spreadsheet or a printed copy of the data as a starting place. The spreadsheet includes the frequency of fires, floods, severe storms, and all climate disasters combined for the entire U.S. and individually for Texas, Florida, California, North Carolina, and Georgia.

Only fire, flood, and severe storm data are provided in the disaster dataset since these are the specific disasters modeled in AWARE. However, other disasters from the Billion-Dollar Weather and Climate Disasters map, particularly tropical cyclone data, are also relevant to students' investigations.

Evaluate

Have groups create posters to present their findings to the class. These posters serve as a final source of evidence to help students answer the essential question.

Teacher's Note: Time-Saving Presentation Format

In the interests of time, consider having students participate in a Gallery Walk rather than formally presenting their posters. If you opt for this presentation format, display **slide 16**.

After students have viewed their classmates' posters, have students revisit the list of themes they've developed throughout the lesson. Then, go to **slide 17** to review the essential question with students.

Finally, go to **slide 18**. Have each student use the Claim, Evidence, Reasoning (CER) strategy to construct an evidence-based explanation for why people choose to live in places at high risk for severe weather events.

Alternative Explanation Formats

CER is the most straightforward strategy for student explanations. However, as long as students' answers are evidence-based, other strategies such as Fishbone, Mind Maps, or One-Pager may be suitable alternatives.

Students' answers should include the reasons why people might choose to live in these places despite the risk (i.e., the themes they've developed throughout the lesson) and examples of how people use weather and climate technology to make these places safer. Their cited evidence should come from AWARE, the Billion-Dollar Disasters map data, the census data, their state-specific findings, and/or their classmates' findings.

Resources

- Census Bureau. (2021). Historical population change data (1910-1920). U.S. Department of Commerce. https://www.census.gov/data/tables/time-series/dec/popchange-data-text.html
- K20 Center. (n.d.). Claim, evidence, reasoning (CER). Strategies. https://learn.k20center.ou.edu/strategy/156
- K20 Center. (n.d.). Fishbone. Strategies. https://learn.k20center.ou.edu/strategy/1664
- K20 Center. (n.d.). Gallery walk/Carousel. Strategies. https://learn.k20center.ou.edu/strategy/118
- K20 Center. (n.d.). I notice, I wonder. strategies. https://learn.k20center.ou.edu/strategy/180
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- K20 Center. (n.d.). One-pager. Strategies. https://learn.k20center.ou.edu/strategy/72
- National Centers for Environmental Information. (2021). Billion-dollar weather and climate disasters [Interactive map]. U.S. NOAA. https://www.ncdc.noaa.gov/billions/mapping