Understanding Climate and Its Impact on Agriculture in Illinois

Grade Level:	9-12
Estimated Time:	60 minutes

Purpose:

The purpose of this lesson is to engage students in exploring Illinois' climate characteristics and the impacts of climate change on agriculture. Through hands-on data collection and analysis of current climate conditions, students will track and interpret key metrics such as temperature and precipitation averages, as well as their departures from historical norms. This lesson will foster critical thinking about the challenges and opportunities presented by climate change and encourage students to formulate hypotheses based on observed trends.

Student Learning Objectives:

1. Understand the key climate characteristics of Illinois, including climate change impacts.
2. Analyze current and historical climate data and identify trends relevant to agriculture.
3. Evaluate how climate changes affect crop selection, farming practices, and agricultural sustainability.

Materials Needed:

- Access to the internet for research
- Projector and screen for presentations- Understanding Climate PowerPoint
- Whiteboard and markers
- Data Analysis Worksheet Packet (1 per student)

Preparation:

Prior to class:

1. Print a copy of the “Data Analysis Worksheet” packet - 1 per student
2. You may want to pre-assign students to small groups

Engage: *10-15 minutes*

Pull up the PPT and begin at **Slide #3**:
SAY: "Our big ideas and questions for this lesson are: ..." and review slide #3 with the class.

Slide #4
SAY: "We are going to watch a very short video created by NASA. Pay close attention to what is happening. There is no talking or narration in the video, you must watch and try to observe or notice what you think this data is showing or telling us. At the end, we will talk about what we noticed and observed. You can write down what you notice in the video, and what you wonder about the video. Okay, ready? Let's go. I can play it twice."

Slide #5
SAY: "Now it's your turn. Let's start with what we noticed. I'll go first. I noticed that Alaska seemed to have a warm spike in the 1920s and again in the 1940s before returning to previous temperatures, before really getting hot in the 1970s and after. I wonder if the world wars contributed to those earlier spikes and what caused the dramatic warm up in the 1970s onward?"

Encourage students to try.

Let them know that they just engaged in data collection, analysis and interpretation and that is the activity they will be doing for this lesson.

Slide #6
SAY: "Let's look at what this means at a more local level. We are going to watch this quick video and see what weather changes mean for midwest farmers."

Show: *Farmer Arlyn Schipper; Extreme Weather in Iowa (https://www.youtube.com/watch?v=2Qe0tiAaEGU) 2:15*

Slide #7
ASK: "How does weather impact farming?"

Answers could include: Influencing when farmers can get into the field to plant; intense rainstorms could cause farmers to have to replant a field; ideal conditions for certain operations like spraying are determined by soil temperatures.

ASK: "How do we know when something–like weather–is changing?"

You may need to guide the conversation toward the desired answers: We can determine change through data collection (keeping track of daily temperatures, for example) and data analysis (comparing daily averages from year-to-year).

Slide #8
ASK: "What are some examples of data that farmers collect?"

Write the responses on the board or smartboard. You may need to guide the conversation toward the desired answers: Expected rainfall, temperature, soil moisture, expected snowfall, wind speed, wind direction, etc.

ASK: "How do farmers collect data?"

You may need to guide the conversation toward the desired answers: Weather radar maps (phones, the news, internet, etc.), weather vane, rain gauge, in cab monitors, etc.)

SAY: "Like I mentioned before, we are going to be collecting, analyzing, and interpreting data today. Let's take a look at the sources we will be working with."

Grow: *5 minutes*

Slide #9
After pointing out the parts of the map that the students need to observe, walk through an example with them. There is an example provided in the comments section of the PPT, but feel free to use whatever example you would like to.

Slide #10
SAY: "Once we have collected data, we have to do something with it."

REVIEW the slide with the class.

SAY: "We will be answering questions about the data that we collect in our activity. In asking those questions, we will be analyzing data."

Slide #11
SAY: "Finally, we need to think critically about what we have collected and analyzed.

You will be asked to interpret and draw conclusions from the data that you will be collecting. We will then come back together as a class and compare our conclusions."

Activity: *35 minutes*

Slide #12

DIVIDE students into small groups. Assign each group a specific climate factor (it's okay if multiple groups have the same climate factor–they should still work independently from the other group and see if their answers differ):

a. Temperature
b. Precipitation

Slide #13

Press "play" on the slide to begin the countdown.
There are lots of different timers on YouTube, some with background music, alarms, and visuals, and some without. Use what works best for your group. We have included a 25 minute timer with no background music and a quiet alarm on this slide, but change it to a different link as appropriate for the classroom.

Walk around the room and listen to groups work, stopping to help those groups who seem to be stuck. Remind the class when there is 10 minutes left.

Slide #14

Bring the class back together. Have each group share their answer to #4 of the worksheet (interpret & draw conclusions).

Slide #15

As a closing reflection, facilitate a brief discussion around the following prompts:

- How do the identified trends reflect the challenges or opportunities for farmers in our county? In Illinois?
- What adaptation strategies might farmers consider in response to climate change?

Expand:

- **Graphing (Optional):** If time allows, have students create graphs to visualize the temperature and precipitation trends. They can use bar graphs for monthly precipitation and line graphs for annual temperature trends.
- **Invite a local farmer or agronomist to discuss real-world climate challenges.**

- **Organize a field trip to a local farm for firsthand observation.**
- **Conduct a research project on sustainable practices in response to climate change.**

Standards and Connections:

Next Generation Science Standards (NGSS)

HS-ESS2-4: Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
HS-ESS3-5: Analyze global climate data to predict future climate changes and their potential impacts on human systems.
HS-ESS3-3: Evaluate and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Illinois Learning Standards for Science (ILS)

SC.IL.ESS.3: Analyze and interpret data to determine relationships and make predictions based on that data.
SC.IL.ESS.4: Develop and use models to represent relationships between systems and their components.

Common Core State Standards

CCSS.ELA-LITERACY.RST.11-12.7: Integrate and evaluate multiple sources of information presented in different formats, including quantitative and technical information.
CCSS.ELA-LITERACY.WHST.11-12.1: Write arguments focused on discipline-specific content, including providing evidence to support claims.

National AFNR Content Standards

FPS.01.01. Research, examine, and discuss issues and trends that impact AFNR systems on local, state, national, and global levels.
FPS.04.02. Assess and explain the natural resource related trends, technologies and policies that impact AFNR systems.
NRS.01.01. Examine natural resource availability and ecosystem function in a particular region.
NRS.01.03. Apply ecological concepts and principles (e.g., weather, air quality, UV protection, atmospheric pressure, etc.) to the interaction of atmospheric and natural resource systems.