Data Literacy Cube:  
A Tool for Differentiated Learning in Earth Science

About this Resource
The tools in this guide are resources to support data literacy in your instructional setting with My NASA Data Earth science data and visualizations. These flexible resources may be used with graphs, data tables, and mapped images of NASA Earth science data (or other sources of Earth data). With these tools, students engage with data by rolling a cube (or die) and answering questions to guide their data analysis. Leveled question sheets provide opportunities for students to connect with data, regardless of language proficiency or academic skill. These tools are aligned with Next Generation Science Standards Science and Engineering Practices and Common Core Mathematics Standards.

Data Literacy Cube Resources
- **Cube template:** Within this guide, you will find a black-line master template for the cube. This template can be constructed for use with the question sheets. Alternatively, gaming dice or virtual dice rollers may be substituted for the cube.
- **Question Sheets:** Question Sheets are leveled for both Lexile and English-language proficiencies. The leveled question sheets contain labeled (bottom left) and unlabeled versions for you to use at your discretion to help you differentiate your instruction. Note: The Lexile range provided on each question sheet represents the text’s difficulty. The students’ reading comprehension levels should be taken into account when selecting the appropriate question sheet. WIDA standards and proficiency levels help educators determine which level question sheet is best suitable for the student. For further information, visit the following links: Lexile (https://lexile.com/), WIDA standards (https://wida.wisc.edu/sites/default/files/resource/WIDA-ELD-Standards-Framework-2020.pdf).
**Level 1 - Novice**
- (Lexile Levels - 200-400) (WIDA proficiency level suggestions: 1.5-2.5)
- Intended Audience: elementary students, struggling learners, ELL’s, and students with specific accommodations.

**Level 2 - Developing**
- (Lexile Levels - 210-400) (WIDA proficiency level suggestions: 1.9-2.5)
- Intended Audience: elementary students, struggling learners, ELL’s, and students with specific accommodations.

**Level 3 - Proficient**
- (Lexile Levels - 410-600) (WIDA proficiency level suggestions: 2.5-4.5)
- Intended Audience: students who require reading supports, and those whose sentence and word phrase dimensions are more advanced.

**Level 4 - Advanced**
- (Lexile Levels - 610-800) (WIDA proficiency level suggestions: 4.5-6)
- Intended Audience: fluent English speakers, academically advanced learners, and abstract thinkers.

**Keyword List:** A list of keywords is included on various question sheets. It provides the teacher and learner with opportunities to document key vocabulary words that are incorporated in the data analysis prior to starting the activity. Some words have been included in the list, but space is provided for those who wish to add additional words that are important in the lesson.

<table>
<thead>
<tr>
<th>Keywords (add more words):</th>
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<tbody>
<tr>
<td>area</td>
</tr>
<tr>
<td>least</td>
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<tr>
<td>most</td>
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**Task Card:** The Task Cards provide roles for students to perform while conducting the data analysis. This allows students to specialize in an area of data analysis and recording while contributing to the team. (This is a great way to also include multilingual and other learners.)
Preparation

1. Access Earth science-related maps, graphs, and data for students to analyze. Identify lesson plans and activities that feature data resources in My NASA Data that students will analyze using the Data Literacy Cubes. You may want to print these for students to use. **NOTE:** These tools can be used with other Earth Science models and visualizations commonly found in textbooks, websites, etc.
   a. Visit My NASA Data to identify content related to Earth Science topics. This website provides activities, lesson plans, and a data visualization tool, the Earth System Data Explorer. **To access NASA data** to use authentic Earth science data, visit the My NASA Data visualization tool, [https://mynasadata.larc.nasa.gov/EarthSystemLAS/UI.vm/](https://mynasadata.larc.nasa.gov/EarthSystemLAS/UI.vm/)
   b. **My NASA Data Cube Icons:** My NASA Data activities feature a Data Literacy cube icon. These icons indicate the compatibility of My NASA Data content to be used with the Data Literacy Cubes. Icons are displayed on the right side of My NASA Data webpages to indicate which activity could be used to engage students with the content on the page.

2. Print the appropriate question sheets for the Earth science materials you plan to use with students.

3. Print and prepare the Data Cube using the Cube Template for Students/Groups. (Note: You can also use gaming dice, virtual dice roller, etc. as a substitution.) Consider having students assemble their own cubes, individually or in teams, to foster a sense of ownership. If teams assembled the cubes, consider having the same teams use the cubes throughout the year and keeping the cubes in the classroom. You can also assign roles from the Task Cards. These roles can change throughout the year.

4. Assign question sheets to individual students or groups based on academic levels. Monitor students’ progress over the year and assign new level question sheets as needed.

5. Print Task Cards for each group and other resources as needed. See the Task Card Blackline Master in this resource.
Steps

1. Distribute Earth Science maps, graphs, or data to students/groups, as well as cube or dice.

2. Distribute the appropriate leveled-question sheet to students/groups.

3. Prior to beginning the data analysis, consider the following:
   - Review the list of keywords and their meanings with students.
   - Identify any additional keywords your students need to know and add them in the space provided.
   - Use additional scaffolding strategies as needed. You may also wish to include strategies such as: draw pictures on the cube to show what each question is about, write words in their native language, jigsaw, Frayer Model, Round robin, fishbowl, think alouds, storyboards, etc.

4. Assign the roles from the Task Card to the students in each group.

5. Begin the data analysis by instructing students to roll the cube (or numbered die) to answer appropriate question/s. (Allow students to work in a small group setting while they roll the cube and respond to the questions).
   - If additional writing space is required, have students use regular notebook paper (or word processing document) and attach it to the question sheets.

6. Have each group share with another group or with the class after completing their question sheet.

7. Monitor student progress and assign new level sets as students reuse cubes throughout the year.
Data Literacy Cube

1. Examine
   - myNASA data
2. Search & Find
   - NASA
3. Analyze
   - myNASA data
4. Ask
   - NASA
5. Connect
   - myNASA data
6. Assess
   - myNASA data
Task Card

<table>
<thead>
<tr>
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<th>Name of Student</th>
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<td><strong>Project Manager:</strong> You will help the group stay focused (no distractions), including keeping up with time.</td>
<td></td>
</tr>
<tr>
<td><strong>Data Manager:</strong> You will write the group’s answers to the questions, and the group’s summary of the data you are assigned.</td>
<td></td>
</tr>
<tr>
<td><strong>Chief Engineer:</strong> You will be responsible for selecting the random number (i.e., rolling the die, etc.) and making sure the members in your group respond to the appropriate question.</td>
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<td><strong>Communications Manager:</strong> You will present and explain your group’s summary of the questions.</td>
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Map Cube Questions

Keywords (add more words):
- area
- biggest value
- least
- legend
- most
- smallest value
- Earth System

1. **Examine**- What do the colors of the map tell you? Look closely at the map.
   a. The color I see the most is ____________________________.
   b. The color I see the least is ____________________________.
   c. The (day/monthly/year) on the map is ____________________________.

2. **Search and Find**- Where on Earth do you see this map?
   a. What part of the world does the map show? (For example, country, continent, ocean, etc.) ____________________________.
   b. Point to a spot on the map and color this circle with a crayon (or pencil) of a matching color to show the color in the spot on the map.
   c. The color in the spot I am pointing to tells me that the area on the map is ____________________________.

3. **Analyze**- What do the colors and numbers on the map tell you?
   a. The color on one end of the legend is ________. This means ________.
   b. The color on the other end of the legend is ________. This means ________.
   c. The number on one end of the legend ________. This means ________.

4. **Ask**- What information do you want to know about the map?
   a. I want to know ____________________________.
   b. How ____________________________?

5. **Connect**- How do the data connect to the locations on the map?
   a. The place with the biggest value or number is ____________________________.
   b. The place with the smallest value or number is ____________________________.
   c. What locations share similar values? Why do you think these are similar?

6. **Assess**- What information can you identify on the map?
   a. The information on the map shows ____________________________.
   b. What part of the Earth System is this information related to air, water, land, ice, living things?
Map Cube Questions

Keywords (add more words):
- area
- biggest value
- least
- legend
- most
- smallest value
- Earth System

1. **Examine**- What do the colors of the map tell you? Look closely at the map.
   a. The color I see the **most** is ________________________________.
   b. The color I see the **least** is ________________________________.
   c. The (day/monthly/year) on the map is ________________________________.

2. **Search and Find**- Where on Earth do you see this map?
   a. What part of the world does the map show? (For example, country, continent, ocean, etc.) ________________________________
   b. Point to a spot on the map and color this circle with a crayon (or pencil) of a matching color to show the color in the spot on the map.
   c. The color in the spot I am pointing to tells me that the **area** on the map is ________________________________.

3. **Analyze**- What do the colors and numbers on the map tell you?
   a. The **color** on one end of the **legend** is _______. This means _______.
   b. The **color** on the other end of the **legend** is _______. This means _______.
   c. The **number** on one end of the **legend** _______. This means _______.

4. **Ask**- What information do you want to know about the map?
   a. I want to know ________________________________.
   b. How ________________________________?

5. **Connect**- How do the data connect to the locations on the map?
   a. The place with the **biggest value** or number is__________________________.
   b. The place with the **smallest value** or number is__________________________.
   c. What locations share similar values? Why do you think these are similar?

6. **Assess**- What information can you identify on the map?
   a. The information on the map shows ________________________________.
   b. What part of the **Earth System** is this information related to air, water, land, ice, living things?
**Map Cube Questions**

**Keywords (add more words):**
- Earth System
- highest value
- latitude
- least
- longitude
- lowest value
- most
- pattern

1. **Examine** - What do the colors of the map tell you? Look closely at the map.
   a. The colors that show the **most** represent ____________________________.
   b. The colors that show the **least** represent ____________________________.
   c. The date(s) shown on the map (is/are) ____________________________.

2. **Search and Find** - Where on Earth do you see this map?
   a. Something or someplace I recognize on the map is ____________________________.
   b. The **latitude** goes from ____________________________ to ____________________________.
   c. The **longitude** goes from ____________________________ to ____________________________.

3. **Analyze** - What changes do you observe? What happened?
   a. The **highest values** show up in _______ areas. This means ____________________________.
   b. The **lowest values** show up in _______ areas. This means ____________________________.
   c. One **pattern** or change I observe is ____________________________.

4. **Ask** - What information do you want to know about the map?
   a. I want to know ____________________________.
   b. How ____________________________?

5. **Connect** - How do the data connect to the locations on the map?
   a. The **latitude** and **longitude** of a place with the **highest value**/number is ________.
   b. The **latitude** and **longitude** of a place with the **lowest value**/number is ________.
   c. What locations share similar values? Why do you think these are similar?

6. **Assess** - What information can you identify on the map?
   a. Summarize the information that you learned from looking at the map.
   b. What part of the **Earth System** is this information related to? ____________________________

*Example: atmosphere, biosphere, etc.*
Map Cube Questions

Keywords (add more words):
Earth System  highest value  latitude  least  longitude
lowest value  most  pattern

1. Examine- What do the colors of the map tell you? Look closely at the map.
   a. The colors that show the most represent ____________________________.
   b. The colors that show the least represent ____________________________.
   c. The date(s) shown on the map (is/are) ____________________________.

2. Search and Find- Where on Earth do you see this map?
   a. Something or someplace I recognize on the map is ____________________________.
   b. The latitude goes from _________________ to _________________.
   c. The longitude goes from _________________ to _________________.

3. Analyze- What changes do you observe? What happened?
   a. The highest values show up in ________ areas. This means ____________________________.
   b. The lowest values show up in ________ areas. This means ____________________________.
   c. One pattern or change I observe is ____________________________.

4. Ask- What information do you want to know about the map?
   a. I want to know ____________________________.
   b. How ____________________________?

5. Connect- How do the data connect to the locations on the map?
   a. The latitude and longitude of a place with the highest value/number is ________.
   b. The latitude and longitude of a place with the lowest value/number is ________.
   c. What locations share similar values? Why do you think these are similar?

6. Assess- What information can you identify on the map?
   a. Summarize the information that you learned from looking at the map.
   b. What part of the Earth System is this information related to? _______________

Example: atmosphere, biosphere, etc.
Map Cube Questions

Keywords (add more words):
coordinates   Earth System   longitude   latitude
             time frame   unit   variable

1. Examine- What do the colors of the map tell you? Look closely at the map.
   a. What variable is represented by the colors?
   b. This variable explains _____________________________.
   c. The unit used for the variable is ___________________________. Example, cm, mm, inches, m, km, etc.
   d. The time frame for the map is _____________________________.

2. Search and Find- Where on Earth do you see this map?
   a. The latitude and longitude coordinates are _____________________________.
   b. An area (or coordinates) with the highest values is _____________________________.
      This represents _____________________________.
      Example: North, West, Asia, Africa, 13.4° N, 144.7° E
   c. An area (or coordinates) with the lowest values is _____________________________.
      This represents _____________________________.
      Example: North, West, Asia, Africa, 13.4° N, 144.7° E

3. Analyze- What changes do you observe? What happened?
   a. I observe the following pattern _____________________________.
   b. What changes (or similarities) do you observe in the data values along lines of latitude? What may influence this pattern?
   c. What changes (or similarities) do you observe in the data values along lines of longitude? What may influence this pattern?

4. Ask- What information do you want to know about the map?
   a. My hypothesis is that if _____________________________, then _____________________________.
   b. How many _________? How long _________? How often _________?

5. Connect- How do the data connect to the locations on the map?
   a. Select a location on the map. What does the information on the legend tell you about the location?
   b. Scan the entire map and select a few locations. How does the variable change?
   c. What events or processes could cause these data values to change?

6. Assess- What information can you identify on the map?
   a. Summarize the information that you observed on the map.
   b. What part of the Earth System is this information related to atmosphere, biosphere, cryosphere, geosphere, or hydrosphere?
   c. Explain the changes in this part of the Earth System?
   d. How does this variable affect other parts of the Earth System?
Map Cube Questions

Keywords (add more words):
coordinates   Earth System   longitude   latitude
time frame   unit   variable

1. Examine- What do the colors of the map tell you? Look closely at the map.
   a. What variable is represented by the colors?
   b. This variable explains ____________________________________________
   c. The unit used for the variable is ________________________________ Example, cm, mm, inches, m, km, etc.
   d. The time frame for the map is______________________________

2. Search and Find- Where on Earth do you see this map?
   a. The latitude and longitude coordinates are__________________________
   b. An area (or coordinates) with the highest values is ____________________________
      This represents_______________________________________________________
      Example: North, West, Asia, Africa,13.4° N, 144.7° E
   c. An area (or coordinates) with the lowest values is ____________________________
      This represents_______________________________________________________
      Example: North, West, Asia, Africa,13.4° N, 144.7° E

3. Analyze- What changes do you observe? What happened?
   a. I observe the following pattern___________________________________________
   b. What changes (or similarities) do you observe in the data values along lines of latitude? What may influence this pattern?
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4. Ask- What information do you want to know about the map?
   a. My hypothesis is that if____________________, then____________________
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   a. Select a location on the map. What does the information on the legend tell you about the location?
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   c. Explain the changes in this part of the Earth System?
   d. How does this variable affect other parts of the Earth System?
Map Cube Questions

1. Examine- What do the colors of the map tell you?
   a. The color scale represents the variable ____________________________.
   b. This variable explains ____________________________.
   c. What is the unit for the variable? ____________________________
   d. What is the range for the unit? ____________________________

2. Search and Find- Where on Earth do you see this map?
   a. What is the latitude and longitude range?
   b. Identify a place you recognize and its approximate latitude and longitude.
   c. What type of map projection is this?

3. Analyze- What changes do you observe? What happened?
   a. What patterns are there for the high values?
   b. What patterns are there for the low values?
   c. What time frame does this map represent?

4. Ask- What information do you want to know about the map?
   a. Form a hypothesis about the data displayed on the map.
   b. What inference can you make about the cause of the data displayed?

5. Connect- How do the data connect to the locations on the map?
   a. Look at the legend on the map. What do you interpret that is happening?
   b. How does the variable change by latitude and longitude on the map?
   c. How do the values change by area?
   d. What events or processes could cause these data values to change?

6. Assess- What information can you identify on the map?
   a. Why do you think this variable changed by area?
   b. How does this variable affect other parts of the Earth System?
   c. How could you determine the impact of this variable on other parts of the Earth System?
Map Cube Questions

1. Examine- What do the colors of the map tell you?
   a. The color scale represents the variable ___________________________________________. Example, temperature, precipitation, etc.
   b. This variable explains ____________________________________________________________.
   c. What is the unit for the variable? _______________________________________________. Example, cm, mm, inches, m, km, etc.
   d. What is the range for the unit? ____________________________________________________

2. Search and Find- Where on Earth do you see this map?
   a. What is the latitude and longitude range?
   b. Identify a place you recognize and its approximate latitude and longitude.
   c. What type of map projection is this?

3. Analyze- What changes do you observe? What happened?
   a. What patterns are there for the high values?
   b. What patterns are there for the low values?
   c. What time frame does this map represent?

4. Ask- What information do you want to know about the map?
   a. Form a hypothesis about the data displayed on the map.
   b. What inference can you make about the cause of the data displayed?

5. Connect- How do the data connect to the locations on the map?
   a. Look at the legend on the map. What do you interpret that is happening?
   b. How does the variable change by latitude and longitude on the map?
   c. How do the values change by area?
   d. What events or processes could cause these data values to change?

6. Assess- What information can you identify on the map?
   a. Why do you think this variable changed by area?
   b. How does this variable affect other parts of the Earth System?
   c. How could you determine the impact of this variable on other parts of the Earth System?
Graph Cube Questions

**Keywords (add more words):**
axis axes graph highest horizontal line graph lowest shortest vertical

1. **Examine** - What are the parts of the graph? (Look for clues in the title.)
   a. The information on the line graph shows __________________________.
   b. What does the horizontal axis represent? (This is usually on the bottom with
      numbers.) The horizontal axis represents __________________________.
   c. What does the vertical axis represent? (This is usually on the left with numbers).
      The vertical axis represents __________________________.
   d. What are the lowest numbers on the horizontal and the vertical axes?
      The lowest numbers are __________ and __________.
   e. What are the highest numbers on the horizontal and vertical axes?
      The highest numbers are __________ and __________.

2. **Search and Find** - How is the information connected in the graph?
   a. Place an X on the high points of the line graph. Draw a line connecting the high
      points.
   b. Place an O on the low points of the line graph. Draw a line connecting the low
      points.

3. **Analyze** - How do the numbers change in the graph?
   a. The changes on the line graph that I see are__________________________.
   b. The biggest change on the graph is__________________________.
      This represents __________________________.

4. **Ask** - What do you want to know about the information from the line graph?
   a. Why ____________________________?
   b. How much ____________________________?

5. **Connect** - How can we use this information to help us?
   a. I think___________ would be interested in this graph. (Example: farmers, etc.)
   b. A community member can use this information to__________________________.

6. **Assess** - What information do you see on the graph?
   a. Look at the line graph (not the axes). Describe its shape (Example, straight,
      curve, hill, zig zag, etc.) ____________________________.
   b. What does the tallest point of the line graph show? The point shows__________.
   c. What does the shortest point of the line graph show? The point shows__________.

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Graph Cube Questions

Keywords (add more words):
axiaxesgraphhighesthorizontalline graphlowestshortestvertical

1. Examine- What are the parts of the graph? (Look for clues in the title.)
   a. The information on the line graph shows ________________________ .
   b. What does the horizontal axis represent? (This is usually on the bottom with numbers.) The horizontal axis represents ________________________ .
   c. What does the vertical axis represent? (This is usually on the left with numbers). The vertical axis represents ________________________ .
   d. What are the lowest numbers on the horizontal and the vertical axes?
      The lowest numbers are __________ and __________ .
   e. What are the highest numbers on the horizontal and vertical axes?
      The highest numbers are __________ and __________ .

2. Search and Find- How is the information connected in the graph?
   a. Place an X on the high points of the line graph. Draw a line connecting the high points.
   b. Place an O on the low points of the line graph. Draw a line connecting the low points.

3. Analyze- How do the numbers change in the graph?
   a. The changes on the line graph that I see are ________________________ .
   b. The biggest change on the graph is ________________________ . This represents ________________________ .

4. Ask- What do you want to know about the information from the line graph?
   a. Why ________________________ ?
   b. How much ________________________ ?

5. Connect- How can we use this information to help us?
   a. I think __________ would be interested in this graph. (Example: farmers, etc.)
   b. A community member can use this information to ________________________ .

6. Assess- What information do you see on the graph?
   a. Look at the line graph (not the axes). Describe its shape (Example, straight, curve, hill, zig zag, etc.) ________________________ .
   b. What does the tallest point of the line graph show? The point shows __________.
   c. What does the shortest point of the line graph show? The point shows __________.
Graph Cube Questions

1. Examine- What are parts of the graph?
   a. The title tells me ____________________________ .
   b. The label on the x-axis is______________________.
   The label on the y-axis is ________________________ .
   c. The unit on the x-axis is ________________________.
   The unit on the y-axis is ________________________ .
   d. The scale on the x-axis is_______________ . The scale on the y-axis is ____________ .

2. Search and Find- How is the information connected in the graph?
   a. Place an X on the high points of the graph. Draw a line connecting these points.
   b. Place an O on the low points of the graph. Draw a line connecting these points.
   c. The time range for the data is from ________________ to ________________ .

3. Analyze- How do the numbers in the graph change?
   a. Look at the data. Describe their shape. (Example, straight, curve, hill, etc.).
   b. The bottom of the graph is the ___ axis. This manipulated variable is ________.
   c. The left side of the graph is the ____ axis. This responding variable is__________.
   d. The numbers on the graph show___________________________.

4. Ask- What are questions you can answer with these data?
   a. Why ______________________________? 
   b. How much ______________________________? 

5. Connect- How can we use this information to help us?
   a. I think ____________ would be interested in this data. (Example: farmers, etc.)
   b. How could this community member use these data?

6. Assess- What information do you see on the graph?
   a. Look at the line graph (not the axes). Describe its shape. (Example, straight, curve, hill, zig zag, etc.) The shape is ____________________________ .
   b. The data from the graph ________________ . (Example: increase, decrease, etc.)
   c. The information on the graph tells me that ____________________________. 

Keywords (add more words):
data decrease graph increase label time range
unit scale time range variable X-axis Y-axis
Graph Cube Questions

1. Examine - What are parts of the graph?
   a. The title tells me ________________________________ .
   b. The label on the x-axis is ________________________ .
      The label on the y-axis is ________________________ .
   c. The unit on the x-axis is ________________________ .
      The unit on the y-axis is ________________________ .
   d. The scale on the x-axis is ____________. The scale on the y-axis is ____________.

2. Search and Find - How is the information connected in the graph?
   a. Place an X on the high points of the graph. Draw a line connecting these points.
   b. Place an O on the low points of the graph. Draw a line connecting these points.
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   a. Look at the data. Describe their shape. (Example, straight, curve, hill, etc.).
   b. The bottom of the graph is the ____ axis. This manipulated variable is ________.
   c. The left side of the graph is the ____ axis. This responding variable is ________.
   d. The numbers on the graph show ____________________________________________.

4. Ask - What are questions you can answer with these data?
   a. Why _________________________________?
   b. How much ________________________________?

5. Connect - How can we use this information to help us?
   a. I think ____________ would be interested in this data. (Example: farmers, etc.)
   b. How could this community member use these data?

6. Assess - What information do you see on the graph?
   a. Look at the line graph (not the axes). Describe its shape. (Example, straight, curve, hill, zig zag, etc.) The shape is ________________________________ .
   b. The data from the graph ____________________ . (Example: increase, decrease, etc.)
   c. The information on the graph tells me that ________________________________ .
Graph Cube Questions

Keywords (add more words):
characteristics dependent variable independent variable unit variable X-axis Y-axis

1. Examine - What are parts of the graph?
   a. The name of the variable on the x-axis is _______________.
      It is the ________________ variable.
      independent, dependent
   b. The name of the variable on the y-axis is _________________.
      It is the ________________ variable.
      independent, dependent
   c. The unit on the x-axis is _________________.
      The unit on the y-axis is _________________.
   d. The scale on the x-axis is ________________. The scale on the y-axis is _________________.

2. Search and Find - How is the information connected in the graph?
   a. Place an X on the high points of the graph. Draw a line connecting these points.
   b. Place an O on the low points of the graph. Draw a line connecting these points.
   c. The time range for the data is from _____________ to ___________.

3. Analyze - How do the data in the graph change?
   a. What are the changes that you see happening on the line graph?
   b. When/where do you see the most change in the data?
   c. When/where do you see the least change in the data?

4. Ask - What are questions you can answer with these data?
   a. What are the characteristics of _________________.
   b. When did ________________ happen?
   c. How does ________________ compare/contrast with ________________?

5. Connect - How can we use this information to help us?
   a. What parts of the Earth are affected by this?
   b. What do you think may cause these events?
   c. What community members may need these data? Why?

6. Assess - What information do you see on the graph?
   a. As the independent variable ____________, the dependent variable will _______.
      increase(s), decrease(s), stay(s) the same
   b. Based on what you know about these science variables, explain the data.
1. Examine - What are parts of the graph?
   a. The name of the variable on the x-axis is ________________ .
      It is the __________________________ variable.
   b. The name of the variable on the y-axis is ________________ .
      It is the __________________________ variable.
   c. The unit on the x-axis is __________________________ .
      The unit on the y-axis is __________________________ .
   d. The scale on the x-axis is ___________. The scale on the y-axis is ___________.

2. Search and Find - How is the information connected in the graph?
   a. Place an X on the high points of the graph. Draw a line connecting these points.
   b. Place an O on the low points of the graph. Draw a line connecting these points.
   c. The time range for the data is from ________________ to ________________ .

3. Analyze - How do the data in the graph change?
   a. What are the changes that you see happening on the line graph?
   b. When/where do you see the most change in the data?
   c. When/where do you see the least change in the data?

4. Ask - What questions you can answer with these data?
   a. What are the characteristics of ________________ ?
   b. When did ________________ happen?
   c. How does ________________ compare/contrast with ________________ ?

5. Connect - How can we use this information to help us?
   a. What parts of the Earth are affected by this?
   b. What do you think may cause these events?
   c. What community members may need these data? Why?

6. Assess - What information do you see on the graph?
   a. As the independent variable ___________, the dependent variable will ___________ .
      increase(s), decrease(s), stay(s) the same

   b. Based on what you know about these science variables, explain the data.
Graph Cube Questions

1. **Examine** - What are parts of the graph?
   a. What variable is represented on the x-axis? What is the range of values?
   b. What variable is represented on the y-axis? What is the range of values?
   c. What are the units of measurement for the x and y axes?
   d. What geographic location does the data on the graph represent?

2. **Search and Find** - How is the information connected in the graph?
   a. Place X on the high points of the line graph. Draw a line connecting the points.
   b. Place O on the low points of the line graph. Draw a line connecting the points.
   c. Do the data repeat in recognizable ways? Explain.
   d. What kinds of patterns or trends do you see in the distribution of the data? Explain.
   e. How do the patterns you see in the graph relate to other things you know?

3. **Analyze** - How are the data in the graph related?
   a. Describe the relationship between the variables: positive, negative, or none.
   b. Brainstorm one science variable that you predict to be directly proportional.
   c. Brainstorm one science variable that you predict to be inversely proportional.

4. **Ask** - What are science questions you can answer with these data?
   a. What are the attributes of ________________________________?
   b. What would happen to ___________________________ if ___________________________?
   c. How does ___________________________ compare/contrast with ___________________________?

5. **Connect** - How can we use this information to help us?
   a. I think ____________ would be interested in these data because ________________.
   b. What real-world problems could this community member use these data to solve?
   c. What parts of the Earth System are involved in this/these events?
   d. What other science processes are related to this event?

6. **Assess** - What information do you see on the graph?
   a. What is the numerical range of the data? Mean? Median? Mode?
   b. How is the mean different from the mode in these data?
   c. Are there any outliers? If so, what are they?
Graph Cube Questions

1. **Examine**- What are parts of the graph?
   a. What variable is represented on the x-axis? What is the range of values?
   b. What variable is represented on the y-axis? What is the range of values?
   c. What are the units of measurement for the x and y axes?
   d. What geographic location does the data on the graph represent?

2. **Search and Find**- How is the information connected in the graph?
   a. Place X on the high points of the line graph. Draw a line connecting the points.
   b. Place O on the low points of the line graph. Draw a line connecting the points.
   c. Do the data repeat in recognizable ways? Explain.
   d. What kinds of patterns or trends do you see in the distribution of the data? Explain.
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   b. What would happen to ____________________________ if ____________________________?
   c. How does ____________________________ compare/contrast with ____________________________?

5. **Connect**- How can we use this information to help us?
   a. I think ________ would be interested in these data because ____________________.
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   c. What parts of the Earth System are involved in this/these events?
   d. What other science processes are related to this event?

6. **Assess**- What information do you see on the graph?
   a. What is the numerical range of the data? Mean? Median? Mode?
   b. How is the mean different from the mode in these data?
   c. Are there any outliers? If so, what are they?
Data Cube Questions

Keywords (add more words):
collect/collection  data  highest value  instrument
lowest value  measure

1. Examine - What are the data (information) about?
   a. The data (information) are about ____________________________.
   Example: air temperature, precipitation, plants, etc.
   b. By looking at the data I see _______________________________.

2. Search and Find - How were the data measured?
   a. The data were collected by ________________________________.
   Example: me, scientist, satellite, etc.
   b. The instrument used to measure this data was a/an ________________.
   Example: thermometer, ruler, etc.

3. Analyze - What do the data show?
   a. The place on Earth where the data were collected is ________________.
   Example: city, state, latitude/longitude, global, etc.
   b. I observe that the time when the data were collected is ________________.
   Example: month, year, day, etc.

4. Ask - Write your own questions using the data.
   a. Why ____________________________?
   b. How ________________________________?

5. Connect - How can we use this information to help us?
   a. These data help us understand ________________________________.
   b. These data can help scientists by ________________________________.

6. Assess - What does the information tell you? Calculate or estimate using the data.
   a. The highest value is ____________. The lowest value is ________________.
   b. Graph the data (use graph paper or create your own graph to show your information).
Keywords (add more words):
collect/collection data highest value instrument
lowest value measure

1. Examine - What are the data (information) about?
   a. The data (information) are about ________________________________ .
   Example: air temperature, precipitation, plants, etc.
   b. By looking at the data I see ________________________________ .

2. Search and Find - How were the data measured?
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   b. The instrument used to measure this data was a/an ________________________________ .
   Example: thermometer, ruler, etc.

3. Analyze - What do the data show?
   a. The place on Earth where the data were collected is ________________________________ .
   Example: city, state, latitude/longitude, global, etc.
   b. I observe that the time when the data were collected is ________________________________ .
   Example: month, year, day, etc.

4. Ask - Write your own questions using the data.
   a. Why ________________________________________________________?
   b. How ________________________________________________________?

5. Connect - How can we use this information to help us?
   a. These data help us understand______________________________________ .
   b. These data can help scientists by______________________________________ .

6. Assess - What does the information tell you? Calculate or estimate using the data.
   a. The highest value is____________ . The lowest value is_____________ .
   b. Graph the data (use graph paper or create your own graph to show your information).
Data Cube Questions

Keywords (add more words):
- collect/collected
- data
- geographic area
- highest value
- lowest value
- time range
- unit

1. Examine - What are the data (information) about?
   a. The unit used for the data is _____________________________.
      Example: °C, cm, kg, etc.
   b. The data represent (are about) _____________________________.
      Example: temperature, distance, mass, etc.

2. Search and Find - How were the data measured?
   a. The data were collected every _____________________________.
      Example: day, week, month, year, etc.
   b. The data were collected by _____________________________.
      Example: me, scientist, satellite, etc.

3. Analyze - What does the information tell you? Calculate or estimate the numbers.
   using the data.
   a. The highest value is ______________ and represents ______________.
   b. The lowest value is ______________ and represents ______________.
   c. The pattern/s I see ______________ in the data is/are ______________.
      Example: the most, the least, etc.

4. Ask - Write your own questions using the data.
   a. Why does ____________________________? 
   b. How can ____________________________? 

5. Connect - How can we use this information to help us?
   a. These data help us understand _____________________________.
   b. These data help explain why _____________________________.
   c. These data can help scientists understand _____________________________.

6. Assess - What do the data show?
   a. The geographic area of Earth where the data were collected is ______________.
      Example: city, state, latitude/longitude, global, etc.
   b. The time range (when did it happen?) is from ______________ to ______________.
      Example: Monday, October, 12:00, etc.
   c. Graph the data. (Use graph paper or create your own graph to show your information.)
Data Cube Questions

Keywords (add more words):
collect/collected  data  geographic area  highest value
lowest value  time range  unit

1. Examine- What are the data (information) about?
   a. The unit used for the data is ____________________________.
      Example: °C, cm, kg, etc.
   b. The data represent (are about) ____________________________.
      Example: temperature, distance, mass, etc.

2. Search and Find- How were the data measured?
   a. The data were collected every ____________________________.
      Example: day, week, month, year, etc.
   b. The data were collected by ____________________________.
      Example: me, scientist, satellite, etc.

3. Analyze- What does the information tell you? Calculate or estimate the numbers using the data.
   a. The highest value is ___________ and represents ___________.
   b. The lowest value is ___________ and represents ___________.
   c. The pattern/s I see ___________ in the data is/are ___________.
      Example: the most, the least, etc.

4. Ask- Write your own questions using the data.
   a. Why does ____________________________?
   b. How can ____________________________?

5. Connect- How can we use this information to help us?
   a. These data help us understand ____________________________.
   b. These data help explain why ____________________________.
   c. These data can help scientists understand ____________________________.

6. Assess- What do the data show?
   a. The geographic area of Earth where the data were collected is ___________.
      Example: city, state, latitude/longitude, global, etc.
   b. The time range (when did it happen?) is from ___________ to ___________.
      Example: Monday, October, 12:00, etc.
   c. Graph the data. (Use graph paper or create your own graph to show your information.)
Data Cube Questions

Keywords (add more words):
central tendency data Earth System mean median mode
phenomenon sphere time range variable unit

1. Examine- What are the data about?
   a. The variable is ___________________. It represents ____________________.
   b. The independent variable is__________________________________________.
   c. The dependent variable is_____________________________________________.

2. Search and Find- How were the data measured?
   a. The __________________instrument collected these data.
   b. The data are collected every ______________________ Example: day, week, month, quarter, year, etc.
   c. The unit used to describe the data is ______________________ Example: °C, cm, kg, etc.

3. Analyze- What does the data show?
   a. The geographic area of Earth that is represented is__________________________.
   b. The time range is from____________________ to____________________.
   c. This variable belongs in the____________________________ sphere of the Earth System.
      Example: Hydrosphere, Atmosphere, etc.

4. Ask- Write your own questions using the data.
   a. How do..., Why..., What is...___________________________________________.
   b. I would like to compare____________ with these data because______________.
   c. How do these data affect another sphere in the Earth System?

5. Connect- How can we use this information to help us?
   a. These data help us understand ________________________________
   b. These data can explain the phenomenon of______ because______________.

6. Assess- What does the information tell you? Calculate or estimate the numbers using the data.
   a. The range of the data is______________________________________________.
   b. The data’s mean is equal to ________; median__________; mode ________.
   c. The measure of central tendency that best represents the data is the ________
      mean, median or mode. This is because ________________________________.
   d. Graph the data (use graph paper or create your own graph to show your information).
1. Examine - What are the data about?
   a. The variable is ___________________. It represents ____________________.
   b. The independent variable is _________________________________.
   c. The dependent variable is _________________________________.

2. Search and Find - How were the data measured?
   a. The ____________________ instrument collected these data.
   b. The data are collected every __________________. Example: day, week, month, quarter, year, etc.
   c. The unit used to describe the data is _____________________. Example: °C, cm, kg, etc.

3. Analyze - What does the data show?
   a. The geographic area of Earth that is represented is _____________________.
   b. The time range is from ____________________ to _____________________.
   c. This variable belongs in the ____________________ sphere of the Earth System. Example: Hydrosphere, Atmosphere, etc.

4. Ask - Write your own questions using the data.
   a. How do..., Why..., What is... _____________________.
   b. I would like to compare __________ with these data because ____________.
   c. How do these data affect another sphere in the Earth System?

5. Connect - How can we use this information to help us?
   a. These data help us understand _____________________.
   b. These data can explain the phenomenon of ______ because _________.

6. Assess - What does the information tell you? Calculate or estimate the numbers using the data.
   a. The range of the data is _____________________.
   b. The data’s mean is equal to _______; median ________; mode ________.
   c. The measure of central tendency that best represents the data is the ________. This is because _____________________.
   d. Graph the data (use graph paper or create your own graph to show your information).
Data Cube Questions

1. Examine- What are the data about?
   a. What does the variable represent?
   b. What is the range of the data?
   c. In which sphere of the Earth System does this variable belong?

2. Search and Find- How were the data measured?
   a. What instrument/s collected these data?
   b. How frequently were the data collected?
   c. What unit describes the data?

3. Analyze- What does the data show?
   a. What geographic area on Earth do the data represent?
   b. What time range do these data represent?
   c. What area and time data would you like to collect to help you analyze these data?

4. Ask- Write your own questions using the data.
   a. Identify a question related to these data that you could research.
   b. Identify another scientific variable that you could evaluate with these data.
   c. How do you think this area compares to other geographic provinces in your region?

5. Connect- How can we use this information to help us?
   a. What kinds of research questions could we use these data for?
   b. Describe how you may use these data to explain a naturally occurring event.
   c. How is technology connected to these data?

6. Assess- What information do you see on the graph?
   a. Are there any outliers? If so, what are they?
   b. Do the outliers meet your expectations? Why/Why not?
   c. Graph the data (use graph paper or create your own graph to show your information).
**Data Cube Questions**

1. **Examine** - What are the data about?
   a. What does the variable represent?
   b. What is the range of the data?
   c. In which sphere of the Earth System does this variable belong?

2. **Search and Find** - How were the data measured?
   a. What instrument/s collected these data?
   b. How frequently were the data collected?
   c. What unit describes the data?

3. **Analyze** - What does the data show?
   a. What geographic area on Earth do the data represent?
   b. What time range do these data represent?
   c. What area and time data would you like to collect to help you analyze these data?

4. **Ask** - Write your own questions using the data.
   a. Identify a question related to these data that you could research.
   b. Identify another scientific variable that you could evaluate with these data.
   c. How do you think this area compares to other geographic provinces in your region? (i.e., coastal plain, highlands, etc.)

5. **Connect** - How can we use this information to help us?
   a. What kinds of research questions could we use these data for?
   b. Describe how you may use these data to explain a naturally occurring event.
   c. How is technology connected to these data?

6. **Assess** - What information do you see on the graph?
   a. Are there any outliers? If so, what are they?
   b. Do the outliers meet your expectations? Why/Why not?
   c. Graph the data (use graph paper or create your own graph to show your information).