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).
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.

- area
- biggest value
- Earth System
- least
- legend
- most
- smallest value

**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/

   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
2. Search & Find
3. Analyze
4. Ask
5. Connect
6. Assess
## Task Card

### Group _________

<table>
<thead>
<tr>
<th>Role</th>
<th>Name of Student</th>
</tr>
</thead>
<tbody>
<tr>
<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>
<td></td>
</tr>
<tr>
<td><strong>Communications Manager:</strong> You will present and explain your group’s summary of the questions.</td>
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<td><strong>Extra Position:</strong></td>
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Map Cube Questions

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?
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 _________________.
   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?
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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**?

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example, cm, mm, inches, m, km, etc.

Example: North, West, Asia, Africa, 13.4° N, 144.7° E

Name: ____________________________ Date: ____________________________

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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 ________ .
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 __________.
Graph Cube Questions

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

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 ________________________ .
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 ________________________________.
**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 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

   increase(s), decrease(s), stay the same

   b. Based on what you know about these science variables, explain the data.
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 questions can you 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
      increase(s), decrease(s), stay the same
   b. Based on what you know about these science variables, explain the data.
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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   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?
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).
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).
# 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/collated  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.
   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 ____________________.
   c. The **unit** used to describe the data is _______________.

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.

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

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.
   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? (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).
**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?
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   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?

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   a. Are there any outliers? If so, what are they?
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   c. Graph the data (use graph paper or create your own graph to show your information).