Lesson 02: Mystery Graphs (Low-Inquiry Version)

Lesson Title: What Does This Graph Show?
Intended Grade Level(s): Grades 6-12 (adaptable)

I. Planning

Lesson Focus / Goals

State the big idea(s) of the lesson. Focus on conceptual understanding. Avoid vague objectives. Specify the knowledge and skills students should demonstrate.

The lesson aims to provide the following for students: - Practice interpreting unlabeled graphs - Learn to identify key features of graphs (trends, scale, units) - Understand that graphs represent relationships between variables

Learning Objectives

Write clear, measurable objectives. Include both procedural and conceptual goals. Consider potential misconceptions students might have.

By the end of the lesson, students will be able to: - Describe the trend shown in an unlabeled graph using the teacher's vocabulary - Identify the x-axis and y-axis variables after the teacher reveals them - Explain why the teacher's interpretation matches the graph features - Use correct graphing terminology (trend, scale, axes, relationship) when describing graphs

Potential Misconceptions: - Students might think graphs always show time on the x-axis - Students might confuse correlation with causation - Students might not understand that different phenomena can produce similar graph shapes - Students might focus on individual data points rather than overall trends

Standards Alignment

Note: This is a content-agnostic lesson that places math and science students on equal footing. However, the reasoning processes naturally align to core practices in both disciplines.

Standards for Mathematical Practice (Common Core): - **MP2** – Reason abstractly and quantitatively.
Students interpret graphs as representations of quantitative relationships. - **MP6** – Attend to precision.
Students use precise vocabulary when describing graph features.

NGSS Science and Engineering Practices: - Analyzing and Interpreting Data – Students examine graphical representations to identify patterns and relationships. - **Using Mathematics and Computational Thinking** – Students recognize how graphs model real-world phenomena.

II. Implementation

Materials Needed

List all physical and digital resources, manipulatives, and technology needed. For each item listed, provide a brief justification/explanation for its inclusion.

The following materials are used in the lesson: - **Projector/screen** to display unlabeled graphs - **Four mystery graphs** (printed handouts, one per student) showing: (1) baby weight vs. age, (2) tree circumference vs. age, (3) average monthly temperature over a year, (4) coffee temperature while cooling - **Teacher answer key** with correct interpretation and key features for each graph - **Student recording sheet** with spaces to write teacher's explanations - **Graph features checklist** poster (trend, scale, units, relationship)

Preparation: Create or find four unlabeled graphs with clear trends. Prepare answer key with explanations. Make copies of student recording sheets. Post graph features checklist.

Lesson Flow

(Before-During-After)

Organize your plan using the Before–During–After framework. Include approximate timing, key questions, and anticipated student responses.

Before: (Launch – 5 min)

1. Display **Graph 1** (unlabeled curve showing rapid initial increase that levels off)
2. Ask: "What could this graph be showing?"
3. Take 2-3 quick guesses from students
4. Explain: "Today I'm going to show you four mystery graphs. For each one, I'll reveal what it shows and explain how I can tell."
5. Show **Graph Features Checklist** poster: "When we look at graphs, we examine: trend (up/down/level), scale (big numbers? small?), shape (straight? curved?), and relationship (how do the variables connect?)."
6. Model with Graph 1: "This shows baby weight vs. age in the first year. Notice the rapid growth at first that slows down. That's typical for babies—fast growth early, then it levels off."

During: (Explore – 15 min)

- Distribute handouts with **Graphs 2-4**
- For each graph:
  - Students examine the unlabeled graph individually (30 seconds)
  - Teacher asks: "What do you notice about the shape/trend?"
  - A few students volunteer observations
  - Teacher reveals the answer and explains:
    - **Graph 2** (tree circumference vs. age): "This is tree growth. Trees grow steadily for many years—that's why we see a straight line going up. The x-axis is years, the y-axis is circumference in inches."
    - **Graph 3** (average temperature over months): "This is average monthly temperature where we live. See how it goes up in summer (middle of the year) and down in winter (ends of the year)? That cycle tells us it's something seasonal."
    - **Graph 4** (coffee cooling): "This is coffee temperature cooling down. It drops fast at first, then slows as it approaches room temperature. Scientists call this 'exponential decay.' "
- Students write the answer and key features on their recording sheet for each graph
- Teacher circulates to ensure students are recording explanations accurately

After: (Discuss – 5 min)

- Review all four graphs
- Ask: "What did we learn about reading graphs?"
- Teacher emphasizes: "Graphs show relationships. The shape tells us something about how the variables are connected."
- Point out: "Different phenomena can have similar shapes—trees and babies both grow, but in different patterns."
- Remind: "Always look for trend, scale, and what makes sense for the relationship."

III. Assessment

Formative Assessment

Describe how you will check for understanding during and after the lesson.

Formative: During the lesson, monitor if students: - Are identifying basic graph features (trend, shape) - Are following along with the teacher's interpretations - Are recording the correct answers and explanations on their sheets - Can use the vocabulary from the graph features checklist

Exit Ticket: Students examine one final mystery graph (balloon volume vs. altitude - volume increases as altitude increases). They select the correct answer

from three options: - A. Plant height over days - B. Balloon volume at different altitudes
- C. Water temperature while heating

Then copy the teacher's explanation from the board about why the relationship makes sense.

Peer/Self-Assessment: Students compare their recording sheets with a partner to verify they captured all four graph interpretations correctly.

IV. Reflection & Next Steps

After teaching: Note what worked well and what didn't. Identify topics or skills to revisit. Record surprising student thinking. Suggest changes for next time.

I will aim to answer the following questions after the lesson has been taught: - Did students correctly identify trends after I explained them? - Were students surprised by any of the graph reveals? - Did students suggest alternative interpretations? How did I handle them? - Were the four examples sufficient for students to understand how graphs represent relationships? - How might I choose more engaging/surprising examples next time? - Should I add more scaffolding about how to "read" a graph shape?

Note: Please attach student handouts and any other printed materials that students will need to complete the lesson.

Student Recording Sheet

Name: _____ **Date:** _____

Mystery Graphs - What Do They Show?

For each mystery graph, write down what the graph shows and the KEY FEATURES your teacher explains.

Graph 1: Baby Weight vs. Age
Already completed as example

What it shows: Baby weight over the first year of life
Key features: Rapid growth at first (steep curve), then levels off as growth slows

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Graph 2:
What it shows: _____
Key features: _____

Graph 3:
What it shows: _____
Key features: _____

Graph 4:
What it shows: _____
Key features: _____

Graph Features Checklist

When examining a mystery graph, look for: - **Trend:** Is it going up? Down? Staying level? Cycling? - **Shape:** Is it a straight line? Curve? Wave? - **Scale:** What size numbers are on the axes? - **Relationship:** How are the variables connected?

Exit Ticket:

Look at the mystery graph below. Which option is correct?

- ☐ A. Plant height over days
- ☐ B. Balloon volume at different altitudes
- ☐ C. Water temperature while heating

Copy the explanation from the board: