

SESSION SEVEN EXPLORING RELATIONSHIPS

Outcomes

- To introduce ways to examine the relationship between two sets of data
- To develop the concept of a scatter plot
- To introduce the concept of correlation

Overview

This session uses scatter plots to introduce the concept of correlation. Participants create several scatter plots and examine the difference between positive and negative correlations as well as strong and weak correlation.

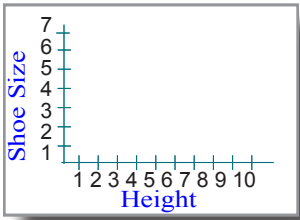
Time

- 5 minutes** The initial activity serves to report on the at-home activity.
- 45 minutes** In this activity participants measure 3 sets of data about themselves, then organize it into 3 scatter plots, developing appropriate scales for each graph.
- 30 minutes** Drawing in an informal "line of best fit," participants examine each of the three graphs and discuss whether there is any relationship between height and foot size; height and head size; and foot and head size.
- 20 minutes** Finally participants examine different scatter plots for positive and negative correlation.
- 15 minutes** In the summary we introduce more formal language of correlation.

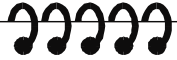

Materials

Facilitator	Transparencies (English & Spanish)
<ul style="list-style-type: none"> • Meter stick or height ruler tacked to the wall • Meter stick for finding line of best fit 	<p><i>BLM 35: Deepening Understanding</i> <i>BLM 36: Mystery Graph</i></p>
Participant	Handouts (English & Spanish)
<ul style="list-style-type: none"> • Tape measures, one per person • Calculators, at least one per pair • Rulers, one for each person • Graph paper, one for each person • Large colored dots, at least 4 per person. If you have males and females in the group, have a different color for each gender. 	<p>One per participant for class <i>BLM 34: What Are Our Measurements?</i> <i>BLM 35: Deepening Understanding</i> <i>BLM 36: Mystery Graph</i></p> <p>One per participant for home <i>BLM 37: Bringing Mathematics Home 7</i></p>

Activities

Preparation of Classroom	Notes									
<p>1. Prepare a chart for recording class data.</p> <p>2. This lesson requires advance preparation of 3 large graphs of the combinations of head size, foot size, and height. You might not want to guess the range in values beforehand as this may ruin your scale if your values are misjudged. Have the graphs ready and labeled and leave the scales blank until data are collected. Choice of scales also makes for an interesting discussion with the participants.</p> <p>3. Post the Chart It! and put out the name tags.</p>	<p>Example chart for recording data:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Height</th> <th>Head Size</th> <th>Shoe Size</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> <p>Example of a graph:</p> 	Height	Head Size	Shoe Size						
Height	Head Size	Shoe Size								
Discussion of Homework (10 minutes)										
<p>Have one or two volunteers share what they felt was the best measure of central tendency and why.</p>										
Measurements (45 minutes)										
<p>1. Give out the What Are Our Measurements? handout, tape measures, and graph paper. Have each small group measure the following data about each person: height, head size, and foot size. Be sure all are using centimeters.</p> <p>2. Then have one person from each group record the data in the large table on grid paper. Have groups copy the information on their own sheet, Recording Measurements. Ask: <i>Are there any measurements here that look strange?</i> Have them:</p> <ul style="list-style-type: none"> • Find the average height, head size, and foot size. • Identify which average was used. • Make a plot graph of height, head size, or foot size. • Write a sentence or two describing the whole class using these data. <p>3. Give groups transparencies and pens to construct one of the plots. Have them share at the overhead projector. Ask: <i>Where can you find any measures of central tendency?</i></p> <p>4. Share some of the sentences.</p>	<p>Ask this so that any measurements that were done in inches instead of centimeters will be weeded out before they become problematic.</p> <p>Go around to the groups and choose a variety of plot graphs to share so advantages of each can be discussed.</p>									

Activities

Relationships Among Data (30 minutes)	Notes
<p>1. Tell the participants that they have just organized the information in a graph and analyzed it by finding an average. Now they are going to explore relationships. Referring to the large charts, say:</p> <ul style="list-style-type: none"> • <i>We want to be able to record both height and head size on this graph. How could we display the data?</i> • <i>What is our largest height? Smallest? What scale should we use for height?</i> • <i>What is our largest head size? Smallest? What scale should we use for head size?</i> <p>2. Do the same for the other two graphs.</p> <p>3. Model putting information on the graph by placing a dot that represents you on the graph. Then give each person 3 colored dots, and have each put his/her own data in the right position on each of the three graphs, creating 3 scatter plots of data.</p> <p>4. Pick a few dots and ask participants what they know about this particular participant from the graph.</p> <p>5. In groups, have participants discuss each of the three scatter plot graphs, looking for generalizations they can make about each graph. Have participants share their thoughts with the whole class.</p> <p>6. Using a yardstick, have a volunteer draw a line that seems to fit the data for each graph. This line should have about half of the points above and half below the line. Introduce that vocabulary: Line of Best Fit and Chart It!. Using these lines, ask questions such as:</p> <ul style="list-style-type: none"> • <i>If someone were about 190 cm tall, what might our graph predict her head size would be? Foot size?</i> • <i>What about someone 150 cm tall? 90 cm tall?</i> <p>7. Have the participants explore the relationships between the data by asking:</p> <ul style="list-style-type: none"> • <i>Does there seem to be a relationship between height and foot size? Height and head size? Foot size and head size?</i> • <i>Which has the closest relationship?</i> • <i>How can we tell?</i> <p>8. Tell participants that when they look at data for relationships, they are looking at correlations. Correlations can be weak or strong, positive or negative.</p>	<p>To ease congestion, have each group start with a different graph. Monitor the production of the scatter plots to be sure data are entered approximately correctly; beware of switched data.</p> <p>Possible responses:</p> <ul style="list-style-type: none"> • As height gets bigger, foot size gets bigger. • There is not much of a relationship between foot size and head size. • This should have about half the points above and half below the line. <div data-bbox="1143 1184 1344 1486" style="border: 1px solid black; padding: 5px; margin: 10px 0;">  <p>Line of Best Fit The line that comes closest to connecting the points on a scatter plot.</p> <p style="text-align: right; color: blue;">Chart It!</p> </div> <div data-bbox="1143 1535 1344 1822" style="border: 1px solid black; padding: 5px; margin: 10px 0;">  <p>Correlation: Correlations are relationships between two sets of data.</p> <p style="text-align: right; color: blue;">Chart It!</p> </div>

Activities

Height and Age (20 minutes)	Notes
<p>1. Say: <i>In order to discuss correlations, we will look at several graphs.</i> Hand out Deepening Understanding. Have participants discuss the questions in their groups.</p> <p>2. Have groups report on their discussions.</p> <p>3. Use the Chart It! to record the different aspects of correlation: strong, weak, positive, negative, zero.</p> <p>4. Tell them that they will now look at a mystery graph and see if they can guess what it might graph. There are no right or wrong answers, but some answers fit the data better than other answers.</p> <p>5. Show the Mystery Graph transparency. Ask: <i>What pair of items might cause a graph to look like this?</i> Discuss the possibilities.</p>	<div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%; border: 1px solid black; padding: 5px; margin: 5px;"> <p>Types of Correlation:</p> <p>1. Strong - data points lie very close to the line of best fit.</p> <p style="text-align: right; color: blue;">Chart It!</p> </div> <div style="width: 50%; border: 1px solid black; padding: 5px; margin: 5px;"> <p>2. Weak - data points follow a pattern, but are more scattered.</p> <p>3. Positive - both data sets are increasing.</p> <p style="text-align: right; color: blue;">Chart It!</p> </div> <div style="width: 50%; border: 1px solid black; padding: 5px; margin: 5px;"> <p>4. Negative - one data set decreases while the other one increases.</p> <p style="text-align: right; color: blue;">Chart It!</p> </div> <div style="width: 50%; border: 1px solid black; padding: 5px; margin: 5px;"> <p>5. Zero - there seems to be no pattern of increasing or decreasing.</p> <p style="text-align: right; color: blue;">Chart It!</p> </div> </div> <p><i>One possibility is that this is the gasoline left in the tank of a car compared to miles driven since the last fill up. It could be the amount of balance due on a car (in thousands of dollars) as the weeks go by.</i></p>
<p>Closure (15 minutes)</p>	
<p>1. Expand on the concept of correlation by asking questions such as: <i>Which of the graphs that we created today has the strongest positive correlation? Which has the weakest correlation? Do any of the graphs have a negative correlation? Which of our graphs comes closest to a zero correlation?</i></p> <p>2. Ask the participants to share one thing that they thought about differently as a result of this session.</p>	<p>Strong positive correlation: Most likely it will be the head size and height</p>
<p>Take Home Activities (5 minutes)</p>	
<p>Handout the home assignment and explain: Bringing Mathematics Home 7.</p>	
<p>Preparation for the Next Session</p>	
<p>1. Collect name cards for use in the next sessions.</p> <p>2. Save the Chart It! and bring them to the next class. If desired, you may have the log typed and distributed to participants at the next class.</p>	