Outcomes
- To review median and learn the meaning of mode
- To experience use of numerical and categorical data in a chart
- To consider the meaning of "typical" in the context of numerical and categorical data
- To learn how to construct a line plot graph

Overview
This session continues the exploration of measures of central tendency and graphical representation. The meaning of median is reviewed and the meaning of mode is developed. Participants use data collected about themselves in order to explore the concepts in this session.

Time

15 minutes	This activity uses data participants collected from their children about the type of learning strategies used in their mathematics class. Not only does it serve to introduce the topic of the day, but it also can stimulate discussion about how mathematics is taught in your area. Be careful that the discussion does not consume the whole class session.
30 minutes	In this activity, participants chart the data on math activities, number of cans of soda they drink in a month, and types of shoes worn. They then discuss what might be considered "typical" for each set of data.
45 minutes	Participants form a human bar graph based on the number of letters in their last names. While in this formation they explore the mode and median.
20 minutes	In this activity, participants use a prepared line plot to find the mode and median of a set of SAT scores.
10 minutes	The final activity gives participants an opportunity to see how these concepts are developed in their school.

Materials

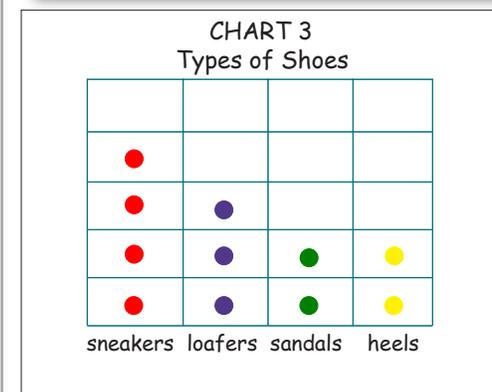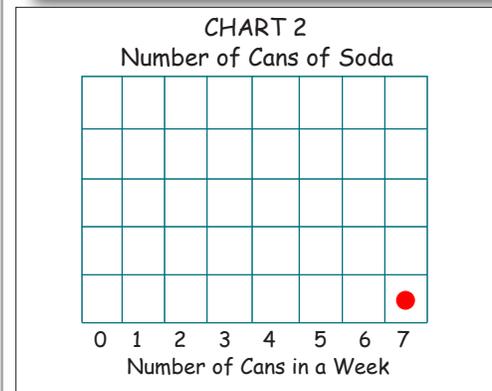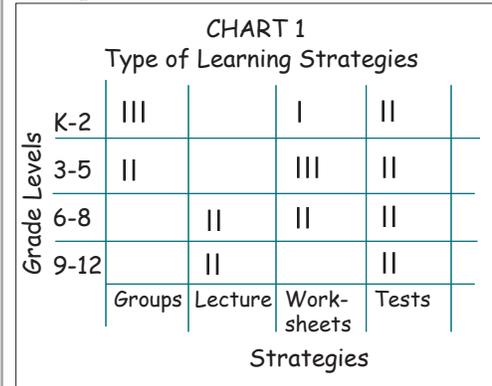| **Facilitator**	**Transparencies (English & Spanish)**
	BLM 25: Collecting Data *BLM 27: Line Plot Graph*
Participant	**Handouts (English & Spanish)**
• Unifix cubes, each participant needs as many cubes as the number of the letters in his/her last name • Grid chart paper and marker, one per person • Large dots, one box for class • Graph paper, one per person • Blank paper, one per person • Colored pencils, one set per group	**One per participant for class** *BLM 26: Problems for a Line Plot Graph* **One per participant for home** *BLM 28.1-2: Bringing Mathematics Home 5*

Activities

Preparation of Classroom	Notes

1. Set up the **Chart It!**
 	
2. Place the name cards from last class near the front of the room where participants can easily find them.
 	
3. Before class begins, prepare three charts for the first activity and display in front of the room. See example.
   a) Chart 1 is for the data the participants collected at home from last sessions home assignment, **Bringing Mathematics Home 4**. This data is related to the types of learning strategies the participants children used at school in the last week in their math classes and should be recorded with tally marks.
   b) Chart 2 is numerical data and should be a chart of the number of cans of soda each participant drinks in a week. The number should be recorded with a dot in the appropriate column.
   c) Chart 3 is categorical data and should be related to the types of shoes the group is wearing that day. Participants should place a dot above the type of shoe that they are wearing. Leave some empty categories so that participants can fill in other types of shoes to fit their need.
 	
4. Display the **Collecting Data** transparency for the first activity to begin as participants arrive. Have dots available for participants to use.
 	
5. Be prepared to discuss the school district's scope and sequence pertaining to graphs and measures of central tendency.
	Example charts:
	
	CHART 1
	Type of Learning Strategies
	
	CHART 2
	Number of Cans of Soda
	
	CHART 3
	Types of Shoes

CHART 1 — Type of Learning Strategies

Grade Levels	Groups	Lecture	Work-sheets	Tests
K-2	III		I	II
3-5	II		III	II
6-8		II	II	II
9-12		II		II

Strategies

CHART 2 — Number of Cans of Soda

0 1 2 3 4 5 6 7
Number of Cans in a Week

CHART 3 — Types of Shoes

sneakers   loafers   sandals   heels

| Discussion of Homework (15 minutes)	
1. As parents arrive, have them fill out the three charts in front of the room by placing dots (one per square) or tally marks in the appropriate columns. 2. Have volunteers share their data from their children's learning strategies at the overhead projector.	If parents do not come with the data on math activities, you will still have the other two graphs to discuss: one of categorical data and one of numerical data.

Activities

Discussion of Homework (continued)	Notes
3. Discuss what seems to be the "typical" learning strategy in the classroom of participants' children. Compare the strategies to the ones in this course by asking: *What type of learning strategies have we done in the class?*	

What is Typical? (30 minutes)	
1. Ask: • *How would you describe a "typical" participant in this room?* • *What do we mean by typical?* • *What characteristics might we use? Height? Age? Number of children? Etc.* • *Can we pick one participant who would be typical?* 2. Examine the "Learning Strategies" chart. Ask: *What would be the typical type of learning strategy experienced by your children in their classroom?* With a partner, have participants discuss what they would consider typical and their reasoning. Have participants share their ideas. 3. Examine the "Types of Shoes" chart. Ask: *What would be the typical type of shoes worn by this class?* With a partner, have participants discuss what they would consider typical and their reasoning. Have participants share their ideas. 4. Examine the "Number of Cans of Soda Drunk" chart. Ask: *What would be the typical number of cans of soda drunk by a participant during the week?* Process it similarly to the other questions. 5. Tell participants that in the last lesson they worked with the idea of median as one way to describe typical, and in this lesson they will work with another way as they learn another graphical representation.	There are a number of possible answers. The category occurring most often might be mentioned. The type of shoe that appears most often might be mentioned. A number of answers are possible, including the number that occurs most often.

Developing Mode and Median (45 minutes)	
1. Give each parent as many Unifix cubes as the number of letters in his/her last name. Ask them to hook the cubes together to make a column.	

Activities

Developing Mode and Median (continues)	Notes

2. Ask participants to move into groups according to the number of cubes they hold, i.e., length of column, forming a human bar graph. Ask:
   Which group(s) have the largest number of people? We call that number the <u>mode.</u>
Remove parents from the group to demonstrate no mode, one mode, and bi-modal if possible.
 	
3. Refer back to the "Types of Shoes" chart. Ask:
   What is the mode for our types of shoes?
 	
Now refer back to the "Number of Cans of Soda Drunk" chart. Ask:
   What is the mode for the number of cans we drink each week?
 	
4. Now the group lines up in order such that the participant with the least number of squares is at one end of the line and the one with the most is at the other end.
 	
5. While they are in line, make a quick transparency of the number of letters in their names by having a count down and writing 2, 3, 3, 3, 4, 4, 4, 4, etc.
 	
6. Find the median by doing the following:
  a) Bend the line in half so that the participant with the most cubes is paired with the participant with the least. The participant with no partner is at the middle of the line, the point at which exactly half of the participants have more cubes and half fewer cubes. The number of cubes of the participant at the middle represents the median.
  b) Redistribute participants so there is an even number of people and repeat, so they see that the median may not be a value in the set.
 	
7. Discuss that the median represents the point where exactly half of the values are greater and half are less.
 	
8. Refer back to the soda chart. Ask:
   What is the median number of cans of soda we drink each week?
 	
9. Refer back to the shoe chart. Ask:
   Can we find the median type of shoes we are wearing? Why or why not?
	Participants should position themselves as if they were on a number line with the numbers increasing from left to right.
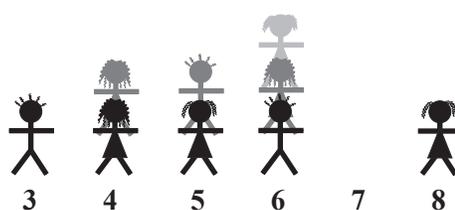	
	  3 4 5 6 7 8
	Number of letters in name
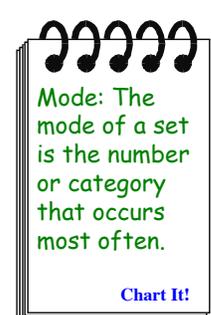	
	Mode: The mode of a set is the number or category that occurs most often.
	
	Chart It!
	
	Bi-modal refers to data that have two values that tie for the mode.
	
	In this session participants experience a new way to find the median. Refer to the definition of median from session 4 on the **Chart It!**
	
	You cannot find the median for categorical data.

Activities

Mode and Median Example (20 minutes)	Notes
1. Distribute the **Problems for a Line Plot Graph**. In small groups, work on the following problems. Be prepared to present your results.	Give about 10 minutes for this group activity.
2. Display the **Line Plot Graph** transparency and say: *This graph is called a **line plot** (just like our Charts 2 and 3). Each star represents the number of times that a particular value occurs. For example, the two stars above the number 800 means that the value 800 occurs two times in this set of data.*	
3. Have volunteers come up and interpret the graph and answer questions a-e on the **Problems for a Line Plot Graph** handout. Questions are also listed below: a) *Find the mode of the data. Explain how you found it.* (500) b) *Find the median of the data. Explain how you found it.* (500) c) *What might these data represent?* (SAT scores) Discuss with the whole group what the data may represent. d) *Do all sets of data have a mode? Explain.* (Numerical and non-numerical data may have 0, 1, 2, or more modes. e) *Do all sets of data have a median? Explain.* (Numerical data sets always have a median; non-numerical data sets do not have a median.)	*If no one knows what this data represents then you may have to explain that the Scholastic Achievement Test (SAT) is an achievement test students take to get into college.*
4. Display the transparency that you made of the length of last names. Have participants do a line plot graph using the length of the last names.	
Connecting to the Schools (10 minutes)	
Help participants identify at what grade level different graphs and terms are introduced.	Having the school district's scope and sequence will help with this discussion.
Take Home Activities (5 minutes)	
1. Handout **Bringing Mathematics Home 5** for a take home activity. Though there are graphs provided, if there is a current subject of interest to your class, include information about that with the homework assignment. 2. Remind participants to bring the answers to questions on graphs to the next session.	

Activities

Preparation for the Next Session	
1. Collect name cards for use in the next sessions. 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.	