



All Sorts of Sorting

LESSON OVERVIEW: In this lesson, students will start with a group of *Think-ets*[™] trinkets, identify attributes, designate categories into which to group them, and sort accordingly. They can then take the step of creating a concrete bar graph to represent their groupings. Older students may explore Venn diagrams by making a concrete model, sorting by attributes.

Curriculum Content Area: Language Arts, Science, Math

Correlation to National Standards:

Language Arts—apply a range of evaluation strategies; evaluate data by posing queries; apply language skills

Science—ability to do scientific inquiry, properties and characteristics of materials

Math—analyze characteristics and properties, understand attributes, formulate questions and collect data, organize, and display relevant data to answer, select and use appropriate statistical methods to analyze data

Skill Development: Classification and categorization, critical thinking, using graphs to represent data

Grade level: PreK to 5

Lesson Summary:

Objective:

Students will divide a group of objects into different categories based on a variety of different attributes.

Students will place objects on a bar graph to demonstrate categories.

Students will add objects to a Venn diagram to demonstrate separate, overlapping and combined attributes.

Time required:

Three class periods with one homework assignment

Materials required:

Think-ets™ Classroom Pack

Two-, Three-, and Four-Column Bar Graph blanks (see pages 6-8).

Two- and Three-Circle Venn Diagram blanks (see pages 9-10).

Vocabulary:

Attribute: a quality, property, or characteristic of something

Bar graph: a diagram in which the numerical values are represented by vertical or horizontal bars representing data

Categorize: to place something in a particular category and define or judge accordingly

Category: a group or set of things that are classified together because of common characteristics

Classification: the allocation of items to groups according to type

Venn diagram: a mathematical diagram representing sets as circles, with their relationships to each other expressed through their overlapping positions, so that all possible relationships between the sets are shown

Activity:

Before the Lesson

1. Make copies of the graph and/or diagram worksheets you will use, enough for 2 per student.
2. Familiarize yourself with the Think-ets™ trinkets in your set.

Day One—Categorization & Classification

1. Divide students into groups of two or three.
2. Provide each group with a handful of about 15 trinkets.
3. Allow time for exploration and investigation.
4. Instruct each group to assign a name to each object in their collection.
5. Identify any unknown objects.
6. Ask for suggestions of ways to sort the collections into groups. Among the possibilities are:
 - Colors
 - Material (wood/non-wood, metal/wood/other...)
 - Texture (soft/hard, smooth/bumpy)
 - Weight (light/heavy)
 - Use (tool/non-tool, edible/non-edible)
 - Living (if object were real, would it be alive or not)
 - Size (miniaturization/life size)
 - Origin (manmade/natural)

7. Direct groups to sort their collections into groups according to various attributes suggested. Invite groups to share the items they have included in various categories and discuss items that may be confusing.

Day Two—Bar Graphs

1. Repeat the activity of Day One with a new selection of trinkets and new groups, if desired. Instruct the groups to sort their collections into soft and hard groups.
2. Explain that there is a way to show categories so that people can get information about them at a glance. Distribute the Two-Column Bar Graph (p6) to groups. Point out that the first column in the graph is for SOFT trinkets, and the second is for HARD ones.
3. Assign placement of trinkets into squares on the bar graph, one per square, starting with the bottom of each column.
4. Note correct placement in columns as students work.
5. Discuss the ability to see the relative amounts in each category, without the necessity of counting each piece when using a bar graph. Ask groups to identify the bigger or smaller category of others' from seeing their bar graphs.
6. Describe that in order to make bar graphs easier to use, a space is filled in for each item being represented. Then papers can be picked up, stacked, etc.
7. Assign, remove a trinket and color the space it sat on. If desired, demonstrate filling numbers in for each row and have students add them to their graphs.
8. Provide examples of other bar graphs and highlight the kinds of information they summarize.
9. If more practice is desired, use the 3-Column Bar Graph blank (p7) and assign categorizing and creating bar graphs for PLASTIC/METAL/WOOD or any other three-way division.
10. For additional experience, or as an evaluation, give students the 4-Column Bar Graph blank (p8) and 12 to 15 trinkets. Ask them to categorize items as FOOD, DISHES, ANIMALS or OTHER, and place on the bar graph, and then show you. Assign coloring of column spaces used when 3-D graph has been checked.

Day Three—Venn Diagrams

1. Discuss the attributes used to divide the trinkets thus far. Mention that we have used categories in the bar that have an either/or nature: material, use, texture, etc. Explain that there is a way to show information when an item can fit into more than one category.
2. Draw two large, overlapping circles on the board. Label the left hand circle SISTERS and the right hand circle BROTHERS.
3. Distribute one sticky note to each student. Instruct them to write their names on the sticky notes. Invite pupils to come up by row and place their name in either the SISTER circle if they have sisters, or the other for those with brothers.

4. Someone is very likely to raise the issue of not being able to identify themselves as having both genders of siblings. If not, raise it yourself. Ask students to see if there is a way to give all the same information, without giving some students another sticky note.
5. Move the double-gendered sib names to the overlap section of the diagram.
6. Call out names and ask classmates to identify whether the person has a sister, a brother or both.
7. Distribute a 2-Circle Venn Diagram blank (p9) and about 12 trinkets to each student. Identify one circle as the place for THINGS THAT I HAVE SEEN IN MY LIFE and the other THINGS THAT ARE ALIVE.
8. Ask students to consider the trinkets as real life items, not the plastic or wood representation of real things, and to place them in the appropriate circles of the diagram.
9. Ask students to look at their neighbor's diagram and tell you one animal that they have seen, or one animal they haven't seen.
10. Show examples of Venn diagrams from textbooks and internet sites.
11. Gather students into cooperative groups of 3. Give each group a 3-Circle Venn Diagram blank (p10) and about 20 trinkets.
12. Explain that one circle is for items that have something to do with EATING, one for things having to do with DRINKS, and the last for KITCHEN TOOLS, UTENSILS, DISHES. Check the progress of groups as they complete their diagrams. Note: not all trinkets will be placed on the diagrams.
13. Clear the diagrams and designate the circles as: things related to cooking and eating, things made of metal, and things made of wood.
14. Assign: Take the Venn diagram blank home and make the circles each represent a category of things in your bedroom. Using words, fill in as many items as possible.

Evaluation:

Content: Verify skills of sorting by attribute and putting data into bar graph and Venn diagram formats by observing the results of these activities.

Process: Note ability of students to represent attribute concepts by sorting. Observe their success populating and extrapolating information from bar graphs. Assess critical thinking skills in how students are able to address overlapping characteristics in objects in the Venn diagram.

Extensions:

- Brainstorm other items that would fit into each category, not included in the trinkets.
- Make other three-dimensional bar graphs. For example, ask each child to bring an apple to school. Graph red, yellow and green apples. Then make applesauce and graph class votes about its flavor: best ever, good, or so-so.

- Make bar graphs and Venn diagrams in other subject areas.
- Make horizontal bar graphs.

Enrichment:

- Invite students to do investigations of their own and make bar graphs to display their results. Possible topics: age of students in class, cat/dog/other pets owned by classmates, hot/cold lunch.
- Utilize graphing capability of class computers to explore other graphic representations of data.

Resources:

Giraffe Graphs: Rookie Read-About Math by Melissa Stewart, published by Children's Press, 2007

Grandma's Button Box by Linda Williams Aber, published by Kane Press, 2002

Graphing: My Path to Math by Penny Dowdy, published by Crabtree, 2008

Graphs: All Aboard Math Reader by Bonnie Bader, published by Grosset & Dunlap, 2003

The Great Graph Contest by Loreen Leedy, published by Holiday House, 2006

Let's Eat Lunch: Learning About Picture Graphs by Susan Vaughan, published by Rosen, 2008

Let's Vote! Learning to Use Simple Bar Graphs by Roland Graham, published by Rosen, 2003

Math Counts: Sorting by Henry Arthur Pluckrose, published by Children's Press, 1995

Three Little Firefighters by Stuart J. Murphy, published by Harper Trophy, 2003

Tiger Math: Learning to Graph from a Baby Tiger by Anne Whitehead Nagda, published by Henry Holt and Co., 2000

Food	Dishes	Animals	Other



