

Teacher's Preparatory Guide

Bringing the Macro to the Nano in the Early Elementary School Classroom Lesson One

Big vs. Little – Macro to Micro

Overarching Question or Statement: What is size?

Purpose: Children will explore the concept of size by comparing and categorizing objects, then constructing various sized structures. Beginning their understanding of big and small will be important as they develop an understanding of the nanoscale in later grades.

Time required: 45 minutes for lesson, extension activities require additional time

Level: Early Elementary, Grades 1-3

Materials

- A collection of common objects of various sizes (rubber ball , marble, unit block, cube block, rock, pebble, piece of drawing paper and a post-it)
- Table top construction materials for children's structures, (table blocks, "Zoobs", "Crystal Climbers", straw construction kits, etc.)
- If possible, a digital camera to record constructions
- Individual blank journals for recording purposes
- Chart paper and markers

Safety Information: There are no safety concerns for this lesson

Advance Preparation:

Gather materials:

Chart paper

A group of everyday objects of varying sizes

Tabletop construction materials (small building manipulatives)

Individual blank journals (purchased or teacher made)

For extension activity: make picture cards of objects of varying sizes

Teacher Background:

National Nanotechnology Infrastructure Network

www.nnin.org

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Developed by Ellie Devine, Lisa Perazone, and Harvard School of Engineering & Applied Sciences

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Important vocabulary for this lesson:

Macro: objects visible to the eye

Micro: not visible with the eye unless using a microscope

Microscope: an instrument used to see objects not visible to the eye

Structure: a whole built of distinct parts

Teaching Strategies: Students will work in the large group and then divide into building teams (smaller groups) during construction period and then regroup as a whole class.

Resources:

Books:

Microscopes and Magnifying Lenses by Janice Van Cleave

Zoom by Istvan Banyai

Re-zoom by Istvan Banyai

Big Dog.....Little Dog by Phillip P. Eastman

What's Smaller Than a Pygmy Shrew by Robert E. Wells

Is a Blue Whale the Biggest Thing There is by Robert E. Wells

Actual Size by Steve Jenkins

Construction materials: Additional commercially made products such as

Crystal Climbers: www.lakeshorelearning.com

Brilliant Builders: www.discountschoolsupply.com

Zoobs: www.teachingsupplystore.com

Write and Draw Journals: www.lakeshorelearning.com

(These can be made by teacher as well)

Instructional Procedure:

Introduction: (approx. 5min.)

Guide students into a discussion of size and scale by asking such questions as: What does it mean when you say something is big? What does it mean when you say something is small? Can you make yourself big? Can you make yourself bigger? How can you do that? Can someone show us? What words describe big? How about small? Can you make yourself small? Can you make yourself smaller? Who can show us that? What words describe small? What is the biggest thing you can think of? The smallest thing? We are going to be looking at big and small things today together.

Part One: (approx. 20 min.)

Gather children around on the floor or at a table where everyone can see the objects being discussed. Take the container of objects and explain that the group will be making two categories, big and small. Children will work as a group to divide objects into two groups, big and small. It would work best to take out two corresponding items, i.e. a ball and a marble, so that children can explore the concept of scale as well as size during this activity.

Ask children to share with a friend some other ideas of things that are big and things that are small.

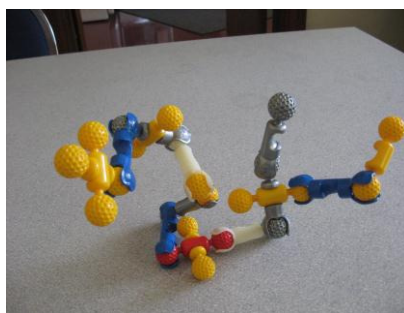
Using the large chart paper, elicit a list of *big* items on one side of the paper and a list of *small* items beside the big list. Encourage children to think of a variety of items for each category.

Also, encourage children to think of other words for *big* and *small*, *macro*, *mini*, *micro*, *tiny*, *huge*.

Big	Small
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Part Two: (approx. 20 min)

Divide the class into teams of five or six children each. Give each team an assignment to build a big or small structure with the construction materials available. As groups complete the task, circulate with a camera, if possible, to record each team's structure. These will be used later in a class book. They can also be used as display photos at a science center.



These photos may also be used as an assessment tool. Photos taken at the end of the unit can be compared with these.

Conclusion: (approx. 5 min.)

Using their blank notebooks, children will draw a picture of something big, and beside it a picture of something small. Encourage the varied vocabulary of macro and mini.

Extension activities:

1. As a follow-up lesson or ideally as a center activity, allow children to experiment with building structures of various sizes and then drawing a picture of them in their science notebook. Children will bring their notebooks to the next class for group sharing.
2. Folder Game: Using file folders, children will sort teacher made cards or ones included with this lesson into two categories, big and small, using pictures of big and small items,
3. Sequence of Size Game: Using teacher made pictures of ones included with this lesson (of objects of different sizes), children will arrange cards in the correctly sized order either from largest to smallest or smallest to largest.

(Lotto games are good sources of these pictures. Cut the images, glue on index cards, and laminate for durability.)

National Science Education Standards K-4

- Content Standard A Science as Inquiry

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- Abilities necessary to do scientific inquiry
- Understanding about scientific inquiry
- Content Standard B Physical Science
 - Properties of objects and materials

National Mathematics Standards K-2 and 3-5

- Understand measurable attributes of object, units, systems, and processes of measurement