Dust off Your Geometry Cabinet!

Joan Schuler, AIMS Conference, February, 2018

HANDOUT

Overview

“We … offer geometric shapes, in the form of material objects, which have a relationship to each other. These shapes can be moved and handled, lending themselves to demonstrating or revealing evident correspondences when they are brought together and compared.

This stimulates mental activity, because the eye sees and the mind perceives things that a teacher does not know how to convey to an immature…mind. Mental processes that are apparently premature and far advanced for the child’s age, thus become possible.”

M. Montessori: Psychogeometry, ‘Introduction to the Elementary Period, p. 55

- Children absorb geometric shapes about them. The prepared environment should reflect this sensitivity.

  "The child has a different relation to his environment from ours... the child absorbs it. The things he sees are not just remembered; they form part of his soul.”

  M. Montessori: The Absorbent Mind, p 56

- Occupations which use geometry include:
  - architects, artists, biologists, city planners, computer graphic & imaging designers, engineers, farmers, gardeners, graphic designers, inventors, mathematicians, physicists, surgeons, and more.

- The sensitive period for stereognostic awareness is a milestone beginning at 12 months.

- The Geometry Cabinet allows the child a concrete way to choose, compare, and isolate shapes as an indirect preparation and foundation for more abstract geometric work in the future.

- Order of drawers – straight-sided, square/rectangles, circles, triangles, polygons, curved (M. Montessori, The Discovery of the Child, p 132)

Experiences

1st: Exploration; using shapes in trial & error like a puzzle

  Variations

  - Frames; children should be free to spontaneously work with the frames in addition to the plane inset shapes. This provides an experience of shapes as ‘negative space’
- Grading; children may spontaneously grade the circles or rectangles. This can also be presented.

2nd: Guided touching; carefully touching the shape then the frame prepares the hand for writing and reinforces an understanding of the differences between shapes (*M. Montessori, The Discovery of the Child, p 206*)

*Variation:*

- Placing shapes into frame using a blindfold (tactile memory)
  and two hands

3rd: Matching; using **geometric cards**; match shapes with one set of cards, two sets, or all three
(Note: An effective storage technique is a trifold for each drawer where card types are separated.)

*Variation:*

- Matching shapes & cards across the room (visual memory).

*Extension:*

- Matching shapes to objects in the room

4th: Naming

- Naming shapes present in the environment
- Naming vocabulary of geometric shapes (introduction tray can be used)
- Naming using prepared labels

*Extensions:*

- Naming using prepared labels (comparative qualities such as biggest, smallest; parts of shapes ex: triangle – apex, midpoint, side, angle etc.)
- Using moveable alphabet to word build names
- Writing the words of shapes

5th: Representing (more abstract)

- **Making a ‘star’** (using bead stair with pentagon); child can also use other shapes as the basis for original designs (*Sr. Carolina del Valle*)
- Making geometric shapes with short chain
- Tracing and perforating paper
- Geometry cabinet ‘inset’ work
- Tracing and sewing geometric shapes
  
  *Extensions:*
  - Matching geometric shapes to objects in the room
  - Associating the polygons with the ‘short chains’

6th: Analyzing (advanced)
  - Angles & sides (identifying, counting)
    
    *Extensions:*
    - Counting; associating numerals with number of angles in shapes
    - Measuring sides of shapes, circumference of circles
    - Geometry Cabinet command cards

Games: Memory & Timing, Advanced
  - Ex Memory: Name all curved shapes
  - Ex Timing: How fast can you take out and replace rectangle shapes? Circles? Both?

7th: Finding Connections – providing and drawing attention to and encouraging discovery of geometric shapes in use in every area of the classroom (as well as outdoors)
  
  *Connections in Daily Living:* folding, dressing frames, food preparation, sweeping, scrubbing etc.
  
  *Connections in Sensorial:*
  - shapes of layouts (ex: 3 knobbed cylinders, ‘sun’ shape Color Box III, variations)
  - plane shapes (on sides of materials such as colored cylinders, brown prism)
  - stereognostic sorting
  - constructive triangles
  - geometric solids and bases
  - binomial & trinomial cubes

*The Discovery of the Child*, p 118, M. Montessori

*Connections in Math:*
-patterns & shapes of materials/layouts (bead stair, counting rods, place value bead cubes and squares; folding short chains into squares, finding squares in long chains, building squares into a pyramid, etc.)

-fractions
- The Bead Cabinet – squares & cubes (sorting, grading)
- building a ‘pyramid’ with 1-10 squares
- stacking squares into cubes
- folding short chains into squares
- finding squares in long chains
- measuring (geometric shapes, circumference of circles)

Connections in Language:
- Metal insets
  writing (shapes of letters)
- all vocabulary, naming, labeling extensions & story writing extensions

Connections in Science & Culture:
- geometric shapes of real objects (leaves, sea star, minerals, etc.)
- geometric leaf/petal shapes (elliptical, ovate, linear, deltoid etc.)
- life cycles
- season cycles
- phases of the moon
- geometry in other cultures

Connections in Art:
- variety in base paper shapes (circular, triangular etc.)
- different shapes for gluing experiences
- stamping & printing
- finger & dot painting
- paper weaving
- forked stick weaving
- origami & kirigami

Non-Montessori Geometry Materials (allow symmetrical geometric designs)
Blocks
Cuisenaire rods
Zometool (3-D)

**Geometry and the Future:**

“It prepares the mind to act rather than receive, and arouses interest that is always refreshing. The prepared mind is thus made active, and when it is time to receive true systematic geometry teaching (at secondary schools), the pupil will resemble an intelligence that meets the teaching halfway with great interest and with an amazing capacity for understanding. He may perhaps give much, rather than take much. This will also produce future benefits for science.”

- **M. Montessori; “Psychogeometry”**

**Photos...**

Highland Park Montessori, Highland Park, Il
Beaverton Montessori, Portland, Oregon
Naperville Montessori, Naperville, Il
Seton Montessori Toddler House, Clarendon Hills, Il
The Montessori St. John’s House, Portland, Oregon

**Resources:**

*Absorbent Mind, The – Maria Montessori*
*Block Book, The – Elisabeth Beth Hirsch*
*Discovery of the Child, The – Maria Montessori*
*Psychogeometry – Maria Montessori*

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