#### Introduction Section

#### Sensorial Curriculum Guide

###### Introduction Section:

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* Points to be included in Introduction
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Description and Sequencing of the Sensorial Materials:

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* Aims and Methods
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Matching and Sorting Systems

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Cover Sheet

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**The Auditory Sense:**Cover Sheet Silence Game

Introductory Activities:

* Sound Basket
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Montessori Bells

###### The Tactile Sense:

Cover Sheet Introductory Activities:

- Basket of Rough and Smooth Touch Boards

Touch Tablets Fabric Boxes 1&2

**Stereognostic Sense:**Cover Sheet Stereognostic Sense

###### Baric Sense:

Cover Sheet Introductory Activities

- Basket of Heavy and Light Baric Tablets

###### Thermic Sense:

Cover Sheet

Thermic Bottles
Thermic Tablets

###### Olfactory Sense:

Cover Sheet Smelling Cylinders

###### Gustatory Sense:

Cover Sheet
Tasting Bottles

###### A Sense of Self:

Cover Sheet Original Addition

**A Sense of Wonder:**Cover Sheet Original Addition

Reflective Journal Entries

There are sixteen suggested materials underlined. Please select twelve materials to present to a child and complete a reflective journal entry. These entries are to be submitted with your album.

Source: NMI, 2004; Revised, June 2005

#### Points to be Included in the Sensorial Introduction

General Points to be Included:

1. The name of the curriculum area.
2. An explanation of what this curriculum is.
3. How the materials are categorized within the curriculum.
4. The philosophical framework for the curriculum.
5. A historical framework, how the materials originated.
6. Interrelationship with Sensitive Periods.
7. Developmental Aims / Direct Aims / Philosophical Aims.
8. Practical Aims / Indirect Aims.
9. How the curriculum fits into the sequence of the total classroom.
10. How the curriculum overlaps other curriculum areas.
11. Important aspects of the materials.

Points to Include that are Specific to the Sensorial Curriculum:

1. Discuss the link between the hand, the senses and the mind.
2. What is the role of the adult in this area?
3. Describe the importance of language lessons in this curriculum and describe the 3 period lesson.
4. Discuss the characteristics of this area that are unique to the design of the materials (control of error, sequence, isolation of difficulty, isolation of the senses, etc.).
5. Discuss the role of the Absorbent Mind and the Mathematical Mind.
6. Please include Montessori quotes that apply to this area.

Source: NMI; 2004

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#### Sensorial Bibliography

1. Absorbent Mind; Maria Montessori

Chapters 14, 15 & 26

1. The Montessori Method; Maria Montessori Chapters 11, 13, 14, 15, 16
2. Dr. Montessori’s Own Handbook; Maria Montessori pp. 49-51; 65-123; 123-131
3. Education for a New World; Maria Montessori
4. The Discovery of the Child; Maria Montessori
5. Montessori Matters; Sisters of Notre Dame
6. Montessori, Her Methods and Movement; R. C. Orem, Ed; G.P, Putnam’s Sons, New York, 1967
7. The Hidden Hinge; Rosa Packard

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#### Characteristics of the Sensorial Materials

The Sensorial materials are grouped according to the sense which the material serves to isolate (Visual Discrimination / Auditory Sense / Tactile Sense / Thermic Sense / Olfactory Sense / and Gustatory Sense). No one sense is necessarily a preparation for another sense, although materials and activities are sequenced within each sense category.

###### Characteristics/Key Terms:

Isolation of the Sense: Whenever possible, all other sensory cues are

removed so that the child is called upon to use only one sense, such as the visual sense or the auditory sense.

Isolation of Difficulty: Within each specific sense, the activities isolate

the level of difficulty. The materials build upon one another in an ascending order of complexity and difficulty, with the beginning activities as a preparation for those that follow. Materials progress from simple to complex.

Sequential: As in all of the curriculum areas, the materials are sequential. The progression on the shelves moves left to right and top to bottom. Also, the child moves his or her whole body and hand in this left to right, top to bottom pattern. This is preparation for both reading and writing.

Auto - Educational: The beauty, clarity and precision of the materials

encourage and enable a child to work independently and successfully.

Control of Error: The control of error allows the child to identify

and correct mistakes through an act of will. This is the real task and test of education. It is this independent self correction that helps the child internalize and master the skill. This aspect of auto education builds problem solving skills.

Repetition: The materials encourage repetition through variations and sensorial games. This repetition leads to refinement of the sense and mastery of the skill.

Extensions involve the use of senses and skill together. Children combine materials and often make new discoveries through comparisons and contrasts.

Language: After the child has manipulated and explored the material, language is introduced. Language is the bridge between the concrete and the abstract; between the experience and the thought.

Hand and Mind: All the materials involve the use of the senses,

the hand and the mind. Sensory motor activity supplies the mind with information.

Source: NMI; 2004

#### Aims and Methods

A number of factors should always be part of the child’s work cycle, regardless of which area in the curriculum the work may be found. The child has gained these fundamental skills of coordination, concentration, independence, order and self esteem through their work with the Practical Life curriculum. With these fundamental skills, a child will be able to interact successfully with the Sensorial materials.

The materials in the Sensorial curriculum all share the same developmental or

###### Direct Aims:

Refinement of the ability to: observe

compare discriminate differentiate reason decide

solve problems appreciate our world

The Direct Aim of the entire Sensorial curriculum is the child’s construction of an internal, cognitive system which is orderly and logical. This system helps the child understand the world through the identification and association of experienced ideas. The materials assist the child in sorting the myriad of impressions that they have gathered through their ability to “absorb” their surroundings.

###### Methods:

The Sensorial curriculum will also offer the child the means and methods with which to acquire increasingly more accurate knowledge. This, in turn, facilitates the child to master his/her environment and form a basis for the development of the child’s intellect and reason.

###### Refinement of the Senses follows a Basic Developmental Order:

1. Perception of differences/recognition of contrasts (sorting)
2. Perception of similarities/recognition of identities (matching)
3. Discrimination between extreme ends of a spectrum (preparation for grading)
4. Perception of minute differences between similar objects(grading)
5. Recall of sensory perceptions (memory games)

###### Indirect Aims:

The practical or Indirect Aims of the Sensorial Curriculum change with each material. They pertain to the specific purpose and/or skill inherent to a particular material. They also correspond to the specific lesson. For example, in the initial presentation of Color box 1, the idea is to recognize and match the three primary colors. At a later stage, language will be introduced along with an additional aim for the child to be able to name the colors.

Source: NMI; 2004

#### Sequencing in Sensorial

The child has gained fundamental sequences from their experience with the Practical Life curriculum which will follow through in each curriculum area of the classroom.

These sequences include:

* left to right
* top to bottom
* simple to complex
* gross to refined
* large to small
* isolation to combination
* single or few to many
* repetition to refinement
* variations to extensions
* indirect to direct
* external to internal
* practical to developmental
* known to unknown

The additional elements in the Sensorial curriculum include:

* concrete to abstract
* hand to mind
* motor to cognitive
* sensorial to intellectual
* perceptual to conceptual
* absorbent to mathematical
* exploration to mastery
* experience to expression
* silence to language
* positive to comparative and then superlative
* 3D to 2D to 1D

Source: NMI; 2004

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#### Progression of Sensorial Presentations

The following outline will give you a logical, concise format for working with any sensorial material.

1. Basic presentation of the material.
2. Exercises listed with a material.
3. Language Lessons:
	1. basic 3 period lessons
	2. comparative lessons
	3. superlative lessons
4. Games with Sensorial materials:
	1. 3 basic games for the dimensional materials
	2. games for other pieces of Sensorial apparatus
5. Variations:

Taking one piece of material and building it in a different fashion from the presentation or exercise.

1. Extensions:

Taking any two or more pieces of materials and combining them together, or, adding something to the activity to increase the challenge (such as a blind fold).

Source: NMI; 2004

#### The Technique of Giving a Lesson

“The teacher must be warned of two things; first, not to insist by repeating the lesson; and second, not make the child feel that he has made a mistake, or that he is not understood, because in doing so she will cause him to make an effort to understanding and will thus alter the natural state which must be used by her in making her psychological observation. Let us suppose that the child makes a mistake. The teacher does not repeat and does not insist; she smiles, gives the child a friendly caress and takes away the colors.”

Maria Montessori; The Montessori Method (pg. 109)

The three periods of development in the learning process, according to Dr. Montessori, are:

1. The unconscious production of order.
2. The conscious production of order with errors.
3. Conscious production of order without errors.

The Montessori Director/Directress is the link between the child and the material. It is their responsibility to be fluent with the presentation and to invite the child to material presentations. The teacher should follow these steps when introducing children to the materials:

1. Initiation:
	* Arouse the attention of the child by inviting them to a lesson: “I have something wonderful to show you today.”
	* Be reasonably sure of the child’s success with the material.
	* Isolate child’s attention from everything but the object of the lesson.
2. Presentation:
	* Demonstrate exactly and slowly.
	* Isolate extremes.
	* Present language when appropriate.
3. Continuation:
	* Allow the child to repeat.
	* Lead the child on to progressive interests and perfection (through the use of the Sensorial and Language Games).
	* Encourage the child to develop extensions and to relate the material to the rest of the environment.

Source NMI; 2004

#### Presentation Presuppositions

When working in the Sensorial area of the curriculum, we will still keep in mind those presuppositions maintained in Practical Life (left to right, top to bottom, large to small, simple to complex, etc.).

There are two types of presentations with the Sensorial materials: pure and participating. The first presentation is often pure, whereas, subsequent lessons should be participating.

Initial Presentation:

1. Invite the child to the lesson.
2. Bring the child with you to the shelf and show them where the material is kept on the shelf.
3. Show the child how to carry the material:
	* 2 hands
	* 1 item at a time
	* using hands to emphasize dimension
4. Give the presentation itself.
5. Show the child how to return the material to its place on the shelf.

General Presuppositions:

* + movement is incorporated in the lesson
	+ follow the order which is inherent within the material
	+ if material consists of a group of ten, introduce the whole system
	+ be aware of the focus:
		- isolate the senses
		- isolate the level of difficulty
		- isolate the extremes
	+ create a consistent system which is (and can be) used with all similar or related materials
	+ first presentation is silent, followed by language which is introduced in a 3 period lesson
	+ emphasize the process of analysis; making comparisons should be obvious
	+ use the control of error built into the material
	+ point of emphasis should always be connected to the sense being isolated
	+ incorporate the developmental order:
		- sorting
		- matching
		- ends of the spectrum
		- grading
		- memory games
	+ use pincer grip to grasp knobs and small objects (preparation for writing)
	+ trace objects with index and middle finger of dominant hand
	+ trace counterclockwise, left to right, top to bottom
	+ trace the frame before the inset, the hole before the object
	+ allow the child to discover the unit of measure
	+ be consistent and dramatic
	+ practice steps in presentation before presenting to the child

Source NMI; 2004

#### Basic Sensorial Language Lesson

Language lessons should not be given until the child has had experience with the materials for which the qualities are inherent. This allows the child to unconsciously observe the qualities in themselves through direct experience before attaching names to those qualities. Language is used to help crystallize the concept or quality being presented.

###### Basic 3 Period Lesson:

Relational Words (large/small)

1st Period (Naming Stage): large/small

2nd Period (“Show Me” Stage): keep exchanging the cubes, giving the

experience of large/small in strong contrast, but showing many applications

3rd Period (“What is this?” Stage): only move to 3rd period when you are

certain they have mastery of the language

Comparatives (large/larger & small/smaller)

Once the child is confident with opposites, begin introducing comparatives.

1. review opposites of large/small
2. introduce a larger cube and a smaller cube
3. continue with a 3 period lesson, guiding the child into discrimination: “This is large.”; “Show me the one that is larger.”

Superlatives (large/larger/largest & small, smaller, smallest)

1. review relational words (large/small)
2. review comparative (larger/smaller)
3. introduce the largest and the smallest cubes
4. place your hand on the large cube: “This is large. Can you show me the one that is larger? Can you show me the largest cube?”

Source NMI; 2004

#### Sensorial Games

Game #1: Memory Game to Reinforce Child’s Discrimination

1. Lay out 2 mats some distance apart.
2. Bring all the pieces of the material from the shelf and mix randomly on mat #1.
3. Lay out the largest cube (prism, cylinder, rod, etc.) on mat #2 and ask the child to bring over the next appropriate cube: “Find the cube that comes next.”
4. Continue in this manner until material is assembled on mat #2.
5. If child’s interest remains, repeat and rebuild on mat #1.

Game #2: Memory of Language, as well as, Sensorial Refinement

1. Lay out 2 mats at opposite ends of the room.
2. Scatter materials randomly on one mat #1.
3. The teacher chooses a piece of the material and brings it to mat #2 and asks child for the next larger/smaller/thicker/longer, etc. one (use whatever language is appropriate).
4. Continue with this language until material is assembled on mat #2. If child is interested, repeat the game.

Game #3: Memory Game

1. This game can be played with any of the dimensional materials.
2. Place the cubes/prisms/cylinders, etc. on mat #1 in order from left to right (large to small, thick to thin, etc.).
3. The teacher assigns a number to each piece from 1-10.
4. Ask the child to close their eyes. Remove one piece from the series and hide it.
5. Ask the child what cube is missing?
6. When the child has guessed, replace it into the series and continue with the game.
7. To keep the game interesting, remove 2 pieces from the series.

Games 1, 2 & 3 can be played with the following materials:

Knobbed Cylinders Broad Prisms Knobless Cylinders Tower of Cubes Length Rods

Source: NMI; 2004

#### Sorting and Matching Systems

**Sorting System**

Begin with objects that have a great contrast (different colors) and work down to finer differences (same color but different sizes).

The set of objects are in a basket or bowl with smaller baskets or bowls to sort into:

* 1. Remove 1 object and place in first basket on the left.
	2. Remove 2nd object and compare it to the object in the first basket.
	3. If it is a match, place into the first basket; if it is not a match, place in the second basket.
	4. Continue until all the objects are sorted.

#### Matching Systems

Matching System #1: Object to Object

All the objects are placed in a basket:

1. Remove 1 object and show it to the child.
2. Place the object in the top left corner of the rug.
3. Remove the second object from the basket and show the child.
4. Compare this object to the first object by placing it to the right side.
5. If a match is found, leave the object in place beside object #1. If a match is not found, move the 2nd object down underneath the 1st object.
6. Continue until all objects are matched.

Matching System #2: Object to Picture

There are 2 distinct sets on a tray or in baskets (a set of objects & a set of matching cards):

1. Lay the objects out top to bottom, aligning them along the left edge of the rug. Space the objects evenly. If needed begin a second column of objects.
2. Take a picture and compare it to the first object in the top left corner of the rug.
3. If it is a match, lay the picture beside the object. If it is not a match, move the picture down to compare with the second object. Continue until a match is found.
4. Continue until all objects and pictures are matched.

Matching System #3: 3 Part Matching Cards

There are 3 sets of cards (a control card, a mute card and a written label):

When working with a Non Reading child, lay the cards out as follows:

1. Lay out the control cards, top to bottom along the left edge of the rug.
2. Match the mute cards to the control cards.
3. Read the labels to the child (modeling yourself as a reader); place the label cards under the mute card.
4. Compare matched cards to control cards.
5. Sort cards back into sets and return.

When working with a Reading child, lay the cards out as follows:

1. Lay out the mute cards, top to bottom along the left edge of the rug.
2. The child reads the labels and places beneath the mute card.
3. Check work with the control cards.
4. Sort cards back into sets and return.

Source: NMI; 2004

**Visual Discrimination: Size**

**Name of Activity:** Knobbed Cylinders (Cylinder Blocks)

**Area:** General: Visual Discrimination Specific: Size

**Materials:** This material consists of four well varnished blocks of natural colored hardwood, each having the same size and dimension (56 cm long, 5 cm high and 7.5 cm wide).

Block #1: height constant, diameter decreases thick to thin

Block #2: height decreases tall to short, diameter decreases thick to thin

Block #3: height increases short to tall, diameter decreases thick to thin

Block #4: height decreases tall to short, diameter is constant

**Aims:** Direct: Refinement of the abilities to observe, compare and

differentiate cylinders of varying sizes.

Indirect: Mastery of the ability to arrange cylinders in order.

Awareness of the concept of “ten-ness”.

**Preparation:** None in the Sensorial area; previous activities using the

pincer grip in Practical Life.

**Age:** First Year

###### Presentation of the Lesson: Presentation #1:

1. Invite the child to the lesson and walk to the shelf. Name the material and show the child how to properly carry the block to a table.
2. Starting with the cylinder on the left, use careful, controlled pincer grasp and remove the cylinder from the block and place randomly

in front of the block. (Careful control of movement should also be emphasized when placing cylinders on table.)

1. Continue to remove all the cylinders from the block, placing randomly in front of the block.
2. Place the extremes in front of the child (thickest cylinder and thinnest cylinder). Pause
3. Replace the cylinders back into the random mix of cylinders.

6 Indicate socket on the left by pointing to it with your index finger. Visually scan the cylinders for the exact match.

1. Using a pincer grip, carefully grasp the knob and position the cylinder over the socket. Touch the back edge of the cylinder into the socket, straighten the cylinder upright and slowly lower the cylinder into the socket.
2. Continue in the same manner, replacing all the cylinders into the proper sockets, moving from left to right.
3. Invite the child to do the activity. When finished, tell the child they are welcome to explore any of the other Knobbed Cylinders (a separate lesson is not necessary for each).
4. Show the child where to replace the cylinder on the shelf.

###### Presentation #2:

1. When the child has mastered the lesson, provide a new challenge by giving language lessons (relational words, comparatives and superlatives).

###### Presentation #3:

1. To keep the child interested in handling the materials, play the Sensorial games with the child.

###### Work of the Teacher:

Points of Emphasis: Using the pincer grip; working with precision and isolating the extremes.

Language: refer to the material description as the language changes with each block

**Points of Interest:** The weight of the blocks and the smoothness of

the wood.

###### Work of the Child:

Points of Consciousness: Only 1 cylinder fits within each socket. Control of Error: all cylinders within their proper socket.

**Variations:** Work with 2, 3 or 4 blocks together.

The following in an optional story which may be told when using all cylinders together with older children.

(“There once was a village of many people of different shapes and sizes. Some were tall, some were short. Some were thick and some were thin. But they all had a place and they all fit in.)

by D. Monahan

**Extensions:** Add a blindfold to the activity. Match the cylinders to the knobbed cylinders. Play games with pattern cards.

Source: Martha Monahan, NMI; 2004

**Name of Activity:** Tower of Cubes

**Area:** General: Visual Discrimination Specific: Size

**Materials:** This material is made up of ten wooden cubes stained in pink enamel or natural wood and is designed for the discrimination of volume. The cubes decrease in three dimensions. The largest cube is 10 cm and the smallest cube is 1 cm. The intervening cubes decrease successively by 1 cm in each of the dimensions and are 9 cm, 8 cm, 7 cm, 6,cm, 5 cm,

4 cm. 3cm and 2 cm.

**Aims:** Direct: Refinement of the abilities to observe and compare.

Indirect: Learning to grade cubes by discriminating volume.

**Preparation:** Knobbed Cylinders and other grading exercises.

**Age:** First Year

###### Presentation of the Lesson: Presentation #1:

1. Invite the child to the lesson and walk to the shelf. Name the material and show the child how to properly carry the smallest cube by cupping it in the palm of the subdominant hand, supporting the cube with the pincer grip of the dominant fingers.
2. Place the cube on the right side of the rug.
3. Continue to carry the cubes to the rug and place randomly on the right side of the rug. As the cubes get larger, hold the sides of the cubes securely.
4. Place the extremes in front of the child (largest and smallest cubes).
5. Replace the cubes back into the random array.
6. Visually scan the cubes and place the largest cube before the child.
7. Carefully and deliberately look for the next largest cube. Center this cube onto the base of the largest cube.
8. Continue visually scanning for the next appropriate cube and build the tower, placing cubes with great care.
9. Admire the work by standing up and walking around the tower, looking at it from various perspectives (also from directly above).
10. Take the tower down in preparation for putting it away. For younger children, build the tower in formation on its side as you take it down.
11. Replace the tower to its stand starting with the largest cube.

###### Presentation #2:

When the child has mastered the lesson, provide a new challenge by giving language lessons (relational words, comparatives and superlatives).

###### Presentation #3:

To keep the child interested in handling the materials, play the Sensorial games with the child.

###### Work of the Teacher:

Points of Emphasis: Careful handling of the cubes. Visually scanning for

the “next’ cube.

Language: large, larger, largest/small, smaller, smallest

**Points of Interest:** Contrast in size of the cubes. Building the tower is

an opportunity for building.

###### Work of the Child:

Points of Consciousness: Largest cube must be at the bottom when building

the tower.

**Control of Error:** Tower could fall if not built properly. Visual disharmony.

**Variations:** Sensorial games (see handout on variations)

**Extensions:** Use in combination with other materials for the discrimination of size. Pattern Cards.

Source: Martha Monahan, NMI; 2004

**Name of Activity:** Broad Prisms

**Area:** General: Visual Discrimination Specific: Size

**Materials:** This material is made up of ten rectangular prisms, painted or stained in dark brown enamel or natural wood. They differ in two dimensions. All prisms are 20 cm long but have graduated cross sections with a difference in width and height which diminish from 10 cm sq. to 1 cm sq.

**Aims:** Direct: Refinement of the abilities to compare, contrast and

discriminate.

Indirect: Ability to grade prisms in decreasing width.

**Preparation:** Knobbed Cylinders and Tower of Cubes.

**Age:** First Year

###### Presentation of the Lesson: Presentation #1:

1. Invite the child to the lesson and walk to the shelf. Name the material and show the child how to properly carry the narrowest prism (either by grasping the ends of the prisms or holding the prism upright and holding the sides).
2. Place the narrowest prism on the upper right side of the rug.
3. Continue to carry the prisms one by one in sequence to the rug, placing vertically in random order on the right side.
4. Place the extremes in front of the child (broadest prism and narrowest prism).
5. Replace the prisms back into the random array.
6. Visually scan the prisms and align the thickest prism vertically and to the left on the rug.
7. Continue to grade the prisms from thickest to thinnest/left to right.
8. Admire your work and invite child to repeat.
9. Replace the stair to the shelf beginning with the thickest prism.

###### Presentation #2:

When the child has mastered the lesson, provide a new challenge by giving language lessons (relational words, comparatives and superlatives).

###### Presentation #3:

To keep the child interested in handling the materials, play the Sensorial games with the child.

###### Work of the Teacher:

Points of Emphasis: Careful handling of the prisms. Visually scanning

for the “next’ prism.

Language: thick, thicker, thickest/thin, thinner, thinnest/ broad, broader, broadest/narrow, narrower, narrowest

**Points of Interest:** Contrast in size and weight of the prisms.

###### Work of the Child:

Points of Consciousness: Grading produces steps; narrowest prism equals

the difference between successive pairs.

Control of Error: Visual disharmony (the child’s eye).

**Variations:** Sensorial games (see handout on other variation)

**Extensions:** Match to pattern cards; trace, color and cut own patterns; build with the tower of cubes.

Source: Martha Monahan, NMI; 2004

**Name of Activity:** Length Rods (Red Rods)

**Area:** General: Visual Discrimination Specific: Size

**Materials:** This set of materials is made up of ten wooded rods painted or stained red. All rods have the same cross section of 2.5 cm x 2.5 cm, but they vary in length, thus changing in only 1 dimension. The longest rod is 1 meter and the rods diminish down to 10 cm (1 decimeter).

**Aims:** Direct: Refinement of the abilities to compare and discriminate.

Indirect: Ability to grade a series of rods from long to short. **Preparation:** Knobbed Cylinders, Tower of Cubes and Broad Prisms. **Age:** First Year

###### Presentation of the Lesson: Presentation #1:

1. Two rugs are needed for this activity - one is laid out from left to right with the second rug laid lengthwise against the right side of the first rug (right short edge of first rug against long left edge of second rug).
2. Invite the child to the lesson and walk to the shelf. Name the material and show the child how to properly carry the shortest rod (lengthwise with one hand at each end of the rod).
3. Place the rods randomly on the rug on the right with the end of the rod aligned along the top of the rug.
4. Continue to carry the rods to the rug and place randomly on the rug.
5. Move the extremes to the empty rug and place horizontally in front of the child (longest rod and shortest rod).
6. Replace the rods back into the random.
7. Visually scan the rods for the longest. Lift the rod and place at the top of the opposite (first) rug, aligning the end of the rod along the left edge of the rug.
8. Continue to grade the rods from longest to shortest. After placing each rod in alignment, sweep your hand along the top of the rod from left to right.
9. Replace the rods to the shelf beginning with the longest rod.

###### Presentation #2:

When the child has mastered the lesson, provide a new challenge by giving language lessons (relational words, comparatives and superlatives).

###### Presentation #3:

To keep the child interested in handling the materials, play the Sensorial games with the child.

###### Work of the Teacher:

Points of Emphasis: Careful handling of the material. Sweeping the

length of the rods. Aligning the rods on the rug.

Language: long, longer, longest/short, shorter, shortest

**Points of Interest:** Variation in the length of the rods and the

challenge of maneuvering the rods while carrying them.

###### Work of the Child:

Points of Consciousness: Rods go from long to short. The shortest rod is the unit of measure.

Control of Error: Visual disharmony (the child’s eye).

**Variations:** Sensorial games; the smallest rod is the unit of measure, Building a maze with the rods, etc. (see Variation and Extension handout).

**Extensions:** Match to pattern cards, trace, color and cut own patterns,

Source: Martha Monahan, NMI; 2004

**Name of Activity:** Knobless Cylinders

**Area:** General: Visual Discrimination Specific: Size

**Materials:** This material corresponds exactly to the Knobbed Cylinders. Each set is brightly colored (red, yellow, green and blue) and the cylinders do not have a knob on the top. The dimensions of the materials are the same as those of the knobbed cylinders. The relationship of the colored set to the blocks are;

Red Cylinders: Block #1 Yellow Cylinders: Block #2 Green Cylinders: Block #3 Blue Cylinders: Block #4

**Aims:** Direct: To observe and compare the series of cylinders with each

other.

Indirect: To grade cylinders within the series.

**Preparation:** Knobbed Cylinders, Tower of Cubes and Broad Prisms and

Length Rods

**Age:** First Year

###### Presentation of the Lesson: Presentation #1:

1. Invite the child to the lesson and walk to the shelf. Name the material and show the child how to properly carry the box of cylinders to a table.
2. Place the box in front of the child and carefully remove the lid, placing it above the box.
3. Carefully remove the cylinders and place in a random mix to the right of the box. Replace the cover to the box and move to the top left corner of the table.
4. Place the extremes in front of the child. Pause – then replace the cylinders back into the random mix.
5. Visually scan the cylinders for the thickest one. Carefully place the cylinder to the left on the table, in front of the child.
6. Continue to grade the cylinders from thickest to thinnest.
7. Replace the cylinders back into the box, starting with the thickest cylinders in the top right corner of the box. Replace the remaining cylinders in the box moving counterclockwise in the box.

8. Replace the box of cylinders on the shelf, inviting the child to explore the other 3 boxes (individual lessons are not necessary for each box).

###### Presentation #2:

When the child has mastered the lesson, provide a new challenge by giving language lessons (relational words, comparatives and superlatives).

###### Presentation #3:

To keep the child interested in handling the materials, play the Sensorial games with the child.

###### Work of the Teacher:

Points of Emphasis: Careful handling of the material. Placing the

thickest cylinders in the box and moving counterclockwise.

Language: Refer to the material description as the language changes with each box.

**Points of Interest:** Bright color of the material. Placement of the

cylinders in the box.

###### Work of the Child:

Points of Consciousness: Cylinders come in different sizes. Control of Error: Visual disharmony (the child’s eye).

**Variations:** Exploring 2, 3 and 4 boxes together. Sensorial games.

**Extensions:** Match to pattern cards; explore the relationship with the Knobbed Cylinders.

Source: Martha Monahan, NMI; 2004

**Discrimination of Color**

**Name of Activity:** Color Boxes 1 & 2

**Area:** General: Visual Discrimination Specific: Color

**Materials:** The material for the visual education for color consists of 3 boxes, each of which contains tablets of color. The first two boxes are for pairing and the third is for grading,

Each tablet measures 4.5 cm by 3.5 cm. The first box is a small rectangular wooden box. It contains six tablets - a pair of each of the three primary colors (red, yellow and blue).

The second box is a long rectangular wooded box. It contains 22 tablets - 11 pairs of colors representing: the primary colors

(red, yellow and blue); the secondary colors (orange, green and purple); and the tertiary color of brown; as well as white, black, gray and pink.

**Aims:** Direct: Refinement of the ability to compare and contrast.

Refinement of the chromatic sense.

Indirect: To match pairs which are alike. Ability to identify colors by name.

**Preparation:** Experiences in the natural world.

**Age:** First Year

###### Presentation of the Lesson: Presentation #1: Color Box 1

1. Introduce the material at the shelf and bring to a rug.
2. Model for the child careful handling of the tablets. Grasp the edge of the tablet and remove from the box, placing randomly on the right side of the rug.
3. Matching System #1 is used to match the pairs of tablets.
4. Place a tablet in the top left corner of the rug. Choose another tablet and compare it to the first tablet. If it is a match, nod your head and place the tablet to the right beside the first tablet. If it is not a match, shake your head no, and place the tablet below the top tablet, aligning on the left edge of the rug.
5. Continue matching all of the tablets using Matching System #1.
6. If the child appears interested, give a 3 period lesson on the primary colors.

**Presentation #2:** Color Box 2

1. Begin with what the child knows by reviewing the primary colors. Remove only the primary color tablets from the box and place randomly on the right side of the rug.
2. Using Matching System #1, match the tablets of the primary colors.
3. Bring out the secondary color tablets (purple, green and orange).
4. Match these color tablets, continuing to place along left of rug.
5. If the child is interested, bring out the remaining color tablets, mixing randomly on the right side of the rug. Match as was done previously.
6. If the child is interested, continue with a 3 period language lesson.

###### Work of the Teacher:

Points of Emphasis: Careful handling of the tablets by the edge. Language: Names of the colors.

**Points of Interest:** The tablets are attractive.

###### Work of the Child:

Points of Consciousness: Each color has a name and each color has a match. Control of Error: Matched pairs and child’s eye.

**Variations:** Sensorial Games

**Extensions:** Matching to objects in the classroom, color mixing, art experiences.

Source: Martha Monahan, NMI; 2004

**Name of Activity:** Color Box 3

**Area:** General: Visual Discrimination Specific: Color

**Materials:** The third color box has nine compartments (\*or six depending on supplier), each containing seven tablets of a color gradation. In all, there are 63 (or 42) tablets, reflecting all the colors contained in Color Box #2 except for black and white. (The box of six compartments represents the primary and secondary colors only.)

\* Accompanying illustrations depict the reduced set of tablets.

**Aims:** Direct: Refinement of the ability to observe, compare,

differentiate and appreciate our world.

Indirect: To grade tablets from darkest to lightest

**Preparation:** Previous color tablet work.

**Age:** First Year

**Presentation of the Lesson: Presentation #1:** Grading Tablets

1. Introduce the material at the shelf and bring to a rug.
2. Model for the child careful handling of the tablets. Remove all the tablets of one color from the box, grasping the edge of each tablet Place tablets of like color randomly on the right side of the rug.
3. Visually scan the tablets and pick out the extremes (darkest and lightest). Place the darkest tablet on the left edge of the rug and place the lightest tablet back into the mix.
4. Scan the tablets for the tablet which is ‘just lighter’\* and place it to the right of and adjacent to the first tablet. (\*Do not verbalize.)
5. Continue grading the tablets from darkest to lightest.
6. If the child appears interested, invite them to choose a series of tablets to grade.

###### Work of the Teacher:

Points of Emphasis: Careful handling of the tablets by the edge.

Careful comparisons of close gradations.

Language: Dark, darker, darkest/light, lighter, lightest.

**Points of Interest:** The attractiveness of the tablets.

###### Work of the Child:

Points of Consciousness: Colors have varying degrees of intensity and

shades.

Control of Error: Child’s eye

**Variations:** Grade from lightest to darkest, grade from the middle of the spectrum.

Place a potted plant in center of rug and grade tables out from center in a radial fashion from dark to light (like rays of sunlight).

**Extensions:** Matching to objects in the classroom, matching to paint store chips, kaleidoscopes, color wheels and art experiences.

Source: Martha Monahan, NMI; 2004

**Discrimination of Form**

**Name of Activity:** Geometric Solids

**Area:** General: Visual Discrimination Specific: Discrimination of Form

**Materials:** Ten solid geometrical forms, all painted blue. These forms include: sphere, cone, cube, cylinder, rectangular prism, triangular prism, ellipsoid, ovoid, square based pyramid and a triangular based pyramid.

**Aims:** Direct: Refinement of the ability to observe, compare and

discriminate.

Indirect: Learning the names of three dimensional forms.

**Preparation:** Experience with forms in nature.

**Age:** First Year Child

###### Presentation of the Lesson:

**Presentation #1:** Sensorial Exploration

1. The child has already seen many of these solids in his work with the materials for the discrimination of size (cube, rectangular prism, cylinder, etc.). We present this material now to give an intuitive concept of solid forms.
2. The solids are divided into three families and they are organized on the shelf within their family.

|  |  |  |
| --- | --- | --- |
| **Flat Based Family** | **Mobile Family** | **Combination Family** |
| cube | ellipsoid | cylinder |
| triangular pyramid | ovoid | cone |
| square based pyramid | sphere |  |
| triangular prism |  |  |
| rectangular prism |  |  |

1. Our goal for this presentation is for the child to hold and feel each geometric solid, so we ask them to carry the solids individually to the rug from the shelf.
2. We name the materials again - “these are the geometric solids”, and we encourage the child to explore with the materials, to discover what solids fit together, how they feel in the hands, etc. We can do this by simply modeling or through words of encouragement.
3. When the child is finished exploring the solids they are replaced one at a time on the shelf. The child will most likely not place them within their family. It is our responsibility to organize the solids at a later point.

**Presentation #2:** Naming the Geometric Solids

1. This process is done in the form of a three period lesson and it begins with introducing 3 contrasting solids, such as: the cube, the sphere and the cone.
2. Carry each of these solids individually from the shelf to the rug, using two hands.
3. This lesson is ideal for 3 to 4 children gathered around the rug.
4. Pick up a solid and name it - “this is a sphere”. Invite the children to pass the sphere around the circle.
5. Using the same format, introduce the other two solids.
6. Lay the three solids on the rug and give a three period lesson to the group.

###### Games to Play with the Geometric Solids

To be successful with these games, the child will know the language for the geometric solids that are chosen for the game.

###### Game #1:

1. At a certain point, we isolate the tactile sense from the visual sense by asking the child to perform the activity with his eyes closed or blindfolded. In this way, we will be giving the child a refinement of the stereognostic sense, the combination of the tactile sense and muscular memory.
2. It is important that the teacher does the exercise with a blindfold herself and that if a child is hesitant to put on a blindfold that they can play the game with their eyes closed.

**Note:** It is also recommended that each child have their own blindfold which they keep in their cubby, as a precaution against spreading eye infections.

1. Place the solids on the rug in mixed order. The teacher puts on the blindfold and asks a child to place a solid into her hands. The teacher models careful handling of the material.
2. “This is a cube! Is that right?” asking the child for confirmation.
3. Repeat with other solids. At the end of your turn, state to the children, “I saw everything but my eyes were closed. I saw everything with my hands!”

###### Game #2:

1. Place all the solids for the game in a basket and cover the basket with a scarf.
2. Say to the children, “I’m going to find the sphere.”
3. Reach under the scarf and feel around until you find the sphere.
4. Repeat the game, encouraging children to take turns.

###### Game #3:

1. Place the solids for the game in a basket.
2. Ask the children to close their eyes. Remove one solid from the basket and place it under a scarf, so its outline is showing.
3. Model feeling under the scarf and guessing the name of the solid.

###### Game #4:

Line up three or four solids on the rug. Ask the children to close their eyes. Remove one solid and hide it behind your back. Invite the children to open their eyes and discover which solid is missing.

###### Work of the Teacher:

Points of Emphasis: Exploring the solids with both hands.

Naming the solids.

Excitement in playing the games.

Language: The names of the geometric solids.

**Points of Interest:** The attractiveness of the material (color, shape,

etc.)

###### Work of the Child:

Points of Consciousness: Each solid has a name.

Geometric solids can be found in the natural world.

Control of Error: The teacher guides careful handling of the

material.

**Variations:** The games.

**Extensions:** Finding shapes in the classroom or in the natural environment.

Rolling shapes through white flour and then rolling onto black paper. The result is a figure equivalent to the unfolding of all sides. If we do this with the pyramids, we lay it on each side, resulting in a star shape. If we cut along the outline, we would be able to fold it up and reconstruct the pyramid on paper.

Making the geometric solids out of clay or paper.

Source: Martha Monahan, NMI; 2004

**Name of Activity:** Geometric Solids and Bases

**Area:** General: Visual Discrimination Specific: Discrimination of Form

**Materials:** A set of nine wooden tablets which are the shapes of the bases of the geometric solids. These two-dimensional shapes include; 3 squares, 2 circles, 2 rectangles, 1 equilateral triangle and 1 isosceles triangle.

**Aims:** Direct: Refinement of the ability to compare and discriminate.

Indirect: Mastery of the ability to match solids to bases. **Preparation:** Geometric Solids and other matching activities. **Age:** First Year

###### Presentation of the Lesson:

1. Matching System 2 is used for this presentation.
2. Bring geometric solids and the box of bases to the work area.
3. Lay out the solids in rows from top to bottom.
4. Remove a base from the box and using matching system 2 begin to match with solids moving top to bottom, comparing each base to a solid.
5. When a match is found, leave the solid on the base.
6. Show the child that some solids have more than one base.
7. Some solids do not have a base (sphere, ovoid, ellipsoid).
8. Take the opportunity to rename the solids.
9. Replace the bases to the box and the solids individually to the shelf.

###### Work of the Teacher:

Points of Emphasis: Leaving plenty of room for bases to be matched.

Testing of bases to solids.

Language: The names of the geometric solids and bases.

**Points of Interest:** The attractiveness of the materials.

The puzzle-like quality of the material.

###### Work of the Child:

Points of Consciousness: Two-dimensional figures correspond to one side of

a three-dimensional figure.

Control of Error: The child’s eye.

**Variations:** Reverse the activity by laying out the bases and matching the solids.

Play the sensorial matching games.

**Extensions:** Make a set of paper bases.

Source: Martha Monahan, NMI; 2004

**Name of Activity:** Geometric Cabinet

**Area:** General: Visual Discrimination Specific: Discrimination of Form

**Materials:** The demonstration tray is a wooden drawer, painted blue inside and contains a circle, square and triangle inset. A six-window frame overlays the tray.

The geometric cabinet is a wooden cabinet with six drawers, each painted blue inside and containing six squares of wood.

\*Most wooden squares have a figure cut out with a knob in the center with which to hold it. When the cut out figure is lifted, the blue background of the drawer shows the shape of the cut out. (\*Drawers with less than six shapes shown have solid ‘filler’ squares.)

Drawer #1: Six variations of triangles which include, (by side) equilateral, isosceles, scalene, and (by angle) right, acute and obtuse.

Drawer #2: Six variations of rectangles, beginning with the square.

The remaining 5 rectangles decrease in width.

Drawer #3: Six circles varying and decreasing in diameter from 10 cm to 5 cm.

Drawer #4: Six regular polygons (equal angles and sides), which include; pentagon, hexagon, heptagon, octagon, nonagon, and decagon.

Drawer #5: Four irregular curved shapes which include curvilinear triangle, oval, ellipse, and quatrafoil.

Drawer #6: Four irregular sided shapes which include an isosceles and a right angle trapezoid, a, parallelogram and a rhombus. (Some may include a kite, or deltoid, and/or a chevron.)

**Aims:** Direct: Refinement of the ability to discriminate plane closed

figures.

Indirect: Mastering the ability to match insets and frames of plane closed figures.

**Preparation:** Geometric Solids, Geometric Solids and Bases.

**Age:** First Year

###### Presentation of the Lesson:

**Presentation #1:** Demonstration Tray

1. Remove the shapes from the drawer and place randomly on the rug in front of the tray.
2. Using the writing fingers of the dominant hand, trace the frame of the shape you are exploring. Trace the frame counter clockwise

three times. The subdominant hand may be used to ‘secure’ the frame.

1. Pick up the corresponding inset with the pincer grip of the sub- dominant hand. Turn the shape over and hold before the child.
2. Trace the inset with the writing fingers of the dominant hand. Trace three times clockwise posing the following questions:

“Do my fingers stay on the shape?” “Do my fingers move while I trace?”

“Do my fingers stop where they started?”

The purpose of the questions is to focus the child’s attention on the shape.

5, Place the inset carefully into the frame, first touch one edge down.

1. Repeat above procedure for the remaining two shapes.
2. Give a three period lesson on the triangle, square and circle.

**Presentation #2:** Introduction to Other Drawers in the Cabinet

(The Circle Drawer shows the greatest gradation and is commonly used in the first presentation.) Presentation is the same as is done for the Demonstration (Demo) tray.

* 1. Arrange a rug lengthwise with a small rug in the lower right-hand corner.
	2. Bring the child to the geometric cabinet and name the material: “This is the geometric cabinet.” Show the child how to carefully pull out the drawer.
	3. Explore the drawers and invite the child to choose one of the drawers. Carefully pull the drawer half way out and pause. Grasp each side of the drawer and remove the drawer from the cabinet.
	4. Bring the drawer to the small rug.
	5. Remove the insets from the drawer, starting with the inset in the top left corner of the drawer. Place the inset on the top left corner of the lengthwise rug.
	6. Continue removing the insets and placing top to bottom along the left edge of the rug.
	7. Using the tracing methods from the demonstration tray lesson, begin tracing the frame, posing the questions as you trace the inset with the writing fingers of the dominant hand:
		+ Do my fingers stay on the shape?
		+ Does my finger move while I trace?
		+ Does my finger stop where it started?
	8. Replace all insets into the tray using the above tracing method.
	9. If appropriate, give a three period language lesson on the shapes in the drawer.
	10. Show the child how to carefully replace the drawer into the cabinet.
	11. Invite the child to explore any of the drawers in the cabinet.

**Presentation #3:** Other Drawers

Presentations can be done for each individual drawer. Ideally, the initial presentation motivates the child to explore the remaining drawers independently.

###### Work of the Teacher:

Points of Emphasis: Careful handling of the material.

Method for tracing the frame and insets. Removing and replacing the drawer into the cabinet.

Language: The names of the geometric shapes in each drawer.

**Points of Interest:** Puzzle like quality of the material.

###### Work of the Child:

Points of Consciousness: Each inset has a corresponding frame. Control of Error: Proper fit into the frames of the drawer.

**Variations:** Sensorial matching games.

Grade shapes within the drawer. Mix 2, 3, 4, 5, 6 drawers together.

**Extensions:** Each drawer is a lesson in language. Each drawer is a classified set (a set of circles, triangles, quadrilaterals, etc.)

Write labels for the child to place with the shapes. Trace and punch out shapes.

Make booklets of drawers and label.

(To make a reverse image booklet, trace and punch out a shape from colored construction paper the size of metal inset paper. Paste the ‘punched out’ shape onto a second colored paper. On its opposite side, paste the ‘remnant’ of paper from the original sheet. This creates a two-sided reverse image. This method is ideal for creating land and water form images, using blue and green paper, in which case the ‘land’ is punched out in green and glued on the blue ‘water’, as the land is higher than the water.)

###### Notes:

Order of the drawers:

As noted, the order of the demo tray is: triangle / square / circle We will follow that same order for the drawers of the cabinet.

Shapes are always graded from largest to smallest within the drawers whenever possible.

Drawer #1: Triangles

Drawer #2: Rectangles (one row by angle / one row by sides) Drawer #3: Circles

Drawer #4: Polygons

Drawer #5: Curvilinear figures Drawer #6: Quadrilaterals

(Variations in draw order and arrangement exist at the elementary level.)

**Note as to the use of the Demonstration Tray:** The removable frame is designed so as to be able to select a different three shapes for the sake of isolation and introduction, especially for the sake of the language lessons.

Source: Martha Monahan, NMI; 2004

###### Name of Activity: Geometric Cabinet with Cards

**Area:** General: Visual Discrimination Specific: Form

**Materials:** The geometric cards are a reproduction of the figures in the geometric cabinet. There are 3 sets of cards. The figures of the first set are completely filled in. Those of the second set have a thick line outlining the shape and those of the third set have a thin line outlining the shape.

**Aims:** Direct: Refinement of the ability to compare, contrast, discriminate and match

Indirect: Mastery of the ability to match two-dimensional figures with their one-dimensional representations on cards

**Preparation:** Puzzles, geometric solids, geometric cabinet

**Age:** First and second year

###### Presentation of the Lesson:

**Note:** Two rugs are used and they are laid out as in the previous exercise.

1. Decide which drawer from the cabinet will be used for this activity. (The circle drawer is recommended initially.)
2. Often the cards for the cabinet are presorted and arranged into the card cabinet. If this is the case, you will remove the cards and bring them to the rug, sorting them into three sets: figures filled in; figures outlined with a thick line; and figures outlined with a thin line.
3. One of the first principles a child follows in Sensorial is to find things that are alike. Sorting the cards can easily be made a group game. With this approach, the cards are scattered randomly on the rug.

One child finds the solid figured cards; another child the

thick lined cards; and a third child to find the thin lined cards. You can also choose one child to be the “checker”.

1. Either way, once the cards are sorted, bring the drawer to the rug.
2. Place the insets from the drawer in sequence along the left edge of the rug from top to bottom.
3. Using matching system #2, match the first set of cards to the insets. Once a match is made, the inset stays on the card.
4. When all of set #1 cards are matched, repeat the matching system using the second set of cards.
5. If the child is still interested, continue with card set #3, matching in the same manner.
6. To put work away, replace insets into the frame within the drawer, and return the drawer to the cabinet.
7. Either collect cards by sets and put away or collect randomly.

###### Work of the Teacher:

Points of Emphasis: Organization of materials and matching

system #2.

Language: Silent at first, them names of shapes.

Types of lines used for cards.

**Points of Interest:** Puzzle-like quality of work.

Difference in appearances of shapes on cards.

###### Work of the Child:

Points of Consciousness: Insets match shapes on the cards.

Reference point for matching is the outer most edge of outlines.

Control of Error: Eye of the Child

**Variations:** Game # 1: Matching at a distance

Place the cards randomly mixed on one rug and the drawer on a table. Place an inset on a tray and have the child find 1, 2, or all 3 cards that match.

Reverse the game by showing the child a card and having them get the inset that matches.

Game #2: Missing Card

Lay out 1, 2, or 3 sets of cards from a drawer. Remove one card. Children figure out which card is missing. Through checking with the insets, the children are eliminating possibilities and using reasoning.

Game #3: Eliminating first - then checking

Set out several sets of cards for a drawer. Remove a card. Have children guess which card is missing. Then explore their guess by matching cards to the insets.

**Extensions:** Child makes own booklet with a thick and thin marker.

Source: Martha Monahan, NMI; 1993; Revised 2002

Geometry Definitions Lines

A straight line is the shortest distance between two points. A horizontal line is a line parallel to the horizon.

A perpendicular or vertical line is a line that stands exactly upright. A perpendicular to a line is a line that makes a right angle with the line it touches. The wall of a room is perpendicular to the floor.

Parallel lines are straight lines, equidistant from one another, in the same plane that cannot meet however far extended.

Convergent lines are lines that approach nearer together. Divergent lines are lines that move away from one another. A curved line is a line of which no part is straight.

A serpentine line is a line that turns one way and then the other way alternately, wiggling like a snake.

A zigzag line is a line whose course is made up of a series of straight lines which turn at right angles.

An oblique line is a line that is neither horizontal nor perpendicular, it is therefore slanting.

Angles

A right angle is one of the angles formed by a line that meets another line so as to make two equal angles (90 degrees).

An obtuse angle is an angle larger than a right angle. Obtuse means dull or blunt.

An acute angle is an angle smaller than a right angle. When we spread our fingers apart, they may a series of acute angles. Acute means sharp.

Adjacent angles are two angles that have a common vertex and a common side between them.

Vertical angles are two angles that have a common vertex and the sides of one angle are extensions of the sides of the other angle.

Complementary angles are two angles which added together equal 90 degrees (a right angle). Each angle is the complement of the other; complementary angles need not be adjacent angles.

Supplementary angles are two angles which added together equal a straight angle (180 degrees/two right angles). Each angle is a supplement of the other; supplementary angles need not be adjacent angles.

Corresponding angles are angles lying on the same side of a transversal that intersects two or more lines, but are not adjacent angles.

Alternate angles are angles that lie one on the one side of the transversal that intersects two lines, the other on the other and non adjacent.

A reflex angle is an angle greater than two right angles (180 degrees). A straight angle is equal to two right angles (180 degrees).

The vertex is the point of an angle.

The Square

A square is a figure having four equal sides and four right angles.

The base of a square is the side on which the given square is supposed to stand.

The median of a square is a line that divides the square in half. The sides of a square are the lines that form the square.

The diagonal of a square is a line joining two opposite vertices. Each angle of a square is a right angle.

Triangle

A triangle is a plane figure with three sides and three angles. Triangles defined by the kinds of angles may be:

acute angled: all angles are less than 90 degrees obtuse angled: one angle is greater than 90 degrees right angled: one angle is equal to 90 degrees

Triangles defined by length of sides may be: scalene: no sides equal

isosceles: two sides equal

equilateral: three equal sides, three equal angles

Rectangle: A four sided figure with four right angles, the opposite sides are equal and parallel.

Square: Four equal sides and four right angles.

Polygon: Many angles, and therefore many sides, especially more than four. Regular polygons have equal sides and therefore equal angles. The name is derived from the number of sides and angles.

Pentagon: five equal sides and five equal angles Hexagon: six equal sides and six equal angles Heptagon: seven equal sides and seven equal angles Octagon: eight equal sides and eight equal angles Nonagon: nine equal sides and nine equal angles Decagon: ten equal sides and ten equal angles

Quatrefoil: a flower with four leaves or a leaf with four leaflets Quadrifid: divided or deeply cleft into four parts

Trapezoid: a plane four sided figure with two parallel sides

Right Angled Trapezoid: a plane four sided figure with two

parallel sides to which a third side is perpendicular.

Rhombus: an equilateral parallelogram having its angles oblique.

Parallelogram: a quadrilateral with opposite sides parallel and therefore equal Oval: having a shape like an egg, broadly elliptical

Ellipse: the figure made by a plane cutting through a cone on a slant Mathematical Gr.: Mathematikos: disposed to learn

Arithmetic: the art of computation by the use of positive real numbers. The science of positive real numbers.

Algebra: the branch of math which treats the relations and properties of numbers by means of letters, signs of operation and other symbols

Geometry: the branch of math which investigates the relations and properties and measurements of solids, surfaces, lines and angles

Dimensions: one dimensional (line), two dimensional (surface, i.e., square, circle) three dimensional (solid, i.e., prism, cylinder)

Triangles:

an equilateral triangle is one in which all three sides are equal and all three angles are equal

an isosceles triangle is one in which two sides are equal a scalene triangle is one in which no sides are equal

The Parts of a Triangle:

the perimeter of a triangle is the sum of its sides

the sides of a triangle are the three lines that bound it

the angles of a triangle are the three angles formed by its sides

the base of the triangle is the side upon which it is supposed to stand

the vertex of a triangle is the point opposite to, and farthest from the base the hypotenuse is the side of a right angled triangle that is opposite the right angle

the legs of a right angled triangle are the sides forming the right angle the legs of an isosceles triangle are the two equal sides

the median of a triangle is a line from any vertex to the mid point of the opposite side

the bisector of an angle of a triangle is a line that bisects that angle, that is, divides it into two equal parts. The bisector is usually regarded as extended to meet the opposite side.

the altitude of a triangle is a perpendicular line from the vertex to the base. The altitude of an obtuse angled triangle, when one of the base angles is the obtuse angle, is found by dropping a perpendicular outside the triangle to meet an extension of the base.

The Parts of a Circle:

the center of a circle is that point which is equidistant from any point on the circumference

the radius is a straight line from the center to any point on the circumference

the circumference is the length of the circle (its outside edge)

a chord is a straight line joining any two points on the circumference a diameter is any chord passing through the center

a secant is a chord produced so that it intersects the circle

an arc is a portion of a circle included between any two points on the circle. A circle may be divided into two arcs by any two of its points: if these are unequal, the larger arc is called the major arc, and the smaller the minor arc. a semi-circle is an arc equal to one half of the circle

a tangent to a circle is a straight line that has but one point in common with the circle, or that touches the circle only in one point outside the circle.

a segment of a circle is bounded by an arc and a chord a sector of a circle is bounded by an arc and two radii

a central angle is an angle whose vertex is at the center and whose sides are radii

Quadrilaterals:

a quadrilateral is a figure bounded by four straight lines, quadri signifies four and lateral means side.

a trapezium is a quadrilateral of which no two sides are parallel

a trapezoid is a quadrilateral two of whose sides are parallel; an **isosceles trapezoid** has two non parallel sides equal in length

a parallelogram is a quadrilateral with both pairs of opposite sides parallel. a rectangle is a parallelogram having four right angles.

a rhombus is a parallelogram having four equal sides and two pairs of opposite angles equal.

a square is a rectangle with four equal sides and four right angles.

Polygons:

A polygon is a figure bounded by straight lines. The sides are the bounding segments (lines), the angles are the angles formed by the sides, and the vertices are the points of intersection of the sides. Polygons are named by the number of sides.

An equilateral polygon has its entire sides equal. An equi-angular polygon has its entire angles equal.

A regular polygon is both equilateral and equi-angular.

The sum of the angles of any polygon is twice as many right angles as the polygon has sides, less four right angles.

A triangle is a polygon of three sides.

A square or an equilateral is a polygon of four sides. A pentagon is a polygon of five sides.

A hexagon is a polygon of six sides.

A heptagon is a polygon of seven sides. An octagon is a polygon of eight sides. A nonagon is a polygon of nine sides.

A decagon is a polygon of ten sides.

Source Unknown; Revised by Northeast Montessori Institute, March 2005

Name of the Activity: SENSORIAL DECANOMIAL (2 children)(Floor/table)DESCRIPTION OF MATERIALS: A rectangular wooden box containing plastic, colored squares and rectangles (colors correspond to the bead stair) representing the factors of the Decanomial Square. A square board with molded edge.PRESENTATION AND EX. 1: Invite one child to bring the board, another child to bring the box to the work area. (If working on the floor, place on a mat). Place the box at the upper right corner. Remove all the squares and arrange in a pyramid in right hand corner of the board. Remove the top square; place it in the top left-hand corner of the board. Remove the second square and align it diagonally with the first square. Fill in the sides with rectangles of like color building each color band successively. Invite the child to participate at the yellow band and continue with work. Show how to put away in stair formation when replacing the material in the box.PRESENTATION AND EX. 2: Set up the square as in Presentation 1.Remove one color band, preferably in the center of the square and place in the box. Remake the square. When you find you have two extra rectangles at each row, pair them and place them to one side. Continue until the square is complete.PRESENTATION AND EX. 3: Beginning with the gold square, select the widest and narrowest rectangles to form a square. Place to the right of the square. Proceed in the same manner following a diminishing order. Proceed through the other color bands in sequence.PRESENTATION AND EX. 4: Create squares with squares and rectangles to form Binomials and Trinomials.Binomials: Start with the gold square. Place it on the table. Take the red square and superimpose it on the upper left corner of the gold square. Ask the child to find the square that fits at the space on the gold square, which touches the corner of the red square. The child will find the blue square. Show him how to place it touching the corner of the red square diagonally. Ask the child to find the rectangles that will fit at the side of the blue square, which will complete the superimposing on the gold square. He finds the blue rectangles and places them in position. Show him how to place his fingers at the intersections of the adjoining lines in order to hold the binomial intact, slide it off the gold square and move it to the upper right corner of the table. Show the child how to continue doing the same exercise with the green square, superimposing it on the gold square as before. The child continues to work with the other squares.Trinomials: Start with the gold square. Remove the red square and superimpose it on the upper left corner of the gold square. Take the green square; superimpose it on the gold square aligning it diagonally with the red square. Ask the child to find the square that will fit on the space on the gold square that corners the green square. The child will find the white square. Take the white square; superimpose it on the gold square aligning it diagonally with the green square. Ask the child to fill in the gaps with rectangles as in the exercise with the formation of the Binomial and to slide them off and continue building Trinomials until all the material has been used. Build an outline of a decanomial square placing the red unit square in the top left hand corner and proceeding in sequential order along the top and down the left-hand side. The child is encouraged to fill in the square following the pattern in outline. CONTROL OF ERROR: Visual disharmony.PURPOSE:For visual discrimination of size and shape.

Preparation for geometry and mathematics

 4 years +

**Name of Activity:** Rectangle Box A

**Area:** General: Visual Discrimination Specific: Form

**Materials:** Contains: 2 yellow isosceles right angled triangles

2 green isosceles right angled triangles equal to the yellow

2 yellow scalene right angled triangles

2 green scalene right angled triangles, equal to the yellow 2 gray scalene right angled triangles, the same size as the yellow and green

2 yellow equilateral triangles

1 red scalene right angled triangle

1 red scalene obtuse angled triangle

**Aims:** Direct: Refinement of the ability to observe, reason and problem

solve.

Indirect: Ability to explore and construct shapes from triangles

**Preparation:** Geometric Cabinet, patterning activities, matching

activities.

**Age:** Second Year

###### Presentation of the Lesson:

1. Invite the child to the lesson and bring box of triangles to a rug. Carefully remove all the pieces from the box and mix randomly on the right side of the rug. Invite the child to help.
2. Ask the child to find the triangles that are the same color and shape. Place these together and assist the child in moving them to the top of the rugs in pairs.
3. Bring down the 2 large green pieces and orient them to each other.

4, When forming the shapes, orient them so that when they slide into place they are in the most recognizable shape and position.

1. Say to the child, “When they are perfectly aligned, tell me to

stop.” Keep one piece stationary with the subdominant hand and slowly slide the second piece into place, aligning the black lines. Engage the child in this game of watching for when the black lines are perfectly aligned.

1. Stop when the child tells you to (a square is formed). Remove hands from the shape and pause. Do not give language at this time. Carefully move the shape up into the top left corner of the rug.
2. Same procedure is used each time (see below\*). saying to the child, “When they are perfectly aligned, tell me to stop.”
3. When all shapes have been formed, isolate three shapes and give a 3 period lesson.
4. Replace the shapes in the box starting with the largest pieces (these will form a square). A space for rectangles will be available in the box, beside the squares, so place these pieces into the box. The trapezoid is oriented on top of the rectangle and the rhombus sits on top of the square.
* Shapes are made in the following sequence, working from the known to the unknown:
	+ square
	+ rectangle
	+ large yellow parallelogram (inverse of square)
	+ green parallelogram (inverse of rectangle)
	+ yellow parallelogram (same size as rectangle and green parallelogram)
	+ rhombus
	+ trapezoid

###### Work of the Teacher:

Points of Emphasis: Orienting and sliding the pieces into shape.

The order of the shapes presented.

Language: “When they are perfectly aligned, tell me to stop.” Names of the shapes formed.

**Points of Interest:** Shapes can be combined into different shapes.

Puzzle like quality of the materials.

###### Work of the Child:

Points of Consciousness: Triangles can make many different shapes.

Different shapes have different names.

Control of Error: Black lines.

**Variations:** Child’s exploration of the material.

**Extensions:** Trace, cut, paste and label triangles to make a chart.

**Notes:** This box introduces the basis for geometry. The child must have had work with the geometric cabinet and show knowledge of identifying basic shapes.

Constructive triangles are puzzles and should be presented as such. Language is given after much experience and when interest begins to diminish.

Source: Martha Monahan, NMI; 2004

**Name of Activity:** Rectangle Box B (blue triangles)

**Area:** General: Visual Discrimination Specific: Form

**Materials:** Contains: 2 blue isosceles right angled triangles, equal to the yellow

and green triangles in Rectangle Box A.

3 scalene right angled triangles equal to the yellow and green pieces in previous rectangle box.

2 equilateral triangles equal to the yellow pieces in the previous box.

1. scalene obtuse angled triangle equal to the red triangle in previous rectangle box.

**Aims:** Direct: Refinement of the ability to observe, reason and problem

solve.

Indirect: To explore new shapes and make discoveries.

**Preparation:** Rectangle Box A

Note: All the shapes from the first Rectangle Box can be found in this box by sliding pieces around each other.

To be successful and in order to have the child “discover” and recognize the newly formed shapes, they must have the language from the first rectangle box.

**Age:** Second Year

###### Presentation of the Lesson: Presentation #1: Sliding

1. Invite the child to the lesson and bring to a rug. Carefully remove all the pieces from the box and mix randomly on the right side of the rug. Invite the child to help.
2. Ask the child to find the pieces that are the same shape (gives the impression of needing fewer pieces). Place these together and assist the child in moving them to the top of the rugs in pairs.
3. When forming the shapes, orient them so that they slide into place in the most recognizable shape and position.
4. Bring down the two pieces for the square
5. Say to the child, “When they are perfectly aligned, tell me to

stop.” Keep one piece stationary with the subdominant hand and slowly slide the second piece into place, along the longest side. Engage the child in watching for when the sides are perfectly aligned.

1. Stop when the child tells you to (a square is formed). Remove hands from the shape and pause to see if the child names the square.
2. Say to the child, “Now, I’m going to show you another shape.”
3. Hold the bottom piece stationary and move the second piece counterclockwise, up and around, slowly sliding into place, saying, “When they are perfectly aligned, tell me to stop.”
4. Remove hands and pause to see if the child recognizes the new shape (parallelogram).
5. Continue sliding piece to the next side of the stationary piece, pausing to admire shape formed and to see if the child recognizes

the new shape formed (another parallelogram).

1. Slide the piece back into its original position, forming a square.
2. Invite the child to explore with this shape or continue.
3. Repeat above sliding process with the rectangle (two different parallelograms).
4. Repeat above sliding process with the trapezoid (wing, an irregular pentagon with a concave angle.)
5. Repeat with the last shape of the rhombus, ending the lesson with the impression that however the pieces are slid, a rhombus is formed.
6. To put away, place largest pieces into the box first, forming a square, followed by pieces to form a rectangle. The trapezoid sits on top of the rectangle and the rhombus sits on top of the square.

**Presentation #2:** Sliding and Flipping

1. As before, bring out pieces and match shapes. Move pairs to the top of the rug.
2. Begin with the pieces for the square;
	* orient and slide pieces into shape, forming a square
	* hold bottom piece stationary and flip the second piece toward you, aligning sides (pause – still a square).
	* flip piece back to original position
	* slide this piece counterclockwise to the next side (parallelogram).
	* flip piece upside down (new shape is isosceles triangle).
	* flip back over and slide – another parallelogram.
	* flip upside down again – isosceles triangle
	* flip right side up and slide back to original position.
3. Repeat the same flipping procedure with the rectangle, trapezoid and ending with the rhombus.
4. Replace pieces as before; forming square and rectangle on bottom of box, followed by trapezoid on top of rectangle and rhombus on square.

###### Work of the Teacher:

Points of Emphasis: Orienting, sliding and flipping the pieces.

Showing excitement at new discoveries.

Language: Language has been given in previous Rectangle Box

**Points of Interest:** Sliding and flipping to make new shapes.

###### Work of the Child:

Points of Consciousness: Triangles can make many different shapes. Control of Error: Child’s eye

**Variations:** Child’s exploration of the material.

**Extensions:** Combine with Rectangle Box A, label a chart. Source: Martha Monahan, NMI; 2004

**Name of Activity:** Triangle Box

**Area:** General: Visual Discrimination Specific: Form

**Materials:** Contains: 1 gray equilateral triangle

1. green scalene right angled triangles
2. yellow isosceles obtuse angled triangles 4 red equilateral triangles

**Aims:** Direct: Refinement of the ability to observe, recognize likeness

and similarities and to problem solve.

Indirect: Mastery of the ability to form triangles from 2, 3 or 4 smaller triangles.

**Preparation:** Rectangle Box A & B

**Age:** Second Year

###### Presentation of the Lesson:

1. Remove triangles and scatter randomly on the right hand side of the rug.
2. Find the pieces that are the same color and size and make groups on the top of the rug.
3. Begin with the 2 green pieces. Orient the pieces, and say to the child, “When they are perfectly aligned, tell me to stop.” Keep one piece stationary and slowly slide the second piece into formation.
4. Move the newly formed triangle to the left and repeat with the yellow pieces. Move the newly formed triangle to the left, beside the green.
5. Repeat with the red pieces, being sure that the first piece positioned is the piece that has three black lines and is pointing downward.
6. Check work by superimposing the gray triangle onto each of the triangles formed (starting on left with green triangle, yellow and red).
7. If the child is interested, give a language lesson on the parts of the triangle.
8. Replace the pieces into the box in the following order: gray, red, yellow. green

###### Work of the Teacher:

Points of Emphasis: Careful handling of the material

Guiding the building order of the triangles

Language: The following language should be taught: Gray triangle; base/side/angle

Green triangle: height or altitude/vertex Yellow triangle: angle bisectors

Red triangle: midpoints

**Points of Interest:** Puzzle like quality of the material.

###### Work of the Child:

Points of Consciousness: 2 (green) scalene right angled triangles equal an

equilateral triangle

* 1. (yellow) isosceles obtuse angled triangles equal an equilateral triangle
	2. small equilateral triangles equal a larger equilateral triangle

Control of Error: black lines

**Variations:** Child’s exploration of the material. See handout on variations

**Extensions:** Label a chart with the parts of a triangle Source: Martha Monahan, NMI; 2004

**Name of Activity:** Small Hexagonal Box

**Area:** General: Visual Discrimination Specific: Form

**Materials:** Contains: 6 gray equilateral triangle

1. red equilateral triangles
2. green equilateral triangles 1 yellow equilateral triangle

6 red isosceles obtuse angled triangles

**Aims:** Direct: Refinement of the ability to observe, recognize likeness

and similarities and to problem solve.

Indirect: Ability to construct the shapes in the box.

**Preparation:** Rectangle Box A&B, Triangle Box

**Age:** Second Year

###### Presentation of the Lesson:

1. Remove triangles and scatter randomly on the right hand side of the rug.
2. Find the pieces that are the same color and size and move groups to the top of the rug.
3. Using the same procedure of sliding and language of “When they are perfectly aligned, tell me to stop.”
4. Build the shapes in the following order:
	* rhombus (2 small red equilateral pieces)
	* trapezoid (3 green pieces)
	* join 2 red isosceles obtuse triangles to form a rhombus
	* repeat, building a second rhombi
	* repeat, building third rhombi
	* join these 3 rhombi to form a hexagon
	* place yellow equilateral on top of and within the black lines of the red hexagon
	* remove 3 side pieces and form another equilateral triangle
	* form a hexagon with the 6 gray pieces
	* explore the possibilities with the hexagon, by:
		+ sliding out two gray pieces and replace with rhombus made of red equilateral triangles.
		+ replace gray pieces into hexagon and then substitute three gray pieces (half) with three green pieces of trapezoid.

###### Work of the Teacher:

Points of Emphasis: Precise handling of the material.

Guiding the building order of the triangles.

Language: hexagon/rhombus/trapezoid/equilateral triangle

**Points of Interest:** Puzzle like quality of the material.

Watching new shapes formed.

###### Work of the Child:

Points of Consciousness: a hexagon is made up of:

1. equilateral triangles
2. rhombi

2 trapezoids

Control of Error: black lines

**Variations:** Child’s exploration of the material. See handout on variations

**Extensions:** Charts showing equivalency.

Tracing and cutting own pieces.

Source: Martha Monahan, NMI; 2004

**Name of Activity:** Large Hexagonal Box

**Area:** General: Visual Discrimination Specific: Form

**Materials:** Contains: 2 red isosceles obtuse angled triangles

2 gray isosceles obtuse angled triangles 6 yellow isosceles obtuse angled triangles

(3 each having either one or two black lines) 1 yellow equilateral triangle

**Aims:** Direct: Refinement of the ability to observe similarities

and differences, to problem solve, to reason and make judgments.

Indirect: To find relationships of shapes in box to a hexagon.

**Preparation:** Geometric Cabinet, Rectangle Boxes A and B,

Triangle Box and Small Hexagonal Box

**Age:** Second to Third Year

###### Presentation of the Lesson: Presentation #1:

1. Invite the child to help remove pieces from the box and place randomly on the right side of the rug.
2. As in previous presentations of the Constructive Triangles, invite the child to find the pieces that are the same and group them at the top of the rug.
3. Bring down the two red pieces for the rhombus and slide them together inviting the child's participation by asking them to tell you when they are perfectly aligned.
4. Bring down the two gray pieces and form a parallelogram.
5. Bring down the yellow equilateral triangle and position in front of the child.
6. Build a hexagon, by sliding a yellow isosceles obtuse angled triangle (with a single black line), along the side of the equilateral triangle. Have child observe when sides are aligned.
7. Repeat for the additional two sides of the equilateral triangle, forming a hexagon.
8. Carefully flip each piece into the center of the equilateral triangle.
9. Return side pieces back to their original positions.
10. Build another equilateral triangle using the three remaining yellow pieces having two black lines.
11. “Open the gate” - open the bottom of the hexagon by moving one of the obtuse triangles, as if it were hinged at the corner. Slide out the fixed equilateral triangle and slide the second equilateral triangle (made of the three pieces) into its place. Close the gate.
12. Invite child to mix up the pieces and practice the above combinations.

**Presentation #2:** Exploration of the red and gray pieces

1. Build the rhombus and parallelogram as in previous presentation.
2. Exploration of the rhombus:
	* Flip the top piece of the rhombus; the shape formed is still a rhombus. Flip back to the original position.
	* Hold bottom piece stationary and slide top piece counterclockwise, forming a parallelogram.
	* Flip this piece, forming a concave quadrilateral (chevron).

Flip back to original position.

* + Slide piece again, forming a parallelogram.
	+ Flip, forming a chevron. Flip back to original position.
	+ Slide piece again back to original position, forming a rhombus. Move to left side.
1. Exploration of the parallelogram:
	* Build gray parallelogram. Flip the right piece making the chevron. Flip piece back to its original position.
	* Holding bottom piece stationary, slide top piece counterclockwise, forming a rhombus.
	* Flip bottom piece - it’s still a rhombus. Flip back to original position.
	* Slide bottom piece counterclockwise, forming a parallelogram. Flip this piece, forming the chevron.
	* Slide piece back to its original position and move to side.

**Presentation #3:** Exploration of the yellow pieces

1. Using the three yellow pieces with the double lines, build an equilateral triangle on top of the solid equilateral triangle. Slide the top triangle off and to the side.
2. Add single lined yellow pieces to the sides of the equilateral triangle with double lines to form a hexagon.
3. Turn the hexagon into three rhombi by separating along the internal black lines of the enclosed equilateral triangle.
4. Form a chevron by joining two of the rhombi and then splitting them in half.
5. Cube illusion:
	* Place the solid equilateral triangle in the center of the rug.
	* Build another triangle on top of the solid triangle by using the three yellow triangles with the double lines.
	* Add the yellow triangles with the single line to form a hexagon. .
	* Pull all the pieces slightly apart forming the illusion of a cube.

###### Work of the Teacher:

Points of Emphasis: Knowing the order the shapes are built.

Precise handling of the materials.

Language: Child should be familiar with the language for this box from previous exercises.

**Points of Interest:** Forming new shapes from existing shapes.

###### Work of the Child:

Points of Consciousness: Introduction to geometry nomenclature and

the inter relatedness of geometric shapes.

Control of Error: Black lines.

**Variations:** Child’s exploration of the material.

**Extensions:** Make charts and booklets.

Make a chart of the relationship found.

Source: Martha Monahan, NMI; 2005

**Name of Activity:** The Power of Two Cube

**Area:** General: Visual Discrimination Specific: Form

**Materials:** Inside a wooden box are contained 7 wooden cubes and rectangular prisms, painted green, yellow or white. The smallest yellow cube is the monomial which, when doubled, is equal to the smallest (white) prism. These, when combined, equal the next larger prism (green). These, in turn, combine to equal the larger yellow cube. Doubling of pieces continues until the whole cube is assembled. The cubes represent that the sum is equal to its parts: (1=1/2+1/4+1/8+1/16+1/32+1/64+1/64)

**Aims:** Direct: Refinement of the abilities to compare, contrast,

observe and differentiate.

Indirect: To place the cubes in the box correctly/to experience the “power of 2”.

**Preparation:** Previous materials for the discrimination of size,

blocks for building.

**Age:** First Year

###### Presentation of the Lesson: Presentation #1:

1. Carefully lift and guide open the lid of the box.
2. Remove the smallest yellow cube and place to the far right of the table. Remove second yellow cube and place below the first cube.
3. Remove the white prism and place to the left of the yellow cubes.
4. Continue to remove cubes and prisms from the box, placing them in a right to left orientation, as they increase in size.
5. Pause to admire the cubes and prisms. Observe if the child notices the progression.
6. Replace pieces in box one at a time working from left to right. Start with the large green prism closest to the box.
7. Close the lid and invite the child to repeat the activity.

###### Presentation #2:

1. Repeat the layout of the material as described above.
2. Move the large green prism to the center of the workplace

and build the cube as before, outside of the box. Continue until the entire cube is assembled on the table.

1. Disassemble by placing the pieces back into a progression from right to left, or for an additional challenge, place the pieces in a random mix.
2. Build the pieces back into the box, beginning with the largest. Carefully close the lid and invite the child to continue to work with the material.

###### Work of the Teacher:

Points of Emphasis: Removing cubes and prisms from the box and

arranging the pieces in a progression of size from right to left.

Language: monomial cube

**Points of Interest:** different sizes and colors of the cubes

###### Work of the Child:

Points of Consciousness: Combining pieces of each size equal

the next largest piece.

Control of Error: Lid will not close or fit properly if pieces

are not replaced in order.

**Variations:** Place the pieces in random order and build into the box.

Build cube outside of the box as in Presentation #2.

**Extensions:** Child may trace bases, color and arrange in order. Source: Martha Monahan, NMI; 2005

**Name of Activity:** Cube of the Trinomial

**Area:** General: Visual Discrimination Specific: Form

**Materials:** A wooden box with two hinged sides which open to reveal two sides of the cube. The top of the cube is painted on the lid. The box contains white, red and blue cubes and yellow, orange, red, brown and green rectangular prisms. This cube, rather than being a representation of the algebraic theorem (a+b+c)3, is the hierarchical representation of the cubing of a three digit number.

**Aims:** Direct: Refinement of the ability to compare, find

similarities and differences and to reason.

Indirect: To place the pieces into the box.

**Preparation:** Monomial cube

**Age:** Second Year

###### Presentation of the Lesson:

The same system is used in these presentations in t he monomial cube. Therefore, the presentation of this material follows the monomial cube. Just as the system used for the binomial and trinomial are the same and are, therefore, presented consecutively.

1. The cubes are arranged by color and laid out from right to left as done with the monomial cube.
2. Remove white cube and place to the far right of the table.
3. Remove the yellow prisms and place to the left of the white cube.
4. Proceed with each set of cubes and prisms, placing in columns to the right of the box. (move from left to right in this order; white, yellow, orange, red, brown, green, blue)
5. Pause and admire the various cubes and prisms.
6. Return the cubes and prisms to the box working in reverse order, beginning with the single blue cube, which is placed directly in the box,
7. Next, cover the blue cube with the three green prisms.
8. Next, the brown pieces are returned, covering the green prisms.
9. Continue in order of rows until cube is reassembled in box, ending with the single white cube (see illustrations).

###### Work of the Teacher:

Points of Emphasis: Lining up cubes by color. Careful handling of

the materials.

Language: cube/trinomial

**Points of Interest:** The color and variety of the cubes and prisms.

###### Work of the Child:

Points of Consciousness: Pieces are replaced by color, rather than by

layer and pattern, different from the other cubes.

Control of Error: Box will not close if pieces are not arranged

properly.

**Variations:** Build outside of the box.

**Extensions:** Find relationships to the trinomial cube.

Source: Martha Monahan, NMI; 2005

#### Advanced (Elementary) Use of the Cube of the Trinomial

The Cube of the Trinomial (numeric or hierarchical cube) is intended to represent the numeric analysis of cubing a three-digit number, i.e., 1113 (111 x 111 x 111).

The colors and lengths of the pieces of the Trinomial Cube [algebraic; (a+b+c)3 ] represent the multiplication combination of terms (a, b, or c), with the three colors representing the squaring of one of the terms (a2, b2, or c2) represented by the length of the sides forming the square (a⋅a, b⋅b, or c⋅c). The cubes are each all one color, as each surface of a cube is a square ( a⋅a⋅a or a3, b⋅b⋅b or b3, or c⋅c⋅c or c3). The black prisms lack color as the surfaces are all rectangular, as the cube is comprised of all three of the varying lengths (a, b and c).

However, with the Cube of the Trinomial, we are representing the cubing of a three- digit number, with each length representative, not of an algebraic term, but of the three places contained within a three-digit number (unit, ten, and hundred). In cubing this three digit number, we end up with the following multiplication expression:

1113 = 111 x 111x 111 = (100 + 10 + 1) x (100 + 10 + 1) x (100 + 10 + 1) =

The above expanded equation results in twenty-seven multiplication combinations formed of one term from each set of parenthesis. The result of multiplying any of the combinations of these three places, determines the color of the piece (see below). The colors, thus, represent the places of unit to million. Each of the three lengths represents a hierarchical value and the color reflects the value of place obtained multiplying the three terms.

In hierarchical progression, the colors represent the following values:

|  |  |  |
| --- | --- | --- |
| **Color** | **Hierarchical Value** | **Derivation of Value (order may vary)** |
| white: | units | (units times units times units) |
| yellow | tens | (units times units time tens) |
| orange | hundreds | (units times tens times tens) |
|  |  | (units times tens time tens) |
| red | thousands | (units times tens time hundreds) |
|  |  | (tens time tens time tens) |
| brown | ten thousands | (units times hundreds time hundreds) |
|  |  | (tens times tens times hundreds) |
| green | hundred thousands | (tens times hundreds times hundreds) |
| blue | millions | (hundreds times hundreds times hundreds) |

Source: Donald Monahan, NMI; 2005

**Name of Activity:** Binomial Cube

**Area:** General: Visual Discrimination Specific: Form

**Materials:** A wooden box with two hinged sides and a top that lifts off.

Inside the box are 8 pieces: 6 rectangular prisms and 2 cubes. When assembled, the pieces form one larger cube in which each component represents a term in the expansion of: (a+b)3

= a3 + a2b + a2b + a2b + ab2 + ab2 + ab2 + b3 or, with like terms combined: a3 + 3(a2b) + 3(ab2) + b3

**Aims:** Direct: Refinement of the ability to observe, compare and

reason.

Indirect: To experience the binomial equation. To replace the pieces into the box.

**Preparation:** monomial cube and the cube of the trinomial

**Age:** First to second year

###### Presentation of the Lesson:

**Presentation #1:** Building by Layers

1. Invite the child to the activity. Name it and carry it carefully to the work place.
2. Remove the lid and turn sides down, displaying the contents of the box.
3. Place lid between the sides with red square in back, left corner.
4. Piece by piece, starting with the solid blue cube, remove pieces from the top layer and place in formation to the far right.
5. Remove the bottom layer in the same manner, starting with the front corner piece. Place in formation to the right.
6. Place your hand on each layer to indicate that they are the same height.
7. Beginning with the solid red cube (a3) and place on the lid, covering the red outline on the lid.
8. Systematically build the bottom layer onto the lid. When all pieces are placed on the lid, build them into the box, starting again, with the solid red cube.
9. Repeat for the top layer, building onto the lid and then into box.
10. Gently close the sides of the box and replace the lid.

**Presentation #2:** Sorting By Colors

1. Starting with the top layer, remove the solid blue cube and place to the far right of the work space.
2. Continue removing the pieces one at a time and sorting into two columns by color. Place the blue and red cubes at the top of each column.
3. Beginning with the solid red cube, place onto the lid in the designated spot. Point to the front sides of the cube, indicating silently to the child that you are looking for a piece that will match the color sides.
4. When the bottom layer is built, transfer into the box starting with the solid red cube.
5. Repeat for the top layer, building onto the lid and then into the box. Gently close the sides of the box and replace the lid.

**Presentation #3:** Building the Cube outside of the Box

1. Remove the pieces and arrange in columns as done in Presentation #2.
2. Move the solid red cube to the center of the workspace.
3. Build the cube outside of the box.
4. Explore the cube by splitting it vertically, noting the pattern on the inside. (Can also separate into horizontal layers.)\*

###### Work of the Teacher:

Points of Emphasis: Gentle handling of the material.

Order of removing pieces from the box and placing in formation.

Language: binomial, cube

**Points of Interest:** putting the cube together as a puzzle

###### Work of the Child:

Points of Consciousness: Reproducing the pattern on the lid helps in

returning the pieces to the box.

Control of Error: Box will not close if pieces are not placed

In the box properly.

**Variations:** see presentations #2 & #3, also:

\*Change horizontal layers into vertical layers and push back together to form cube. (Color pattern

can be observed in all manner of separation of layers.)

**Extensions:** Exploring the relationship between the binomial and trinomial cube.

Building the cube blindfolded.

Source: Martha Monahan, NMI; 2005

**Name of Activity:** Trinomial Cube

**Area:** General: Visual Discrimination Specific: Form

**Materials:** A wooden box with two hinged sides and a top that lifts off. Inside the box are 27 pieces, 24 rectangular prisms and 3 cubes. When assembled, the pieces form one larger cube in which each component represents a term in the (a+b+c)3 expansion: (a+b+c)3 =

a3 + a2b + a2b + a2b + ab2 + ab2 + ab2 + b3 + b 2c + b 2c + b 2c + b c2 + b c2 + b c2 + a2c + a2c + a 2c + ac2 + ac2 + ac2 + abc +

abc + abc + abc + abc + abc + c3 or, with like terms combined:

a3 + 3(a2b) + 3(ab2) + 3(a2c) + 3(ac2) + 6abc + b3 + 3(b2c) + 3(bc2) + c3

**Aims:** Direct: Refinement of the ability to observe, compare and

reason.

Indirect: To experience the trinomial equation.

To replace the pieces into the box.

**Preparation:** All prior cubes: monomial, binomial and the cube of the

trinomial.

**Age:** Second Year

###### Presentation of the Lesson:

**Presentation #1:** Building by Layers

1. Invite the child to the activity. Name it and carry it carefully to the work place.
2. Remove the lid and turn sides down, displaying the contents of the box.
3. Place lid between the sides with red square in back, left corner.
4. Piece by piece, starting with the solid yellow cube, remove pieces from the top layer and place in formation to the far right.
5. Remove the middle layer in the same manner, starting with the front corner piece. Place in formation to the right.
6. Repeat for the bottom layer, building in formation to the near right.
7. Place you hand on each layer to indicate that they are the same height.
8. Begin rebuilding with the solid red cube (a3) and place it on the lid, covering the red outline on the lid.
9. Systematically build the bottom layer onto the lid. When all pieces are placed on the lid, build them into the box, starting again, with the solid red cube.
10. Repeat for the middle layer, building onto the lid and then into box.
11. Next, build the top layer, first on the lid and then into the box..
12. Gently close the sides of the box and replace the lid.

**Presentation #2:** Sorting By Colors

1. Starting with the top layer, remove the solid yellow cube and place to the far right of the work space.
2. Continue removing the pieces one at a time and sorting into three columns by color. Place the three cubes at the top of each column and the black prisms in a separate column to the left of the others..
3. Beginning with the solid red cube, place onto the lid in the designated spot. Point to the front sides of the cube, indicating silently to the child that you are looking for a piece that will match the color sides.
4. When the bottom layer is built, move into the box starting with the solid red cube.
5. Repeat for the middle and top layers. Gently close the sides of the box and replace the lid.

**Presentation #3:** Building the Cube outside of the Box

1. Remove the pieces and arrange in columns as done in Presentation #2.
2. Move the solid red cube to the center of the workspace.
3. Build the cube outside of the box.
4. Explore the cube by splitting it vertically, noting the pattern on the inside.

###### Work of the Teacher:

Points of Emphasis: Gentle handling of the material.

Order of removing pieces from the box and placing in formation.

Language: trinomial, cube

**Points of Interest:** putting the cube together as a puzzle; also,

the child may notice that the pieces of the binomial cube are contained with this cube.

###### Work of the Child:

Points of Consciousness: Reproducing the pattern on the lid helps in

returning the pieces to the box.

Control of Error: Box will not close if pieces are not placed

in the box properly.

**Variations:** see presentations #2 & #3

**Extensions:** Exploring the relationship between the binomial and

trinomial cube.

Building the cube blindfolded.

Source: Martha Monahan, NMI; 2005

Auditory

#### Some Thoughts on Silence

* Silence is something we fill in very quickly in our society. Yet, it is something very precious.
* Silence provides a rest from multi-sensory stimulus, an opportunity for rest, and focus.
* Sometimes, the emphasis is given to our words…not by the words…but by the spaces in-between.
* If we are speaking, the child is NOT observing…he is listening (we hope).

If we are speaking, WE are doing the reasoning, the teaching, the thinking… the child is therefore NOT DOING the LEARNING.

* Remember, it is when the child is involved in her own intellectual (or motor activity) that

she is using her intelligence and learning…or acquiring true knowledge…vs.…memorization or blanket acceptance of what we say.

* If a material is too difficult to demonstrate silently (furniture could have been demonstrated silently) then your steps are too complex or not thought out well enough. In this case, the activity needs to be rethought and simplified.
* Also…try to plan activities as building blocks for each other, such as, for the color wheel…

to start with one wheel with six circles and then, when the children have mastered that and internalized their discoveries, introduce the one with twelve circles…

or for cutting...first to do one with a few folds and cuts, followed by one more difficult.

* The more preparation a child has had with previous experiences and activities the easier each successive martial will be - and the more confident and independent the child will be!
* If there are WHYS to an activity…do the activity…allow time for the experience to be observed...then discuss or explain. Perhaps the child will have already perceived that which you may previously have gone to explain. Let the child do the observing…absorb the activity…THEN…the child is truly ready for the discussion…he has had experiences with that thing you are talking about.
* SO…try to begin to discipline yourself…and also to feel the peace and renewal you can experience from silence. It’s hard at first, because, not only are we an overly verbal society…and not only do we say irrelevant or unnecessary things more of the time in our social verbiage…we’ve all built up patterns and habits of being “teachery”…

----Will you tell us about what happened when you demonstrated the pouring in your classroom?

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#### Introduction to Silence

One of the first situations that promoted the Silence game was when a baby was brought into a Montessori classroom. The child was sleeping and so as not to disturb its sleep, the children in the room were asked to see if they could be as quiet as the sleeping baby. This is not an easy task for young boisterous children, as it requires them to concentrate on their body, trying to keep it still and silent. Besides that, they are not to produce any sounds from their mouths, either. For many, it is a state of “unnaturalness”, and they must truly think about what they need to be doing to reach that point.

Through the creation of silence, one can learn to appreciate and discriminate surrounding sounds. We learn to “see” with our ears as we quiet ourselves and listen to the song of a bird, the patter of raindrops against a windowpane, or the distant laughter of children in the playground. One will also be able to turn his/her thoughts and senses inward, thus developing an awareness of each breath taken – and how the body relaxes as it inhales and exhales.

It is these qualities that we wish to instill among the children, for it will help them to be so much more aware of not only their surroundings, but of themselves, as well.

###### MAKING SILENCE (The Silence Game)

Nowhere can a person - child or adult - find peace and a feeling of being centered within himself and in the world as well as in the experience of silence. In today’s often frantically-paced society, children have few opportunities to have this important experience. Their ears are often over stimulated to the point where they are forced to “tune out” the hubbub around them. When they are shown, by some simple techniques discussed below, how to make silence, they love it. Contrary to what many adults believe, children are quite capable of being silent and seem to derive great spiritual energy from the practice.

“Making silence” is the way to introduce silence activities to children. The term emphasizes the fact that silence does not just happen - that it usually takes an active, conscious effort to produce it. The children then see it as an appealing challenge.

1. Begin making silence by making noise. Discuss and model making noise, then being quiet. Then make a game; make a repetitive noise (I break it into three kinds of noises/movements: those of hands, such as clapping; those of feet, such as stamping; and those of mouths, such as repeating a word or phrase); at the sound of a bell, stop the noise and remain silent until the bell rings again. Repeat several times. Start with a very short time and gradually lengthen.
2. More specific methods may be used to prepare for making silence. Children may be encouraged to tense and relax sections of their bodies, while sitting cross-legged at circle and close their eyes (voluntary). A guided meditation, story, etc., may be used to calm the group and lead into silence. Children can be shown how to be aware of their breathing and heartbeats. The Nienhuis book\* about making silence (or a teacher-made version of same) can be read to guide the children through the steps.
3. At the end of the silence period, children may be encouraged to share sounds which they heard while they were silent. Dismiss by whispering names or gently touching.

\*We are going to make silence. / Keep your body still. / Keep your hands still. / Sit quietly (take a deep breath). / Speak to no one. / Close your eyes. / Think how quiet it is. / Listen.

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**Name of Activity:** Sound Basket

**Area:** General: Sensorial

Specific: Auditory Discrimination

**Materials:** This is an introductory activity to introduce children to the beauty and variety of sounds. The basket contains beautiful, natural objects that produce interesting sounds. A label can be placed in the basket, which reads “sound”.

**Aims:** Direct: Refinement of the ability to observe and compare.

Indirect: Ability to find differences among things which make sounds.

**Preparation:** Silence games, listening activities and oral language

development games.

**Age:** First Year

###### Presentation of the Lesson:

1. Take the basket to a table or rug.
2. Place basket to the left of the table or rug and remove label.
3. Teacher models careful handling of the objects by removing one object and shaking it gently by each ear.
4. Teacher invites the child to listen to the sound. Place the object at the top of the rug beneath the label.
5. Invite the children to participate by taking turns listening to the objects.
6. Discuss the sounds made by the objects, discussing which is loudest, which is softest, etc.
7. Replace the objects carefully into the basket and return it to the shelf.

###### Work of the Teacher:

Points of Emphasis: Careful handling of the objects.

Listening at each ear.

Discussion of the qualities of the sounds.

Language: loud and soft; names of the objects

**Points of Interest:** Interesting sounds and objects.

Curiosity about sounds.

###### Work of the Child:

Points of Consciousness: Different things make different sounds.

You can predict some sounds from appearance, while others may surprise you.

Control of Error: Child’s ear.

**Variations:** Change the items frequently to keep the children's interest.

Encourage the children to bring in objects that make interesting sounds.

**Extensions:** Do activity with a blindfold.

Make a tape with matching pictures.

Source: Martha Monahan, NMI; May 2005

**Name of Activity:** Sound/No Sound Basket

**Area:** General: Sensorial

Specific: Auditory Discrimination

**Materials:** This is an also an introductory activity to begin to refine the children’s listening abilities. A beautiful collection of objects are placed in an attractive basket. The objects are classified as having a sound or not having a sound. Labels can be placed in the basket, which read “sound”/“no sound”.

**Aims:** Direct: Refinement of the ability to observe and discriminate.

Indirect: Ability to sort objects by sound.

**Preparation:** Sound basket, silence games and listening games.

**Age:** First year.

###### Presentation of the Lesson:

1. Bring the basket to a rug. Remove and introduce the labels.
2. Take out one object with dominant hand and shake it gently by each ear. If it makes a sound, place it to the left under the label for “sound”. If it does not make a sound, place it to the right of the center, under the label “no sound”.
3. Continue the process until all the objects have been sorted according to whether they do or do not make a sound.
4. Invite the children to enjoy the activity. Return the materials to the basket and replace the work.

###### Work of the Teacher:

Points of Emphasis: Model careful handling of the objects and shaking

gently at each ear. Sorting the objects.

Language: Initially silent, later, comment on the sounds.

**Points of Interest:** Interesting objects to manipulate and listen to.

###### Work of the Child:

Points of Consciousness: Objects may or may not make sounds. You cannot

always tell by appearances if an object will make a sound.

Control of Error: Child’s ear.

**Variations:** Change the objects frequently.

Categorize or grade the sounds.

**Extensions:** Printed labels for the objects.

Make booklets of the objects. Write sounds on a list.

Source: Martha Monahan, NMI; May 2005

**Name of Activity:** Sound Cylinders

**Area:** General: Sensorial

Specific: Auditory Discrimination

**Materials:** Two wooden boxes; one with a blue cover and one with a red cover.

Each box contains 6 hollow cylinders with either red or blue lids. The cylinders each contain one of the following: a small quantity of either sand, rice, pebbles, beans, peas or beads. When shaken, each cylinder makes a different sound. The cylinders are graded loudest to softest.

**Aims:** Direct: Refinement of the ability to observe and compare. Indirect: Ability to match the sounds; then grade the sounds.

**Preparation:** Sound basket, sound/no sound basket, listening games

and the silence game.

**Age:** First to second year.

###### Presentation of the Lesson: Presentation #1: Matching

1. Carry boxes one at a time to a table. Initially begin with only three or four sets of cylinders, contrasting in sound.
2. Place boxes side by side in the center of the table. The red box is the control and goes on the left.
3. Remove lids and place right beside each box, with colored side up.
4. With dominant hand, remove one red cylinder. Shake beside each ear. Repeat shaking beside the child’s ears. Place cylinder in center front of the table. Your subdominant hand rests in your lap.
5. With dominant hand, remove one blue cylinder from the box on the right and repeat shaking beside your ears and the child’s ears.
6. If it is a match to the red cylinder, place the pair in the upper left corner. If it does not match, place the blue cylinder on the blue lid beside the box.

7 Listen to the control and repeat listening to another blue cylinder. When a match is found, replace all the blue discarded cylinders on the blue lid back inside the box.

8. Repeat this matching system until all pairs are matched. Return all the cylinders to their respective boxes and carry one at a time back to the shelf.

**Presentation #2:** Grading the Cylinders

1. Bring one box of cylinders to a table.
2. Remove one cylinder and listen to it by shaking it beside your ear and the child’s. Place this cylinder in the center of the table in front of the box.
3. Remove another cylinder and listen to it. If it is louder than the control cylinder, move it to the front center of the table and discard the softer sounding cylinder onto the lid beside the box.
4. Continue to compare the ‘control’ cylinder to another cylinder from the box until the ‘loudest’ cylinder has been found. Move this cylinder to the front center of the table.
5. Choose a new ‘control’ cylinder and continue as above until the loudest of remaining cylinders is found. Place this behind the loudest cylinder. Repeat the grading process as described.
6. When the grading is complete, listen to the graded cylinders. Replace cylinders back into the box and return the material to the shelf.

###### Work of the Teacher:

Points of Emphasis: Organization of boxes and lids on the table.

Organizing matching and discarding process. Placement of non-dominant hand in lap (discourages child from taking a cylinder in each hand and shaking them).

Language: Silent lesson initially, then loud/soft, louder, loudest and softer, softest.

**Points of Interest:** Interesting sounds and appearance of the boxes.

Same colored cylinders are indistinguishable until shaken.

Playing a matching game.

###### Work of the Child:

Points of Consciousness: The contents of the cylinders make different

sounds.

Careful listening is required to distinguish between them.

Control of Error: Matched pairs. Last set will not match if an error

has been made previously. Color coding can be added to check work.

**Variations:** Play as a game with several children.

Matching at a distance.

Grading cylinders from softest to loudest.

###### Extensions:

Source: Martha Monahan, NMI; May 2005

**Name of Activity:** Exercises for the Bells

**Area:** General: Sensorial

Specific Auditory Discrimination

**Materials:** A series of bells in duplicate, from middle C to high C. One complete set is mounted on neutral stands, the other on white stands (8) and black stands (5) in the scale of the tones.

A set of two boards marked with black and white spaces on which the bells stand (corresponding to the black and white notes of the piano). A wooden hammer

A muted: a flat piece of wood with one end covered with felt **Additional materials for further use with the bells include:** A series of pattern boards

A control staff board representing the scale

A mute staff board to be used with the following: A box of movable notation material

**Aims:** Direct: Refinement of the ability to observe and compare.

Indirect: Discrimination of musical sounds; the pairing and grading of tones and semi-tones; indirect preparation for musical educations.

**Preparation:** Silence games, listening activities, singing

**Age:** Second to Third Year

###### Preliminary Presentations with the Bells:

Presentation 1: Carrying the Bells Presentation 2: Striking the Bells Presentation 3: Muting the Bells

**Presentation #1:** Carrying the Bells (may be done either a group or individually)

* 1. Invite the child to the material and explain, “I’m going to show you how to carry the bells.”
	2. Lift a bell, holding the stem with your dominant hand, while supporting the base with the opposite hand.
	3. Carry the bell to a table and gently set it down.
	4. Invite the child(ren) to carry a bell to the table and return it to the shelf.

**Presentation #2:** Striking a Bell with the Hammer

1. Introduce the name of the hammer and demonstrate how to hold the hammer vertically with pincer grip. (other hands are steadying the base of the bell at the bottom.
2. Slowly swing the hammer in a pendulum motion, gently striking the bell above the rim lightly one time.
3. Allow the tone to continue ringing; may hum along.
4. Let each child carry a bell to a table and practice striking the bell. Encourage the child to hum, imitating the sound.
5. The bell may be returned to the shelf or left on the table for the next lesson.

**Presentation #3:** Introducing the Mute

1, Introduce the mute and explain that it is used to ‘stop’ or ‘mute’ the sound.

1. Hold the hammer in the dominant hand as described in the previous lesson.
2. In the other hand, hold the mute at the end opposite the felt end.
3. Strike the bell as done in previous lesson.
4. Invite the child to listen to how long it sounds, imitating the sound.
5. Now, strike the bell and mute, placing felt end of mute under the rim of the bell, stopping the sound.
6. Return the bell to the shelf. Play up and down the scale.
7. Invite each child to repeat the lesson, being sure to play up and down the scale when finished.

###### Exercises with the Bells:

Exercise 1: Selecting one neutral bell and using mute

Exercise 2: Matching three contrasting bells of the Diatonic Scale Exercise 3: Matching all eight bells of the Diatonic Scale

Exercise 4: Grading the Diatonic Scale (First Method) Exercise 5: Grading the Diatonic Scale (Second Method) Exercise 6: Grading the Diatonic Scale (Third Method) Exercise 7: Matching the Chromatic Scale

Exercise 8: Grading the Chromatic Scale

**Exercise #1:** Selecting and practicing muting with one bell

Child selects a neutral bell and repeats the previous presentations, emphasizing the muting and playing up and down the scale. Encourage the child to repeat, using different bells.

**Exercise #2:** Matching three bells of the Diatonic Scale (See LANGUAGE)

1. Select and remove from the series of bells three contrasting neutral bells (C, F, A) and place in mixed order on the edge of the shelf.
2. Strike the white C bell, listen to note and hum. Mute the bell.
3. Strike a neutral bell, listen, hum and mute. If it is a match, place in sequence in front of the corresponding white bell. If it is not a match, place to one side on the shelf.
4. Continue using the matching system to match remaining two bells.
5. Play up and down the scale.
6. Remove the same three bells and invite the child to match the neutral bells to the white bells. Encourage repetition using different bells.
7. Give a three period lesson on “high” and “low”.

**Exercise #3:** Grading all eight bells of the Diatonic Scale

Child may move forward on the shelf and mix all neutral bells, then match to white bells in sequence, beginning with middle C. (Mute each bell before striking subsequent bell.)

**Exercise #4:** Grading the Diatonic Scale - First Method

1. Remove all of the neutral bells and mix randomly as in Exercise

#2 above.

1. Find neutral middle C by matching with corresponding white middle C, as before (mute as described). Place neutral middle C on board in front of white middle C.
2. Strike neutral middle C, then one of the mixed bells. Continue checking mixed bells until the next highest bell (neutral D) is found, going back to neutral middle C and muting each time. Place this bell in place on the scale (to the right of neutral C).
3. Using neutral middle C and D as control, find the next highest bell, and place on the scale. (Mute bells after each check.)
4. Continue for all remaining bells, going up the scale with matched neutral bells each time as control, saying, “Let’s find the bell that is just higher.” Go up and down scale when finished.

**Exercise #5:** Grading the Diatonic Scale - Second Method

1. Mix the bells and match the neutral middle C and place onto board as described in above lesson.
2. Play neutral C and find D; play D to find E; E to find F, etc., until all are graded. Finish by playing up and down the scale.
3. Invite child to repeat, encouraging going up and down scale.

**Exercise #6:** Grading the Diatonic Scale - Third Method (SEE LANGUAGE)

1. Remove and mix the bells (names of the notes presented here).
2. Without playing white control middle C, find the neutral middle C by playing a bell, humming and muting. Place ‘found’ neutral middle C on the board.
3. Without replaying the chosen C bell, select the neutral D bell by pitch alone. Place on board.
4. Repeat for all of the bells, selecting by pitch alone. Play up and down the scale when finished, using the white bells as controls.

**Exercise #7:** Matching some or all of the black bells (Chromatic Scale)

1. Remove a few or all of the sharps and flats from the shelf.
2. Place in sequence on the shelf, the black stands serving as the control. (Mute each bell after striking and humming.)

**Additional Exercise:** May remove three neutral bells from chromatic scale and one from diatonic scale. Match as in exercise 2. Play up and down scale. Encourage repetition.

**Exercise #8**: Grading the Chromatic Scale

1. Remove and mix all of the neutral bells and grade as in previous exercises.
2. Play up and down the chromatic scale, encouraging repetition.
3. Introduce the names of sharps and flats and the relation to each other and other bells.

**Games to Play with the Bells** (These could easily be done in small group lessons.)

Game #1: Matching diatonic bells at a distance (then chromatic) Game #2: Grading diatonic scale at a distance (then chromatic) Game #3: Just Softer / Louder - Higher / Louder

Game #4 Listening Games (preparation for silence game)

**Game #1:** Matching the diatonic bells at a distance (then chromatic)

1. Have children remove and mix all eight neutral diatonic bells on another table.
2. Choose a neutral diatonic bell, strike, hum and mute. Carry sound only (in ear or mind) to control set, play control white bell (listen and mute) until match is found. Bring neutral bell to shelf and place in proper place on board.
3. Invite other children to take turns and match other bells.
4. When all eight neutral bells are in place, play up and down scale.

(Additionally, above matching may be done with chromatic scale. White and black bells serve as control.)

**Game #2:** Grading diatonic scale at a distance (then chromatic)

1. Take neutral diatonic bells to another table. Mix and grade as before. White bells serve as a control.
2. Return bells to shelf. Play up and down scale.

(Additionally, above grading may be down with chromatic scale. White and black bells serve as control.)

**Game #3**: Just Softer / Louder - Higher / Louder

1. Bring all neutral diatonic bells to a table. Play a bell and ask child to find one “just lower, or just higher.” Repeat using other bells.
2. Return bells and play up and down the scale.

(Additionally, above may be done with entire chromatic scale.)

**Game #4** Listening Games (preparation for silence game)

1. Have child close eyes and raise hand when a bell is stuck with the hammer. Child keeps hand raised until no longer can hear bell.
2. Have children close eyes and identify sounds in the environment (i.e., tearing paper, running water, writing on black board).
3. May have children find a hidden clock.
4. Have a child walk around room striking a bell, as other children with eyes closed point in direction of bell.
5. Prerecorded tapes of sounds may be played.

###### Work of the Teacher:

Points of Emphasis: Careful handling of the bells and materials.

The beauty and simplicity of the material.

Language: Introducing Names of Notes (Three Period Lesson) ‘high’ / ‘low’

Three Period Lesson on Names of Notes:

###### First Period:

* Remove C, F and A; place in sequence.
* Strike C; sing “This is C”; mute. Strike F and sing “This is F”, alternating pitch of voice to go with pitch of bell.

Mute and repeat for A. Mix bells.

###### Second Period:

* Now sing “Show me C.”; “Which is F?”; “Now show me A.”
* Allow for much repetition at this period.

###### Third Period:

* Play notes; ask child what they are. Allow child to play them, also. After repeating exercise, replace bells and go up and down scale.

(Presentation of chromatic note names (sharps and flats) is done in the same manner.)

**Points of Interest:** The neutral bells all look the same, but they can be

distinguished by their pitch.

Hearing the length (duration) of an ‘unmuted’ tone. Stopping the tones with the mute.

###### Work of the Child:

Points of Consciousness: Careful listening is required to distinguish between

the various pitches of the bells.

Control of Error: (Matching) Labels of note names may be placed on

the front of the control bells (the black and white bells) with matching note names on the bottom of the neutral bells. The control is therefore visual. (Grading) When grading, the neutral bells are placed in front of the control bells, which are left graded on the shelf. After the exercises, the child can check by playing the two sets to see if they match (auditory check.) Checking can also be done with note names, if available, as bells do not come with such labels.

**Variations:** Matching at a distance.

Grading the bells at a distance.

Bring neutral bells to one table and select one to bring to second table. Then find the bell that is ‘just higher’/’just lower’ at a distance.

**Extensions:** Introduce the note pattern boards.

Source: Montessori Institute of Atlanta (MIA/AMI); 1978 Revised: Donald Manahan, NMI; 2001, 2005

The Montessori Bells

The bells are sensorial materials for the refinement of the auditory sense. Music is all around but the child rarely has an opportunity to isolate pitch. The bells serve as an alphabet for music and help to clarify sound, both musical and non-musical. They are a good preparation for the silence game and increase sound awareness and distinction. The child’s language development is enhanced. The bells are the key to music and allow the child to focus on the auditory sense. They should be presented as early as the first day and should be used daily.

The white bells represent the diatonic scale of one octave, beginning with middle C. These serve as a control of error and should remain in place behind the neutral bells. The black bells represent the sharps and flats. The white and black bells combined represent the chromatic scale. The black bells and their corresponding neutral bells are stored under the shelf when not in use.

Our own familiarity and comfort in working with the bells is essential in presenting them in a way which encourages repetition and exploration on the part of the child. The neutral bells may be color coded on the bottom of their bases for easy identification.

Proper care and handling should be stressed, as improper handling may alter their pitch.

The bells should be handled by the stands and never by the metal bell. Extreme temperature variation may also affect the pitch of the bells. Care of the bells may serve as a good practical life exercise for an older child.

Exercises for the Bells

Materials: A series of bells in duplicate, from middle C to high C. One complete set is mounted on neutral stand, the other on white stands (8) and black stands (5) in the scale of the tones.

A set of two boards marked with black and white spaces on which the bells stand and corresponding to the black and white notes of the piano.

A wooden hammer

A muted: a flat piece of wood with one end covered in felt Additional materials for further use with the bells include:

A series of pattern boards

A control staff board representing the scale

A mute staff board to be used with the following: A box of movable notation material

Source: Montessori Institute of Atlanta (MIA/AMI; 1978) Revised Donald Monahan; NMI 2004

Tactile Sense

**Name of Activity:** Rough and Smooth Basket

**Area:** General: Sensorial

Specific: Tactile Discrimination

**Materials:** This is an introductory activity to introduce children to the variety of textures. The basket contains beautiful, natural objects that have interesting textures and that allow the child to classify according to “rough” and “smooth”. Labels can be added to the activity.

**Aims:** Direct: Refinement of the ability to observe and compare.

Indirect: Ability to find differences in texture.

**Preparation:** Objects in the natural world.

**Age:** First year.

###### Presentation of the Lesson:

1. Bring the basket of objects to a rug and invite several children to participate.
2. Introduce activity and set out labels, if used.
3. Remove an object and model careful handling of the item. Use your hands to carefully explore the object. Pass object to a child to hold and explore.
4. Say “rough” and place to the left of the rug (beneath label if used).
5. Continue exploring the objects and sorting them into two categories of “rough” and “smooth”.
6. Replace the materials carefully into the basket and invite the child to repeat the activity.

7, Return objects to place on shelf.

###### Work of the Teacher:

Points of Emphasis: Model careful handling and exploration of each

object.

Sorting the objects.

Language: Silent lesson followed by “rough”/“smooth” and names of the objects.

**Points of Interest:** The objects themselves and their textures.

###### Work of the Child:

Points of Consciousness: Objects have different textures. You can predict

some textures but others may surprise you.

Control of Error: Child’s tactile sense.

**Variations:** Change the objects frequently.

Place interesting objects found in nature in the basket. Use objects from different categories: shells, rocks, etc.

**Extensions:** Add labels for “rough” and “smooth”.

Source: Martha Monahan, NMI; May, 2005

**Name of Activity:** The Touch Boards

**Area:** General: Sensorial

Specific: Tactile Discrimination

**Materials:** There are three boards in this series. The first board is divided into two sections, with one side covered with medium sandpaper and the other side is well varnished, providing a smooth surface.

The second board is the same size as the first and has several alternating strips of sandpaper and strips of varnished wood.

The third board is a duplicate of the second board with the difference being that the sandpaper strips are graded from rough to increasingly rougher to roughest.

**Aims:** Direct: Refinement of the ability to observe and compare.

Indirect: 1st & 2nd Boards: ability to distinguish rough and smooth 3rd Board: the ability to feel rough surfaces from

rough to roughest

**Preparation:** Rough and Smooth Introductory Basket, Practical Life

activities.

**Age:** First Year

###### Presentation of the Lesson:

1. Child and adult may sensitize their fingertips by placing them in warm water or by rubbing them on a piece of cloth or carpet.
2. Boards are presented one at a time and not in the same presentation. They are placed in the following orientation:

1st Board: sandpaper square is on the left

2nd Board: sandpaper rectangle closest to the left edge 3rd Board: least rough strip is on the left

1. Stroke the boards, using the first two fingers of the dominant hand, top to bottom and left to right. Language differs as follows:

1st Board: stroke rough side, saying “rough”; then stroke the smooth side saying “smooth”.

2nd Board: stroke strips left to right, saying “rough”, “smooth”, “rough”, “smooth”.

3rd Board: stroke only the rough strips, beginning with the rough strip on the left, saying “rough”. Next strip say “rougher”. Continue with the language of “rougher” until the final strip, when the language changes to “roughest”.

1. Return work to its proper place upon shelf when finished.

###### Work of the Teacher:

Points of Emphasis: sensitizing finger tips

left to right orientation of rough areas correct language for each board

using two fingers of the dominant hand

Language: rough/rougher/roughest smooth/smoother/smoothest

**Points of Interest:** the boards themselves

###### Work of the Child:

Points of Consciousness: the finger tips can distinguish between rough and

smooth and variations Control of Error: child’s sense of touch

**Variations:** present boards 2 & 3 together

**Extensions:** feeling various fabrics of clothing Source: Martha Monahan, NMI; May 2005

**Name of Activity:** The Touch Tablets

**Area:** General: Sensorial

Specific: Tactile Discrimination

**Materials:** A box containing five pairs of sandpaper covered tablets. Each pair has a slightly different color and gradation of roughness.

**Aims:** Direct: Refinement of the ability to observe and discriminate. Indirect: Ability to match sets of tablets of varying roughness.

Ability to grade one set of tablets.

**Preparation:** Basket of Rough and Smooth, the Touch Boards

**Age:** First to Second Year

###### Presentation of the Lesson: Presentation #1: Matching

1. Take the tablets from the box and stack randomly in the center of the work space (for the first presentation, teacher may want to limit the number of sets being matched).
2. Without looking (close eyes, look at the ceiling or use a blindfold), take the top tablet off the pile and place in front of you.
3. Stroke the tablet top to bottom, using two fingers of the dominant hand.
4. Feel the tablet on the top of the pile for a match. If they are the same, place the pair in upper left corner. If they do not match, turn the top tablet over and place to the side.

5, Return to the control tablet until a match is found, then repeat with new control tablet.

6. When all are matched return materials to their place.

**Presentation #2:** Grading

1. This activity is done with only one set of tablets.
2. Stack the tablets in the center of the work place. Place a control table in front of stack.
3. Stroke the control tablet from top to bottom. Stroke the tablet on the top of the pile; if it is rougher, replace it as the control, placing the smoother tablet in the discard pile.
4. As each new ‘roughest’ (just smoother) tablet is identified, place in sequence beside previously identified tablet(s), which will progress from roughest to smoothest when finished.

5 Invite child to repeat or return materials to shelf.

###### Work of the Teacher:

Points of Emphasis: Method of arranging tablets on the table.

Touching the tablets without visual cues. Using fingers of the dominant hand.

Language: rough, smooth/rougher, roughest/less rough

**Points of Interest:** Some tablets look very similar but are different.

Challenge of matching and grading tablets.

###### Work of the Child:

Points of Consciousness: Even though the tablets look much the same, they

can be distinguished from each other by touch.

Control of Error: Child’s touch. Last pairs will not match if an error

has been made previously; color coding can be added as a control of error.

**Variations:** Children can play together, handing tablets to each other.

**Extensions:** Labels for grading.

Divide sets and play matching at a distance.

Source: Martha Monahan, NMI; May 2005

**Name of Activity:** Fabric Boxes 1 & 2

**Area:** General: Sensorial

Specific: Tactile Discrimination

**Materials:** Box #1: A box or basket containing approximately eight pairs of

different types of fabric (cotton, satin, linen, wool, silk, velvet, gauze, burlap, corduroy, muslin, etc.) Each fabric piece is about 6” square and the edges are finished.

Box #2: The same organization as Box #1 except the fabric is all the same color and varies only in texture.

**Aims:** Direct: Refinement of the ability to observe and discriminate.

Indirect: Ability to match two sets of fabrics of different texture by using the sense of touch.

**Preparation:** Rough and smooth activities including touch boards and

touch tablets.

**Age:** First to Second Year

**Presentation of the Lesson: Presentation #1:** Fabric Box #1

Note: This activity is to be done with a blindfold, if the child is comfortable.

1. Place box or basket of fabric squares on the work place. Remove fabric squares and mix randomly into one pile that is in the center of the workplace.
2. Matching is done as with the touch tablets. Take the fabric square from the top of the pile and hold in the subdominant hand. Take the next fabric square from pile and compare. Discards go to the right of the central pile while matched pairs go in the upper left corner.
3. All discards are returned to the pile before the matching system begins again.
4. When all matches are found, remove blindfold and see that all pairs visually match.
5. When completed with the activity, replace all the materials.

**Presentation #2:** Fabric Box #2

1. This presentation is the same for Fabric Box #1. The difference is in the appearance of the fabrics, they are all the same color.

###### Work of the Teacher:

Points of Emphasis: Being consistent with the matching system

Modeling using a blind fold or keeping your eyes closed.

Language: First presentation is silent, later give names of the fabric and describe the texture.

**Points of Interest:** Attractive appearance of the fabric swatches.

Opportunity to wear a blindfold.

###### Work of the Child:

Points of Consciousness: Touch alone can determine a match.

Control of Error: Child’s touch. In Fabric Box #1 appearance of the

fabrics.

**Variations:** Change fabrics

**Extensions:** Place fabrics in the stereognostic bag.

Add labels for the names of fabrics and textures. Make booklets of fabric types.

Source: Martha Monahan, NMI; May, 2005

Stereognostic Sense

**Name of Activity:** Mystery Bag/Stereognostic Bag

**Area:** General: Sensorial

Specific: Stereognostic

**Materials:** A cloth bag with five or six sets of objects. Initially the objects chosen have contrasting textures and shapes, but, to continue to challenge the children and refine their stereognostic sense, the contrasts have smaller differences.

**Aims:** Direct: Refinement of the ability to discriminate, differentiate

and order.

Indirect: Ability to match objects by feeling them without a visual cue.

**Preparation:** Tactile discrimination activities, activities involving a

lightness of touch and manipulative games such as blocks and puzzles.

**Age:** First through third year.

###### Presentation of the Lesson:

1. Bring the bag to the rug. For a young child, remove the objects from the bag and place in pairs on the rug to show the child that this is a matching game. Return the objects to the bag.
2. Put dominant hand inside the bag. Stress the non visual aspect of the game (looking away, keeping the top of the bag closed, etc.) Feel around inside the bag and remove one object and place on the rug.
3. Put hand back inside the bag to find the match to the object on the rug. Be dramatic and suspenseful, it’s a game! Once found, bring out the object and place the matched set on the top left side of the rug.
4. If a mistake is made, place the object back into the bag. Pick up the first object and reexamine it carefully with your eyes closed. Reach back inside the bag, feeling for the match.
5. Continue until all matches are made, allowing the child to take over the game as soon as possible.
6. Place all objects back in the bag and invite the child to play again, or to help replace the work.

###### Work of the Teacher:

Points of Emphasis: Letting the child see the matches beforehand if

necessary.

Playfulness of the activity.

Using your whole hand to explore the objects. Placement of the matches on the rug.

Language: Initial lesson is silent. Later, the names of the objects or descriptive words to describe how the objects feel.

**Points of Interest:** Interesting items in the bag.

Playing a game.

###### Work of the Child:

Points of Consciousness: The hand distinguishes the differences. Control of Error: Matched pairs.

**Variations:** Children play together by separating the matches. One child hands the other an object to be matched. Child reaches in the bag for the match. Second child takes a turn, etc.

**Extensions:** “Feely Box”

Pictures or labels for objects. Place geometric solids in the bag.

Source: Martha Monahan, NMI; May 2005

Baric Sense

**Name of Activity:** Heavy and Light Basket

**Area:** General: Sensorial

Specific: Baric

**Materials:** The basket contains beautiful, natural objects that allow the child to classify “heavy” and “light”. Labels for heavy and light can be added to the basket. This is a wonderful opportunity to include objects from other cultures.

**Aims:** Direct: To introduce the child to the concept of heavy and

light.

Indirect: To sort the objects by weight (heavy/light)

**Preparation:** This is an introductory activity. Child has had previous

experiences of weight in their daily life, as well as, with some of the sensorial materials (broad prism, tower of cubes, etc.).

**Age:** First Year

###### Presentation of the Lesson:

1. Bring the basket of objects to the workplace. Show the child the labels for “heavy” and “light”. Place the labels at the top of the rug.
2. Remove one object from the basket and model for the child careful handling and exploration of the object. Feel the weight of the object and determine if it is heavy or light. Say “heavy” and place under the label.
3. Continue to sort the objects by weight.

###### Work of the Teacher:

Points of Emphasis: Careful handling and exploration of the objects. Language: heavy/light

**Points of Interest:** The selection is varied and contains

beautiful objects collected from various cultures.

###### Work of the Child:

Points of Consciousness: Objects have different weights. Control of Error: The teacher.

**Variations:** Vary the objects in the basket.

**Extensions:** Find objects from the environment and the natural world. Make a chart of heavy and light using pictures or drawings.

Source: Martha Monahan, NMI; June 2005

**Name of Activity:** Baric Tablets

**Area:** General: Sensorial

Specific: Baric

**Materials:** A large wooden box divided into three sections, each containing 6 wooden tablets in their natural color. Each set is made of different types of wood to present weight differences of heavy, light and medium.

**Aims:** Direct: To encourage discrimination of weight by refining

the ability to observe, compare, differentiate, reason, decide and solve problems.

Indirect: To sort and match the tablets by weight.

**Preparation:** Sorting activities, introductory weight activities and work with a scale.

**Age:** Second Year

###### Presentation of the Lesson:

1. Bring the box of baric tablets to the workplace. You may want the introductory lesson to be done with the extremes of the sets (heavy and light tablets only).
2. Remove one heavy and one light tablet and position them to be resting on the fingertips of your upturned hands.
3. Raise and lower your hands slightly to model feeling (gauging) the weight.
4. Ask the child to hold out a hand and place the heavy tablet carefully on his fingertips. Say “heavy”.
5. Repeat with the light tablet saying “light”. Have child raise and lower hands as to indicate; “heavy”/“light”.
6. Do a three period lesson.
7. Replace tablets into the box.
8. Remove all tablets from the box and mix randomly into one pile.
9. Place the pile directly in front of you. Remove the top tablet and place on your left fingertips (this is the control tablet). Check the weight.
10. Remove the second tablet and place onto your right fingertips. Model the checking of the weight to determine if these tablets match.
11. If it is a matched pair, place them side by side in the upper left hand corner of the workplace. If it is not a match place the tablet (in the right hand) in the discard pile to the right of the pile.
12. Continue matching the tablets. Each time a match is found, mix the discarded tablets back into the main pile.

###### Work of the Teacher:

Points of Emphasis: Method of sorting and matching. Language: heavy, light, medium, weights

**Points of Interest:** The smoothness of the tablets, the differing

weights, the positioning on the fingertips, closing the eyes or using a blindfold.

###### Work of the Child:

Points of Consciousness: “I can feel the weight without looking.” Control of Error: matched pairs

**Variations:** Mix the sets of tablets to be matched (medium and light only or heavy and medium only).

**Extensions:** use of a scale/other weight activity

Source: Martha Monahan, NMI; June 2005

Thermic Sense

**Name of Activity:** Thermic Bottles

**Area:** General: Sensorial

Specific: Thermic

**Materials:** A wooden box divided into eight sections, each containing a metal bottle. The bottles have a lid with a metal ring attached. All the bottles are identical.

**Aims:** Direct: To encourage discrimination of temperature by refining

the ability to observe, compare, differentiate, reason, decide and solve problems.

Indirect: To match bottles of the same temperature. To grade the bottles from hot to cold.

**Preparation:** Matching activities, introductory thermic activities.

**Age:** Second or third year.

**Presentation of the Lesson:** Presentation #1

1. This presentation must be prepared just prior to use (children may help in preparation). Set out a pitcher of hot water and one of cold. Fill two thermic bottles with hot water and two with cold. Initially, you may wish to use only one set of bottles with warm water in them. Later, add another pair of bottles. Remember, the bottles will only hold these temperatures for a short time.
2. Once the bottles have been prepared, bring the box to a table and place it directly in front of you. There should be one set of bottles on the left side and one set on the right side.
3. Remove one bottle from the left side (this is the control) and hold it for a few seconds.
4. Remove a bottle from the right column and compare the temperature to the control.
5. If they are the same temperature, place them side by side in the upper left corner of the work place. If they are different, place the bottle in the right hand in the discard column (beside the box).
6. Continue matching sets. The control is on the left and the testing bottles are on the right. Return the discards back into the mix each time a match is made.

**Presentation #2:** Grading

1. Use only one set of prepared bottles. Place them in the box.
2. Remove one cylinder and place in the left hand. Feel the temperature for a few seconds. Remove a second cylinder. If it is hotter, move it to the front to use as the new control. Place the first cylinder in the discard column (to the right of the box).
3. Continue through the complete set, always moving the hotter cylinder to the front and discarding others.
4. When the hottest cylinder is found, move it to the upper left corner. Place the discards back into the box and begin the process again.

###### Work of the Teacher:

Points of Emphasis: Method of filling the bottles. Handling them as

little as possible to keep the temperatures from equalizing sooner. Method of matching and grading.

Language: hot, cold, warm, cool

**Points of Interest:** Smoothness of the bottles; feel of the different

temperatures; change in the temperature of the bottles over time.

###### Work of the Child:

Points of Consciousness: “I can match the temperatures by using my hands,”

“If the bottle is hot, my hand gets hot.”

Control of Error: matched pairs

**Variations:** use fewer or more bottles

**Extensions:** Do other temperature activities. Example: prepare a bowl of hot water and a bowl of cold water. Prepare a larger bowl of warm water. Put left hand in the cold water and right hand in the hot water. Place both hands in the warm water. Describe what you feel.

Source: Martha Monahan, NMI; June 2005

**Name of Activity:** Thermic Tablets

**Area:** General: Sensorial

Specific: Thermic

**Materials:** A rectangular box containing six pairs of tablets made of different materials (marble, wood, felt, glass, etc.).

**Aims:** Direct: To encourage discrimination of temperature by refining

the ability to observe, compare, differentiate, reason, decide and solve problems.

Indirect: To match the tablets by comparing temperature.

**Preparation:** Matching activities, introductory thermic activities.

**Age:** Second or third year.

###### Presentation of the Lesson:

1. Bring the box of thermic tablets to the work space. Remove tablets from the box and place them in a mixed pile in front of you.
2. You must close your eyes or use a blindfold to match the tablets by temperature.
3. Take the top tablet in your left hand and feel the temperature for a few seconds.
4. Take the next tablet from the pile in your right hand and feel the temperature.
5. If they are the same, place the matched set in the upper left hand corner. If they are different, place the tablet in your right hand in a discard pile to the right of the pile.
6. Continue testing tablets and discarding them if not a match.
7. After each match, return all the tablets in the discard pile to the main pile.
8. Check matches at the end of the activity.

###### Work of the Teacher:

Points of Emphasis: Handling the tablets as little as possible to

keep the temperature from equalizing sooner.

Language: hot, cold, warm, cool

**Points of Interest:** different textures as well as temperatures.

###### Work of the Child:

Points of Consciousness: “If the tablet is hot, my hand gets hot”. Control of Error: matched pairs

###### Variations:

**Extensions:** Feel other surfaces, such as windows, floors, carpets, etc.

Discussion of temperature and how it affects our lives.

Source: Martha Monahan, NMI; June 2005

Olfactory Sense

**Name of Activity:** Smelling Cylinders

**Area:** General: Sensorial

Specific: Olfactory

**Materials:** Matched pairs of fragrances in bottles, jars, sachets, etc. (Containers should be distinguishable as two separate sets.)

**Aims:** Direct: To encourage discrimination of smell by refining the

ability to observe, compare, differentiate, reason, decide and solve problems.

Indirect: To match the pairs through the sense of smell.

**Preparation:** Matching activities, introductory activities.

**Age:** First Year.

###### Presentation of the Lesson:

1. Bring the box of smelling jars to the table.
2. Take one jar from the left column and undo the lid. Wave the scent toward you and remember the scent. Set the jar down directly in front of you with the lid just resting on top.
3. Take a jar from the right side and follow the same procedure.
4. If they are the same scent, place the matched pair side by side in the top left corner of the table. If they are different, place the discard to the right side of the box.
5. Continue the process of matching, using the jars on the left as the control, remembering to return the discards once a match is found.
6. Check the matches and have child repeat, or return the work.

###### Work of the Teacher:

Points of Emphasis: The method of matching.

Language: The names of the scents. Other language as relates to the olfactory sense.

**Points of Interest:** Method of matching/waving the scent towards

you/different scents.

###### Work of the Child:

Points of Consciousness: “I can match the smell in the jars (bottles,

etc.) to other familiar scents.”

Control of Error: Matched pairs.

**Variations:** Vary the scent in the bottles.

**Extensions:** Have many olfactory activities that isolate one scent (flowers, fruits, spices, etc.).

Match bottles to pictures or objects. Describe what you smell.

Source: Martha Monahan, NMI; August 2003

Gustatory Sense

**Name of Activity:** Tasting Bottles

**Area:** General: Sensorial

Specific: Gustatory

**Materials:** Two distinguishable sets of tasting bottles for matching, in which a variety of flavors, such as: salty, sweet, sour, bitter, etc., are contained.

**Aims:** Direct: To encourage discrimination of taste by refining the

ability to observe, compare, differentiate, reason, decide and solve problems.

Indirect: To find matched pairs through the sense of taste.

**Preparation:** Matching activities, introductory activities of introducing

one smell at a time, introducing fruits, etc.

**Age:** First year

###### Presentation of the Lesson:

1. Bring the box of tasting bottles to the table.
2. Take one bottle from the left column (with subdominant hand) and set on table below tray or box.
3. While firmly holding bottle secure on table, remove lid with other hand and place a small drop of liquid on a spoon or on the curve of your hand between your thumb and index finger
4. Secure lid of bottle and lick hand with drop of liquid.
5. Take a bottle from the right side and follow the same procedure to check of match.
6. If they are the same taste, place the matched pair side by side in the top left corner of the table. If they are different, place the discard to the right side of the box.

7, Continue the process of matching, using the bottles on the left as the control, remembering to return the discards once a match is found.

8. Check the matches and return the work.

**\* Note;** Some teachers include a small glass of water with this activity to cleanse the palette between matches.

Also, it is important to practice this activity to find the most comfortable method of handling the bottles and tasting the liquids to avoid spills and provided the most suitable modeling.

###### Work of the Teacher:

Points of Emphasis: The method of matching.

Language: The names of the flavors (sweet, sour, bitter, etc.)

**Points of Interest:** Experiencing different tastes.

###### Work of the Child:

Points of Consciousness: Food contains a wide variety of flavors. Control of Error: Matched pairs.

**Variations:** Change the flavors in the bottles.

**Extensions:** Introduce many gustatory experiences through exploring cultures of the world.

Source: Martha Monahan, NMI; August 2003

A Sense of Self

\* Original Addition

A Sense of Wonder

\* Original Addition