

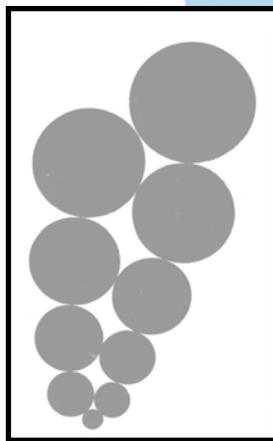
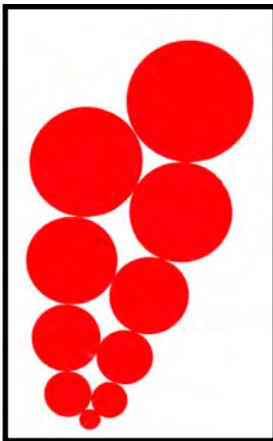
Problem Solving Activities with the Knobless Cylinders

Marc Jensen

This article is an adaptation of a presentation originally created by Bee Pape, looking at extensions of the knobless cylinders that she developed while teaching 3-6 year olds at Casady and at OCU.

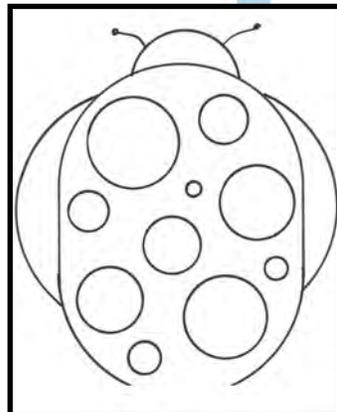
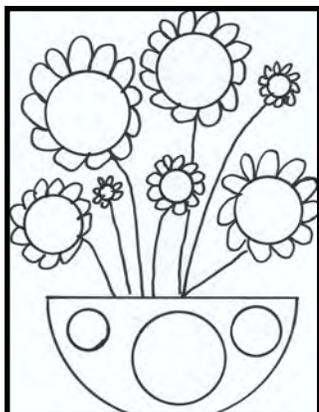
As sensorial materials, the knobless cylinders are designed to lead the child from sensation to ideas, from mere seriation to a logical world. They are a platform for knowledge construction through exploration, imitation, initiation, and pattern completion. It is important to keep in mind when considering extensions of the knobless cylinders they have three independently varying attributes: height, diameter, and color.

When working with open-ended sensorial materials such as these, extensions may be designed that allow children to work on both decoding and encoding of attributes. Decoding activities occur as the child uses pattern materials to recreate a construction. Encoding activities revolve around copying a pattern the child has built with the concrete materials into another medium.



It is possible to create a variety of design works that call for encoding with the knobless cylinders. Some of these are open-ended, and some have only one possible solution. Patterns such as these are true not problem solving activities, only one to one matching. The pattern on the left here calls for matching both color and diameter, only one cylinder matches each circle.

Matching only diameter and not color on the right, many different ways to fill the pattern could present themselves to the child.



Many design works such as these images can also be created around the cylinders, including inviting children to invent their own. These are both open-ended, and could be completed with yellow, green, or red cylinders.



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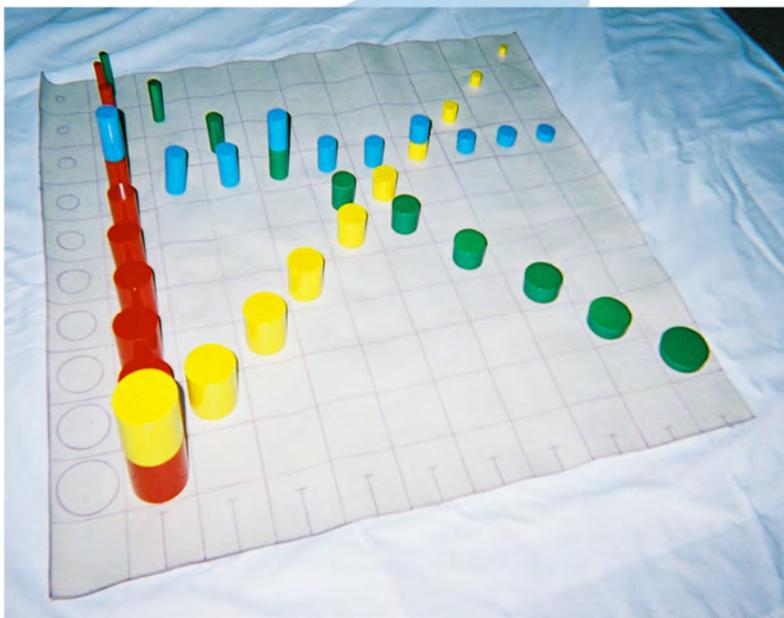
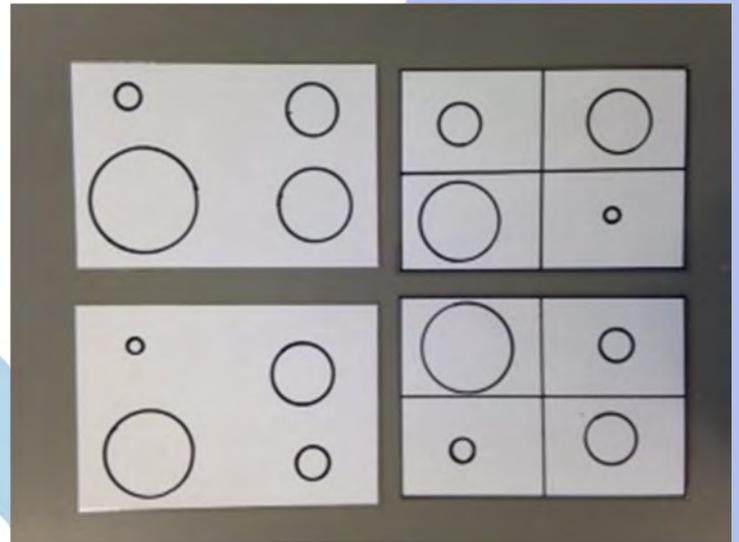
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Problem Solving Activities with the Knobless Cylinders, continued...

Knobless Cylinder Lotto Game

Two versions of knobless cylinder lotto are pictured here, showing sets of lotto cards with or without grid-lines. In both versions, the set of diameters is divided up with the widest possible differences on each card.

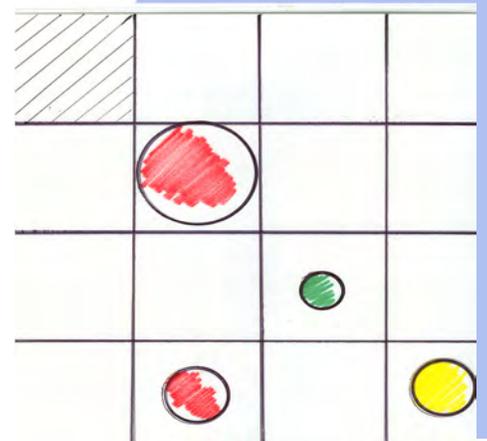
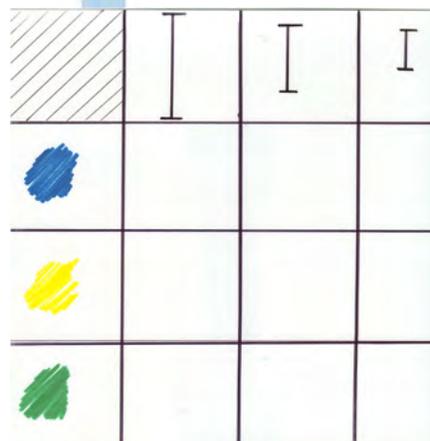
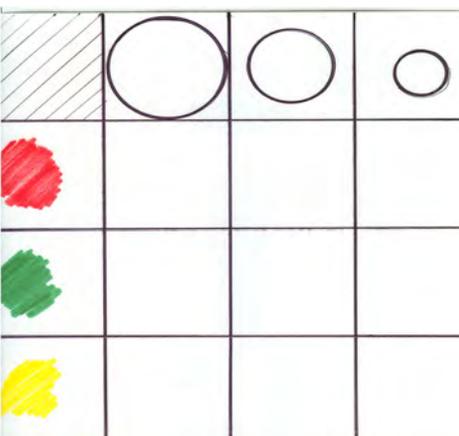
To play this game, all ten cylinders from a set would be placed together into a mystery box. As each child takes a turn, he or she would reach into the box and try to find a cylinder that matches a diameter on his or her card. In this version, two cylinders would remain unused at the end of the game.



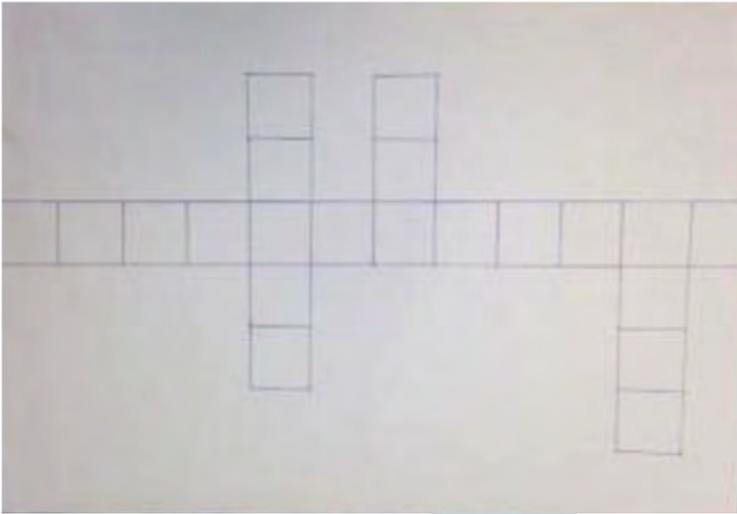
Matrices

By assigning the axes of a matrix to either height, color, or diameter, children can explore the relationship between the sets of cylinders, or use them as an advanced patterning work. The master matrix of height vs. diameter pictured on the left can incorporate together all of the cylinder sets and show their relationship.

Many other matrix designs are possible using two different attributes of the cylinders. A few possibilities are shown below. This could also be set up as an open-ended work with children constructing their own axis guides.



Problem Solving Activities with the Knobless Cylinders, continued...



Knobless Cylinder Dominoes

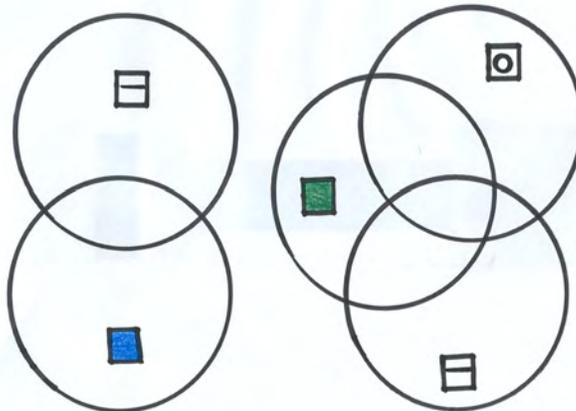
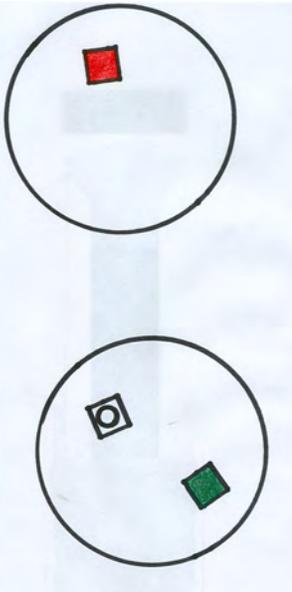
Using dominoes as a model for this activity, participants would only be allowed to play a new cylinder in a square adjacent to another cylinder that matched it either in height, diameter, or color.

A more challenging version of this game could require the players to match *two* attributes in order to play a cylinder.

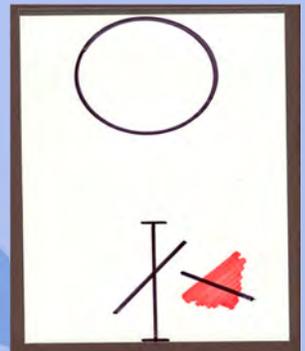
Venn Diagrams

Begin with just one set ring. Exploring only one attribute at a time, place a height card in the ring and make every possible match, then switch to a diameter card and repeat, and then a color card. After this, explore using two cards from different categories simultaneously in the set ring.

Expand this work to use two intersecting set rings with a card from each category in each ring, and then expand again to use three intersecting set rings (six areas total, pictured on lower right), using all three attributes. Given the attributes of the cylinders, have the children predict how many pieces—if any—there will be any of the areas.



“What Am I?” Cards



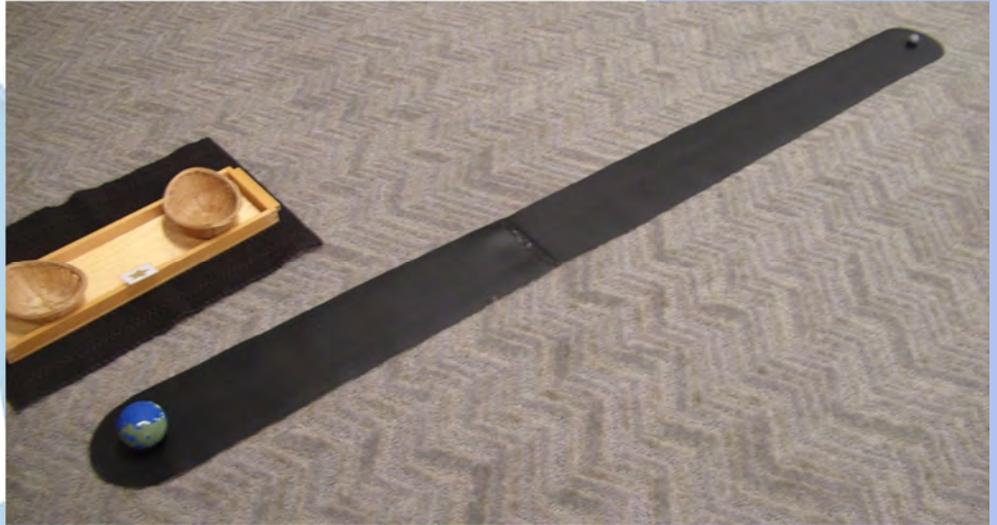
Using positive and/or negative attributes, “What Am I?” cards could be designed to have only one or multiple solutions.

All of these extensions of this simple, classic material fulfill Montessori’s sensorial ideal of leading the child from sensation to ideas, moving from grading and matching to performing logical problem solving.

2015-16 Intern Projects

Marc Jensen—Earth and Moon

This project is a first introduction to planetary science through an exploration of the Earth and Moon. The Moon is something that children are fascinated by at many levels. It is my hope that at a high level, children will take away from this project a better understanding of our place in the universe and a renewed sense of wonder and inquiry about the Moon. This project



introduces Earth/Moon celestial mechanics through concrete, manipulative models, giving language as appropriate. There are a few main ideas that this project is intended to convey:

- The Moon is a rocky planetary body like the Earth, only somewhat smaller.
- The Moon is a natural satellite of the Earth, orbiting our planet at a great distance.
- Moonlight is reflected sunlight. When we see the lighted moon in the sky, we are looking at the day side of the Moon.
- As the Moon orbits the Earth, the amount of its day side that we see changes, producing different visible phases.
- These phases have names and occur in a sequence.

Works included in this project begin with scaled globes of the Earth and Moon, presenting the Moon as a body like the Earth. This relationship is then placed in the context of space, with a second work that models the correct orbital distance, a planetarium work

that models the spinning Earth and orbiting Moon with a light as the sun, and then finally a Moon phase card layout material. In this way, this project uses the Montessori model of starting with the whole system, and then moving in and exploring what we see from Earth and why it appears that way. This project would fit into the larger sequence of Montessori Cosmic Education activities.

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Meya Jiang—Woodwind Instruments

Since children love music, I will use their interests to teach them some music knowledge. In this project, I want the children to know the names of the five instruments in the woodwind family of an orchestra and how they make sounds. After the children know the names and know how the instruments work, I will let them hear the five instruments sound characteristics.

My project contains five main activities: Four Part Cards (Vocabulary cards, written labels with objects), Language Master Cards, Making a Woodwind Instrument



Book, Making an Instrument, and Fill the Staff Up. Fill the Staff Up is a two-person work that provides an opportunity to develop their social ability. The children can also help each other know the instruments better. The four extension activities are Reading Book, Pictures on the walls, Hot Potato with Woodwind Instruments Cards, Inviting a Friend to Play Instruments.



2015-16 Intern Projects

Hyeonsook Moon—Arachnids vs. Insects

My year-long project aims at helping children to familiarize themselves with insects and arachnids by expanding their knowledge about them and improving their observation skills and ability to distinguish insects from arachnids with criteria, such as the number of legs and body parts of insects and arachnids. There are two tests, a pre-test and a post-test, to examine to what extent this project helps the children meet the goals. The main activities are sorting insects and arachnids, using three-part cards to identify the names of common insects and arachnids, using three-part cards for the body parts of insects and arachnids, making a book, and making origami of a ladybug with six legs. Extended activities are reading books about insects and arachnids and drawing them.



Caroline Rong Zang—North America and Asia

I came up with this project because I noticed my case study child was attracted by the world map when he was taking the music class. He is also interested in learning foreign languages: he is able to count from 1- 20 both in French and Chinese; besides this, my area has two children from Asian background families, and another two boys are able to say a few animals' name in Chinese. My children also noticed that my appearance looks different from them. So I thought it would be wonderful if they had experience to know the details of the two continents: North America and Asia.



For this project, I wanted them able to learn the differences between Asia and North America. The works in this project include: 1. food sorting 2. Animal sorting 3. Artifact sorting (Vocabulary words with written labels: 3 part cards) 4. Practical life: sorting by using chopsticks; extensions include book reading and vocabulary writing to include a book about North America and South America. They should be able to sort the foods, animals, and artifacts after giving the lesson. I also wanted to introduce the use of chopsticks for sorting food.

Si Shi—Owls of Oklahoma

I decided to do this project after reading through the data I collected during my observation of the child that I chose in the classroom. During a circle time, he talked about a baby elephant in the zoo that died. I think the child is interested in animals because he was concerned about animals. Moreover, I saw the child liked playing a game about eagles with others on the playground. He pretended to soar like an eagle. During a lunch time, he also talked about birds with another child. I thought I could do my project about birds.



One time, when the teacher introduced some works about owls and constellations at the cabin in Westminster school, he spent a whole work time coloring an owl using different colors. I want to combine all of his interests together. Owls are animals, and they can soar. Consequently, I decided to do a project about owls of Oklahoma.

For this project I want the child to learn the names and some other infor-

mation of six owls in Oklahoma, the life cycle of owls, and the eating habits of owls. I think it is important for the child to know the names of owls so that he can name owls when he sees them in the zoo or other places. I want to introduce owls' eating habits because owls' eating habits are very special because they eat mammals, birds, and other creatures as whole. My project includes four main activities and two extension activities. The four main activities are vocabulary cards with written labels and information about each owl (four part cards), language master, an owl's life cycle making, and the food hunting game. The food hunting game is a two-person game which can help the child become more social. Extension works include reading books about owls in the book area as well as singing songs about owls during circle time. The works help the child follow the procedures, and help him be more independent.