SHAPES WITH A LINE

Piaget reminds us that children must be able to explore a shape with their hands and name it, only then do they understand the concept called "square" (Clements & Sarama, 2009).

Description

Thinking With a Line (TWAL©) was developed by Cathy Weisman Topal to help children develop an understanding of spatial orientation. With line printing, children discover how to create designs, patterns, and complex structures using cardboard rectangles dipped in paint or ink. Line printing uses one of the most basic elements of art, the line. Lines may appear vertical (as you stand), horizontal (as you sleep), or diagonal. Lines help us to understand shapes, designs, letters, and buildings. Lines allow children to identify how things, such as shapes, are constructed.

http://thinkingwithaline.com/books-materials/55-teachers-guide

Our team developed this activity before resources were available on this topic from Topal. Now, she also has ideas about how to use her work with shape.

http://thinkingwithaline.com/getting-started/construct/shapes

In our lesson, children will use line printing to create different geometric shapes. Working with the line printing tools, children directly explore the attributes of different shapes. Through line printing, children are able to communicate ideas and thoughts they may not be able to express verbally or through drawing and writing. Line printing offers a medium for communication while allowing children to develop their fine motor skills. Using the language of lines, children explore geometric shapes in the world around them.

Learning Objective(s)

- Use line vocabulary to describe shapes
- Identify shapes by their line attributes (number, type and angle)
- Creating different shapes using the line printing technique

Tips for DLLs

Books should be read more than once with a different focus each time. It is important to help children make associations explicitly by asking them to recall scenarios, words, concepts that have been previously addressed by other texts or experiences. During the Shapes with a Line activity, relevant pages of the books could be shown to remind children of the shapes and shape properties they talked about.

Literature

Primary Books

Shape Space, by Cathryn Falwell

Other Books

Color Zoo, by Lois Ehlert
Shapes, Shapes, Shapes, by Tana Hoban
So Many Circles, So Many Squares, by Tana Hoban
Mouse Shapes, by Ellen Stoll Walsh
Shapes, by Philip Yenawine

Teacher Primary Books and Websites

Learning and Teaching Early Math: The Learning Trajectories Approach, by Douglas H. Clements and Julie Sarama
Thinking With A Line, by Cathy Weisman Topal
Thinking With a Line http://www.smith.edu/twal/
Wassily Wasilyevich Kandinsky *http://www.wassilykandinsky.net/*

Materials

Shape Sheets	Newspaper for covering tables	Curved Cardboard Pieces
12" x 18" White Construction Paper	Paper Plates	- 3" x 2-½" curve (from masking tape)
9" x 12" Newspaper	Blue Paint	- 1-½" x 2-½" (from toilet paper roll)
12" x 18" Newspaper	3" x 3" Corrugated Cardboard Squares	Found Materials (see below)
18" x 24" Newspaper	1" x 4" Corrugated Cardboard Rectangles	

Found Materials

Masking tape rolls	Small bottle caps	Styrofoam cups
Pencil grips	Spools	Toilet paper rolls
Large bottle caps		

Line Vocabulary (*Adapted from Cathy Weisman Topal, *Thinking With a Line*)

Vertical Line (*Linea Vertical*)	I	Row of Vertical Lines (*Fila de líneas verticals*)	IIIII
Horizontal Line (*Linea Horizontal*)	---	Stacks of Horizontal Lines (*Pila de líneas horizontals*)	--- --- ---
Crossing Lines (*Líneas Cruzadas*)	**+ or X**	Long Lines (*Líneas largas*)	_____
Diagonal Lines (*Linea Diagonal*)	\ /	Short Lines (*Líneas cortas*)	___
Zig Zags	**WWW**	Broken Lines (*Líneas rotas*)	- - - - - -

Descriptive Line Vocabulary (*Adapted from Cathy Weisman Topal, *Thinking With a Line*)

Listed below is a descriptive line vocabulary list. As your children works with lines, they may discover new words to define the different types of lines. As children come up with new words for the lines, add them to the list.

Vertical	**Horizontal**	**Diagonal**
Up and down (*arriba y abajo*)	Sideways (*lateral*)	Downhill (*cuesta abajo*)
Upright (*vertical*)	Flat (*plano*)	Leaning (*inclinado*)
Upstanding (*recto*)	Lying down (*acostado*)	Uphill (*cuesta arriba*)

Preparation

1. Newspapers to cover the table.
2. Prepare a paper plate with a squirt of paint(smooshed) for each child (or per pair of children)
3. Cut out square and rectangle corrugated card board for each child (see instructions above).
4. Newspaper (see above)

for practice work and construction paper (see above) for when children are ready to make final prints.

5. Visuals of different shapes and their names printed
6. Attribute tiles of different shapes

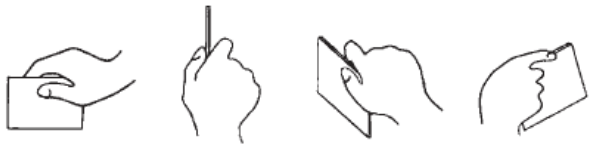

Image from
https://www.kutztown.edu/academics/visual_arts/arted/PDF/Topal%20Line%20Printing.pdf

Procedure

Experience 1:

1. Tell children that they will be using a technique called printing using this square and rectangle cardboard tools to print different lines.
2. Hand each child the precut corrugated cardboard tools. What do they notice about it? Have they seen cardboard before? What is it used for?
3. Have children hold up the line printing tool. Ask them to look through the cardboard. Help children find the corrugated side of the cardboard - this is the side you print with.
4. Demonstrate the line printing rules.
    a. Print with the side you can look through.
    b. Rest cardboard against the tray of ink when not in use.
    c. Put only the painted side in the paint.
    d. Pick up the cardboard from the clean side when you are ready to print.
5. Demonstrate and name the different types of lines.
6. Let children print different lines. Go around and talk to each child about the different lines they are creating. What can they create with lines? Can they make a circle using these tools?

Tips for DLLs

Strong supports of vocabulary introduction incorporate use of words that are not only associated to the topic of study, but also given that these words are nuanced versions of each other, distinctions will be important to make clear through prepared pictures or examples. Use of the words must be weaved through other activities and routines as often as possible (e.g., during outside time "See the stairs for the slide are up and down and the teeter totter is sideways). Also important is to intentionally use specific words to both name and describe materials as they are used.

Experience 2:

1. Ask the children to think about shapes they know.
2. Ask children to look around their environment - on the floor, walls, and on one another for a square.
3. Provide visuals of squares or square attribute tiles (enough for each child to look at or touch)
4. Ask children to share what they notice about the square.
5. Ask children how they think they would make a square.

6. With a square in front of you, review the square's attributes with the children
    a. Squares are made from four straight lines, two horizontal lines and two vertical lines
    b. All the lines are the same length or equal.
    c. Squares have four right angles.
    d. Squares are connected at the corners.
7. You can also demonstrate the attributes while printing one
8. Tell the children they will be making squares using the line printing they used previously.
9. Review and dip cardboard in paint, line print on paper. (This process is easier when children stand as they can apply even pressure more easily.)
10. Remind children to press firmly.
11. Once the children have printed, lift, and then repeat until the square is created. Repeat!
12. As children line print, ask them to think about the square.
    - What types of lines (see Line and Descriptive Line Vocabulary above) are needed for the square? *Curvy or straight?*
    - How many lines are needed to make each square?
    - How would you connect different lines to make square?
    - Once children have created squares with support using the support sheets, have them create squares without support.
    - As their confidence builds and they have success making squares without support, ask them to think about different sizes of squares. How would you make a big square? How would you make a small square?

Lesson Extensions

1. Throughout the week, have the children practice making different kinds of shapes. By spreading out the experiences over time, children will develop a deeper understanding for the shape 'concepts' they are exploring. Following the Procedure listed above, have the children explore: Rectangles, Rhombuses, Triangles.
2. Once the children have explored shapes using straight lines, begin exploring shapes with curvy lines including *circles* and *semi-circles*. Offer children a challenge.
    a. Ask children to think about *circles*.
    b. How would they make circles with line printing tools?
    c. If not, what would they use to make circles? Provide children with different 'Found Materials' listed above to make circle shapes. Allow children time to test their ideas.
    d. Once children have made circles, present another challenge. How would they make semi-circles?
3. Take a Shape Walk Outside. Have the children look for and name different shapes in their neighborhood.
4. Take a Shape Walk in Art. Invite children to join you at the Art Center. Have children look for and identify different shapes in various art works. Consider using Philip Yenawine's *Shapes,* or artwork from the Internet.

Tips for DLLs

As children begin to make lines, teachers should appropriately initiate conversations with individual DLL children in English focused on "here and now." (e.g., I am dipping my cardboard in the ink and pressing it on the page. See? Now there is a line."

5. Introduce 'Found Materials,' one at a time, allowing children time to understand the different opportunities for shape creation each presents.
6. Invite the children to practice making Letter Shapes at the Writing Center.

Straight Letters (A, E, F, H, I, K, L, M, N, T, V, W, X, Y, Z) using line printing.

Preparation
1. Lay newspaper on the table.
2. Squirt paint on a paper plate, smoosh.
3. Place line printing tools on the table.
4. Review Straight Letters: A, E, F, H, I, K, L, M, N, T, V, W, X, Y, Z

Procedure
1. Standing up, ask children to start with Straight Letter A (or whatever Straight Letters you might be focusing on in your curriculum), progressing to other Straight Letters as they master the last.
2. Dip cardboard in paint, line print on newspaper.
3. Remind children to think about their Straight Letters as they line print.
4. Once the children have mastered making Straight Letter shapes, move onto Curvy Letter shapes.

Tips for DLLs

During group learning experiences, the teacher should ask questions that are adapted to individual DLL children's level of English acquisition keeping in mind that while open-ended questions and description type questions are good for some, other more close-ended questions may be better for less verbal children. Providing language to support children's responses is a good strategy at first.

Curvy Letters (B, C, D, G, J, O, P, Q, R, S, U) using line printing.

Preparation
1. Lay newspaper on the table.
2. Squirt paint on a paper plate, smoosh.
3. Place line printing tools on the table.
4. Review Curvy Letters: B, C, D, G, J, O, P, Q, R, S, U

Procedure
1. Standing up, ask children to start with Curvy Letter B (or whatever curvy letters you might be focusing on in your curriculum), progressing to the other Curvy Letters as they master the last.
2. Dip cardboard in paint, line print on newspaper.
3. Remind children to think about their Curvy Letters as they line print.

Check ✓ for Understanding - *Show Me!*

- ☐ Do children know the difference between horizontal and vertical lines? TO *CHECK – Say: "*Point to a vertical line. Now, point to a horizontal line."
- ☐ Do children understand the properties of basic 2D shapes? TO *CHECK – Say: "*Are all four lines of this square the same size? Are all the lines connected at corners?"

Teacher Reflection Questions

1. How does line printing promote concept and skill development, specifically, geometrical thinking and spatial sense? *(Possible responses: the activities draw attention to the properties of the shapes, such as how many sides and corners each shape has, and that the sides need to be touching at the corners)*

2. How does working with line printing promote the development of language and literacy skills for all learners? *(Possible responses: the active, hands-on exploration can engage children in valuable geometry work at many levels of English language proficiency. It does not necessarily require children to give verbal responses if they are not ready, but it can be a source of rich language for children who are ready to describe their actions and the pictures they create using the vocabulary described above.)*