

Geometry and Tactile Graphics for Students in Grades 3 to 8

Lesson 5: Teaching Your Student to Create Their Own Drawings



Objectives

Participants will be able to:

1. State why it is important for a student to be able to create their own drawings.
2. Name a variety of tools a student can use to create their own drawings.
3. Identify multiple ways a student can create their own drawings.

The Importance of Drawing

- Part of learning to read tactile graphics involves students creating their own tactile graphics, not just reading what others create.
 - Drawing geometric shapes
 - Drawing processes or stages
 - Producing or modifying drawings and diagrams

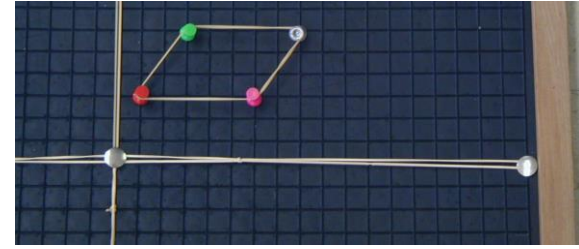
Beginning Tactile Production Skills

- Trace inside stencils on a Draftsman Board, TactileDoodle, or inTACT Sketchpad using special film
- Peel and stick textures such as foam shapes or Graph Benders onto paper to form pictures
- Use magnetic shapes or those from the Wheatley board to make pictures on a magnetic sheet or Velcro board
- Create pictures on the braillewriter
- Use manipulatives
- Graph using grid paper along with tactile dots

As the Professional, You're the Guide, not the Director

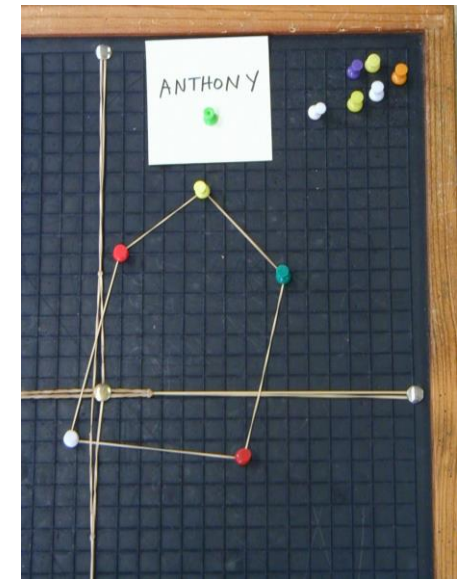
- There are multiple tools students can use to represent any of the concepts addressed in this lesson.
- Students need to have materials available and organized in a way that makes sense to them.
- Knowing what supplies the student has available will help you guide the student in making choices.
- Creativity on your students' part is important.
- Students need to recognize their own preferences.
- Students need to learn to make their own choices to maximize clarity and efficiency.

Example: How to Draw 2-D Shapes



Student Drawing:

- Push pins placed in the corner of board for easy access and placement on the Graphic Aid for Mathematics
- Student uses rubber bands to connect push pins in order to make shapes.
- Student can divide shapes by using additional rubber bands to connect non-adjacent points.
- Student can place a card with the problem number in print and braille by the problem and take a picture to send to turn into the teacher.

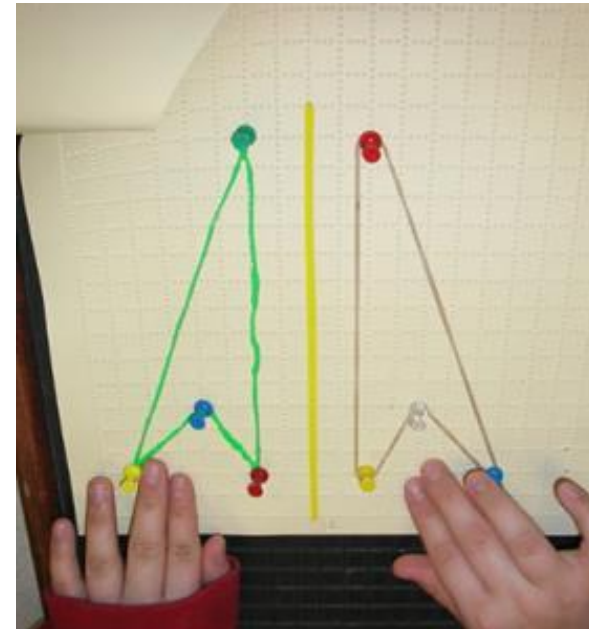


Example: How to Draw Reflections

A reflection is like a flip over a line.

Student Drawing:

- The student was given the drawing on the left made with puff paint and push pins.
- The student counted the number of squares from each push pin to the line and placed a new push pin the same distance on the other side of the line.
- The student connected the push pins with a rubber band to create the reflected shape.

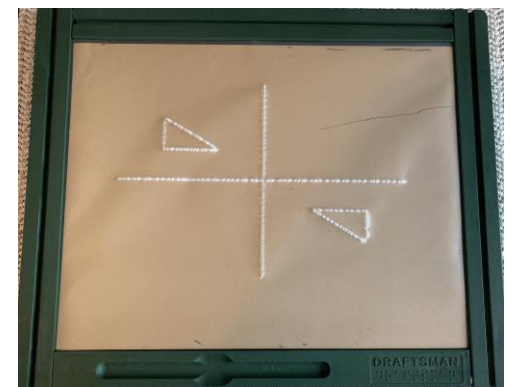
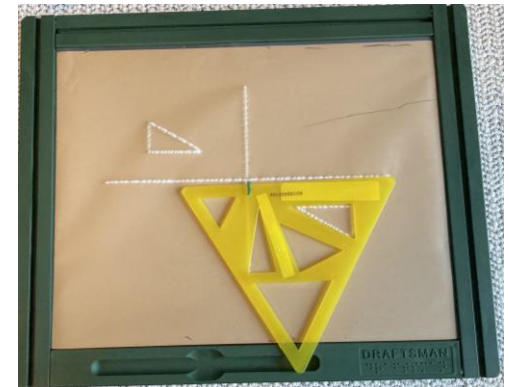


Example: How to Draw Rotations

A rotation is like a turn.

Student Drawing:

- Student drew the axes on the drawing board with a straightedge.
- Student used a Wikki Stix to mark on the stencil the location of the origin.
- Student drew the first triangle in the 2nd quadrant.
- Student rotated the stencil and made sure the Wikki Stix was still at the origin.
- Student drew the rotated triangle in the 4th quadrant.



Example: How to Draw Translations

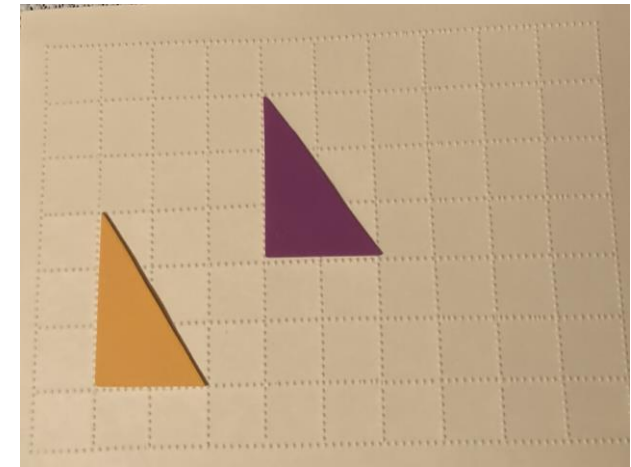
A translation is like a slide or shift.

Student Drawing Method 1 (specific):

- Teacher placed a foam triangle on graph paper.
- Student took a second foam triangle the same size and shifted it 3 to the right and two up and stuck it onto the graph paper.

Student Drawing Method 2 (general):

- Student used a cookie cutter to trace a shape of a heart on a drawing board.
- Student shifted the cookie cutter right and then down and traced it again on the drawing board to show the overall concept of a translation.

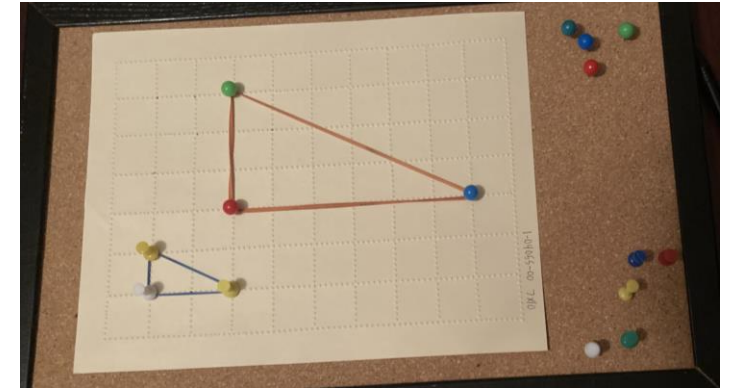


Example: How to Draw Dilations

Dilation is when a shape is magnified or reduced.

Student Drawing:

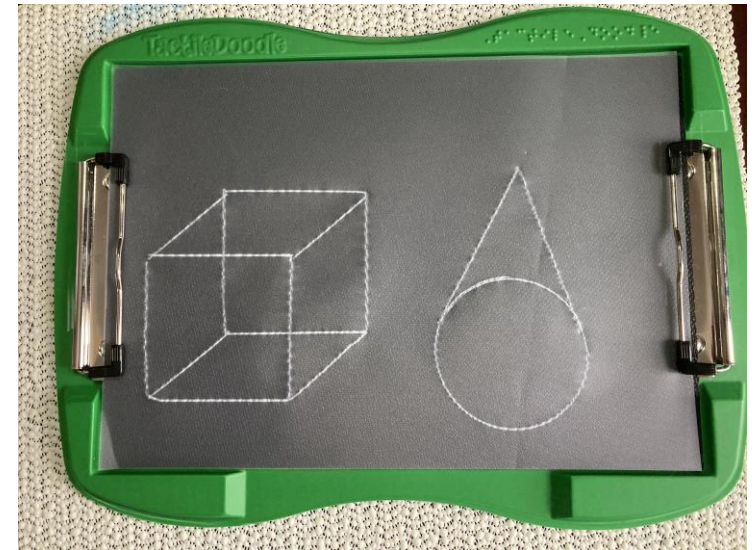
- Student used a corkboard with tactile graph paper and one type of push pin to graph a triangle.
- Student found the coordinates of each point and multiplied them by 3 and then graphed a new point at those coordinates with a second type of push pin.
- Student used rubber bands to form the triangles.



Example: How to Draw 3-D Shapes

Student Drawing:

- Cube: draw two overlapping squares and then connect the corners.
- Pyramid: draw a shape and then connect all vertices to the same point above the shape.
- Cone: draw a circle and then connect the left and right side of the circle to a point above the circle.
- Cylinder: draw 2 circles and connect the sides.



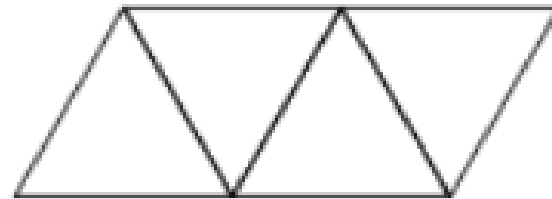
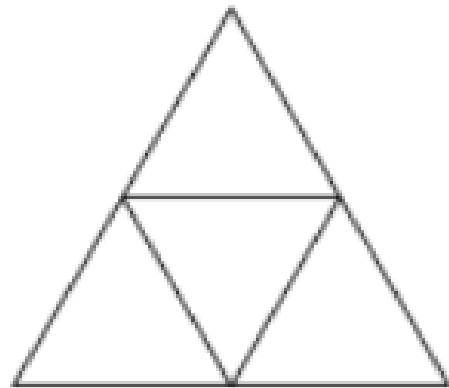
Example: How to Represent Platonic Solids

- Know Platonic Solids!
 - Tetrahedron (4 triangular faces)
 - Cube (6 square faces)
 - Octahedron (8 triangular faces)
 - Dodecahedron (12 pentagonal faces)
 - Icosahedron (20 triangular faces)
- When students “draw” these solids using Geometro pieces, they need the “large” set.
- Mini and medium sets often do not have enough shapes for students who need to “draw”.



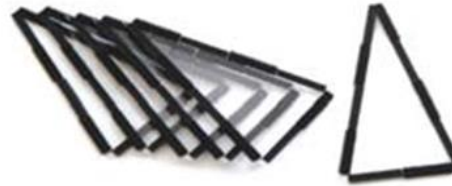
Example: Representing Nets of Pyramids and Prisms

- Optional materials for purchase: Hands-on System for Learning Three-Dimensional Geometry www.geometro.net
- There is more than one way to create a net.



There is More to Geometro: Pyramids and Prisms Expanded

- Isoceles Triangles
- Rectangles
- Octagons
- Decagons

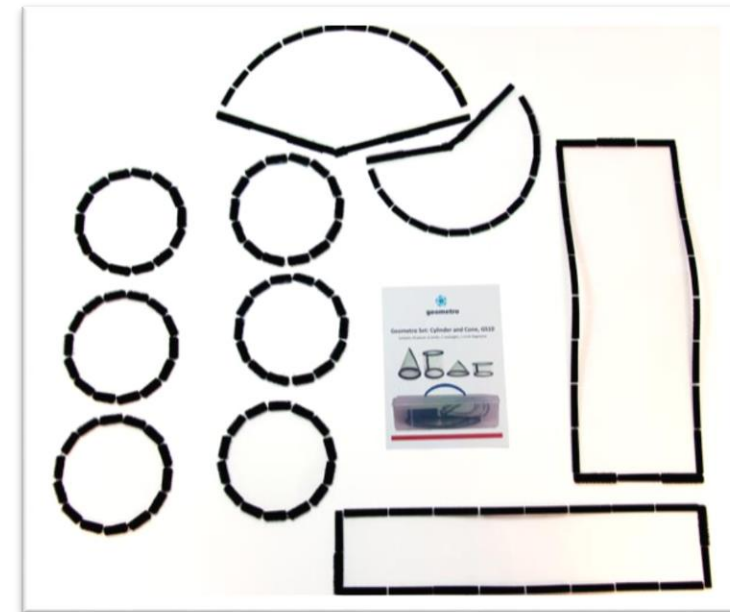


Order these extra shapes
from APH – each is a
separate product.

Example: Geometro GS10 Cylinder and Cone from 2D to 3D

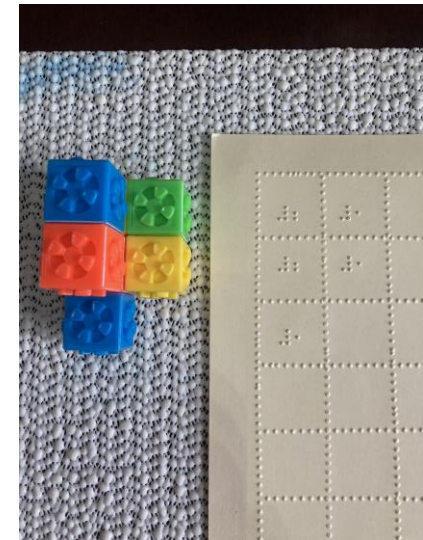
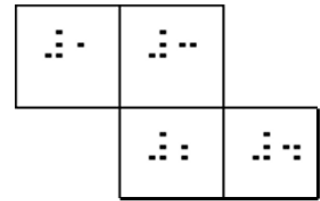
- Provides students with the following to form two cylinders and two cones having the same base, but different heights.

- Six circles
- Two rectangles
- Two circle sectors



Example: Drawing 3-D Figures and Mat Plans

- Mat Plan – top view of a solid, with the number of cubes appearing in each vertical column displayed in the corresponding box.
- Student uses Omnifix cubes to create the figure in the mat plan
- Student uses 1" graph paper and the braillewriter to make their own mat plan



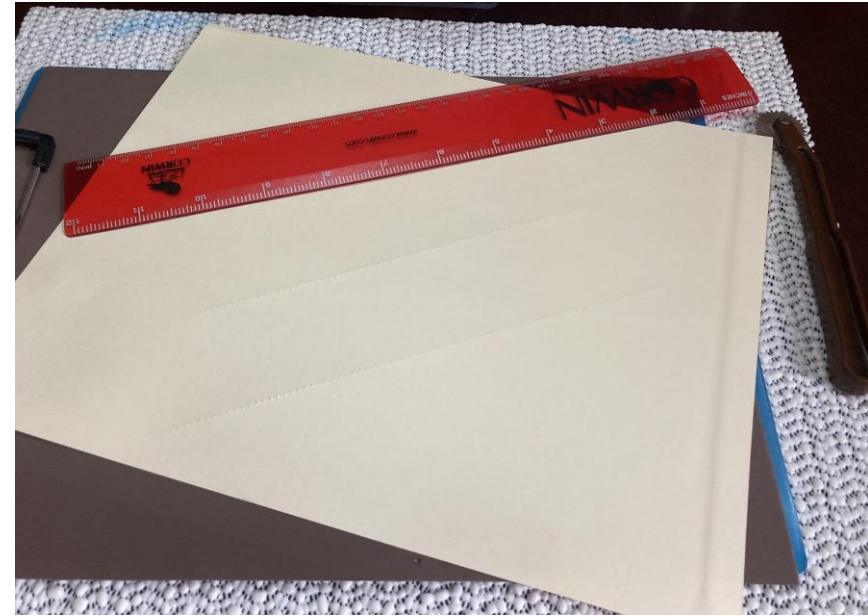
Example: Drawing Orthographic Views

- Orthographic views
 - Top view
 - Bottom view
 - Side view
- StackUps Kit includes:
 - Velcro cubes
 - Mat plan cards
 - 3-D figure cards
 - Grids and Velcro squares for orthographic views



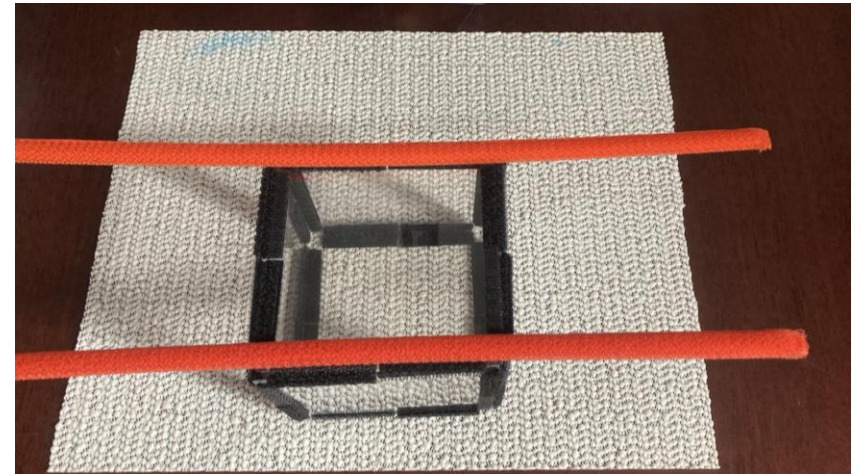
Example: Drawing Parallel and Perpendicular Lines in 2-D ¹⁸

- Student Drawing:
 - Student uses a piece of braille paper on top of a foam sheet on a clipboard.
 - The student uses a sewing wheel on each side of a ruler to create parallel lines on the braille paper.



Example: Drawing Parallel and Perpendicular Lines in 3-D

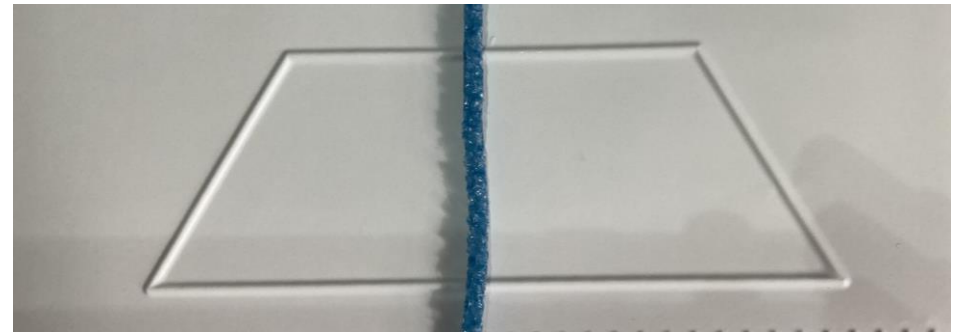
- Student Drawing:
 - The student creates a 3-D shape using the Geometro Velcro Shapes.
 - The student uses the hook material rods (ordered separate) to mark the edges that are parallel or perpendicular.



Example: Drawing Lines of Symmetry

Student drawing:

- Student uses the already created tactual shape.
- The student uses the line from the Graph Benders set to create the line of symmetry on that shape.



Example: Dividing a Segment in Half

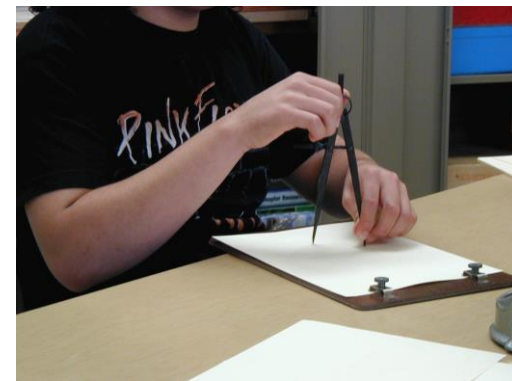
Student drawing:

- Student places a piece of paper on the rubber pad.
- Student uses a sewing wheel and ruler to create a line segment.
- Student uses the tactile compass for math and art to divide the segment into two equal parts, or bisect, the segment.



Compasses Students May Have Access To

- There are rubber tip compasses and compasses with a wheel.
 - Rubber tip compass (currently not available for purchase).
 - Rubber tip compass is more like compass peers use.
 - Student needs to learn to put pressure on both the point and the part they are drawing with.
 - Beam compass (must put a rubber mat under it)
- Students need to practice with a compass before they must use it in class.



Example: Drawing an Angle with a Specific Measure

Student drawing:

- Student finds the measure of the angle using the tactile dots on the protractor and places the wand pointing towards that measure.
- Student draws the angle using the blue wand part of protractor and the bottom of the protractor to create the angle.
- Student can use the protractor to create acute, right, and obtuse angles.

