Tactile and Advanced Computer Graphics Module 1

An Introduction to Tactile Graphics
# Introduction to Tactile Graphics

## Summary

**Goals:**
Transcribers-in-training will understand the purpose and significance of tactile graphics, as well as experiment with and utilize a variety of materials to achieve the best quality for reproduction on the thermoform machine.

**SMART Objectives:** *Specific, Measurable, Achievable, Realistic, and Time-sensitive*

By the end of this module, students should be able to:

GD1.1: Define a “tactile graphic” and be able to emphasize the importance of graphics in the blind community.

GD1.2: Identify the equipment used in creating collage and types of collage materials: those provided and others in the immediate environment.

GD1.3: Create basic shapes and images using a variety of methods.

GD1.4: Evaluate and manipulate a graphic based upon review of a reproduced thermoform copy.

| Instructor(s): | Braille Instructor  
|               | Tactile Graphics Instructor |
| Delivery Method(s): | Lecture  
|                   | Experiential Activities |
| Length: | 6-6.5 hours |

**Any Applicable Business and/or Soft Skills?**
Adaptability, creativity, resourcefulness.

**Corresponding LOC Lesson #**

Graphic Design Module 1-1
Title of Module: *Introduction to Tactile Graphics*

The intent of this module is to establish the definition of a tactile graphic, as well as emphasize the use and importance of tactile graphics within the blind community. Transcribers-in-training will participate in creating simple collage graphics to become familiar with the materials used and the process, and then analyze and improve tactile graphics after learning to make reproductions with a thermoform machine.

**Agenda – topics to be covered in the module and length of each item**

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<th>Topic: Tactile Graphics</th>
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<td>B. An Introduction to Points, Lines, and Textures</td>
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<td>D. What is a Thermoform Machine?</td>
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**Materials & Supplies – items needed in order to carry out the agenda and classroom activities**

1. Tactile samples
2. Pens, pencils, erasers, scissors
3. Braille paper (100#, 11.5 x 11)
4. Carbon paper
5. APH Tactile Graphics Kits (point equipment, line equipment, texture [pattern] plates, rubber pad, ruler, slate and stylus, braille eraser)
6. Strips and sheets of plastic, cardstock, cloth, manila strips and plastic strips
7. Color code labels for layering
8. String in different varieties and grades (candlewick, yarn, twill, kite string, etc.)
9. Elmer’s glue, glue pen, glue tray
10. Glitter puff paint
11. Grid tape
12. Thermoform samples
13. Thermoform paper (Brailon)
14. Thermoform machine
16. Handouts: Preparing String with a Glue Wash (1.B.2), Making a Mirror Image and Using the Spur Wheel to Create a Raised-Line Drawing (1.C.1), Using Prepared String to Create a Raised-Line Drawing (1.C.4), Using Other Materials to Create an Image (1.C.6), Square (1.C.7), Triangle (1.C.8), Circle (1.C.9), and Fish (1.C.10), Thermoform Machine (1.D.1)

NOTE: Most of the collage items on the materials list can be found in your local arts and crafts, hardware, office supply, or even drug store.

Classroom Preparation – steps to follow when setting up the learning environment

1. Set up workspace for hands-on training and individual exploration.
2. Prepare videos for viewing.
3. Set up thermoform machine for lecture, training, and reproduction.
Curriculum Content

A. What Are Tactile Graphics and Why Are They Important? (1 hour)

Objective GD1.1: Define a “tactile graphic” and be able to emphasize the importance of graphics in the blind community.

PREINSTRUCTIONAL ACTIVITIES

Prompt transcribers-in-training to view the workspace and take stock of materials and equipment located there. They will use this space to create tactile graphics.

CONTENT PRESENTATION AND LEARNER PARTICIPATION

The following provides some potential introductory remarks as well as relevant context that may be useful for the instructor.

What are tactile graphics and why are they important?

As you have already learned, in the world of a blind student, studying and exploration are informed in large part by the sense of touch. Little fingers learn to recognize little dots, braille dots, which become symbols for letters, which make whole words. And then shapes change to contractions, which eventually form larger words and sentences, and on and on!

As you know from your own experience, a picture is worth a thousand words. Images and drawings are just another way to understand ideas. While a sighted student can easily identify the location and shape of Florida on a map of the United States, the task could be much more difficult for a blind student. Perhaps he or she has heard that it’s called the east coast “pan handle”, and so would identify with a pan handle shape. However, the student might not have enough information to fully learn the location and shape of Florida in relation to the rest of the country or the Atlantic Ocean. The purpose of tactile graphics is to give blind people the opportunity to see and learn as sighted people do. A transcriber could create a tactile graphic of the east coast of the United States, and a blind student would be able to explore the map with his or her fingers, finding not only Florida, but also a compass rose indicating the direction North, the latitude and longitude of Florida’s state capital, Tallahassee, in addition to neighboring states Alabama and Georgia, as well as the Gulf of Mexico!

As outlined in the BANA Guidelines and Standards for Tactile Graphics, a tactile graphic is not simply a raised print image. Tactile graphics are transformed representations of
images, adapted to provide information through the sense of touch. For the sighted, an enormous amount of information is absorbed just by looking around. Tactile graphics assist in study and experiencing the world! They are best used in cooperation with other methods of learning, including braille text or audio description.

**ACTIVITY:** Hand samples of tactile graphic masters and thermoformed reproductions to students. View and discuss tactile graphic samples (also referred to as “tactiles” or “graphics” in this text). As a group, ask transcribers-in-training to determine what the images are, what materials are used, and the information a blind person might gain from each.

**ASSESSMENT**

Review the definition and importance of

**tactile graphic:** a transformed representation of a print image, adapted to provide information through touch. Tactile Graphics enhance learning, and allow people with visual impairments to learn as sighted people do.

B. An Introduction to Points, Lines, and Textures (1.5-2 hours)

Objective GD1.2: Identify the equipment used in creating collage and types of collage materials: those provided and others in the immediate environment.

**PREINSTRUCTIONAL ACTIVITIES**

Ask transcribers-in-training to open the APH Tactile Graphics Kit and to spread the equipment out within the workspace. Prepare the handout, **Preparing String with a Glue Wash (1.B.2)**, and the videos, **Tools for Creating Tactile Graphics (1.B.1)**, and **Preparing String with a Glue Wash (1.B.3)**.

**CONTENT PRESENTATION AND LEARNER PARTICIPATION**

As a class, view the video, **Tools for Creating Tactile Graphics (1.B.1)**. Equipment and materials should be studied and shown to class as the instructor discusses each item. Stress the importance of careful handling, as many of the pieces are small or sharp.

**An Introduction to Points, Lines, and Textures**

There are three primary drawing techniques used within tactile graphics: points, lines, and textures. **Points** are used to indicate the location of specific objects, for example, a point on a number line or a state capital on a map. Larger points (small objects) may
also be used for tactile graphics when counting is involved. **Lines** are used to indicate boundaries or lines to be followed, for example, the perimeter of a circle, or a river and country boundary. **Textures** designate a specific area of space, for example, layers of the earth’s composition, or fluid within a flask.

Each transcriber-in-training is provided with an individual APH Tactile Graphics Kit. The equipment in the kit is necessary for creating tactile graphics and is to be **handled with extreme care**. There is a variety of equipment which will be useful as you begin to create tactile graphics.

**Points and Objects**

There are seven tongs with point symbols contained in your kit. To use them, place your rubber mat on a hard, flat surface. Insert a sheet of paper between the tongs, move the symbol to the location you’d like to emboss, and press down firmly on the point symbol once with the larger end of the wooden hammer (also included). This kit was originally designed to create foil masters, so take care when embossing. Pressing the tongs with too much force, or more than once, may tear the paper.

**Other Materials**

There are hundreds of other options for creating point materials, many of which you can find in the aisle of an arts and crafts store. You can stack small color coding labels to form a dot on a page, or use glitter puff paint to create large raised dots (coat with a glue wash, or equal parts mix of water and glue, to prevent the thermoform paper from sticking to puff paint). Plastics, cardstock, and other items from around the home can be used to create solid objects on a tactile graphic. Later in this module, you will learn to test material effectiveness by evaluating thermoformed copies of your tactile graphic **masters** (the original set of collage graphics from which copies will be produced). Review the materials for point making. What could each point be used to represent?

**Lines**

The APH Tactile Graphics kit contains three pieces of equipment for creating lines. There are two types of line equipment: stationary line equipment, and wheels, or spur wheels. Place the rubber mat on a hard, flat surface. Place the paper on top, hold the tool like a writing utensil, and use it to draw into the paper. Be sure to apply enough pressure to make an indentation in the paper, but not too much to cause a tear. For the purpose of this course, you will not be required to use the vent tool or line sharpening tool as explained in the **APH Tactile Graphics Kit Guidebook**.
**ACTIVITY:** Ask the transcribers-in-training to prepare string for use on a tactile graphic. Distribute handout, *Preparing String with a Glue Wash (1.B.2)* and show the video, *Preparing String with a Glue Wash (1.B.3)*.

*Textures and Patterns*

Three textured plates are included in your tactile graphics kit. To use these, place the rubber mat on a hard flat surface. Place a plate, raised-dot side up, and then position your braille paper over the plate. Use the wooden hammer to push down on areas where you’d like to include the texture. You may have to press down several times to produce a readable pattern.

There are many other materials that can be used to create texture and patterns. For example, grid tape will create a hard grid of easily identifiable squares. Kitchen handy wipes have a distinct pattern that stands out when thermoformed. Browse through the materials provided. What other items would produce textures or patterns for a tactile graphic?

**ASSESSMENT**

Review each of the mark-making tools: points, lines, and textures. Ask the transcribers-in-training to provide the definition of a tactile graphic master. How is a master different from a copy?

Transcribers-in-training will utilize the string created later in this module, at which point they will determine the effectiveness of each string. Brainstorm other types of lines, points, and textures. What household or everyday items could be used as tactile pieces? Ask students to look around the room to find other potential materials.

C. How Can I Create This? Working Independently on Collage (2 hours)

Objective GD1.3: Create basic shapes and images using a variety of methods.

**CONTENT PRESENTATION AND LEARNER PARTICIPATION**

Distribute the handout *Making a Mirror Image and Using the Spur Wheel to Create a Raised-Line Drawing (1.C.1)*, review the instructions, and show the videos *Using Carbon Paper to Make a Mirror Image (1.C.2)* and *Using the Spur Wheel to Create a Raised-Line Drawing (1.C.3)*.
Distribute the handout Using Prepared String to Create a Raised-Line Drawing (1.C.4) and explain that the video, Laying Prepared String to Create a Raised-Line Drawing (1.C.5) demonstrates an alternative method of using string immediately following the glue wash. Finally, distribute the handouts Using Other Materials to Create an Image (1.C.6), Square (1.C.7), Triangle (1.C.8), Circle (1.C.9), and Fish (1.C.10).

How can I create this? Working independently on collage.

Now that you have been able to view and feel the materials a transcriber would use to create tactile graphics, you will try to create your own! You will be provided with a set of four handouts, each with a different image. Use a spur wheel, prepared string, plastic, cardstock, cloth, and other materials provides to create each image on a piece of braille paper. For a more complicated image, think about using combinations of materials. With this hands-on activity, you will learn to master creating collage graphics with equipment and a variety of materials. Be sure to follow instructions and handle equipment with care.

**ACTIVITY**: Transcribers-in-training should use this information and the image handouts provided by this module to complete the exercises. The order of tactile completion should be as follows: Square (1.C.7), Triangle (1.C.8), Circle (1.C.9), and Fish (1.C.10).

**ASSESSMENT**

The instructor should review and define a mirror image in regard to tactile graphics.

Gather the group for discussion. Ask questions: How did transcribers-in-training find the exercises? Which was the easiest method? Conversely which was the most difficult? Were certain methods more effective for certain images?

Remind transcribers-in-training that they can opt for multiple methods on one drawing, but a transcriber must always keep the reader in mind. Someone reading with the hands will have a more difficult time deciphering lines and textures than someone who reads with the eyes. Transcribers-in-training should display work to peers and the group should walk around and "look" at images using fingers.

**D. What is a Thermoform Machine?** (1.5 hours)
Objective GD1.4: Evaluate and manipulate a graphic based upon review of a reproduced thermoform copy.

PREINSTRUCTIONAL ACTIVITIES

This lesson involves instruction on the thermoform machine. Ask transcribers-in-training to take out the best tactile graphic they've created, as they will be reproduced using the thermoform machine. Prepare the thermoform machine for use (requires about 20 minutes to heat sufficiently).

CONTENT PRESENTATION AND LEARNER PARTICIPATION

Distribute and review the handout Thermoform Machine (1.D.1). Ask the class to gather around the machine as each mechanism is explained. Review the content with transcribers-in-training and thermoform a sample graphic.

What is a Thermoform Machine?

The thermoform machine is used for easy reproduction of tactile graphics. When you create a tactile master for a geometry textbook, for example, you may be asked to send the master set to your contracting agency for future use. A thermoformed copy of the master tactile will be inserted into the final book a blind reader will receive. Many braille production agencies will produce thermoformed copies of graphics for many years.

Take a look at the thermoform machine handout provided. There are a few components to the thermoform machine: heating element (box), frame and clamp, vented suction grating, time and heat control dials, and pump reset button. You should turn on the thermoform machine and allow it to warm up for 10-15 minutes before each use.

Here's how the machine works: Place your master collage tactile graphic face up on the vented suction grating so it fits nicely within the rubber border (try it with the left side of the tactile closest to you). Place a piece of plastic thermoform paper, Brailon, on top of the graphic, sheen side down. Pull down the frame and secure the clamp. Take a look; this creates a rubber seal around the edges of your graphic. Any collage or braille that falls under this seal will not thermoform.

The standard settings for the thermoform machine time and heat are marked with a raised dot on each dial. Move the time and heat control dials only if necessary. Certain graphics and materials will need time and head adjustment. You'll discover this through trial and error.

Pull the heating element box forward as far as possible and hold it in place. Be sure to grab using the handle; the box is very hot! After the heat time elapses (a standard of
5 seconds), you will hear the suction pump activate. Essentially, the heat molds the plastic over your collage and the suction pulls and seals the plastic around the raised image. Push back the heat box and shut off the pump with the pump reset button. Turn off the thermoform machine when you’ve finished a project.

The thermoforming process is valuable for creating quick and readable copies of tactile graphics. However, you should remember that whatever you place on your collage will appear on the final thermoformed copy (or won’t appear, depending on your work!). Extra pieces, excess glue, jagged edges and stray lines are some mistakes to avoid. Also, you’ll be able to see and feel when lines are not thick enough or prominent. All of these things affect the readability of a graphic, and can be distracting or provide incorrect information to a braille reader. Imagine looking at a thermometer on a piece of paper. There are two lines pointing to two different degrees of Fahrenheit. How will you know which is the correct line or the correct temperature? Keep your end user, whether it is a young child or student or adult, in mind when reviewing your thermoformed copies. Tactile graphics should contain all the information a braille reader needs without any extras!

**ACTIVITY:** Practice thermoforming and evaluating graphics. Sit with another transcriber-in-training and close your eyes while reading each tactile thermoform copy with your fingers. Can you feel everything on the page? Are there lines or textures that are too similar? Give your peer a review of their graphics. Discuss recommendations for improving the graphics.

Some problems you might encounter include:

- Excessive glue
- String lines that do not close end-to-end
- Adhesive strips which are too short and create gaps, or too long which overlap
- Spur wheeled lines are too light, or do not match the outline

**A Note on Quality:** Production of archival quality tactile graphics is essential to becoming a successful tactilist and transcriber. The quality of your work should not only reflect careful consideration of the end user, in many cases, a young child trying to learn, but also have the capability to be stored for future use. Many braille production agencies reproduce large quantities of tactile graphics using thermoform machines and are required to store them for long periods of time. When a graphic is “archival,” a transcriber-in-training must understand that all collage should be adhered firmly onto heavy grade paper and graphics should not be so delicate that they cannot be handled.
ASSESSMENT

Review the parts of the thermoform machine and its function. Define the following:

**readability**: the information provided or not provided by a graphic for understanding the material.

**end user**: the person to whom the graphic will mean something and provide information (from young child to older adult).

**archival**: the ability for a graphic to be stored for many years without losing tactile pieces. Pieces should adhere securely to heavy grade paper and not be too delicate.

After each transcriber-in-training has thermoformed his/her tactile graphic and reviewed with one peer, the instructor should ask the group for suggestions on how to fix problems addressed by the handout (e.g. glue spots, short strings, lines that do not appear embossed fully enough). Feedback in a group setting is essential to perfecting collage techniques.
Tactile and Advanced Computer Graphics Module 1

An Introduction to Tactile Graphics Handouts
Preparing String with a Glue Wash (1.B.2)

Materials needed:

- string (a standard collage string)
- Elmer's glue
- a little bit of water
- glue tray
- paper towel

Different sizes and textures of string are frequently used for line making in the creation of tactile graphics. One of the problems with using string is that it is easily dislodged from the paper after multiple thermoform reproductions. In this activity, you will learn to prepare the string so that it adheres securely to the tactile graphic master and retains durability over the course of many uses.

Cut approximately one yard of string. Mix a small amount of water with the glue, so the consistency of the wash is smooth but not too thick, like heavy cream. Fold the string in half. Dip your index finger in glue and run glue down between your thumb and index finger twice to ensure even coverage. Repeat procedure on the remaining half of the string. Hang the string from the table or place on paper towels. Leave to dry for approximately five minutes, after which the string will have stiffened.

(See video Preparing String with a Glue Wash (1.B.3) for demonstration.)
Making a Mirror Image and Using the Spur Wheel to Create a Raised-Line Drawing (1.C.1)

Materials needed:

- braille paper
- carbon paper or light table
- pencil
- ruler
- tape
- APH Tactile Graphics kit, various graphic materials.

To begin, place a piece of braille paper on a hard surface in your workspace. Place a piece of carbon paper, shiny side down, on the braille paper. When using the spur wheel, you must create a mirror image of what you'd like to draw, so that after you wheel and flip the paper over, the tactile drawing will be facing the same direction as the original image. See the video demonstration, Using Carbon Paper to Make a Mirror Image (1.C.2).

To create the mirror image, place the handout, shape face down, on top of the carbon paper. (You may want to first trace your image with a dark-colored marker to see the image more clearly from the back of the sheet.) Align the image so it will be centered and straight on the page. Using a pencil, slowly trace the outline of the image on the back side of the handout. Use a ruler for straight lines. When you pull off the handout and carbon paper, the carbon outline will be on the braille paper.

You can also trace an image onto braille paper using a light table. Tape the image, face down, on a light table. Then position your braille paper on top and trace with a pencil.

After your image is drawn on the braille paper, place your rubber mat on a hard surface and the braille paper, image face up, on top. Use a wheel to trace the shape, and again, employ a ruler for straight lines. When the page is turned over, a blind student will be able to “read” the textured line. The different types of wheels in your kit are used to produce straight and curved lines.

When wheeling, remember to apply enough pressure for the line to be felt on the opposite side. If you do not succeed on your first try, be sure to match the teeth on the wheel with the teeth impressions on the paper, and begin the line again or wheel over your last attempt. See video Using the Spur Wheel to Create a Raised-Line Drawing (1.C.3) for demonstration.
Using Prepared String to Create a Raised-Line Drawing (1.C.4)

Materials needed:
- braille paper
- carbon paper or light table
- pencil
- ruler
- tape
- prepared string
- Elmer’s glue
- paper clip or other pointed instrument for glue application

To begin, place a piece of braille paper on a hard surface in your workspace. Place a piece of carbon paper, shiny side down, on the braille paper. Place the handout, shape face up, on top of the carbon paper.

If using a light table, place the image face up on the light table and the braille paper on top.

Align the image so it will be centered and straight on the braille page. Using a pencil, trace the outline of the image.

Using an instrument (such as an open paperclip or double stylus) apply a small amount of glue on a short section of the shape outline. When gluing string, always work with small sections at a time. This prevents the glue from drying out as you work.

Place the string on top of the glue and pat with a dry rag to remove excess glue. If there is excess glue on the edges of the shape, use the tweezers to follow the outline of the shape, carefully scraping the glue off. You can also use the tweezers to mold the string into basic shape.

Continue this procedure until approximately one inch of the outline remains unfinished. Determine the length of string that will be needed to complete the collage and cut accordingly. Glue the remainder of string to the shape contour.

See video, Laying Prepared String to Create a Raised-Line Drawing (1.C.5) for an alternate method.
Using Other Materials to Create an Image (1.C.6)

Materials needed:

- braille paper
- carbon paper or light table
- pencil
- ruler
- tape
- cloth, cardstock, plastic
- adhesive sheets or Elmer’s glue

Draw a shape on braille paper with the steps outlined for using prepared string. There are several methods of creating an object with solid materials, the first of which being to simply cut out a shape from the texture or pattern you plan to use. To do this, place the texture on a hard surface. Place the carbon paper, shiny side down, on top of the texture, and then the handout face up on top of the carbon paper. Trace the outline of the shape with a pencil. You should be left with a carbon image on the material. This may not work with some materials; use trial and error to determine the best method for creating a shape.

In addition to cutting out a solid piece, you can use adhesive pieces for this activity. Strips (manila and the plastic) can be cut and placed on the outline. By nature, plastics are much more prominent than paper on thermoformed tactile graphics.

Place a strip to the outline of your shape, and mark it with a pencil. Cut at the pencil mark. A paper backing on the strip can be removed to expose the adhesive underside, and then the strip can be placed on the outline. Continue marking and cutting strips until the collage is complete. Adjoining the strips together is often difficult at the beginning, but practice makes perfect!
Square (1.C.7)

Try to create the image below using the following materials:

- Spur wheel
- Prepared string
- Plastic
- Cardstock
- Textured cloth
Triangle (1.C.8)

Try to create the image below using the following materials:

- Spur wheel
- Prepared string
- Plastic
- Cardstock
- Textured cloth
Circle (1.C.9)

Try to create the image below using the following materials:

- Spur wheel
- Prepared string
- Plastic
- Cardstock
- Textured cloth
Fish (1.C.10)

Try to create the image below using the following materials:

- Spur wheel
- Prepared string
- Plastic
- Cardstock
- Textured cloth
Thermoform Machine (1.D.1)

- Frame
- Clamp handle
- Heating element (box)
- Vented suction grating
- Clamp assembly
- Power
- Pump reset
- Time and heat control dials