Seven String Kumihimo
Notice and Wonder Habits Connect

#STEMontheCheap Materials and Tools

Yarn or thick string – 7 different colors
Scissors
Writing Utensil
Cardboard – corrugated, about 6"x12"
Masking or duct tape – 8 pieces: 1" wide x 2" long

Habit of a Systems Thinker Connect

Start by asking systems thinkers to watch for examples of how a system's structure generates its behavior as they do this activity.

Hands-On Directions

1) Find a round object that is 4-5" (10-13 cm) in diameter. A small bowl or a roll of masking tape works well.
2) Use the object to draw two circles onto the piece of cardboard.
3) Use the scissors to cut the cardboard circles out.
4) Put the two circles on top of each other, making sure the corrugation of each circle is perpendicular to the other to improve the strength of the device you are building.
5) Place a two-inch piece of tape over the edge of the cardboard circles so there is about an inch of tape on each side of the circles.
6) Place another two-inch piece of tape exactly opposite the first.
7) Place two more pieces of tape at 90° to the first two pieces.

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8) Place four more pieces of tape in the center of the gaps between the first four pieces of tape. There should now be eight pieces of tape evenly spaced around the edge of the cardboard circle as shown in Figure 1. They are numbered according to the order they were added.

9) Use the scissors to cut ½" slits into the edge of the cardboard circle starting at the center of each piece of tape, as shown in Figure 1.

10) Carefully use the scissors to make a hole in the center of the circle. Hollow out the hole in the center by inserting and spinning the scissors until it is about ½" diameter, as shown in Figure 1.

11) Cut about three feet of each of the seven colors of yarn.

12) Use an overhand knot to tie one of the ends of the seven strings together, as shown in Figure 2.

13) Push the knot through the center hole in the cardboard circle so the knot is centered in the hole in the cardboard with the tails of the strings hanging down below.

14) Put a string in each of the slits leaving one open, as shown in Figure 3.

15) Hold the cardboard circle so the slit without a piece of yarn is to the southeast direction if up (away from you) is north on the circle, as shown in Figure 3.

16) Take the piece of yarn three slits up from the open slit out of its slit by grabbing it from behind and pulling it forward to pop it out of its slit. Move it to the open slit and slide it into that slit.

17) Rotate the cardboard circle clockwise so the new open slit is now in the southeast location.

18) Repeat steps 15-17 to continue braiding the strings together.

19) When the strings start to get too short to braid, take the braid off the cardboard circle by freeing all the strings.

20) Tie an overhand knot at the end of the braid to keep it from unraveling.

It will take some time to build up the braid for it to be long enough to observe its structure by repeating steps 15-17 above. This is a great time to talk about time delays and patterns. This can be related to the need for collecting as much data as possible before coming to a conclusion about what the pattern is in a system. Is it possible to know what the pattern is after just 10 moves, 20 moves, etc.?

Need to see it? Use the camera on your phone or tablet to scan the QR code to the right or use this link for a video on Seven String Kumihimo: https://bit.ly/7stringkumihimo
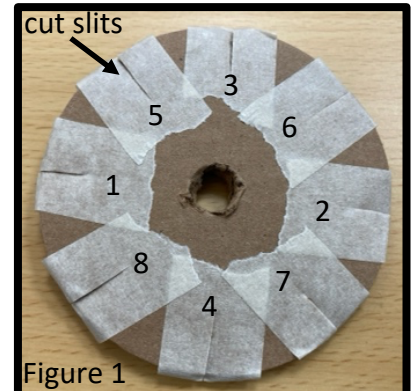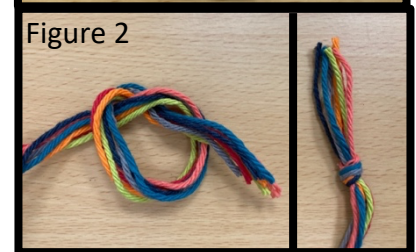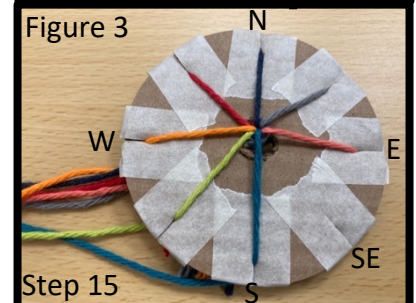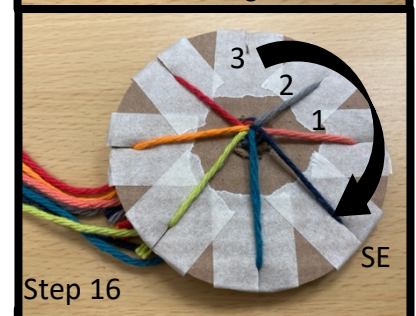

Figure 1

Figure 2

Figure 3 — Step 15

Step 16

Step 17

Habit of a Systems Thinker Notice and Wonder Reconnect

Notice…
- After braids have several inches of length to them, ask systems thinkers what they notice about their braid's structure.
  - They should notice the braid is circular or round in shape.
  - They should notice the pattern of the colors seems to be regular – repeating the same pattern.
  - They should notice the same color of yarn lines up lengthwise with a slight spiral to it.

- Have them compare their braid to those of others around them to observe similarities and differences.
  - The braids are all round.
  - The colors may be in a different order.
  - The tension on the braids may be different so some may be looser or tighter than others.
- Have them share out any other noticings they might have.

Wonder…
- Remind systems thinkers to consider how the parts (strings) of the braid affect one another and how the organization and interaction of the strings create the braid that emerges.
- Now let them wonder! First by themselves, they should complete as many "I wonder…" sentence frames as possible related to the braid they just made.
- After they have had time to write their own wonderings, they can share out with one or two other systems thinkers. Encourage them to record any new wonderings they had not considered.
  - Some possible wonderings could be:
    - I wonder if this would work with more/fewer strings.
    - I wonder what would happen if you move the second string instead of the third string away to the open slit.
    - I wonder what the braid would look like if you use just two or three colors of string.
    - I wonder if the cardboard has to be a circle.
    - I wonder how long the braid is compared to how long the original strings were.

> **I wonder… Sentence Frames**
> I wonder why…
> I wonder if…
> I wonder what…
> I wonder how…
> I wonder what would happen if…

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- Have systems thinkers review their wonders and discuss which are Testable Wonders. This discussion should include how they would test their wonder.
  - All of the wonders listed are testable. In the same order is a quick description of how a systems thinker would test them.
    - Start with more or fewer than seven strings to see if the braiding technique will still work. Adding more strings means they will have to add more slits to their circle.
    - Move the second string instead of the third string long enough to see what happens – does it form a braid or not.
    - Start with seven strings but only use two or three different colors instead of seven different colors. This is a great one to have systems thinkers make a prediction about – what do they think the braid pattern will look like.
    - Make a different shaped cardboard braid holder and see if it still works.
    - Measure the starting string length and ending string length to get an idea about the ratio of the two.

Background

The braiding technique used in this activity is connected to the Japanese silk braiding technique called kumihimo. There is a fantastic video about the history and significance of kumihimo in Japanese culture here: https://www.japanhousela.com/events/the-history-and-significance-of-kumihimo-in-japanese-culture/

From the website above (accessed Dec. 13, 2022): "Kumihimo are braided silk cords that have been made for over fourteen hundred years in Japan. Based on techniques introduced to Japan from the Asian continent in the sixth century, these cords evolved in Japan in complexity, color and style as they were incorporated into increasing areas of Japanese life. Initially used as decorative ties in the costumes and furnishings of the Imperial court and as detailing for religious shrines and equipment, the cords became integral elements of the arms and armor of the warrior classes and later decorative accessories for kimono."