Loops

Overview

Every day, you likely do certain tasks over and over. You tie your shoe, and then you tie your other shoe; you do this same action 2 times. You button up your coat - one button at a time you use your fingers to push the button through the loop. And if your coat has 5 buttons, you do this same action 5 times.

And let's say it is your birthday! (Think about how old you will be on your next birthday...) Someone will put a candle on the cake and then light it; and will do this over and over, based on how old you are! So if you are turning 7, a candle will be put on the cake 7 times; and then we light a candle 7 times. And if you have 10 friends with you to celebrate, you will serve a piece of cake to someone 11 times (don't forget yourself, it's your birthday after all!)

When we do the same action over and over like this, it is called a **loop**. Loops are a series of actions that are repeated until we designate them to stop. Like with the candles, we lit 7 of them, because we decided ahead of time that there would be seven candles based on age.

In computer science, loops are an essential part of programming. When writing a program (which we can think of like a set of instructions) often a certain task may need to be completed and repeated a certain number of times or until we reach a certain stopping point. Instead of writing the same instruction over and over and over, we can simply use a **loop - which is a sequence of instructions that is repeated until a specified stopping point is reached.** A stopping point could be when a certain number of repetitions has been completed, or when a certain condition is met.

We will see with these activities that writing out the same instructions over and over and over can be tedious! This could lead to mistakes, and it takes up a lot of time to write each step over and over, and it takes up more space on the paper. So when we need to write instructions, loops allow us to simplify repeating tasks, so that instead of writing the same instruction 100 times over, we can write the instruction once, and state that we would like it to be repeated until the instruction has been carried 100 times.

These activities work well with children ages 5 - 9; but we encourage you to adapt as you see fit for your home and work with younger ones to engage sensorially with the simple activity of making a necklace and pointing out patterns.

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Activity 1: Follow a Code to Make a Necklace

Materials (see below)
- beads
- string
- misc. ribbon/fabric for bows
- scissors
- paper
- pencil

What if I don't have access to a printer right now?
No problem! You can use the Loops Template PDF as a guide for drawing and writing your own.

STRING
You can use a thicker string here, such as butcher's string, yarn, thin rope, thin strips of fabric, shoelaces, old clothing.

BEADS
If you have some one hand - great! Larger works better, depending on your string. You can make beads with pasta (we painted these), clay, paper, fabric, straws...browse the internet for ideas.

BOWS
These are just small strips of ribbon, fabric, or canvas...if you have clothing to donate, you can cut this up, or use old rags... be creative!

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**Activity 1: Follow a Code to Make a Necklace**

Process
1. Print and cut out the Code Cards from the Loops Template PDF. (If you do not have access to a printer, you can create your own - use the Loops Template PDF as a guide to copy them onto paper.)

2. *Today we are going to make necklaces! We will learn how to follow instructions in order to make patterns for our necklaces.*

You will start with a string (whatever you have available: yarn, long strip of fabric, thin rope, etc.) that will become the necklace; in other words the beads are strung onto it, and the bows are tied to it.

3. Demonstrate and practice the three actions we will be using:

- Tie a knot (knot the string once)
- String a bead (put one bead on the string)
- Make a bow (tie a ribbon or scrap of fabric to the string)
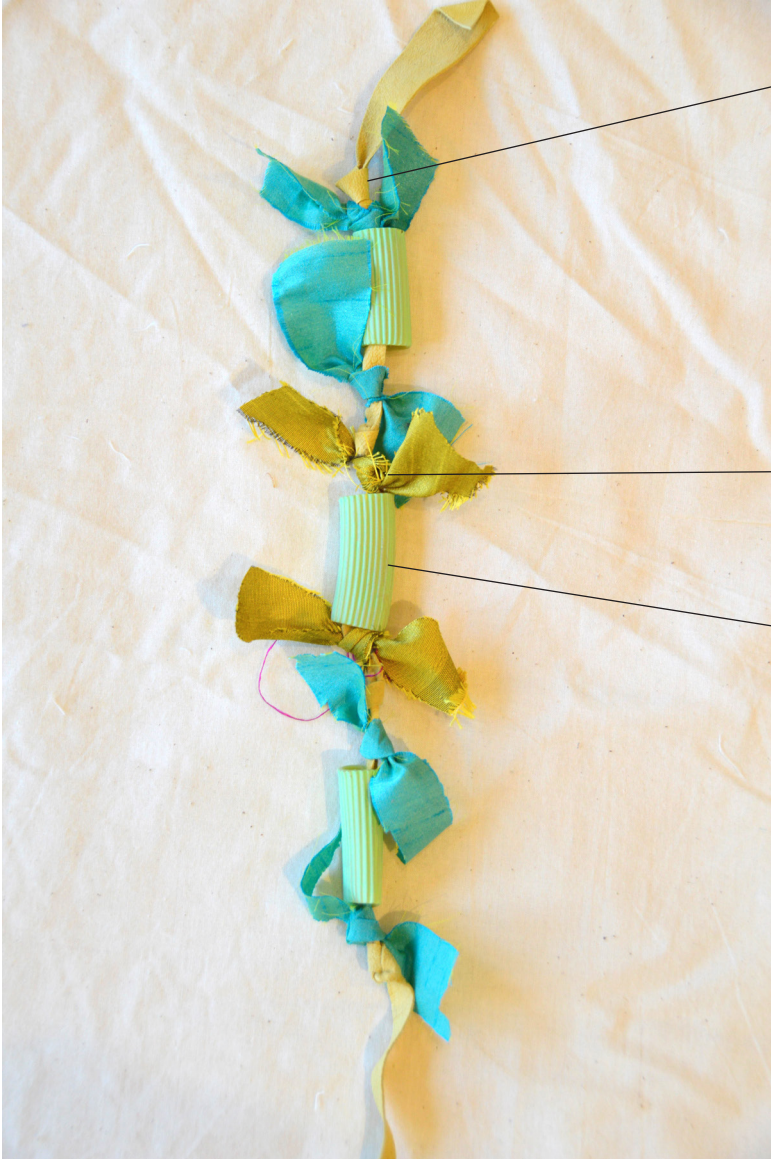
Tie a knot

Make a bow

String a bead

4. *Suppose I wanted to explain to you how to follow a certain pattern to make a necklace. How do you think I would tell you what to do to make this specific necklace?*

Since we are going to be carrying out a **sequence** of steps, I could tell you to do this:

<div align="center">

make a bow, tie a knot, string a bead,
make a bow, tie a knot, string a bead,
make a bow, tie a knot, string a bead,
make a bow, tie a knot, string a bead,
make a bow, tie a knot, string a bead,
make a bow, tie a knot, string a bead,
make a bow, tie a knot, string a bead,
make a bow, tie a knot, string a bead,
make a bow, tie a knot, string a bead,
make a bow, tie a knot, string a bead,
make a bow, tie a knot, string a bead,
make a bow, tie a knot, string a bead.

</div>

5. Would you be able to follow this? Why or why not? In what ways could it be challenging?
      (You may lose your place, or get confused; it also takes a while to explain this, or to write these steps out.)

6. *Let's look at these instructions closely again. Do you see any patterns?*

7. Yes! There are patterns or sequences - these are steps that we see repeated over and over again. What are they? Since the steps "make a bow, tie a knot, string a bead" are repeated over and over again, we could also say and write something like:

<div align="center">

Do the following sequence of steps 12 times:
Make a bow, tie a knot, string a bead.

</div>

We wrote the first example with 12 lines of instructions; and the second time with only 2 lines. Which set of instructions would be easier for you to follow? Why?

8. Let's follow some instructions to make a necklace. We will be following a kind of code that simplifies our instructions and makes it clear to understand. When we repeat a specific sequence of instructions, we call this a loop. **A loop is a series of steps that we repeat until we have reached a stopping point.** A stopping point may be when we have repeated a certain number of times, or maybe when we run out of string!

9. Start with Code Card - 1, and explain how to read it, following the example below:

Repeat 6
Tie a bow
Make a knot
String a bead
Make a knot
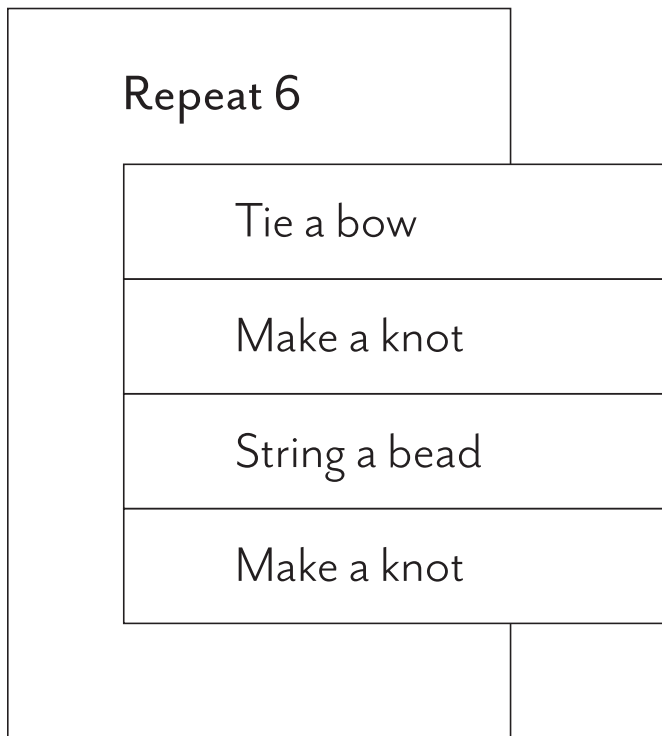
Example
The code for this necklace would read something like this - tie a bow, then make a knot, string a bead, make a knot; and do this whole sequence six times.

10. Either together or independently, follow this code to create your own necklace!

11. A key point - when do we know when to stop? (When we have repeated these steps the designated number of times) You may need to count as you go. We need to keep track of how many times we have done something. You can keep a running tally on a piece of paper, so that each time you carry out this repeating sequence you can make a mark.

12. Try the other code cards.

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Activity 2: Make Your Own Code for a Necklace

Process

1. After completing the first activity and understanding the concept of loops and how to read the Code Cards, together or independently have the child design their own code for a necklace, using the concept of loops.

2. You may draw/write these on a piece of paper, or use the cut out templates if you have a printer.

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Activity 3: Decode a Necklace

Process

1. Do this activity after completing the other activities (or at least the first one) and the child has demonstrated a solid understanding of loops. Review the concept of a loop.

2. Either create a new necklace for the child and/or ask the child to create one, using these 3 actions (make a bow, tie a knot, string a bead) but without using a pre-made Code Card.

3. With a completed necklace, look at the pattern. *Do you see any repeating sequences?* Could you write this pattern as a code using loops?

Discuss and explain, and then together write/draw a code card for the necklace.
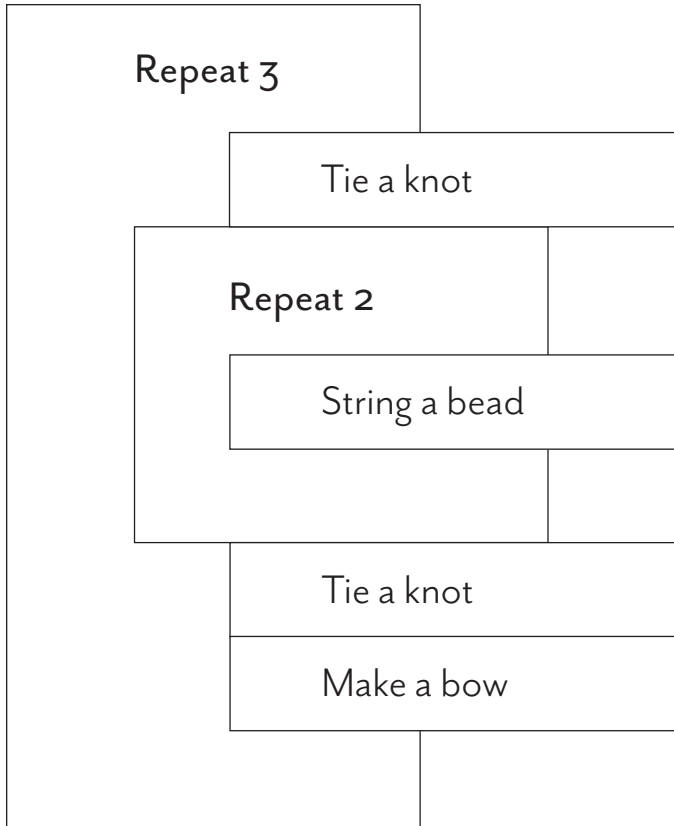
Repeat 6

| Tie a bow |
| Make a knot |
| String a bead |
| Make a knot |

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Code Card 2 - Example

Repeat 3

Tie a knot

Repeat 2

String a bead

Tie a knot

Make a bow

Loops
Code Card 3 - Example

Repeat 5

Repeat 5

Tie a knot

String a bead