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How are things connected? (Switches)

06 NOVEMBER 2015

Make interactive light-up projects with LED lights and DIY switches and represent things that are connected.

Grade Level: Suitable for Grade 3 and up

Suggested Time: 2-3 hours or three 45- 60 min sessions

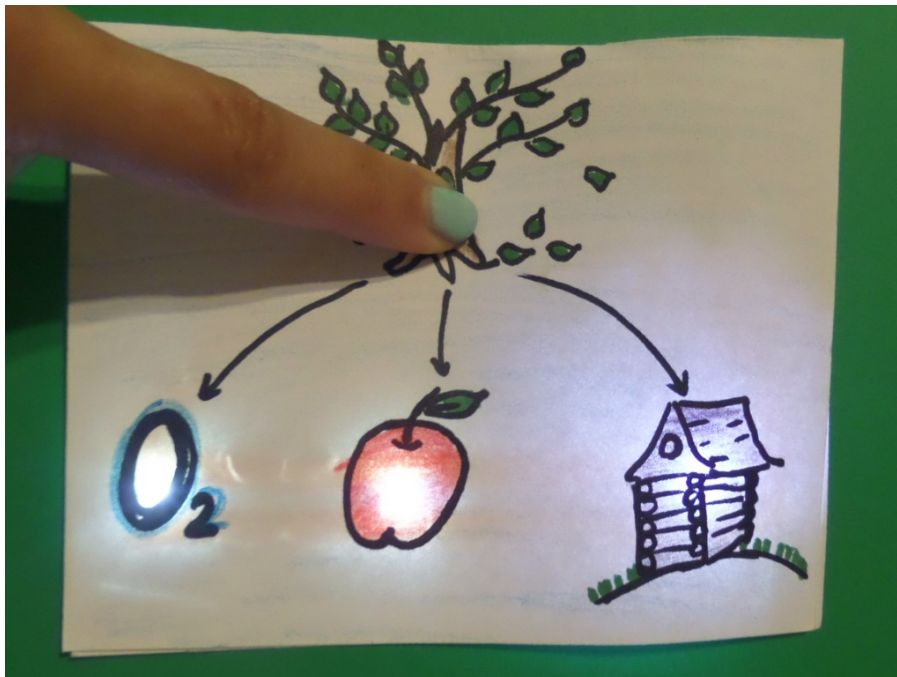
Overview

This guide introduces circuits with different types of DIY switches and Chibitronics LED light stickers. The students will be able to explore and identify things that are connected and represent them using an interactive paper based light-up project.

This activity is an extension to the basic circuits.

This guide is divided into 3 parts

1. Make a simple circuit with on and off paper switch
2. Add multiple switches in a circuit using AND/OR switch logic
3. Create a blinking slide switch



Learning Goals

By completing this activity, students will:

- Build circuits with DIY paper switches
- Design an interactive light-up paper project
- Learn how a switch works

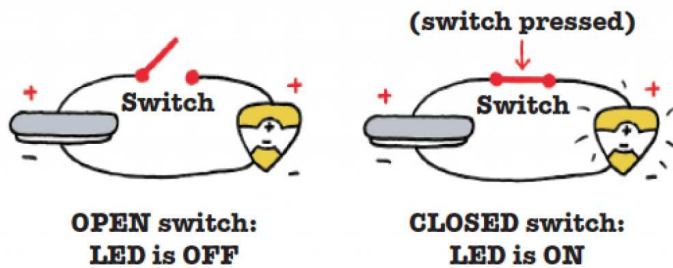
Key Concepts:

Part 1

- **Switch** (Please refer to the Circuit Sticker Sketchbook Chapter 3)

You can make your projects interactive by using a switch to control your lights! A **switch** is a gap in your circuit that can be connected and disconnected using another piece of foil, turning things on and off.

When the switch is closed the light turns on because the loop is complete and electrons will flow through your circuit. When the switch is open, electrons cannot find a closed loop; so, they will stop flowing, and the light will turn off.



Part 2

- **AND/OR Switch logic** (Please refer to the Circuit Sticker Sketchbook Chapter 3)

If you put multiple switches in a single loop ("in series"), you have to press all the switches at the same time to turn on your light. This is called a logical **AND** because you have to press Switch 1 and Switch 2 to make a complete circuit.



You can also connect multiple switches using different branches ("in parallel"), so that pressing any one of them will turn on your circuit. This is called a logical **OR** because you can press Switch 1 or Switch 2 to make a complete circuit.

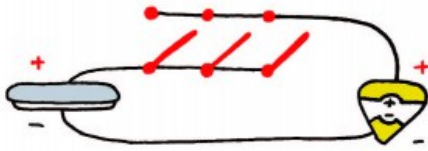


Part 3

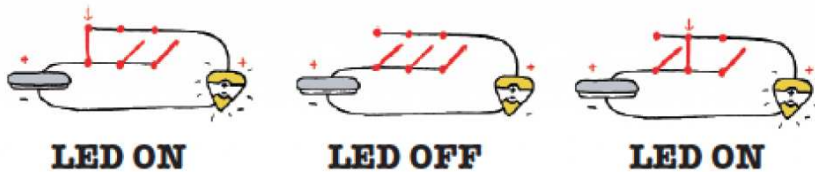
- **Blinking Slide Switch** (Please refer to the Circuit Sticker Sketchbook Chapter 4)

You can craft all sorts of switches that open and close gaps in the circuit, or even combine them to create more complex switches.

In the blinking slide switch, there is one long gap and multiple places you can press to close the circuit. This is an implementation of the “OR” switch logic (see above)



Here, as you press down and slide your finger along the switch, the gap opens and closes, causing the light to blink on and off!



We encourage you to first let the students try making these circuits. You could introduce these concepts as they are making their projects, explain while you are helping them troubleshoot or revisit them at the end of the session.

Materials and Resources

For this activity you will need:

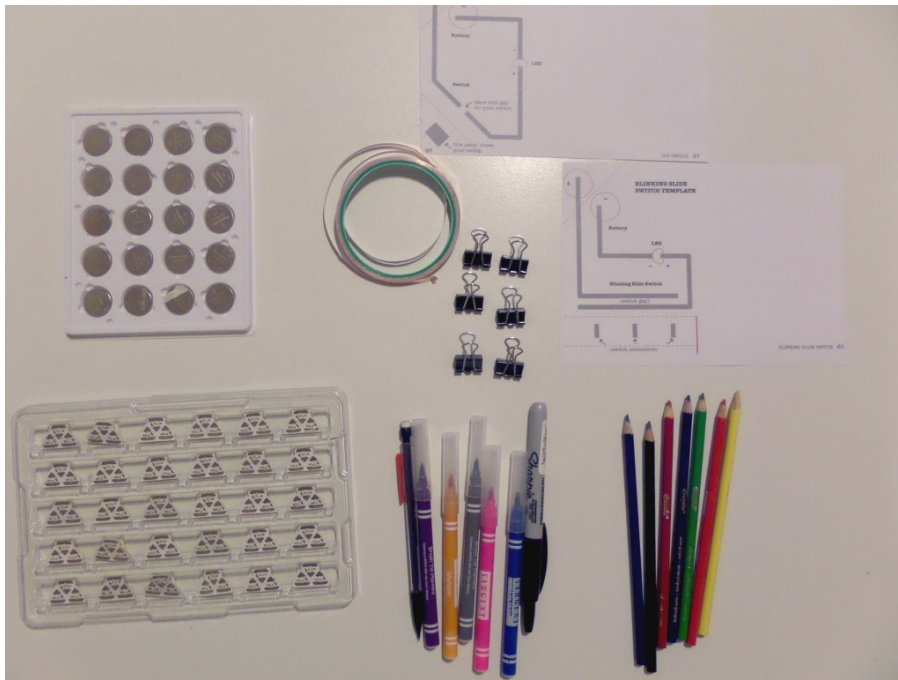
- LED light Stickers
- 1 or more coin cell batteries (3V)

Store your batteries separately, and away from other bits of metal. This avoids accidental connections that can drain the batteries.

- Binder clips
- Conductive copper tape

The edges on the copper tape can be sharp. Watch your fingertips.

- [DIY switch template](#)
- [Blinking Slide Switch template](#)
- Drawing supplies
- Additional craft supplies (if needed)



Visit our website to order materials

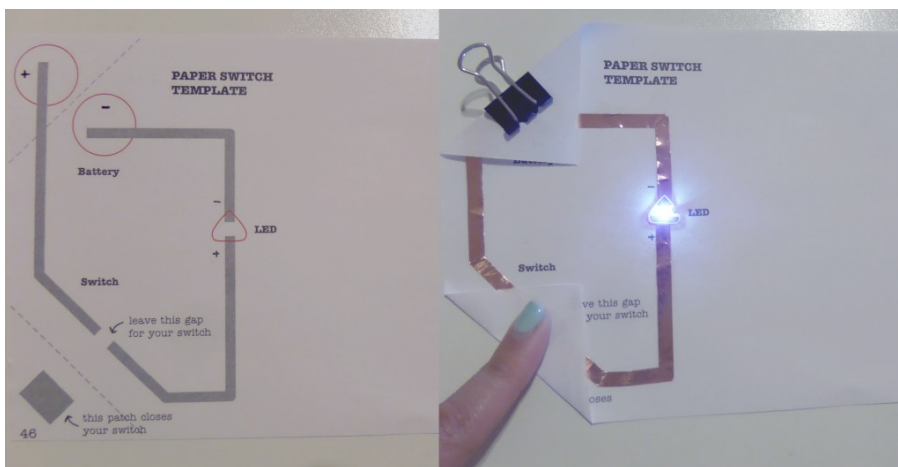
<http://store.chibitronics.com/collections/all>

Let's Start

Create an examples of your own interactive light-up projects with different DIY switches. Share your projects with your students.

Part 1: Make a paper push-button switch that turns an LED light on when you press the button!

- Revisit basic circuit. Ask the students what they recall about their first circuit.
- Pass around the **DIY switch template**, copper tape, battery, LED light sticker and binder clip. Refer to this tutorial to make the circuit with a push-button



Once the circuit is complete and working, have the students quickly share them with each other. You could use this step as an opportunity to provoke questions and also encourage the students to share their questions with the group.

Question prompts

Describe what... ?

What would happen if ... ?

Why do you think that ... ?

How would you... ?

Remember to ask, "What questions do you have?"

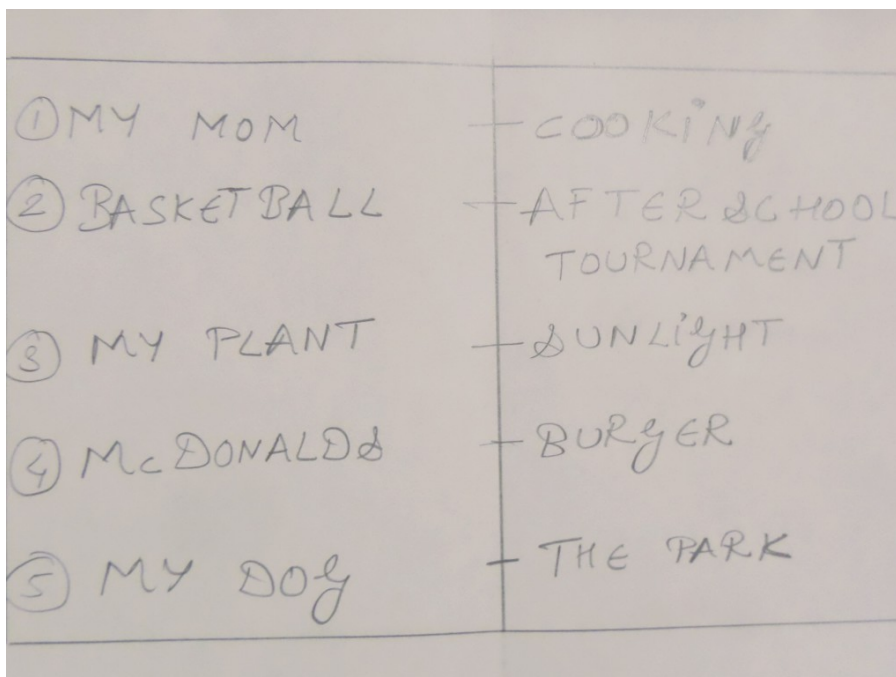
If their circuits are not working, give students opportunities to troubleshoot. Ask them to check if their connections are strong enough.

Creative prompt

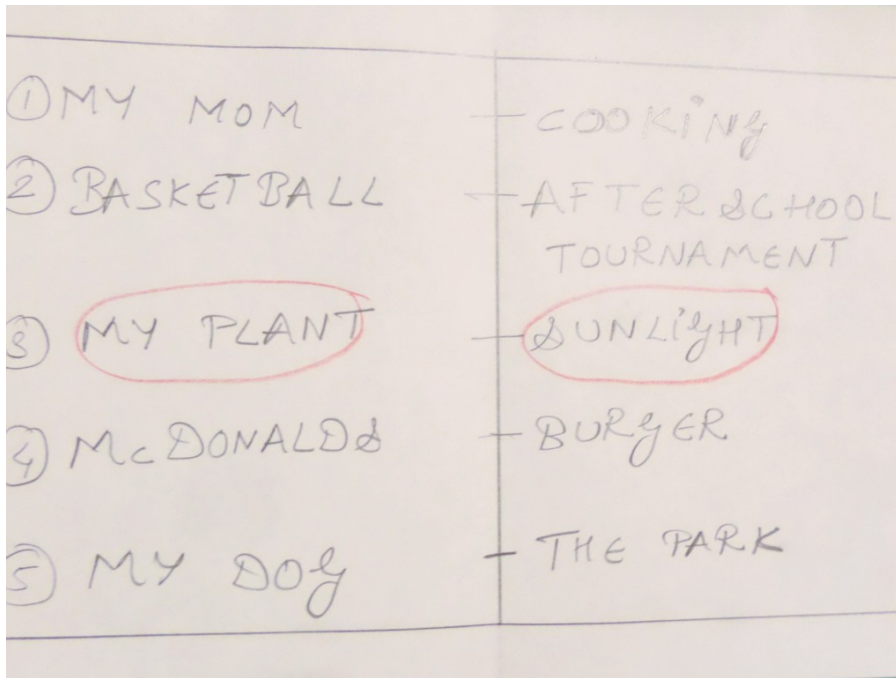
Ask students to draw two columns on a sheet of paper. In the first column make a list of something/someone they like. The list could include objects, people and places.

For eg: My mom, basketball, snow, my plant, McDonalds, my dog etc.

In the second column ask them to write something/someone that have a connection with what they have in the first column. These connections could be literal or metaphorical.



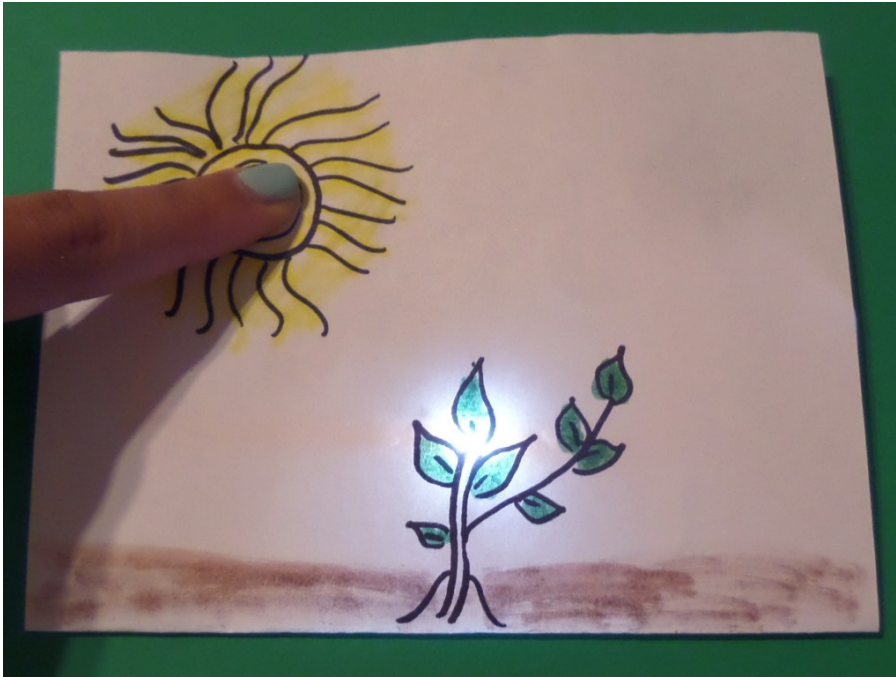
- Have the students quickly share their list with their peers.
- Ask students to choose a combination from their two column notes.



- Ask them to fold their switch circuit template and make a drawing of the selected objects/people/places from the list. They could align one thing with the switch and other with the LED light.

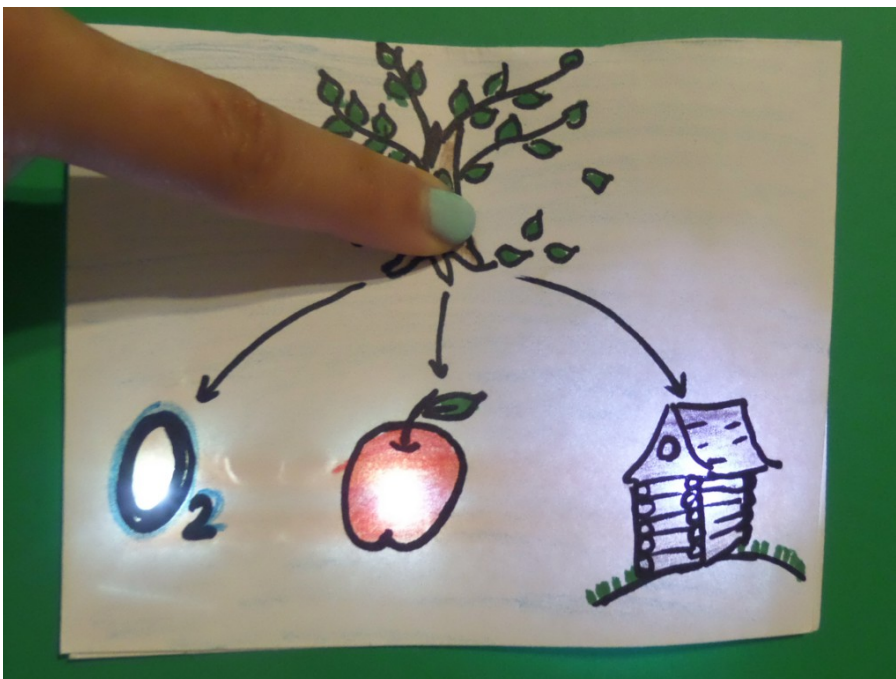


And you are done! Encourage students to share their light-up connections and relationships.

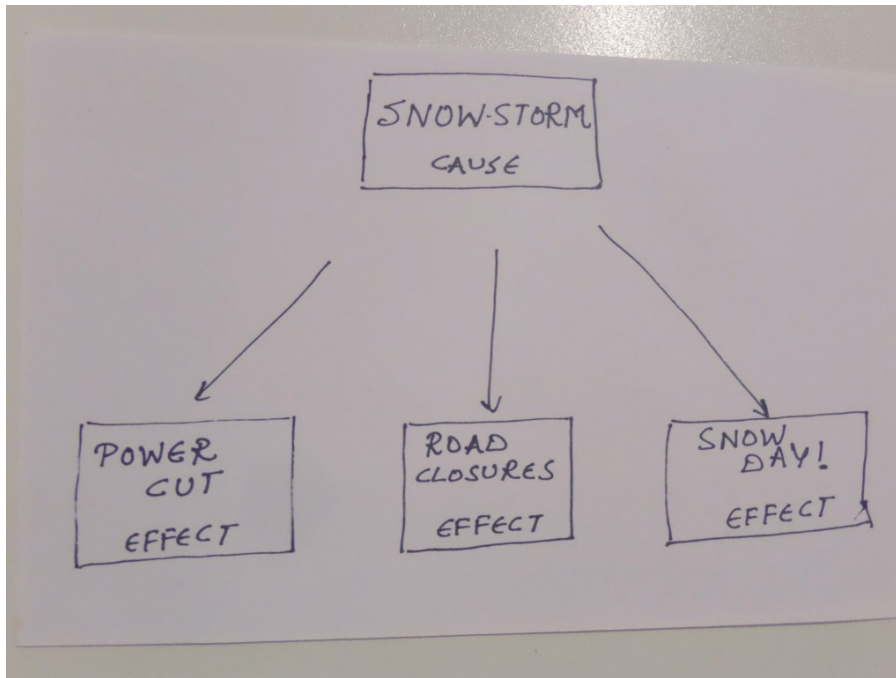


- If students are comfortable with creating circuits, you could encourage them to try making a switch with a circuit with multiple LED lights.

Here is an example



This activity can be used to explore cause and effect relationships.



Part 2: Explore And/OR switches (see key concepts)

Using the same theme of connections and relationships encourage the students to try the And/OR switches. You could divide the class into two groups. One group could try creating the AND switches and another could make the OR switches.

Part 3: Create Blinking Slide Switch

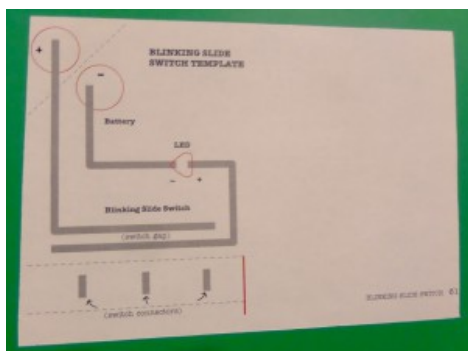
This is really exciting and interactive circuit. You can combine multiple switches together to create blinking effects.

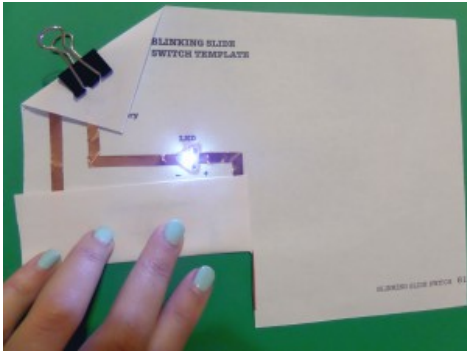
- Show the students an example of a blinking slide switch. As you slide the finger along the switch, the LED light will blink on and off.
- Ask students to brainstorm a list of things that come to their mind when they see the blinking switch. For eg, eyes blinking, stars twinkling, candle flame etc

Creative prompt

This circuit reminds me of...

- Pass around the [Blinking Slide Switch template](#), copper tape, battery, LED light sticker and binder clip. [Refer to this tutorial](#) to make a circuit with a blinking LED.





- After their circuits are complete and working, ask the students to fold their template and make a drawing of something that reminds them of the blinking gesture.



And you are done!

Wrap-Up

- Encourage students to share all their projects with a group and give each other feedback.
- Ask students to compare and contrast different types of switches

Make sure to notice children's engagement and process while doing this activity. Listen to their ideas and ask them questions about their creations.

Projects Gallery

Explore new ideas, materials and themes.



Alignment to Standards

We think the following standards are most relevant to this activity. You could adapt this list for your class session. The complete list of all the standards can be found on the respective websites of each framework.

ISTE standards:

Creativity and innovation- Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.

- Apply existing knowledge to generate new ideas, products, or processes
- Create original works as a means of personal or group expression

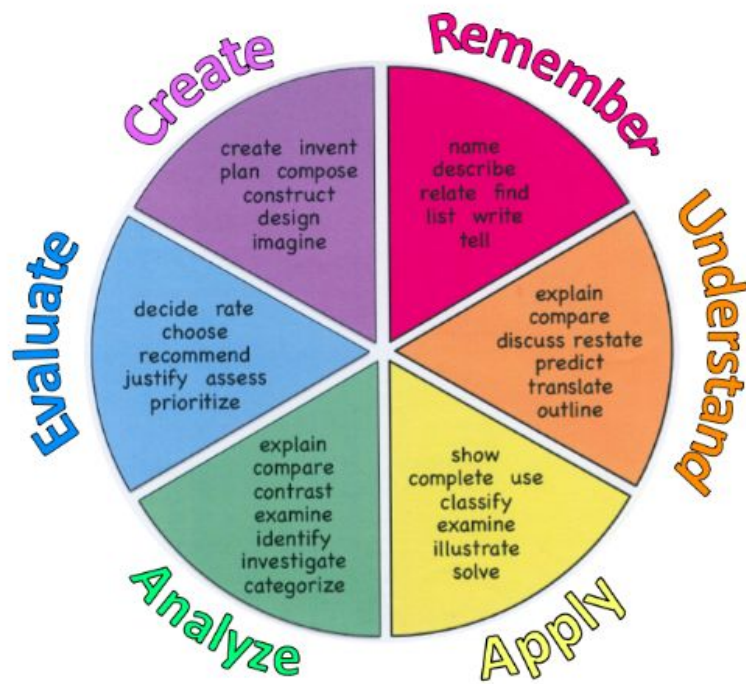
Technology operations and concepts- Students demonstrate a sound understanding of technology concepts, systems, and operations.

- Troubleshoot systems and applications

NGSS Standards

- Practice 1 Asking questions and defining problems
- Practice 6 Constructing Explanations and Designing Solutions

You could also refer to **Bloom's Taxonomy** as part of your classroom assessment.



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Fig: Bloom's Taxonomy

image credit: patheos.com

Good Luck for the session! Don't forget to share your experiences with the **Chibitronics community**. We are always excited to hear new stories!

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