Electricity and Circuits

Activity 4: Connecting Multiple MudWatts Together

NGSS Alignment

CORE IDEAS

Core Idea PS1: Matter and Its Interactions

PS1.A: Structure and Properties of Matter

Core Idea PS3: Energy

PS3.A: Definitions of Energy

CROSS CUTTING CONCEPTS

- ☐ Patterns
- ☐ Cause and effect: Mechanism and explanation
- ☐ Scale, proportion, and quantity
- ☐ Systems and system models
- ☑ **Energy and matter: Flows, cycles, and conservation**
- ☐ Structure and function
- ☐ Stability and change

PRACTICES

- ☑ **Asking questions (for science) and defining problems (for engineering)**
- ☐ Developing and using models
- ☑ **Planning and carrying out investigations**
- ☑ **Analyzing and interpreting data**
- ☑ **Using mathematics, information and computer technology, and computational thinking**
- ☑ **Constructing explanations (for science) and designing solutions (for engineering)**
- ☑ **Engaging in argument from evidence**
- ☑ **Obtaining, evaluating, and communicating information**

Activity 4: Connecting Multiple MudWatts Together

What happens when you connect multiple MudWatts together? More Power! But, depending on how you connect them, you will either get more voltage or more current. We encourage you to experiment with connecting multiple mudwatts together and seeing the effects for yourself!

Time: 30 minutes

Materials:

- Multiple MudWatt Science Kits
- Jumper wire
- Alligator Clips
- MudWatt MaxTracker (multimeter + resistors)

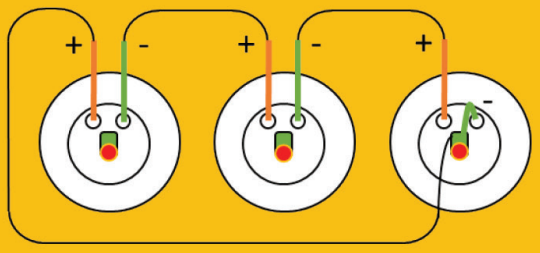
Procedure

Assemble MudWatt™ according to the instructions included in the kit. To compare different treatments, add a special ingredient to the soil or change something about the configuration of the MudWatt. More instrustions on this can be found in Module 4.

It may take up to 10 days before the red LED on the hacker board starts blinking, but you will start taking measurements before that.

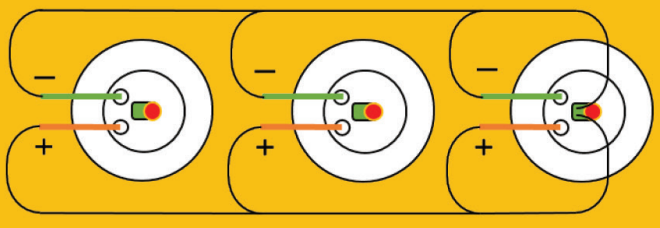
Connecting MudWatts in Series

In circuits, when components are connected in **series**, it means that the (-) end of one component is connected to the (+) end of another. In his configuration, an electron has to through all the components in order to complete the circuit. When MudWatts (or standard batteries) are connected in series, their voltage is added, but their current stays the same.



Connecting MudWatts in Parallel

In circuits, when components are connected in **parallel**, it means that he (+) end of one component are connected to the (+) end of another and the same is true for the (-) ends. When MudWatts (or standard batteries) are connected in parallel, their current is added, but their voltage stays the same.



We encourage you to experiment with different configurations to see the effect. For example, you could put some MudWatts in series, and others in parallel and measure the circuits overall voltage and current values to see if they are what you would expect.

Apart from measuring the voltage and current of your multi-MudWatt circuit, try to measure the impact on the power, as measured by the blinking LED and the MudWatt Explorer App. Do two MudWatts double the blink rate of the LED, or the buzz rate of the buzzer?