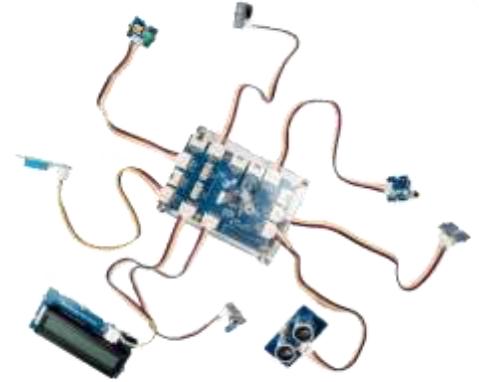


## Electronic Devices in the GrovePi Kit

- » 3 LEDs (red, blue, green) - provides LED light (or flashes)
- » Push button – detects when button is pushed
- » Rotary Knob – detects when knob has been turned
- » LCD Display – displays 2 lines of text with a color background
- » Buzzer – emits a loud buzzing sound
- » Noise sensor – detects level of noise in a room (or loud noises)
- » Temp-Humidity sensor – detects temperature and humidity in room
- » Light sensor – detects the level of light in the room (or when a light is turned on or off)
- » Ultrasonic Sensor (distance) – detects the distance to an object (or when an object has moved)



Note that each of the devices can be mounted to a box – they each have small holes where screws can be safely used to mount them (but screws are not included in the kit).

Also there is a flexible cable connecting the device to the GrovePi board. This means the board can be protected inside a box while the sensors or user interface items are mounted to the box.

There is also a power cable which connects the GrovePi to a USB type plug (like the ones used for cell phones).





Below are some ideas to help get started thinking about an Invention you can make with the GrovePi kit.

## Earth Science Projects

### Weather Station

Have you wondered how the weatherperson on TV gets their information for predicting the weather? Design a weather station to record temperature, humidity, and other data about the environment.

Design a device to assist with measuring weather data. What types of data will you collect?

What sensors will you use? Where will you place the weather station? How will you protect the sensitive electronics from water and weather extremes? Can it record and display data that you can use to create charts to illustrate the various effects that the weather has on your immediate environment? You can even compare your data to the local weather report data, and to historical data for your town.

## Physical Science Projects

### Security Alarm or Pet Monitor

Have you wanted to have your own personal security system in your room?

Design a security system that detects when a door or drawer has been opened. It could sound an alarm or be silent and just record the event. Or if you have a pet that seems to be able to get out of a door, set up an alarm system to let you know when they have opened the door.

Other features might include a button that turns off the alarm, lights which come on or flash, and a way to turn up or down the loud buzzer (in case people complain about the noise). You

might also record the date and time when the alarm is set off and display it. How will you detect the door is opened? What kind of doors or openings will it work with? What will your alarm kit look like? Where will it be placed? Will people be able to detect it is there?

## Measuring Light Levels

Have you noticed that there are many different designs for lamp shades and light fixtures used in homes, schools, offices, theaters, and malls? How does the type of material used affect the level of light? Design an experiment to determine which materials are best for reflecting, absorbing, or transmitting light. For example, for testing absorption of light, add materials with different opacities to interrupt the light stream (such as: a paper towel, white paper, colored paper, cardboard, cloth, wood, plastic, metal, mirror, glass). For testing reflecting light, move the material so that it surrounds the light and light waves reflect off before it hits the sensor. For transmitting light, move the material so that light bounces before it gets to the sensor.

Design a device to assist with measuring light levels. What lights will you use? (or you may include both natural light from windows as well as light from lamps). What sensors will you use? Will your data change with the time of day? What information will you display to make it easier to record? Record data, take pictures, and create charts to illustrate how different types of materials have an effect on the level of light.

## Life Science Projects

### Plant growth affected by temperature and humidity

How does temperature and humidity affect the growth of plants? Design an experiment to compare plant environments where temperature and humidity are different in each. How will you control the growth environment? How will you measure temperature and humidity? Design a device that will assist in gathering data for this experiment. What sensors will you use? Record data over time, take pictures, and create charts to illustrate how temperature and humidity affect plant growth.

### Light for plant growth

How is plant growth affected by the type and level of light? Design an experiment using plants in various light conditions. How will you control the light levels and the growth environment? How will you eliminate other changes to the environment - keep the plants the same and other conditions the same? Design a device that will assist in gathering data for this experiment. What sensors will you use? How will you detect and record light levels at different times of the day for each light condition? Chart the data over several weeks to illustrate how light affects the growth of plants. Record data, take pictures, and create charts to illustrate how plants are affected by different types and levels of light.

## Maker Space Projects

### Quiz Machine

Have you ever wanted to make quizzing a little more fun or do you enjoy stumping your friends in Trivia? How about designing a Quiz Machine?

First you will need a way to display the questions and 3 Possible Choices. Then you need a way of selecting A, B, or C as the answer. Perhaps then one of 3 colored lights comes on to show the answer chosen. Then maybe a buzzing sound is heard if the answer is not correct, or the lights flash if it is correct. Those are just some possibilities, you may add different options to your Quiz Machine. How do you go from one question to the next? Can questions be skipped? How is color used in the display? What if the question doesn't fit on two lines?

### Timer

In many games and sports events there is a start and stop time, and whoever finishes first is the winner. How about building a device to help with this? You will need a way of notifying everyone when to start. Then the timer should display the elapsed time. Then you need a way of detecting when a person crosses the finish line (or ends the game) and the timer stops. Then the displayed elapsed time is the winning time. What other features would make this useful for several different types of games?