



Data Exploration

In this lesson, students will be able to:

- Explore different types of sensors available on a databot device
- Collect data using a databot device
- Connect data collected to real-world applications

Materials Needed:

- databot sensors, or equivalent sensors gathered that would collect some of the variables listed on Page 2 of this worksheet
- iPad or phone with the Vizeey app
- databot Resource page: <https://databot.us.com/category/course/>

Time to Complete:

Intro = 10 minutes

Activity = 30 – 60 minutes *If you want students to explore each sensor on the databot and answer the questions for each sensor, you will want to plan on two days for this activity.

Conclusion = 10 minutes

Introduction

Data is an important component of our lives. Think of how many times a day you rely on data to help you make decisions. People check the weather to decide on their wardrobe based on data. People predict who is going to win football games based on data. People track how many steps they took in a day based on data. In precision agriculture, we use data to help us make more informed decisions about how we take care of our fields, livestock, greenhouses, or any other agricultural and horticultural project you can think of.

Why collect data?

In agriculture, we are trying to save time, money, and resources. With rising input costs, we are looking for ways to help producers save money and increase their return on investment. One way they can do this is by understanding the impact of the products they use. Different sensors can provide this information through us whether it be in real time throughout a growing season or at the conclusion of a year so we can make improvements for next year.



Databot Sensors

For today's activity, we will be using a databot. This databot comes equipped with 15 different sensors to collect data in the classroom. Here is a short description of each sensor and what it collects:

- Accelerometer=senses motion and change in speed
- Air Pressure=measure atmospheric pressure
- Altimeter=measures the altitude of an object above a fixed level
- Ambient Light=general light, the primary source of light for a room, and measures the intensity or brightness of the light
- Carbon Dioxide=measures carbon dioxide to determine air quality
- Color=detects the color of an object by measuring the intensity of red, green, and blue light reflected from it
- Gesture=monitors the user's movement
- Gyroscope=device used for measuring or maintaining orientation and angular velocity
- Humidity=measure of the amount of water vapor in the air. Relative humidity is how much water the air can hold at a given temperature
- Magnetometer=device that measures magnetic field or magnetic dipole moment
- Proximity (Time of Flight)=sensor that is able to detect the presence of nearby objects without any physical contact
- Sound=detects sound waves through its intensity and converting it to electrical signals
- Temperature Probe=collects temperature readings
- UV=measures UV radiation in terms of wavelengths from the sun
- Volatile Organic Compounds=compounds that have a high vapor pressure at room temperature

Activity

Today's activity is exploratory. We are going to collect data from many of these sensors and reflect how these sensors impact our lives.

Data Collection: Use the databot "Bot Basics" documents provided (<https://databot.us.com/category/course/>) to learn more about each sensor and conduct the activity it describes. Use the space on the next few pages to write your reflections for each sensor.



Accelerometer:

In your own words, explain **acceleration**.

Demonstrate and name the three axes of the Cartesian Coordinate System.

What are the units we use to express **acceleration**.

How does this data connect to the real world?

How does this data connect to agriculture?

How do you use this sensor in your life?

Air Pressure:

In your own words, explain **air pressure**.

Why does **air pressure** decrease as you climb a mountain?

What are the units we use to express **air pressure**.

How does this data connect to the real world?

How does this data connect to agriculture?

How do you use this sensor in your life?



Altimeter:

In your own words, explain what an **altimeter** is and how it works.

What is the difference between **altitude** and height?

Why do the databot **altimeter** values fluctuate even when resting in the same location?

How does this data connect to the real world?

How does this data connect to agriculture?

How do you use this sensor in your life?

Ambient Light:

In your own words, explain the difference between **illuminance** and **luminance**.

What are the units used for expressing levels of light?

What happens to levels as you move further from a light source?

How does this data connect to the real world?

How does this data connect to agriculture?

How do you use this sensor in your life?



Carbon Dioxide:

In your own words, explain **CO₂** and its effect on humans.

What are some examples of how **CO₂** sensors are used in the real world?

What are the units we use to express **CO₂** levels in the air we breathe?

How does this data connect to agriculture?

How do you use this sensor in your life?

Color:

How does this data connect to the real world?

How does this data connect to agriculture?

How do you use this sensor in your life?

Gesture:

How does this data connect to the real world?

How does this data connect to agriculture?

How do you use this sensor in your life?



Gyroscope:

How does this data connect to the real world?

How does this data connect to agriculture?

How do you use this sensor in your life?

Humidity:

In your own words, explain **humidity**.

Explain the purpose of calibrating your databot to local **humidity** levels.

Why does the **humidity** level increase inside a bag when you breathe into it?

How does this data connect to the real world?

How does this data connect to agriculture?

How do you use this sensor in your life?



Magnetometer:

In your own words, explain magnetism.

What are the units used for expressing the strength of a magnetic field?

What happens to magnetic field strength as you move away from a source of magnetism?

How does this data connect to the real world?

How does this data connect to agriculture?

How do you use this sensor in your life?

Proximity:

How does this data connect to the real world?

How does this data connect to agriculture?

How do you use this sensor in your life?



Sound:

In your own words, explain **sound intensity**.

What are the units used for expressing levels of **sound intensity**?

What happens to **sound intensity** levels as you move further from a source?

How does this data connect to the real world?

How does this data connect to agriculture?

How do you use this sensor in your life?



Temperature:

In your own words, explain **temperature**.

Explain the difference between the Fahrenheit and Celsius temperature scales.

Why does the **temperature** decrease in an endothermic reaction?

How does this data connect to the real world?

How does this data connect to agriculture?

How do you use this sensor in your life?

How does this data connect to the real world?

How does this data connect to agriculture?

How do you use this sensor in your life?



Ultraviolet:

What is the electromagnetic spectrum? Give three examples of wavelengths from the spectrum.

Why is **Ultraviolet** radiation dangerous?

What is the UV index and where can you check for UV levels daily?

How does this data connect to the real world?

How does this data connect to agriculture?

How do you use this sensor in your life?

Volatile Organic Compounds:

In your own words, explain **Volatile Organic Compounds** (VOCs).

What is an example of off-gassing?

What is the unit of measurement for VOCs and what level is dangerous?

How does this data connect to the real world?

How does this data connect to agriculture?

How do you use this sensor in your life?



Reflection

Which of these sensors explored on the databot seem to have the strongest connection to uses in agriculture?

What sensors have you seen used in agriculture before?

What was the biggest takeaway from this exploration?

Conclusion

We are collecting more data than we ever have. You are the first generation to completely grow up surrounded by data. Being able to understand, interpret, and think critically about data is a life-skill that you will continue to need to sharpen as you go through life, regardless of what job you land someday.