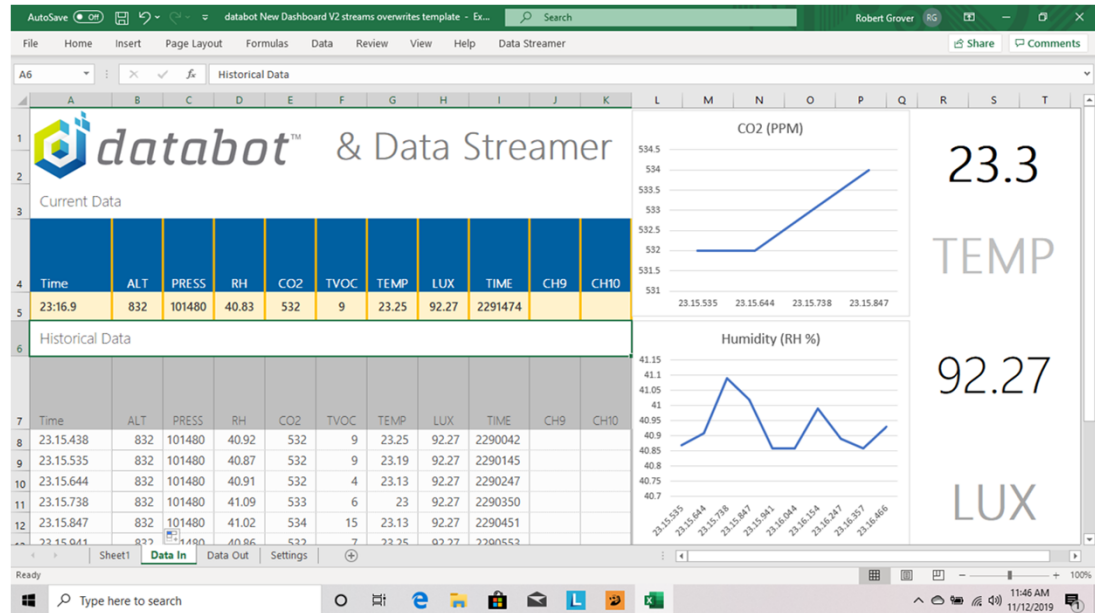




Sensor Based STEM w/ databot™ & Excel



One little cube... Science on the move.



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Sensor Based STEM w/ databot™ & Excel



Your Presenter: Robert Grover

Robert Grover began his STEM education career in 1988 teaching LEGO engineering, robotics, programming, digital arts, and more.



ROBERT O. GROVER
CEO, aRobotics LLC
www.databot.us.com
robert@databot.us.com



Over the past thirty years Robert has worked with students, teachers, and administrators all over the world developing and refining solutions that make STEAM education easier, more engaging, and more effective.



Sensor Based STEM w/ databot™ & Excel



Today's Webinar

- Learn about the Microsoft Hacking STEM Initiative
- Excel and Data Streamer - a remarkable add-in for Excel in the classroom.
- Meet databot™ - a wireless all-in-one sensor device
- See examples of Excel & databot™ working together, visualizing data in real-time.
- Discussion of NGSS and ISTE Standards
- Q & A session
- Links and Resources for Getting Started





Sensor Based STEM w/ databot™ & Excel

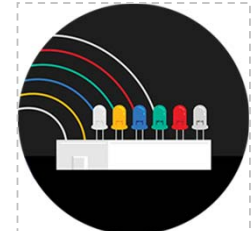
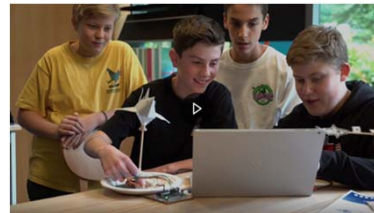


What is Hacking STEM?

Mission Statement

"Modernize STEM education to enable every student on the planet to achieve more"

- Modernize: Develop skills that model real world jobs and engage students in solving real world problems.
- Every Student: Remove economic barriers.





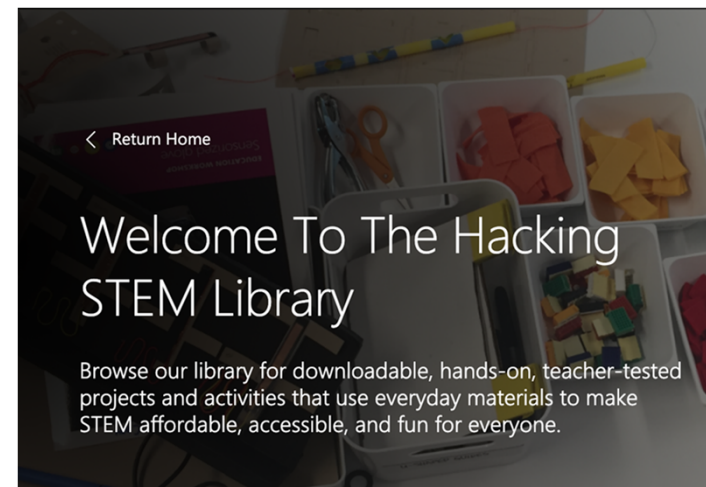
Sensor Based STEM w/ databot™ & Excel



What is Hacking STEM?

The initiative provides free software and teacher-authored, Middle School lessons & hands-on activities.

- Educators can build affordable inquiry and project-based activities highly relevant to careers of today and tomorrow.
- Visualize data across science, technology, engineering, and math (STEM) curriculum.





Sensor Based STEM w/ databot™ & Excel



PARTNER EDITION



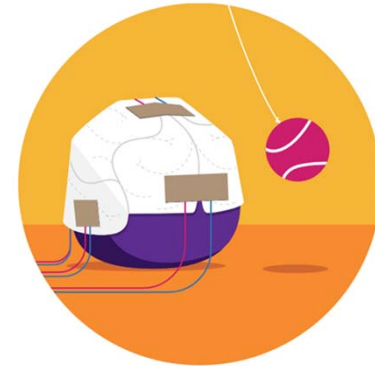
Exploring shark movement

- 📅 Each lesson takes 75-150 minutes of classroom time
- 🛒 Costs approximately \$1.00-\$3.00 per student, excluding tools and microcontroller
- ☑ Meets middle school NGSS and ISTE standards



Comparing Speeds

- 📅 Takes 45-90 minutes of classroom time.
- 🛒 Free! No tools or microcontrollers needed.
- ☑ Meets middle school technology, math, and physical education standards.



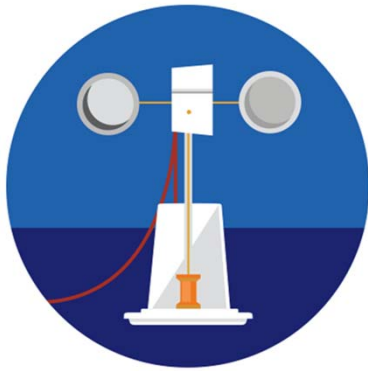
Brain Impact Simulator

- 📅 Takes 4-6, 50-minute class periods
- 🛒 Costs approximately \$3.00 per student, excluding tools and microcontroller
- ☑ Meets middle school NGSS, ISTE and Health standards

<https://www.microsoft.com/en-us/education/education-workshop/>



Sensor Based STEM w/ databot™ & Excel



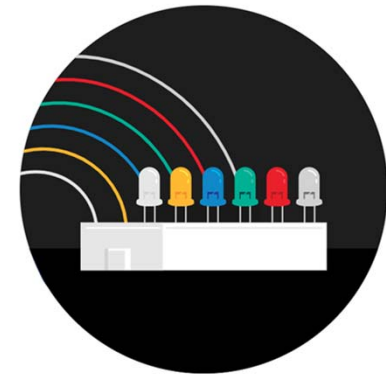
Anemometer

- 📅 Takes 1 to 2 weeks of classroom time
- 🛒 Costs approximately \$2.00 to \$5.00 USD per student, excluding tools and microcontroller
- ☑ Meets middle school science, technology, engineering and math standards (STEM)



Sensorized Glove and Robotic Hand

- 📅 Takes 1.5 to 2 weeks of classroom time
- 🛒 Costs approximately \$3.00 USD per student, excluding tools and microcontroller
- ☑ Meets middle school science, technology, engineering and math standards (STEM)



Electromagnetic Spectrum

- 📅 Takes 3, 50 min. class periods
- 🛒 Costs approximately \$3.00 per student, excluding tools and microcontroller
- ☑ Meets middle-school NGSS and ISTE standards

<https://www.microsoft.com/en-us/education/education-workshop/>



One little cube... Science on the move.



Data Streamer for Excel

Microsoft | Education School leaders Educators IT Students and Parents Higher ed More CONTACT SALES



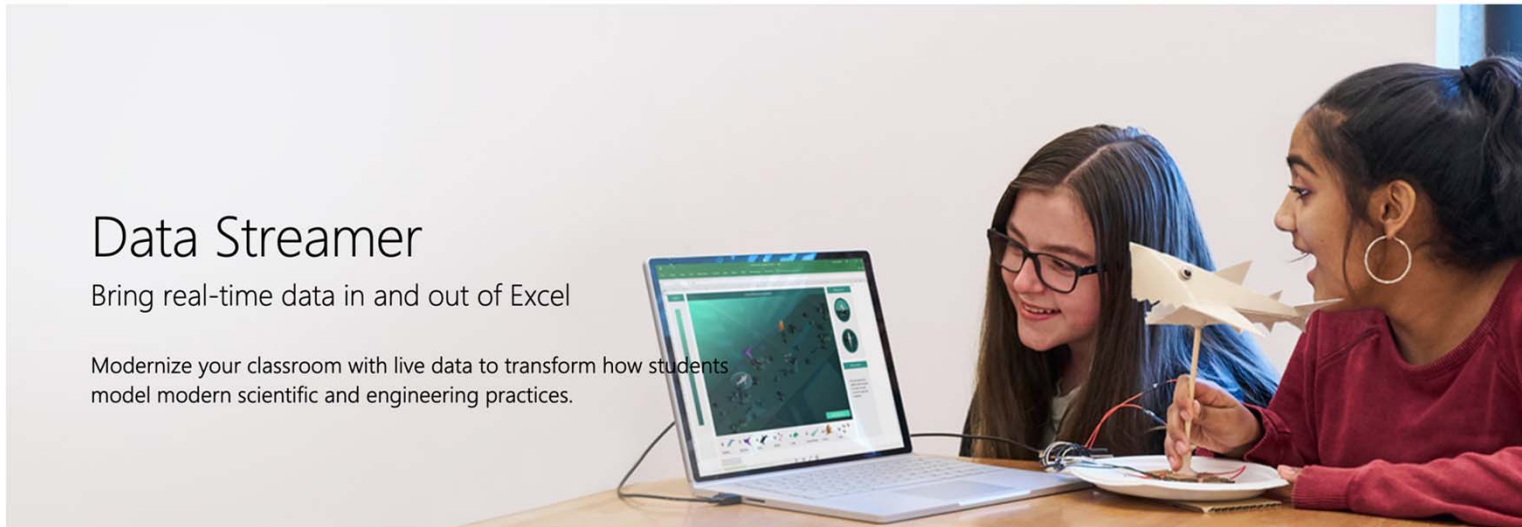
Discover how to engage and empower all students >

Education / Educators / DataStreamer

Data Streamer

Bring real-time data in and out of Excel

Modernize your classroom with live data to transform how students model modern scientific and engineering practices.





Sensor Based STEM w/ databot™ & Excel



Now let's meet databot™!!



databot™ is a low-cost, friendly and engaging data logger that combines 10 internal sensors, 1 external temperature probe, an internal SD card memory, and Bluetooth low energy wireless to provide a simple way to collect data for programs like Excel using Data Streamer.

- External Temperature Probe
- Humidity
- UVa, UVb and UV Index
- Ambient Light
- CO2 & VOC
- Altimeter
- Accelerometer
- Gyroscope
- Magnetometer
- Sound
- Air Pressure

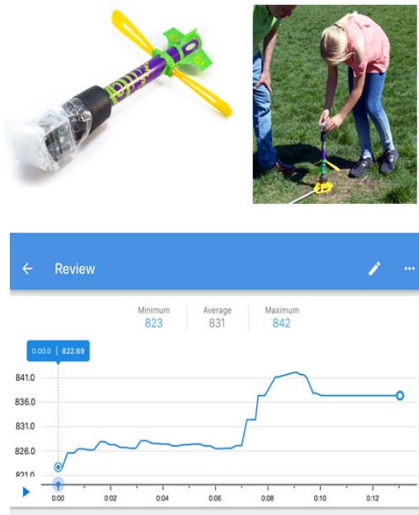
databot™ fits in the palm of your hand, is rechargeable, wireless, and inexpensive to bring data exploration to your classroom in a fun and painless way.



Sensor Based STEM w/ databot™ & Excel



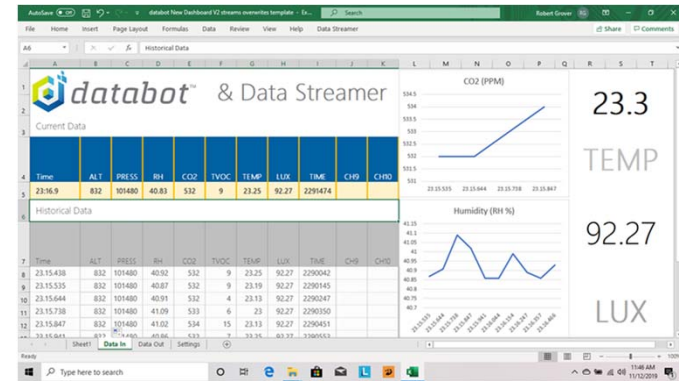
Chromebook Rocket Launch



Simple, Wireless Data Collection



Works with Excel Data Streamer or offline with CSV Files!



One little cube. Science on the move!



Sensor Based STEM w/ databot™ & Excel



Now let's meet databot™!!

This is databot™'s main sensor board which provides you with up to 7 different sensor values for students to work with.

Microphone
Lux
Ultraviolet



TVOC &
CO2

- Decibels
- Lux
- UV-a
- UV-b
- UV-Index
- CO2 - PPM
- Volatile Organic Compounds PPB

Any of these values can be used with Excel!





Sensor Based STEM w/ databot™ & Excel



Now let's meet databot™!!



BLE	SD	Power	Main Sensor
I/O	SPKR	IMU	Board
	HUM	ALT	

databot™ 's side view! Multiple boards provide a lot of capability

- Accelerometer
- Gyroscope
- Magnetometer
- Air Pressure
- Altitude
- Humidity

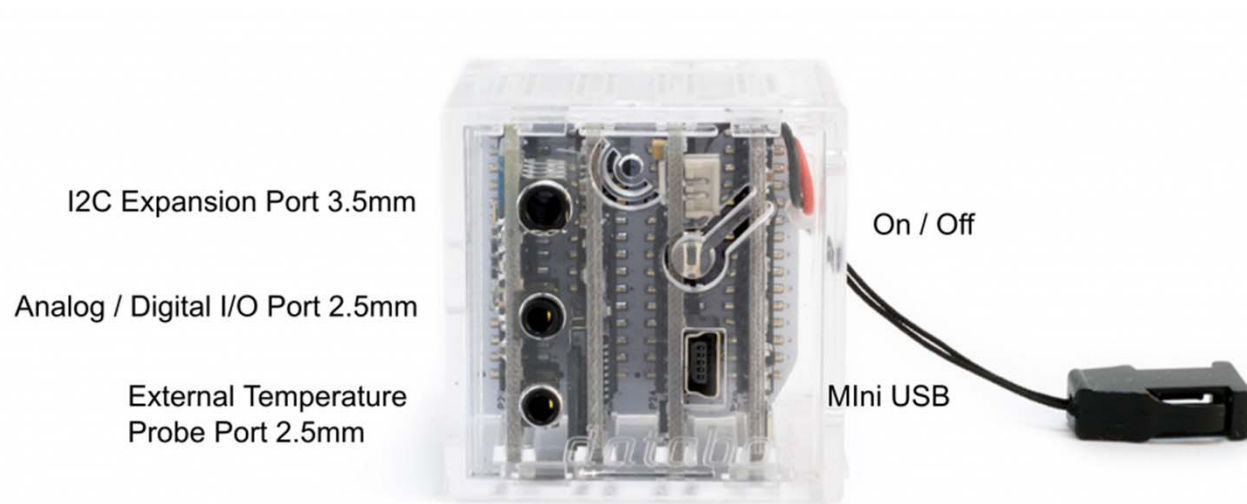
Again, any of these values can be used with Excel!



Sensor Based STEM w/ databot™ & Excel



Now let's meet databot™!!



databot™ was built for inter-operability with all kinds of systems so you can add on sensors, integrate it with other systems and generally invent and hack to your heart's content.

Now let's meet databot™!!

3.7v 250 mAh Rechargeable LiPo
Battery

Lanyard Attachment

Fischertechnik Attachment

LEGO Attachment

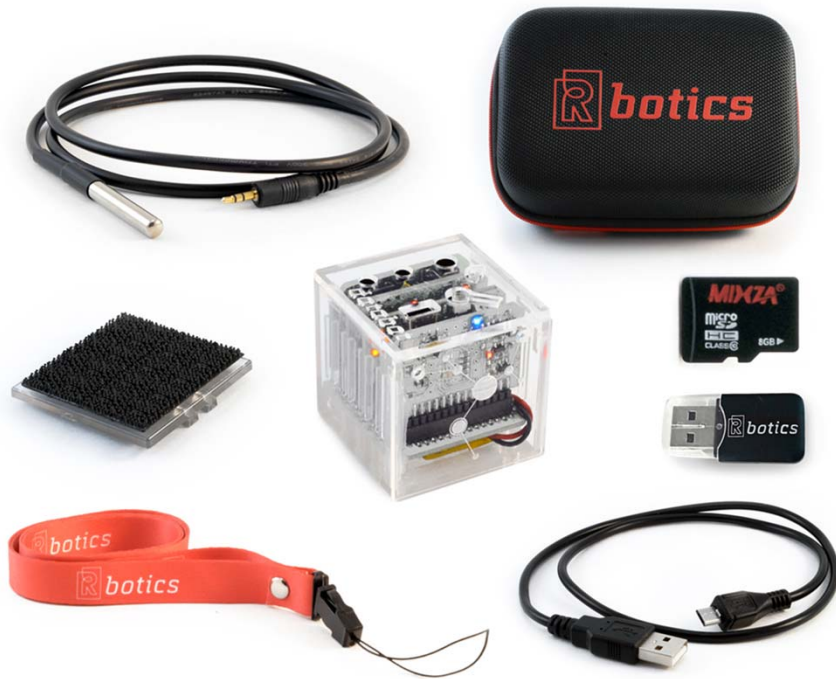
Velcro Plate Attachment



databot™ was built for inter-operability - LEGO, fischertechnik, velcro - all kinds of fun ways to integrate with both physical and electronic systems.



Sensor Based STEM w/ databot™ & Excel



Kit Contents - databot™

- Soft Case
- Mini USB for charging and programming
- Velcro Plate for Attachments
- External Temperature Probe
- Lanyard
- 8GB Micro SD Card and Reader
- databot™

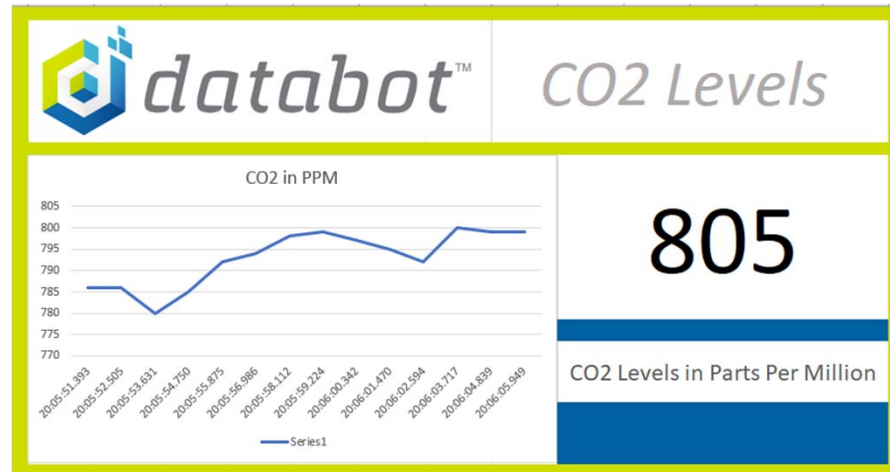


Sensor Based STEM w/ databot™ & Excel



Simple Experiment with Excel & databot™

- Set Excel to display CO2 Levels
- Challenge students to produce the highest level of CO2.
- Note the changes in CO2 levels as students breathe. What causes a higher value?!



MS-LS1.C

As matter and energy flow through different organizational levels—cells, tissues, organs, organisms, populations, communities, and ecosystems—of living systems, chemical elements are recombined in different ways to form different products.



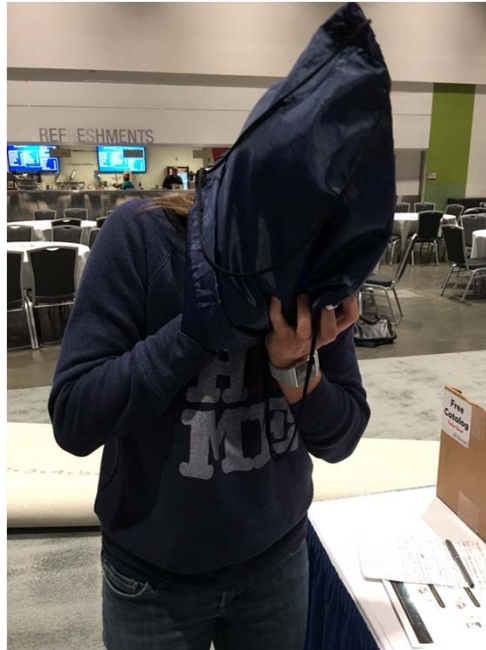
Sensor Based STEM w/ databot™ & Excel



I'll Huff & I'll Puff



The databot™ Game

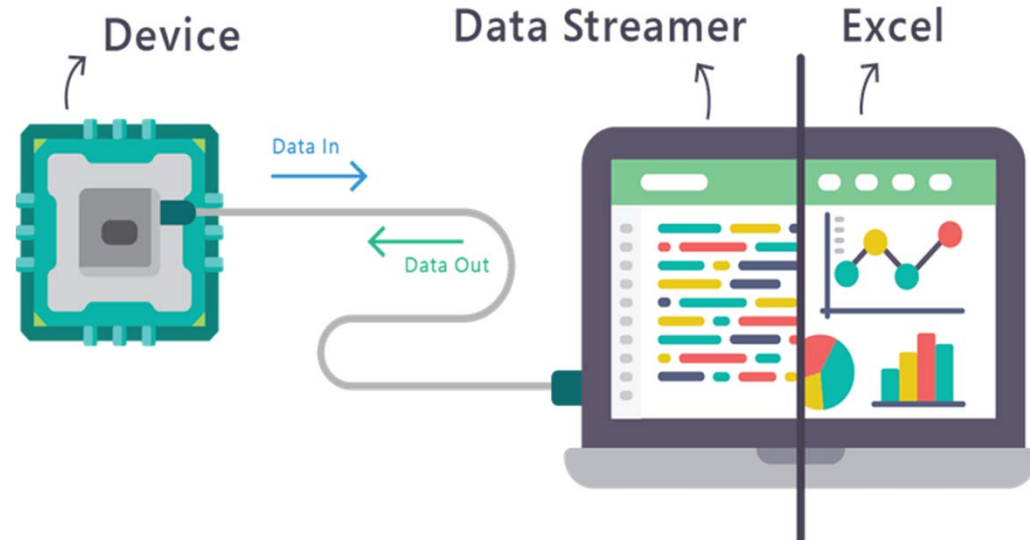


Ninja Walk



What is Data Streamer?

- Start with a microcontroller board and sensor.
- When enabled, Data Streamer enables the interaction between the board and Excel.
- Takes data FROM the board TO Data In for visualizing.
- Takes data TO the board FROM Data Out for Excel-generated board commands.



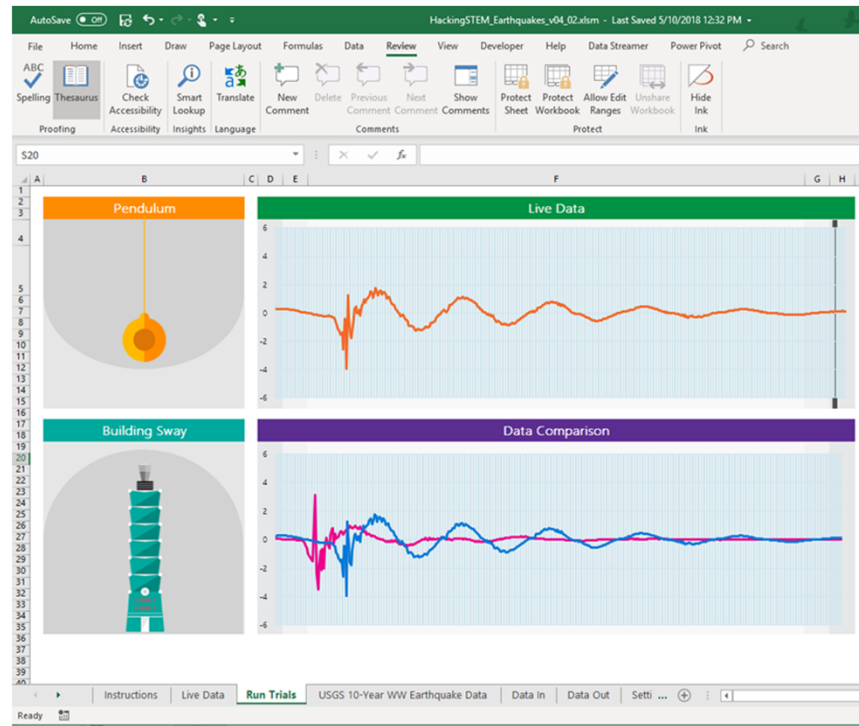
Let's Try It!



Sensor Based STEM w/ databot™ & Excel



Data Streamer Examples

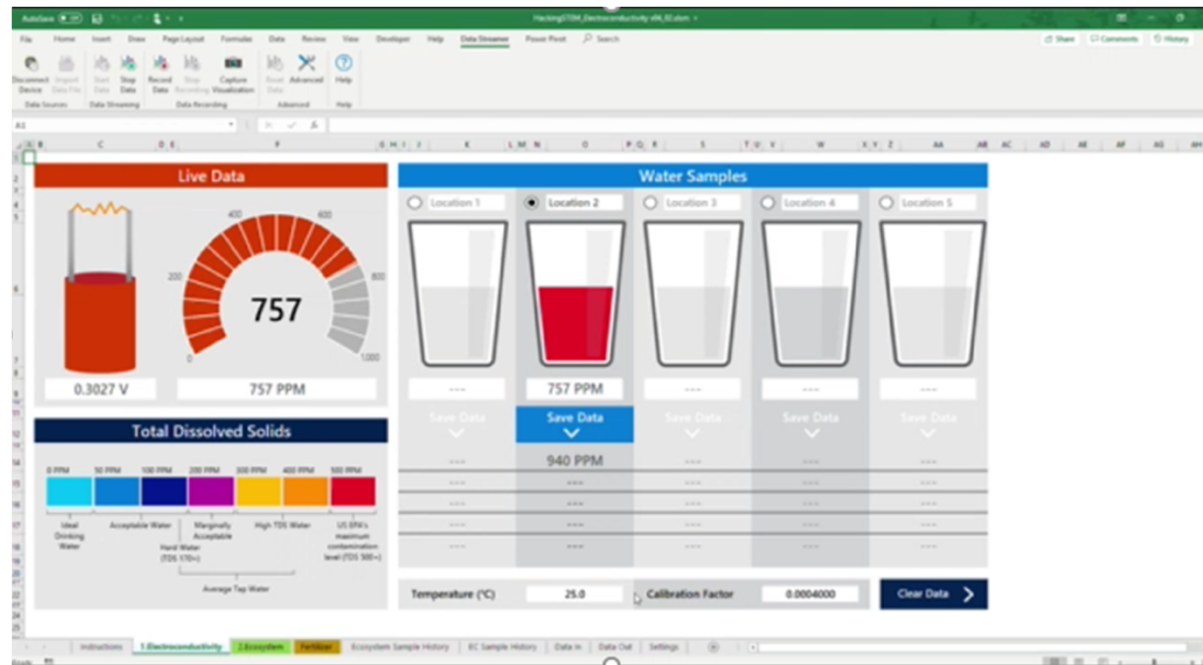




Sensor Based STEM w/ databot™ & Excel



Data Streamer Examples

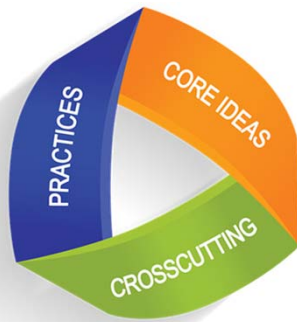




Sensor Based STEM w/ databot™ & Excel



NGSS Practice 4 Analyzing and Interpreting Data



See the Full Appendix of NGSS Practices:

<https://www.nextgenscience.org/sites/default/files/Appendix%20F%20%20Science%20and%20Engineering%20Practices%20in%20the%20NGSS%20-%20FINAL%20060513.pdf>



Practice 4 Analyzing and Interpreting Data

Once collected, data must be presented in a form that can reveal any patterns and relationships and that allows results to be communicated to others. Because raw data as such have little meaning, a major practice of scientists is to organize and interpret data through tabulating, graphing, or statistical analysis. Such analysis can bring out the meaning of data—and their relevance—so that they may be used as evidence.

Engineers, too, make decisions based on evidence that a given design will work; they rarely rely on trial and error. Engineers often analyze a design by creating a model or prototype and collecting extensive data on how it performs, including under extreme conditions. Analysis of this kind of data not only informs design decisions and enables the prediction or assessment of performance but also helps define or clarify problems, determine economic feasibility, evaluate alternatives, and investigate failures. (NRC Framework, 2012, p. 61-62)

As students mature, they are expected to expand their capabilities to use a range of tools for tabulation, graphical representation, visualization, and statistical analysis. Students are also expected to improve their abilities to interpret data by identifying significant features and patterns, use mathematics to represent relationships between variables, and take into account sources of error. When possible and feasible, students should use digital tools to analyze and interpret data. Whether analyzing data for the purpose of science or engineering, it is important students present data as evidence to support their conclusions.



Sensor Based STEM w/ databot™ & Excel



ISTE Standards

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Sensor Based STEM w/ databot™ & Excel



Thanks for Attending!

Presentation Appendix

(PDF will be shared)

1. Microsoft Hacking STEM Lesson Plans
2. databot™ Kit contents and configurations
3. Databot Sensor specifications and data sheets
4. Using databot with other software.





Sensor Based STEM w/ databot™ & Excel



databot™ Purchase Configurations



databot™ Single – The Classic



\$179.99

Add to cart



databot™ 2 Pack – Twice the Fun!



\$350.00

Add to cart



ClassPack 10 – the Big Enchilada!



\$1,750.00

Add to cart



Sensor Based STEM w/ databot™ & Excel



databot™ Technical Info

Sensors

[I2CMPU-9250I2C](#): Inertial Measurement Unit (IMU) includes Accelerometer, Magnetometer, Gyro.

[MPL-3115A2I2C](#): Precision Altimeter for Air Pressure, Altitude, Temperature.

[SGP-30](#): Sensiron Gas Platform for CO2/VOCs.

[SHTC3](#): Sensiron Digital Humidity Sensor for Humidity and Ambient Temperature.

[VEML-6075](#): Ultraviolet Sensor for UVA and UVB.

[ADMP-401](#): Omnidirectional Microphone for Sound.

[APDS-9301](#): Miniature Ambient Light Photosensor for Light (lux).

Data

MicroSD Writer: Internal MicroSD Card Writer for Data Storage.

[HM19 BLE Module](#): Bluetooth Low Energy Module for Wireless Communications.

External Ports

[DS18B20](#): Dedicated 2.5mm Stereo Jack includes Waterproof Temperature Probe.

2.5mm stereo port: Open Analog 2.5mm Stereo Jack includes Open Expansion for Analog Sensors.

I2C 3.5mm stereo port: Open I2C 3.5mm Stereo Jack includes Open Expansion for I2C Devices.

Other

BusBoard LED Strip: Programmable LED Strip includes Programmable Indicator. Address (A3)

250mAh LiPo: Internal, Rechargeable LiPo Battery is the Primary Power Supply. 2-4 hours.

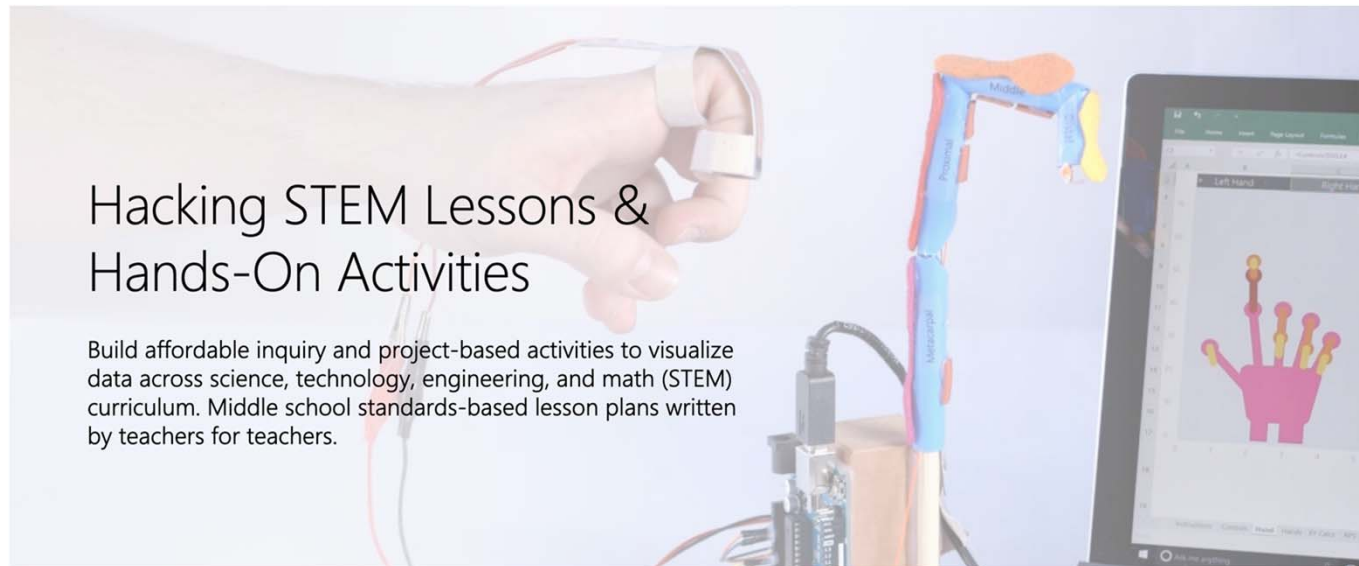
External power bank, 5v DC Micro-USB source for extended run times 24+ hours



Sensor Based STEM w/ databot™ & Excel



databot™ and Excel - the Hacking STEM Website



Hacking STEM Lessons & Hands-On Activities

Build affordable inquiry and project-based activities to visualize data across science, technology, engineering, and math (STEM) curriculum. Middle school standards-based lesson plans written by teachers for teachers.

<https://www.microsoft.com/en-us/education/education-workshop>



Sensor Based STEM w/ databot™ & Excel

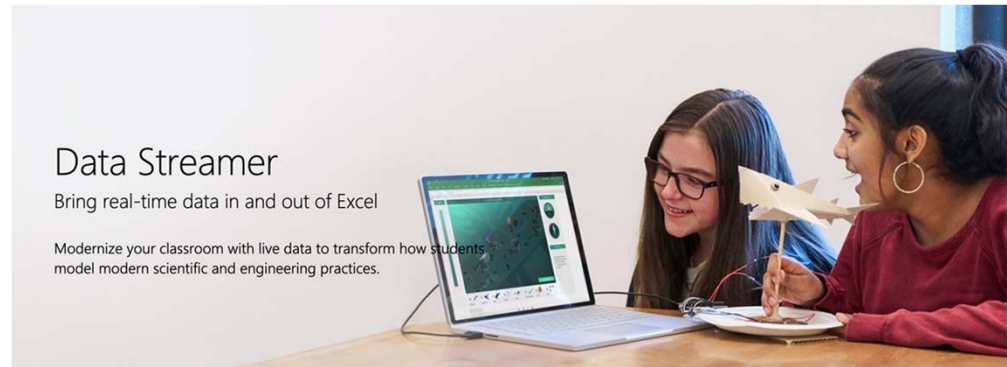


databot™ and Excel Data Streamer

Data Streamer

Bring real-time data in and out of Excel

Modernize your classroom with live data to transform how students model modern scientific and engineering practices.



Website

<https://www.microsoft.com/en-us/education/hackingstem/datastreamer>

Tutorial and Support

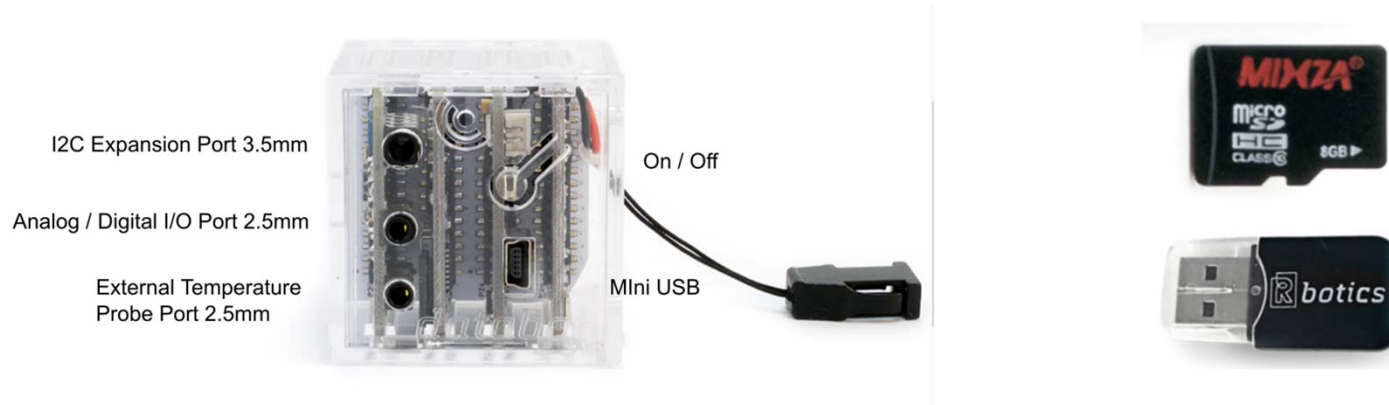
<https://docs.microsoft.com/en-us/microsoft-365/education/data-streamer/using-in-excel>



Sensor Based STEM w/ databot™ & Excel



Using databot™ with other software - Internal SD Card and CSV logging



Logging Data for Other Applications

Write data files to internal SD 8GB data card, use provided SD card reader to transfer to Chromebook, Windows, Mac, etc. and load into analysis programs.

Getting Started Information with databot

<https://databot.us.com/start>



Power Up Your Science Program w/ databot™ & Google



Official Website

<https://sciencejournal.withgoogle.com/>

Where to Get Google Science Journal



Science Journal

Google LLC Education Education

Everyone Family Friendly

This app is compatible with some of your devices.

Android Play Store



Science Journal by Google

Google LLC

4.5, 1.7K Ratings

Free

iOS App Store

The screenshot shows the homepage of the Science Journal website. At the top, there is a navigation bar with links for "Getting Started", "Experiments", "For Teachers", "For Developers", and "Support". A "GET THE APP" button is visible in the top right corner. The main content area features a large blue banner with the text "Inspire and empower with Science Journal". Below this, a paragraph describes the app: "Science Journal transforms your device into a pocket-size science tool that encourages students to explore their world. As they conduct eye-opening experiments, they'll record observations and make new, exciting discoveries." A "WATCH VIDEO" button is located at the bottom left of the banner. The background of the banner shows two young girls running in a field under a blue sky with colorful kites and a white line graph overlaid on the scene.