GOOGLE SCIENTIFIC JOURNAL FOR ENVIRONMENTAL DATA COLLECTION

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Technology Focus: This unit focuses on data collection through the use of Google Science Journal or a student made device. It can be applied to Grade 7 and up Science and Tech classes.

- **Arduino based Sensors and Serial Monitor**
- **BBC: Microbit with additional Sensors**

Description:

The unit focuses on data collection through the use of Google Science Journal or a student made device. An example of the narrative for this unit is written below. Can be applied to Grade 7 and up Science and Tech classes.

(Narrative) Our planet is changing and we are even affected in our local area. My proposal is that we allow students to have the opportunity to develop technology that would allow them to data mine (collect information) their environment in which they are learning. The teacher would have a unit that would allow them to show the students how to collect data based on a variety of sensors that could be found in programmable circuit boards. They would also show students how to use Google journal to collect data that would assist in developing a solution to an inquiry-based problem.

Level: Basic - Google Science Journal

Moderate to Advanced:

- Arduino based Sensors and Serial Monitor
- Microbit with additional Sensors

Audience: Grade 7/8 Science & Technology

Tool Highlights:

Google Science Journal iOS (iPhone or iPad) (https://itunes.apple.com/us/app/science-journal-by-google/id1251205555?mt=8)

Google Science Journal for Android (https://play.google.com/store/apps/details?id=com.google.android.apps.forscience.whistlepunk&hl=en)

Body:

This unit will allow teachers to explore Google science journal and any other programmable circuit boards that they may have access to. The primary goal is to train both teachers and students how to utilize technology such as iPhone, iPads Android tablets and phones to collect data from the environment around them. As well, this unit will provide an opportunity for teachers to use Arduino, BBC Micro:bits, or any other programmable circuit boards to collect information that could assist in making valuable decisions.

Video on what Science Journal by Google is about:

https://www.youtube.com/watch?v=bb0u9doPdug (https://www.youtube.com/watch?v=bb0u9doPdug)

- Ministry Expectations (overall expectations, STSE expectations, specific expectations)
  - GRADE 7 - UNDERSTANDING EARTH AND SPACE SYSTEMS “HEAT IN THE ENVIRONMENT’
    - Big Ideas
      - Heat has both positive and negative effects on the environment. (Overall expectation 1)
    - Overall Expectation
      - assess the costs and benefits of technologies that reduce heat loss or heat-related impacts on the environment;
  - GRADE 8 - UNDERSTANDING EARTH AND SPACE SYSTEMS WATER SYSTEMS
    - Big Idea
      - Water systems influence climate and weather patterns.
    - Overall Expectation
      - assess the impact of human activities and technologies on the sustainability of water resources;
      - investigate factors that affect local water quality;
      - demonstrate an understanding of the characteristics of the earth’s water systems and the influence of water systems on a specific region.

- Key Concepts
  - Using technology to collect information
  - Using the information to make decisions
- Prior Skill Sets
  - Coding (Blockly, block-based Javascript - Scratch etc)
  - Basic circuitry
  - Research (knowing how to find accurate sources online)

- Materials and Equipment
  - Access to phones or tablets (personal or school-owned)
  - Arduino kits
  - BBC Micro:bit and Sensors
  - mCores (the microcontroller found on an mBot)

- Instructional strategies (Brainstorm, provocation, group, individual, hands-on activity, other)
    - Please see below
- Safety (both in the classroom and online - using third-party tech tools)
    - Students will be reminded when working with any Electronics that making direct contact with the circuit board could lead to electrocution and that it should be respected when used. Foreign objects should not come into contact with the circuit board at any time and when connecting and disconnecting any sensors, the programmable circuit board must be powered off before any change can occur. it is imperative to remind the students that they are working with sensitive technology that they can use for their project but if it is abused it will either break or be taken away.
    - In regards to privacy; Students need to be reminded that they do not share any information online unless it is directly related to the teacher and class. When using Google scientific journal no information should be shared with anyone outside of the group.

- Teaching Suggestions/Hints
    - There are plenty of online resources that can be accessed by both students and teachers when it comes to coding technology. Each type of technology usually has its own community of supporters and makers.
        - BBC: Microbit https://microbit.org/ (https://microbit.org/)
        - Arduino and other Arduino based techs https://www.arduino.cc/ (https://www.arduino.cc/)
        - https://www.makeblock.com/steam-kits/mbot (https://www.makeblock.com/steam-kits/mbot)
    - Sites for coding
        - MakeCode https://www.microsoft.com/en-us/makecode (https://www.microsoft.com/en-us/makecode)
        - Scratch https://scratch.mit.edu/ (https://scratch.mit.edu/)
        - mBlock http://www.mblock.cc/ (http://www.mblock.cc/)

Scope and sequence:

1. Identify the problem (lesson 1 & 2)
    1. Introduce data collection
    2. Brainstorm a solution
    3. Research the tools needed for data collection
2. Build/code the tools (lesson 3)
    1. Collect the data (light, sound, motion, temperature, frequency, electromagnetic, etc)
    2. Display the data

LESSON 1:

Estimated Time: 30 - 45 minutes

Guiding Question: Based on information found on the internet regarding weather trends what might we expect next year?

Concepts: Research and Brainstorming

Lesson Description: The lesson introduces the Inquiry.

Materials and Resources	Learning Goals
Access to the internet Paper and Markers Or Pencil and paper Google Docs	• Internet research • Brainstorming • Show evidence of prior knowledge • Discovery learning • Assessment for Learning

Time	Lesson Content	Instructions/ Tips/Tricks

5 minutes	Introduction 1. Teacher explains: "It is 2019 and the weather is changing and conditions are more abnormal. Based on current and past trends in the weather pattern, predict what might be happening next year."	Allow students to research from the following websites: http://climate.weather.gc.ca/ (http://climate.weather.gc.ca/) https://www.accuweather.com/en/climate-change (https://www.accuweather.com/en/climate-change)
30 minutes	2. After making a prediction, students will be instructed to begin researching using almanacs or websites that focus on climate change. 3. Students should seek information about their current local environment (around their school or their town)	This is a good site that explores the possible choices people can make where water is a concern. http://h2o4la.com/ (http://h2o4la.com/)
10 minutes	Activity 1. Participants can work independently (working in pairs is always an option). They should organize their findings into a presentation (Google Slides or Microsoft Powerpoint) or on a chart/sheet.	Introduction of the Science Journal - The teacher may want to share the app at this point. They can show live data collection in the classroom just to get the idea inside the students' minds.
	Conclusion Ask the students: How did you begin your research? What key factors did you identify that are affecting climate? How is climate affecting the school you attend or the town you live in?	

LESSON 2:

Estimated Time: 25-50 minutes

Guiding Question: Based on the research gathered from the previous class; How can we gather information about our local environment to see that is happening around us?

Concepts: Collecting Data

Lesson Description: Developing an understanding of data collection (can be linked to Grade 7/8 Ontario Math Data Management)

Materials and Resources	Learning Goals
Access to the internet Paper and Markers Or Pencil and paper Google Docs Science Journal (Google App)	• Internet research • Collecting Data (using the technology) • Identifying Changes

Time	Lesson Content	Instructions/ Tips/Tricks

5 minutes	Introduction - “Based on the previous lesson, we are going to be looking around us and trying to identify what can happen if our local environmental changes and what data can we collect.”	
40 minutes	Activity: Introduce the Science Journal and how it collects data using the sensors built into the device (phone or tablet) Have the students walk around their environment (teacher can choose where they might be interested in exploring - could be in school or outside) Use the “Data Collection Tracking Sheet” (https://drive.google.com/open?id=1ydvJQty_bndd0dsbQ6ZfxHG0z3cePbKc) to manage the work.	You can collect information inside or outside: • Classroom • Library • Cafeteria • Gym • Field • Local green space They can look at the following variables: • Light • Sound • Motion • Temperature • Events • Electromagnetism
10 minutes	This should be repeated over a couple of sessions to compare the results. The students should also record weather conditions and other data provided by AccuWeather (https://www.accuweather.com/) or other such sites.	
	Conclusion: Have the students share their findings with the class.	

LESSON 3:

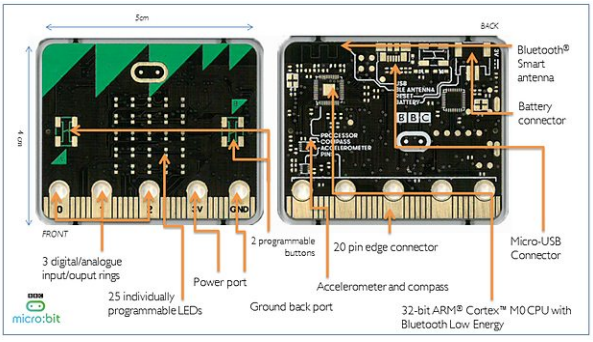
Estimated Time: 25-50 minutes

Guiding Question: How might one be able to collect and store data from the environment using a technology that’s coded by someone?

Concepts: coding

Lesson Description: Creating

Materials and Resources	Learning Goals
Any Programmable Circuit board Software to interface with the board	• coding

Time	Lesson Content	Instructions/ Tips/Tricks
5 minutes	Introduction: We had an opportunity to collect data from observations and research and using the Science Journal. Now, we need to try to design our own data collectors.	
	STEP 1: (For the purpose of providing an example, we will use the Microbit) Identify the parts of the programmable board that can collect data. https://www.microbit.co.uk/blocks/book/hello-world (https://www.microbit.co.uk/blocks/book/hello-world)	•
X minutes	App for using with the Microbit to collect data. "Bitty Software have recently released the Bitty data logger app for Android and iOS, which allows you to capture and chart accelerometer data from your micro: bit" • ○ https://www.kitronik.co.uk/blog/bitty-data-logger-app-bbc-microbit/ (https://www.kitronik.co.uk/blog/bitty-data-logger-app-bbc-microbit/)	
10 minutes	 STEP 2: Log into Makecode to start coding	

Tutorials are very good. The students will gain an understanding of the potential of what can be done with the microbit (and the limitations)

https://makecode.microbit.org/courses/ucp-science/data-collection (https://makecode.microbit.org/courses/ucp-science/data-collection)

STEP 3: Students choose what they will code to collect information from their environment (this could be physical - shaking the devices to increase a count or using an external sensor like photoresistor to find out how much or how little light is in a given area.)

https://microbit-challenges.readthedocs.io/en/latest/tutorials/accelerometer.html (https://microbit-challenges.readthedocs.io/en/latest/tutorials/accelerometer.html)

STEP 4: Collect the Data and present it visually. The students can take all the information and display the outcomes based on the last 3 lessons.

Assessment strategy (for, as, of learning, rubrics (strands), peer evaluation sheets, other)

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Success Criteria can be developed by the students with the teacher and a customized rubric should be developed from that

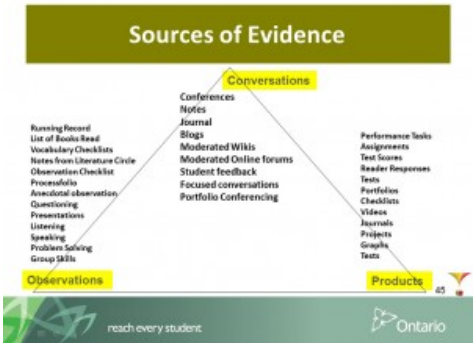
For Learning: Ask the students to brainstorm and identify topics related to this unit of study (review of content).

As Learning: During the data collection using the Science Journal or a device they have designed use conferencing and descriptive feedback to deal with questions or issues may arise during the process (of collecting and identifying what can be collected). It would also benefit both the student and the teacher if a self-reflection be kept. A Design process journal kept would assist in documentation. Click here for Google Search (https://www.google.ca/search?q=myp+process+journal&safe=strict&source=lnms&tbm=isch&sa=X&ved=0ahUKEwj73JjI7OfdAhUE-6wKHb5HDQsQ_AUIDigB&biw=1440&bih=755#imgrc=_)

Process Journals can be presented and shared with peers.

Of learning: The conclusions of each lesson will produce evidence that can be assessment/evaluated against a rubric.

The Triangle of Assessment provides some concrete examples (and opportunities) to find evidence of, as, for learning.



NEXT STEPS/EXTENSIONS/ACCOMMODATIONS/OTHER TOPICS FOR THIS TECH TOOL:

Include other possible applications

This unit can be used for other grades.

For grade 8, this can be linked to Understanding structures and mechanisms - systems in action

For Grade 9 - Electrical Applications

Grade 10 - Climate Change/Earth's Dynamic Climate

Microbits are the easiest to work with but Arduinos, mCores and other programmable boards can perform similar tasks.

Microsoft has developed the MakeCode environment to be simple and diverse for students to use.

ADDITIONAL RESOURCES:

- Classroom examples (optional)
- Support Resources: Worksheets created by you or other resources (APA citation) Please make sure each resource is clearly titled and ordered to coordinate with the body, with the same keywords..
- Related Background Resources: APA citation

Links

- Links are also embedded above
- App for using with the Microbit to collect data. "Bitty Software has recently released the Bitty data logger app for Android and iOS, which allows you to capture and chart accelerometer data from your micro:bit"
    - https://www.kitronik.co.uk/blog/bitty-data-logger-app-bbc-microbit/ (https://www.kitronik.co.uk/blog/bitty-data-logger-app-bbc-microbit/)

(mailto subject out this (https://www.facebook.com/sharer.php?u=https://connex.stao.ca/classroom-catalyst/google-scientific-journal-for-environmental-data-collection) (https://twitter.com/intent/tweet?text=https://connex.stao.ca/classroom-catalyst/google-scientific-journal-for-environmental-data-collection) (https://plus.google.com/share?url=https://connex.stao.ca/classroom-catalyst/google-scientific-journal-for-environmental-data-collection)

WATCH THE VIDEO

03:44 min

(//www.youtube.com/embed/S2iGrRbKVsM?width=800&height=450&iframe=true)

RESOURCES

What is the Microbit? (//www.youtube.com/embed/TBSUd5jVzws?width=800&height=450&iframe=true)

data collection tracking sheet 1.xlsx (https://connex.stao.ca/sites/default/files/data_collection_tracking_sheet_1.xlsx)

ELEMENT

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