USING GOOGLE FORMS AND SHEETS TO CREATE LARGE DATASETS THAT ALLOW FOR A RICH ANALYSIS OF STUDENT-COLLECTED INQUIRY DATA (SNC1P)

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Title: Investigating the effects of humans on the local school ecosystem using the Google Suite for Education with SNC1P students

Technology Focus: Using the power of Google Forms and Sheets to create large datasets that allow for a rich analysis of student-collected inquiry data.

Description: Students will fill out a Google Form on the ecosystem data that they collect, which will then be exported into a Google Sheet and analyzed so that students can see trends in their class's dataset without much effort on either the student or teacher's part. The students are empowered to analyze their own data while teacher is a guide on the side.

Level: Low-medium. Teachers should have a basic grasp on how to post Google Docs, Forms, and Sheets to google classroom or another learning management software. Teachers should understand the relationship between a Google Form and its linked Sheet so that they can show students where their inputted data has been analyzed. Teachers should also feel comfortable using the chart editor in Google Sheets to change the axis titles. See additional resources for support.

Audience: Secondary. Main use was designed to match the SNC1P curriculum during Strand B: Biology, but this could also be used in a SNC1D classroom to cover Strand B: Biology as well. Students at this level are most engaged when they participate in hands-on activities related to their own lives and environmental experiences such as their local school environment.

Tool Highlights: Google Forms and Sheets

Body:

Big Ideas:

- Ecosystems consist of a variety of components, including, in many cases, humans.
- Human activity can affect the sustainability of aquatic and terrestrial ecosystems

Ministry Expectations (overall expectations, STSE expectations, specific expectations):

1. Overall Expectations:

    1. A1. demonstrate scientific investigation skills (related to both inquiry and research) in the four areas of skills (initiating and planning, performing and recording, analysing and interpreting, and communicating);
    2. B1. analyse the impact of human activity on terrestrial or aquatic ecosystems, and assess the effectiveness of selected initiatives related to environmental sustainability;
    3. B2. investigate some factors related to human activity that affect terrestrial or aquatic ecosystems, and describe the consequences that these factors have for the sustainability of these ecosystems;
    4. B3. demonstrate an understanding of characteristics of terrestrial and aquatic ecosystems, the interdependence within and between ecosystems, and the impact humans have on the sustainability of these ecosystems.
2. Specific Expectations
    1. A1: A1.1, A1.2, A1.3, A1.4, A1.5, A1.6, A1.8, A1.10, A1.11, A1.12, A.13;
    2. B1: B1.1;
    3. B2: B2.1, B2.2, B2.3, B2.4, B2.5;
    4. B3: B3.2, B3.5.
3. STSE Expectations:
    1. Goal 1. To relate science to technology, society, and the environment;
    2. Goal 2. To develop the skills, strategies, and habits of mind required for scientific investigation.

Key Concepts:

Students collect data on their school grounds to examine how human disturbance has caused changes in their ecosystems.

Prior Skill Sets:

Students will be familiar with using Google Apps for Education. The students will also understand the concept of human disturbance and what effects that can have on the environment. They will also be able to read basic graphs and interpret trends from them. A reminder checklist can be given to the students using the following PDF: http://club.cciproject.org/charts/media/checkBar.pdf (http://club.cciproject.org/charts/media/checkBar.pdf)

Materials and Equipment:

- Student worksheet (https://docs.google.com/document/d/18z9wnHSsMo6xEfTx5EH8dKJWdFD0hUH1e68QZO2b5GA/edit?usp=sharing)
- Student google form (https://drive.google.com/open?id=1QZXAz9gWYC9i3CCPcHV6hqsdIyO1AaJgJ2-4w40bvbg) (MAKE A COPY PLEASE!)
- Teacher google sheet (https://drive.google.com/open?id=101HvsG4wxxHHTPxPge_Qo3FG2xdDuNcxf2sXti39QpM)
- Chromebooks/iPads
- Pencils and Pens
- Projector
- Measuring tools

Instructional strategies:

1. Share the handout (https://drive.google.com/open?id=1psjBqc_elt26SCaCT_02h8wCvt9eCJg1dCJo0wczamg) with your students either by posting to google classroom, by providing a link, or by printing out a hard copy for each student.

2. Brainstorming which methods your class will use to measure ecosystem health (E.g. measuring plant life, measuring the presence of animals, looking at soil samples for microbial life) and human disturbance type (E.g. pesticide use, run-off, garbage present, lawn cutting, etc.).
3. Pick a type of disturbance that you want to measure in your school's yard that has had an effect on the school's ecosystem.
4. Pick one way of measuring ecosystem health (or more - you can modify the form to collect multiple types of data).
5. Hands on: Assign each pair of students to measure the ecosystem health in one area of the school yard near the disturbance and measure again in a relatively undisturbed area.
6. Individual work: One student from each group can input data into the Google Form (https://drive.google.com/open?id=101HvsG4wxxHHTPxPge_Qo3FG2xdDuNcxf2sXti39QpM) (MAKE A COPY PLEASE!) and then examine the class dataset to draw conclusions. For a tutorial on using Google Forms, watch a video here (https://www.youtube.com/watch?v=oMdljepMERA).
7. While the students are inputting their data, you need to edit the chart in the sheet (https://drive.google.com/open?id=1YP1Zpbliek4Xtj2SxsBf2eV4jjDLTeifx59gwjaXRx4). This could be done in advance by inputting some test data.
    1. At the top of the form, click the responses tab.
    2. In the top right corner of the responses tab, click the green sheets button to open the linked sheet that says "view responses in Sheets"
    3. Click on the chart, which opens the chart wizard. The chart will already be linked to the data.
       There are currently some bugs in Google Sheets which prevent the data from being viewed. In the meantime, a workaround for this involves opening the sheet in Microsoft Edge (explorer), Safari, or Firefox.
    4. Once the chart wizard is open, click the "customize" tab within the chart wizard.
    5. Click the row that says "Chart & axis titles"
    6. Under "Type", select Chart Title, and fill in the factors you examined in your class's investigation.
    7. Update the axis titles by again selecting "Type" and Horizontal axis title and Vertical axis title.
    8. After displaying the graph, click on the three dots on the side of the graph and click publish, get the link, and then post it to google classroom.
8. Class Discussion: Lead a conversation with the class about what happened when the environment was disturbed.

Safety (both in the classroom and online - using third party tech tools):

- Supervise students while they are measuring the environmental data to ensure they do not get injured. (STAO 2011:OPHEA 2015)
- Ensure that the permissions are set for only members of the school board so that all of the information is protected within the school board's server.

Teaching Suggestions/Hints:

- Have some suggestions on methods of assessing environmental health so that they all have a starting point.
- Test out the Google Form before giving it to the students to ensure that the sheet is linked.
- You may add or remove questions from the Google Form depending on your class' needs.
- You will need to edit the graph titles to match what your class examined.

Assessment strategy

Assessment for learning:

- Check in with students during the brainstorming to see whether they understand the concepts of disturbance and ecosystem health.
- Watch students sample the ecosystem and give them immediate feedback.
- When the students are inputting their data, ask them questions to gauge their understanding.

Assessment as learning:

- Teacher:
  - Watch students as they plan their experiment to assess their organization.
  - You can assess the student's self-regulation during the measurements and their ability to direct themselves to the second measurement.
- Student:
  - Examine graphs created with their partner and self-assess whether or not the graph meets the criteria set by the teacher
    - Students can then make necessary changes/corrections

Assessment of learning (Rubric (https://drive.google.com/open?id=1CMkNBwEMKzesv6PJ640UFDMzlxgA027cHVkoL8Y3zUU)):

- Check each student's graphs to assess their scientific communication.
- Assess the conclusion for both content and communication.
- Assess students application skills on the final question to see whether they can connect the results of the study and what humans can do to preserve or protect the health of the ecosystem.

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

- Have students measure the ecosystem health twice throughout the unit to see if the health has improved or declined.
- Have students measure the ecosystem health twice before or after a disturbance to see if the ecosystem health has improved or declined.
- Design other labs that use the power of Google Forms and Sheets to create large datasets.

ACCOMMODATIONS:

- Some students may have accessibility needs that may be difficult to meet in the school yard. Have students with mobility needs conduct their study in a location that is easier to reach than other students.
- Give all students the option to complete their investigation on their chromebooks/iPads so that they can use the accessibility tools.

ADDITIONAL RESOURCES:

Using Google Docs:

Google. (2018) GSuite Learning Centre. Retrieved from https://gsuite.google.com/learning-center/#!/ (https://gsuite.google.com/learning-center/#!/)

Creating forms:

Johnson, A. (2016). Google Forms - Recommended Way to Collect Data [Video file]. Retrieved from https://www.youtube.com/watch?v=oMdljepMERA (https://www.youtube.com/watch?v=oMdljepMERA)

Modifying Graphs in Sheets:

Cool, S. (2013). How to Make a Graph in Google Sheets (Scatter Plot) [Video file]. Retrieved from https://www.youtube.com/watch?v=st7DFULsP0M (https://www.youtube.com/watch?v=st7DFULsP0M)

Safety:

OPHEA. (2015) A Safe Space to Play, Learn & Grow. Retrieved from https://www.ophea.net/article/safe-space-play-learn-grow (https://www.ophea.net/article/safe-space-play-learn-grow)

STAO. (2011) Safe on Science. Toronto, ON: STAO.

(mailto:?subject=Check out this page&body=https://connex.stao.ca/classroom-catalyst/using-google-forms-and-sheets-to-create-large-datasets-that-allow-for-a-rich)

(https://connex.stao.ca/classroom-catalyst/using-google-forms-and-sheets-to-create-large-datasets-that-allow-for-a-rich)

WATCH THE VIDEO

07:37 min

(//www.youtube.com/embed/S9S2sLE1MhA?width=800&height=450&iframe=true)

RESOURCES

- Lab Overview (https://drive.google.com/open)
- Student Handout (https://drive.google.com/open)
- Google Form (MAKE A COPY PLEASE!) (https://docs.google.com/forms/d/101HvsG4wxxHHTPxPge_Qo3FG2xdDuNcxf2sXti39QpM/edit)
- Linked Google Sheet (https://drive.google.com/open)
- Achievement Charts (https://drive.google.com/open)
- Sample Filled Student Handout (https://drive.google.com/open)

ELEMENT

- Technology Enabled Learning (/expert-elements/technology-enabled-learning)

(/classroom-catalysts) RETURN TO CATALYSTS (/classroom-catalysts)

STAO/APSO WEBSITE (http://stao.ca/cms/)
SEARCH (/search)
PRIVACY POLICY (/privacy-policy)
TERMS OF USE (/terms-of-use)
CONTACT (/contact)

FACEBOOK (https://www.facebook.com/STAOAPSO?fref=ts)
TWITTER (https://twitter.com/staoapso)
GOOGLE+ (https://plus.google.com/u/0/+ScienceTeachersAssociationofOntarioDresden/about)
INSTAGRAM (https://instagram.com/staoapso/)