Data Collection

Standards addressed:

Common Core Math

(Grade 5)

- Numbers and operations
- Measurement and Data

(Grade 6)

- Ratios and proportional relationships
- Statistics and probability

(Grade 7)

- Analyze proportional relationships and use them to solve real-world and mathematical problems
- Statistics and probability

(Grade 8)

- Functions
- Statistics and probability

Next Generation Science

MS-ETS1 Engineering Design

MS-ETS1-1.

- Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

MS-ETS1-2.

- Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

MS-ETS1-3.

- Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

MS-ETS1-4.

- Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process
    - such that an optimal design can be achieved.

Learning objectives:

- Students will learn how to collect, enter, and analyze data and make inferences based on evidence and their observations.

Reading for comprehension:

What can data give us?

By using the existing network provided by school gardens located throughout the State of Hawai'i, we can collect evidence-based information in the form of data. This data can help determine information such as what are your slug/snail population compositions and dynamics, how do your slug and snail populations fluctuate in relationship to weather and time of the year, are your efforts to control slugs and snails in our school garden are effective, and what methods of control do you find are most effective. Additionally, regular observations of slug and snail species will better ensure early detection of new arrivals of invasive slugs and snails that are important agriculture pests or effective intermediate hosts of the rat lungworm parasite.

What is Data?

Data: *is a set of quantitative or qualitative variables.*

The collection of **factual quantities** and **qualities** of **variables** that relate to an area in which we have an interest can provide insight into the questions we are asking and suggest avenues for solutions to problems we are trying to solve. This collection, comprised of numbers and categories, is called data. Data is evidence-based rather than memory-based. The collection of data, especially long-term data, is essential when we are trying to better understand and solve a complex problem.

Therefore, data collection is imperative for integrated pest management. Here are definitions of some of the terms you must know when collecting and analyzing data.

Variable

A variable is something that changes or varies. Examples of variables that will be collected as a part of slug and snail control efforts in the school garden will be weather conditions (sunny, cloudy, rainy), time of year, rainfall, and possibly temperature. The data collected will also include names of slug or snail species, for example VER CUB for Veronicella cubensis, the Cuban slug, you will record how many of each species type were found under what shelter, and what was the shelter type (cardboard, wood, plastic etc.). We divide these variables into two categories; qualitative or quantitative variables.

Qualitative variables are those attributes being studied that have qualities which can be put into categories such as sunny, cloudy, partly cloudy, rainy, hot, cold, dry, wet, big, small, slug, snail, VER CUB, PAR MAR, cardboard, wood, plastic, etc. These variables are sometimes referred to as categorical variables.

Quantitative variables are those attributes that have a number assigned to them. Examples of these variables are the amount of rainfall per week (e.g. 5.5 inches, 5 ½ inches, 13.97 cm), how many slugs and snails were collected, how many of each species were collected, how many slugs and snails were collected under each shelter/trap material type, etc. Quantitative variables collected in the school garden will include whole numbers (0, 1, 2, 3, ….) and rational and real numbers (numbers expressed as fractions or with decimal points).

Materials needed for data collection

- Rain and temperature gauges
- Data sheet
- Clipboard
- Pencil
- Ruler

- Camera (optional but recommended)

Data Sheet: what information to enter and how to enter it.

This will be a statewide collection of data. As there are approximately 200 school and youth garden projects in Hawai'i, we may have many schools collecting data and therefore it is important that the data all be consistently entered in the same manner for easy transfer and entry into a Google Sheet. Once in Google Sheets the data can be used to find information such as mean, median, and mode, it can be transformed to provide pictorial information about our data, such as **bar graphs, charts, scatter plots, and line graphs**. There are other statistical formulas that can be used to provide even more complex information about our questions, such as variance and standard deviation. The data collected can easily be applied to grade level math standards for grades 5-8. One suggestion might be to have grades 5/6 collect the data in the garden and then turn it in to grades 7/8. Grades 7/8 will then analyze the data and use it for reports to the school garden, and their school's ArcGIS online story map. Below is an example of the standard data sheet currently in use. It is can easily be made in a Word program using click insert in the tool bar, and then click table. Create the appropriate number of columns for the shelter types being used, ample row numbers, and space at the bottom for writing notes. A master data sheet can be downloaded from the file named Master Data Sheet.

School _____ Island_____
GPS_____ Elevation_____
Date_____ Weather_____
Rainfall amt._____
Moon phase (optional) _____
Data collected by_____

Species	Cardboard	Plastic	Wood	Other

Comments:

- School name: The school name should be identified. If the school has an abbreviation for the school name enter the abbreviation in all uppercase letters.
- Island: Identify which island the school is on. Enter the GPS coordinates for the school location, and the elevation of the school. These variables are important and can be found using Google Earth.
- Elevation should be given in meters.
- The date (e.g. 01/23/2018)
- Weather (e.g. sunny, partly cloudy, etc.) is recorded.
- Rainfall data is essential for understanding slug and snail behavior, population size, etc. A good quality rain gauge should be placed in a permanent position in the garden and rainfall data amount should be observed and recorded on a weekly basis. The rain gauge should be emptied after the amount of rain is recorded. For weeks with heavy rainfall, the gauge may be emptied when full as long as the total amount of rainfall for the week is recorded. Rain amounts should be given in centimeters. The rainfall data presents good opportunities good opportunities for practice with conversions. Rainfall data could also be information used by other classes. Weekly rainfall amounts could be announced to the entire school for the information to be used by other teacher/student/class investigations.
- The moon phase is optional but would provide interesting information, especially from school gardens using the Hawaiian moon calendar. This information can be of great value and we applaud those cultural practitioners who use the lunar calendar as a guide for activities.
- Name of the person entering the data records.
- Comments: Write comments about anything of interest, such as eggs found, other creatures found, moisture conditions under the shelter, etc.

Entering the species name

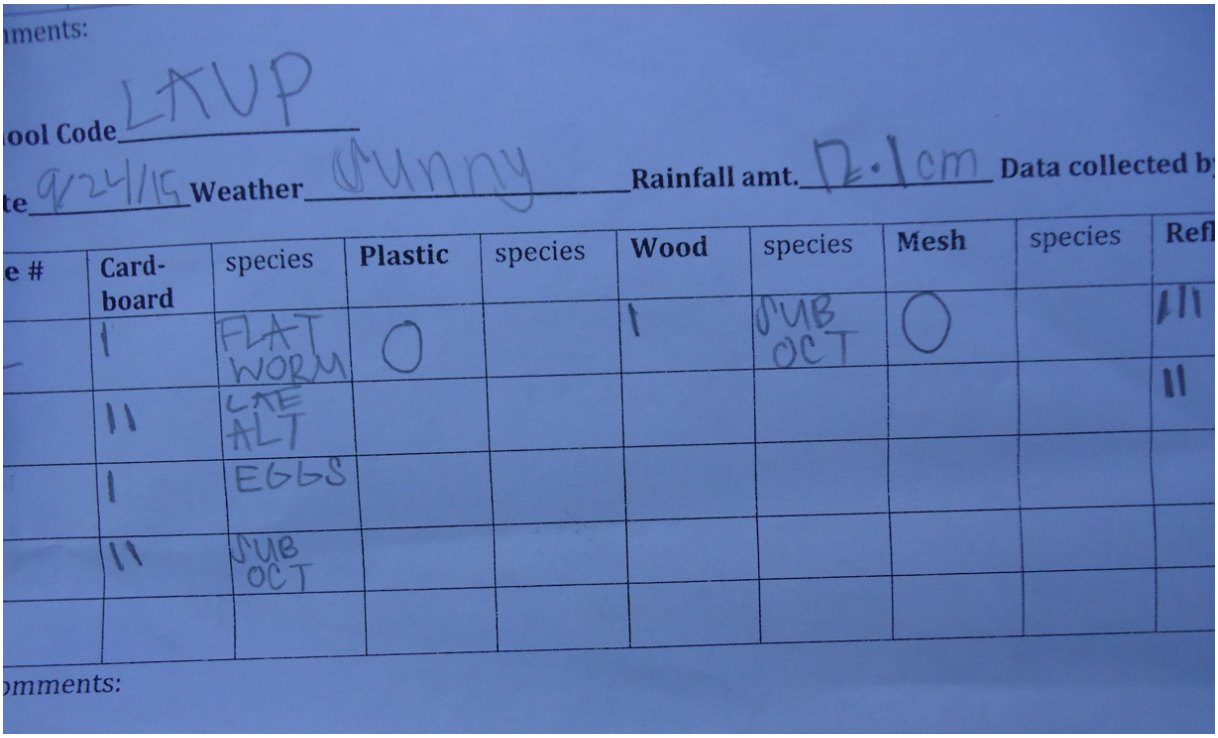
The species name entered will use the first three letters of the genus and species names, and the names are entered in upper case letters. For example, the Cuban slug *Veronicella cubensis* would be entered as VER CUB, and the semi-slug *Parmarion martensi* would be entered PAR MAR. If only the genus is known but

not the species the genus name is entered as above, followed by the letters sp for species. For example, if we know the slug is a *Deroceras,* but we are unsure if it is *D. laeve* or *D. reticulatum,* we just enter DER sp.

Entering the number of species found

When entering numbers of slugs found under a trap type we use tally marks rather than numbers. The use of tally marks easily allows for the addition of another slug or snail found and eliminates the need for erasing. The tally marks below represent the number five. The first four lines are upright and represent 1, 2, 3, 4, and the diagonal line represents 5.

This is an example of student data entry on the data sheet used for a pilot project.



ments:

ool Code LATUP

te 9/24/15 Weather Sunny Rainfall amt. 0.1cm Data collected b

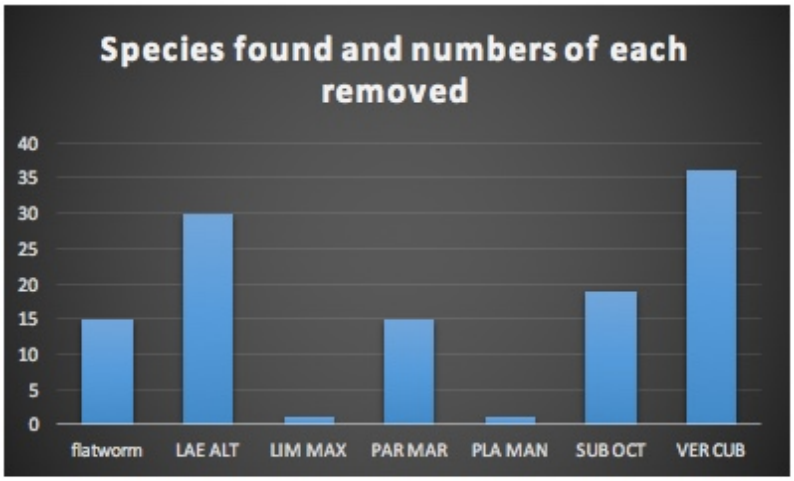
e #	Card-board	species	Plastic	species	Wood	species	Mesh	species	Ref
	1	FLAT WORM	0		1	SUB OCT	0		111
	11	CATE ALT							11
	1	EGGS							
	11	SUB OCT							

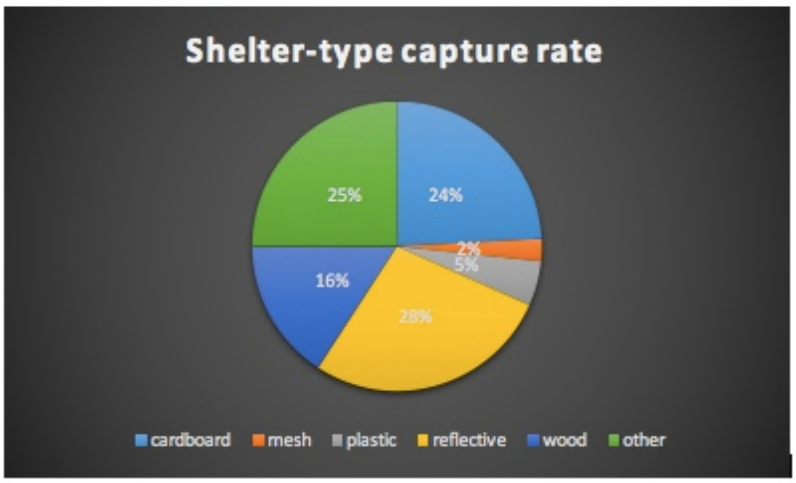
omments:

Comments should be entered in the space left at the bottom of the page. Comments can include information on a slug or snail that could not be identified, or information about eggs, flatworms, or any other information that is of interest and

suggests further research or documentation. If unknown gastropod species are found, a properly staged photograph with a ruler for size reference can be taken. The photograph can be sent to malacologists or others familiar with gastropod identification.

Data should be collected once a week when the shelters are checked. Each team of students should be responsible for collecting the data. Students in the team should rotate data collection so everyone gets a chance to become familiar with the process. The data sheets should be taken to the classroom, and students enter the information into a Google spreadsheet. A separate spread sheet can be made for each month with each sheet labeled with the month name, and the sheets saved into one file. Headings should be made to match the qualitative variable information collected, and tally marks translated to appropriate whole/real numbers to record the quantitative data collected. Once the data is entered into spreadsheets and saved it can be analyzed using statistical analysis and visualized in bar graphs and pie charts. The use of real data collected by the students can help them better understand abstract mathematical concepts. Below is an example of a bar chart of species found and a pie chart of shelter-type capture rate.





Note: In addition to data collected for species found under shelters, it is important to identify and record the slugs, snails, and flatworms captured during slug/snail hunts, or those found during gardening activities. The location where they are found can be recorded as "other." If there are important observations, such as the type of plant(s) nearby, the information may be helpful in our efforts to better understand slug/snail behavior.

Student activities:

Math Activities

- Make a graph that show the numbers of each type of species captured.
- Make graphs that show the shelter-type capture rate.
- Make a graph that shows numbers of species captured per month
- Make a graph of rainfall per month

- Draw inferences; how does rainfall affect numbers of slugs and snails captured? How does the time of year or season affect numbers captured?
- Develop inferences based on the data collected and develop a position that can be stated and use evidence to defend your position.

Language Arts Activities

- Students conduct research on various species of gastropods found in the garden and create informational identification materials for each of the species common to their school garden.
- Students create content describing management intentions, key observations, descriptions of data analysis results, discussions relating to results, and conclusions. These writing samples can be used for story map reporting.

This material is written by Kathleen Howe and produced by the Hawaii Island Rat Lungworm Working Group with funding from the Hawaii Invasive Species Council and support from the Daniel K. Inouye College of Pharmacy. Photo credits: Jarvi Lab.