TESTING A HYPOTHESIS USING CITIZEN SCIENCE VOLUNTEERS

Target Group: **Year 10**

Australian Curriculum Reference: **Science (Biological Science)**

+ Scientific understandings, discoveries and inventions are used to solve problems that directly affect peoples' lives (ACSHE100).
+ The values and needs of contemporary society can influence the focus of scientific research (ACSHE230).
+ Formulate questions or hypotheses that can be investigated scientifically (ACSIS198).

LESSON SUMMARY

This unit of work will cover a number of lessons for up to six weeks.

Students will use the methods of citizen scientists to test a hypothesis about a scientific issue that affects lives in the local community. Students will collect data electronically and draw conclusions from it that could be tested further in the future.

LESSON CONTENT AND METHODOLOGY

Introduction

Students will pick a local science issue and develop a hypothesis about this issue. They will then develop a citizen science project to test their hypothesis by calling on electronic data input from a range of people that they know.

Body

+ Teacher reviews with the class the process of developing a scientific hypothesis (refer to Worksheet 1).
+ Students are introduced to the concept of citizen science and its importance in collecting data across a broad cohort of people.
+ Students watch the following videos and then teacher leads a discussion about what citizen science volunteers do.
    + *Building the knowledgebase of biology using citizen science*, Andrew Su, TEDxClaremontColleges: www.youtube.com/watch?v=hT_pj1cB0Q8
    + *Citizen Science in Australia* (the benefits of citizen science in Australia as told by people involved in citizen science pursuits): www.youtube.com/watch?v=SfCqeHsO830

+ Teacher introduces Worksheet 2 and facilitates the 'Think Pair Share' activity which will lead to a final set of hypotheses that the class will work on to collect data using citizen science volunteers.
+ Having decided on the hypothesis that they will test, students develop a method for electronically collecting data using citizen science volunteers. The activity should involve the volunteers providing data about their observations over a six week period.
+ Collection methods could be via a private Facebook group, by regular online survey input, by email, through a student-designed phone App, by Tweet, or any other appropriate electronic method. Students must submit their plan for assessment and approval before commencing the data collection activity.
+ Students manage the collection of data over a six week period and report on the progress of their project in a weekly lesson.
+ Students are given guided lesson time to develop a final report on the results of their data collection, including their conclusions from the data and further research that would be needed in the future.
+ Students will present the findings of their research using an in-class science symposium format. The presentation must include reference to volunteers in the project.
+ Students will submit a 200 word abstract of their work for class distribution in the form of a symposium program.

ASSESSMENT

Students will be assessed on the following components of the work:

+ the plan for data collection to test their hypothesis
+ their 200 word abstract
+ a report presentation at the in-class symposium.

RESOURCES

+ *Building the knowledgebase of biology using citizen science*, Andrew Su, TEDxClaremontColleges: www.youtube.com/watch?v=hT_pj1cB0Q8
+ *Citizen Science in Australia* (the benefits of citizen science in Australia as told by people involved in citizen science pursuits): www.youtube.com/watch?v=SfCqeHsO830
+ Worksheet 1: Developing a Hypothesis
+ Worksheet 2: Developing a Hypothesis (Think Pair Share).

WORKSHEET 1

Developing a Hypothesis

Suppose you and your neighbour are growing tomatoes. One day you notice that your neighbour's plants are much bigger than yours. What's causing the difference? How can you get your plants to grow as big as your neighbour's?

The question you asked about the tomato plants could lead you to develop a hypothesis.

A hypothesis (plural: hypotheses) is a prediction about the outcome of a scientific investigation. Like all predictions, hypotheses are based on a person's observations and previous knowledge or experience.

In science, hypotheses must be testable. That means that researchers should be able to carry out an investigation and obtain evidence that shows whether the hypothesis is true or false.

The way a hypothesis is written can outline a way to test it. Try to word each of your hypotheses in the form of an If...then...statement.

Read the following three examples. Notice which of these predictions are testable. Notice which are properly worded hypotheses.

Example 1

If I give my plants fertilizer, then they will grow as big as my neighbour's plants (testable and properly worded).

Example 2

If I get lucky, then my plants will grow bigger (not testable, because you can't control "getting lucky").

Example 3

My plants aren't growing bigger because I don't water them enough (not worded properly).

Tips for Developing Hypotheses

Ideas for hypotheses often result from problems that have been identified or questions that have been raised.

+ To help develop ideas for a hypothesis, write down several questions about the topic.
+ Try to narrow the questions to one that can be investigated scientifically. Then write the hypothesis.
+ Make sure the hypothesis is a prediction.
+ Make sure the hypothesis can be tested through an investigation.
+ Check the way you worded the hypothesis. A properly worded hypothesis should take the form of an If...then...statement.

WORKSHEET 2

Developing a Hypothesis (Think Pair Share)

Here is a beginning list of local science issues that can impact on people's lives. Add to it by working with a group in your class.

+ Allergies.
+ Fitness levels.
+ Water quality.
+ Impact of humans on fishing or native wildlife.
+ Impact of diet on general health.
+ Impact on skin from getting a tattoo.
+ Sleep patterns.

Students use 'Think Pair Share' technique to develop a final hypothesis from their group.

Think Pair Share

Think: Individually select two local issues that have an impact on people's lives. Develop a hypothesis about each of them.

Here are two examples.

1. If a person lives in Tuggeranong, are they more likely to suffer from hayfever than someone who lives outside Canberra?
2. If a person does 30 minutes walking every day, does it change the number of hours they sleep at night?

Pair: With a partner, share the two hypotheses that each of you have come up with. Person one speaks first describing their hypotheses, followed by person two. The pair has time to discuss each of the hypotheses and decide on one that they will take on to the Sharing step.

Share: The pair joins with another pair to discuss the final hypotheses that they each chose. Within this group only one can be selected for sharing with the whole class.

Share: In a whole class group, one representative from each of the Share activities presents that group's hypothesis. This is recorded for the whole class to see.

Students must now select one of the hypotheses from the class list that they will test using citizen science volunteers. Students may work individually, or in pairs.