Year 10 – Citizen Science 70min Lesson 5

Conclusions and new projects

Learning Intentions	Lesson Outcomes
• Students explore mathematical modelling and learn how to carry out appropriate statistical analysis methods to analyse their data • Students will create a model the relationship between biodiversity and human activity at their school • Students will draw upon their scientific knowledge of biodiversity concepts to draw conclusions about their own results • Student will evaluate their conclusions, including identifying sources of uncertainty and possible alternative explanations, and describe specific ways to improve the quality of their data. • Students will upload their data to contribute to the larger citizen science project	• Understand how mathematical modelling is used in STEM and be able to describe some examples of everyday mathematical models and how they impact our lives • Understand how to build a mathematical model from your data to estimate the biodiversity at your school • Infer results from your model to scientifically compare 2 different habitats • Draw conclusions from your results and communicate and evaluate your scientific approach • Understand the considerations for a good citizen science project and research ethics

Australian Curriculum Content Descriptors	Australian Curriculum General Capabilities
Science **Scientific Inquiry Skills** • Analyse patterns and trends in data, including describing relationships between variables and identifying inconsistencies (ACSIS203) • Use knowledge of scientific concepts to draw conclusions that are consistent with evidence (ACSIS204) • Evaluate conclusions, including identifying sources of uncertainty and possible alternative explanations, and describe specific ways to improve the quality of the data (ACSIS205) • Critically analyse the validity of information in primary and secondary sources and evaluate the approaches used to solve problems (ACSIS206) • Communicate scientific ideas and information for a particular purpose,	**Critical and creative thinking** • Inquiring – identifying, exploring and organising information and ideas **Critical and creative thinking** • Generating ideas, possibilities and actions **Critical and creative thinking** • Reflecting on thinking and processes **Critical and creative thinking** • Analysing, synthesising and evaluating reasoning and procedures **ICT Capability** • Creating with ICT **ICT Capability**

including constructing evidence-based arguments and using appropriate scientific language, conventions and representations (ACSIS208) **Geography** **Geographical Knowledge and Understanding** • Human-induced environmental changes that challenge sustainability (ACHGK070) **Digital Technologies** **Processes and Production skills** • Analyse and visualise data to create information and address complex problems, and model processes, entities and their relationships using structured data (ACTDIP037)	• Communicating with ICT **Numeracy** • Recognising and using patterns and relationships **Numeracy** • Interpreting statistical information

Assessment

Formative assessment

Students record their data and mathematical model in Microsoft Excel and upload this to contribute to the citizen science project. Students reflect on their results and collate their conclusions in groups on paper and report back to the class. Students present their findings in a digital presentation.

Phase/Slide	Learning Activity	Resources
Slide 1 - 4	• Greetings/introduction • Acknowledgement of Traditional Custodians • Lesson outcomes	PowerPoint
Slide 5 - 6 Engage	• Introduction to mathematical modelling and its uses in different STEM careers	PowerPoint
Slide 6 Explore Evaluate	• Review how to utilize mathematical modelling to evaluate insect and plant biodiversity from the data collected in the previous lessons • Teacher: Pose a question to the class to guestimate the total number of insects supported in both habitats surveyed	PowerPoint

Phase/Slide	Learning Activity	Resources
Slide 7-9 Evaluate Reflect Problem solve	• Activity 1: In groups model the total number of insects found in the 2 habitats using the previous data collected and the spreadsheets provided • Teacher: Guide the students through the activity with each step explained on the slides.	PowerPoint and Excel spread sheets https://support.microsoft.com/en-us/office/create-a-box-and-whisker-chart-62f4219f-db4b-4754-aca8-4743f6190f0d
Slide 10 Evaluate	• Students will now statistically compare the insect and plant biodiversity in both habitats using Data analysis sheet 1. • Teacher: Guide the students through the steps on the slide to plot a bar graph known as a box and whisker plot to compare the total number of species of plants between the two habitats. By using this bar graph we can see whether there are more/or less plant species in either habitat	PowerPoint and spread sheets
Slide 11 Evaluate, Reflect Problem solve Explain	• Draw conclusions in class discussion: How has human activity impacted biodiversity in our local area?	PowerPoint and spread sheets
Slide 12 Elaborate	• Activity 2: Students to work in groups of 4 to draw conclusions from their findings and report back to the class • Students now have an estimate for the number of insects that are supported by both habitats. Was this close to their guestimate? • What can they conclude about each habitat? • Which habitat supports more insects? • Use the data analysis sheet 1, to answer these questions • Answer: This will depend on the data collected by the class in the previous lessons • Teacher: Guide them through the 4 questions that they must answer when reflecting on their findings	PowerPoint and sheet of paper

Phase/Slide	Learning Activity	Resources
Slide 13 Reflect	• Activity 3: Presenting your findings • Students design a digital presentation of their findings. • They can use some of the PowerPoint templates to visualise their data or other software	PowerPoint Range of Powerpoint templates for students to use
Slide 14 Elaborate	• Activity 4: As a class collate data and upload to the citizen science project as directed on the slide	PowerPoint
Slide 15 - 20	• Activity 5: As a class brainstorm what you think are important features of a successful citizen science project • Discuss the 3 elements of a citizen science project: 1. **Motivating and clearly communicated** • The research question and motivation behind it must be clearly defined so people can understand what you want them to do, and most importantly, why. 2. **Good scientific approach and ethically sound** • The task that you want the citizen scientists to perform must be clearly thought out, easy to complete and most importantly safe to do! 3. **Utilise local knowledge** • The task should make the most of the citizen scientists' local knowledge. Citizen scientists are not just an extra pair of hands. Their local knowledge is key to your project's success, so draw upon this to improve your results!	PowerPoint
Slide 21 Evaluate Reflect	• Wrapping up of ideas	PowerPoint
Slide 22	• Possible extension ideas	PowerPoint
Slide 23	• USC researcher presentation	PowerPoint

Slide 24	• Link to Microsoft excel box and whisker plot info	PowerPoint