Motu Manawa Marine Reserve
Integrated Science and Technology Plan

Year(s)	Level(s)	Duration	Teacher	Classroom
1/2	1	1 term		

BIG QUESTION/ISSUE

Principles: Community Engagement, Future Focus

Motu Manawa Reserve is a valuable resource on our doorstep that many students, parents and teachers are unaware of. We want to explore flora and fauna in the local estuary and see how we might make it more accessible for the public, while conserving it for future generations.

Confident, connected, actively involved lifelong learners.

Selected Values and how students might develop them

☐ Excellence

☐ Innovation, Inquiry and Curiosity

☒ Diversity: *Identify past and present connection the Maori people have with Motu Manawa. Explore the importance of the sea to Pasifika people.*

☐ Equity

☒ Community and Participation: *Working together for the good of our estuary.*

☒ Ecological Sustainability: *The long-term approach to caring for Motu Manawa Marine Reserve.*

☐ Integrity

Selected Key Competencies and how students might develop them

☒ Thinking: *Making a Vision Map - planning for the future. Using Edward de Bono's Six Thinking Hats.*

☒ Using Language Symbols and Texts: *Mapping and Signage.*

☒ Managing Self: *Exploring how I can make a difference.*

☒ Relating to Others: *Presenting ideas about making the estuary able to be enjoyed by all.*

☒ Participating and Contributing: *Nature of Science Focus*

SCIENCE ACHIEVEMENT OBJECTIVES		TECHNOLOGY ACHIEVEMENT OBJECTIVES
Nature of Science (Essential) ☐ Understanding about science ☐ Investigating in science ☐ Communicating in Science ☒ Participating and Contributing		**Technological Practice** ☐ Planning for practice ☐ Brief Development ☒ Outcome development and evaluation
Living World ☐ Life processes ☒ Ecology ☐ Evolution	**Physical World** ☐ Physical inquiry and physics concepts	**Technological Knowledge** ☐ Technological modelling ☐ Technological products ☐ Technological systems
Planet Earth and Beyond ☒ Earth systems ☐ Interacting systems ☐ Astronomical systems	**Material World** ☐ Properties and changes of matter ☐ Chemistry and society	**Nature of Technology** ☒ Characteristics of technology ☐ Characteristics of technological outcomes

Science Learning Outcomes & Success Criteria *(linked to SCHOOL KC /values etc)*

Nature of Science

Students will:

- Actively participate and contribute their experiences at Motu Manawa Marine Reserve to link their science learning to their daily living.

  PASIFIKA PRINCIPLE: KNOW THE LEARNER

Success Criteria: I can:

- Talk about the reserves / parks our family visits and why they are important
- Share my ideas about who can help us learn about the reserve;
- Listen to people explain why the reserve is important;
- Share ideas about improving the reserve.

Living World, Ecology

Students will:

- Observe and value the diversity of living things that like living at Motu Manawa Marine Reserve.

Success Criteria: I can:

- List some of the living things that make their home in the reserve;
- Explain why these living things live in the reserve;
- Share some detailed information about a bird of their choice, and explain what makes it suited to life in the reserve/estuary.

Planet Earth and Beyond, Earth Systems

Students will:

- Explore and describe Motu Manawa Marine Reserve.

Students will be able to:

- Explain why Motu Manawa is a Marine Reserve, and some of the features of its estuary.

Technology Learning Outcomes and Success Criteria

Technological Practice, Outcome Development and Evaluation

Students will:

- Undertake research in order to find ideas for an improvement to Motu Manawa Marine Reserve. Evaluate these ideas in order to select and develop one or more, which fits with the identified attributes.

Students will be able to:

- Identify an appropriate improvement, and describe it through drawing and/or modelling.

Nature of Technology Characteristics of Technology

Students will:

- Understand that technology introduced to improve the estuary area involves purposeful intervention though design.

Students will be able to:

- Discuss why Motu Manawa Marine Reserve represents the natural world, while things that people introduce to improve the Marine Reserve represent technology. Explain why the two concepts are different, and why we have to take care that introduced technology(s) don't harm natural resources.

OPPORTUNITIES FOR INTEGRATION WITH OTHER LEARNING AREAS

☐ Learning Languages

☒ Mathematics (Statistical Investigations): Conduct estuary investigations using statistical enquiry.

☒ Social Sciences (All objectives)

☐ Health and PE.

☒ English (Speaking, Writing and Presenting – All objectives)

☐ Arts

ENHANCING MAORI and PASIFIKA ACHIEVEMENT
(Principles of Treaty of Waitangi, Inclusion, Equity, Community Engagement)

- Ask the students what they or their families know about Motu Manawa Marine Reserve.
- Discover how the Maori interact with Motu Manawa Marine Reserve, past and present.
- Explore the past and present importance of Marine resources to Pasifika people.
- Build partnerships with family/whanau and Maori in managing the resource.
- Find out why Maori people called the reserve Motu Manawa (Motu is Maori for island, Manawa for Mangrove).

SUGGESTIONS FOR LEARNING IN SCIENCE	
TASKS AND ACTIVITIES	**ASSESSMENT**
Establish prior knowledge	
Before beginning the unit. • Each student draw and label a bird including special features that they think make it a bird. • Individually or as a class, collect prior knowledge about what an estuary might be and what lives there.	"What we know now?" Student understandings at beginning of unit. These tasks can be revisited though out the unit, and at the end. Refer to BSC book *Three Birds*.
• Write a class definition of what is a bird. • Look at birds in school grounds, pictures of sea/wading birds. Arrange to have a pet bird in class. *Ready to Read* "Splash". • Refine the class definition of a bird. • Discuss the features of an estuary and what might live there.	
Engage students affectively/emotionally	
• Walk to Motu Manawa Marine Reserve and make observations of the habitat, types of birds who are there and what they are doing. Record images on cameras, clipboards etc. *(Notes for teachers: check tide times, adult support for ratio by water 1:4; bring binoculars.)* • Invite a DOC ranger to accompany the group and talk with students about what an estuary is, and why this one is a marine reserve – what, why, where, when, how? • Students summarise/ share their findings.	Allow opportunity to revisit prior knowledge of birds/estuaries using different colour (dated).
Research, build understandings, generate further questions, present findings	
• Reveal essential question to the class: *How are wading birds suited to their estuary habitat?* • Students discuss question and relate it to their Motu Manawa Marine Reserve visit. *Do they have any new understandings to add? Do they have further questions?* • Explore main features and functions of a wading bird using student and other photos, and recorded information as a class resource for discussion and labelling o eye, beak, feathers, wing, tail feathers, foot/claw • Discuss how these features help the bird to survive in the estuary • Gather, organise and record information using skimming/ scanning techniques, note taking, note making, • Presenting summarised information in a format of their choice: poster, brochure, fact sheet, slide show, scientific report, or other. Resources: Kiwi Conservation Club site; bird books from library; *Ready to Read* / school journals; visiting experts.	Does their information presentation reflect the features of the bird and how they suit estuary life?

Evidence of Progression	
• Revisit bird task by giving students a choice about whether to add to their original labelled bird drawing, or make a new one. • Revisit estuary knowledge task either individually or as a class.	Is there clear progression in their postviews about estuaries and bird features, compared with their prior knowledge? Discuss with students how the results demonstrate learning

SUGGESTIONS FOR LEARNING IN TECHNOLOGY	
TASKS AND ACTIVITIES (Colours refer to Edward de Bono's 'Six Thinking Hats' – see below)	**ASSESSMENT**
Establish Prior Knowledge	
• Before proceeding, provide children with A3 sheet with the following question written in the middle. Ask them to draw or write any ideas, in 'web' or 'mindmap' style. If they have none then get them to write a question. Explain that if they don't know yet, this is good because it gives us an idea of where to start the learning. ○ How might we use technological practice to help Motu Manawa Marine Reserve?	Web or brainstorm activity allows evidence of initial understandings around *Characteristics of Technology* AO. This can be added to as students develop knowledge over time.
Shared Class Activities	
• Share following brief with children: ○ *We are planning ways to make it easier for people to learn about, get close to, enjoy and look after Motu Manawa Marine Reserve (*MMMR*).* • Talk again about what an estuary is; think about what else they might see there (eg, plants, people, water, mud). Plan a visit to MMMR for high tide to see another perspective (ie fewer wading birds around). WEAR OLD CLOTHES. • Revisit estuary – to explore MMMR from the perspective of it being a community resource. • *Red hat* thinking • What can you see, hear, touch, smell? How does it make you feel? • *White hat* thinking, record in different ways: • 360º panorama with digital cameras (students rotate taking photos at each point) with 'Water view'/'What a view' title for classroom display; • sketches; • notes on physical features. • Record sounds using cellphone or dictaphone type device. • *Blue, green* and *red hat* thinking: ○ Design, plan and make a diorama model of the estuary area using a sand tray; use the photos and a 2D map as well, to show context and help with spatial awareness – students use this to help visualise the area they will be working in. • *Yellow hat* thinking ○ Why is MMMR a special taonga for us and others? Consult with Maori kaumatua and/or conduct a survey to find out how aware people are about the resource.	
Individual and Group Activites, Building Understandings	
• Make real estate agent boards with photos from visit 2 – list major selling points of the unique estuary area with slogans such as "once you live here, you will never want to leave". • Display these above diorama model. THIS IS A GOOD LEARNING ACTIVITY TO ENCOURAGE STUDENT ENGAGEMENT AND STUDENT VOICE	

Shared class activities: finding ideas and opportunities	

• Discuss what is meant by technology, and the difference between the natural and made world (this can be achieved by taking them for a walk around the school). Explain that technological practice is carried out by people that see something that can be improved, and plan a way to do this. Make the link about how the estuary is an example of the natural world, but we can also use technological practice to improve it.
• *Black hat* thinking, what was not so good about the estuary?
Identify issues such as:
   o Pollution – noise, rubbish, dirty water – stormwater.
   o Predators – cats, dogs, rats, possum.
   o Mud – is mud pollution?
   o Nowhere to sit down or picnic or barbecue.
   o No information/signage to tell visitors, what is it called; what they/we are looking at?
   o No instructions/signage – about controlling pets, explaining bird life, about how visitors should behave, about safety.
   o How do you get into MMMR?
• *Green hat* thinking –explore what we can improve.
How can we make our taonga (MMMR) more accessible to the people?
• Bus stop (involving older students as scribes and as additional community involvement). One stop focuses on each issue (prioritise as needed) students respond to each issue at the stops recording their response on specific coloured post-it-notes which are placed on the question chart.
• Collate and discuss answers onto "master" Big Idea sheet – as inquiry develops more responses will be added on other coloured Post-it notes. This indicates progression.
• *Green hat* thinking, vision mapping and research using:
   o their families and the wider school community information about marine reserves, eg, Kiwi Conservation Club, DOC;
   o resource people, eg, engineers;
   o stakeholders to interview about how they would like to see MMMR being used (eg, community members of different ages, and other students);
   o photos of technological outcomes that have been used at other reserves to make it easier for people to learn about, get close to, enjoy and look after the reserve.
	Do children see the difference between natural and made world?
	
	Can they find examples of technology around the school.
	
	Can they identify in their community people who carry out technological practice? (The school caretaker probably does this a lot).
	
	Bus stop activity is a group assessment task around *Outcome Development and Evaluation*. Developing understanding can be demonstrated by different coloured stickies.

Evaluation and consolidation of ideas and opportunities	
• *Yellow and black hat* thinking, evaluate, and revisit Big Idea sheet and identify/clarify further opportunities to make it easier for people to learn about, get close to, enjoy and look after MMMR such as: *seating, boardwalk,* barbecue, rope swing, signage (information, mapping and instructional, advertising), cycle track, viewing platform, bird hide, jetty ramp, kayak, o Teacher and students prep*a*re attributes chart for each viable idea/opportunity, eg, your outcome needs to be safe, blend into the environment, be kind to environment and its inhabitants, attractive, informative, robust, • *Yellow and black hat* thinking, students use attributes chart to analyse opportunities/ideas	Opportunity to revisit the web or mindmap (developed earlier) about technological practice.

Developing an outcome	
• *Yellow, black and red hat* thinking, using the attributes to help, Choose 2 ideas from the Big Idea list. • Discuss task, children are going to make models to communicate their chosen ideas for improving MMMR, and place them on the diorama. These will be used to share their ideas with DOC staff and other stakeholders to MMMR. • Make sure students understand the difference between 'what a model is/does' and the 'real thing' – show them a range of examples of models of different products (e.g. model house, bridge, car, plane etc) and discuss with them how the model communicates information about such things as the intended shape, size, materials to be made from etc in order that other people can understand what it is that you wish to make (Note: the local council may be able to provide models of projects they have undertaken/intend to undertake as examples of how they used models to communicate to people what their technological outcome will look like when it is built/implemented) • *Blue, green and red hat* thinking, draw a detailed plan of model for the diorama. Identify materials, show how they will be joined and placed in the diorama. Talk about size (scale) that the model needs to be in relation to the diorama (Materials could be ice-block sticks, string, plasticine, playdough, clay, twigs, cardboard, paint and crayons in neutral colours). • Make and place the models in the diorama.	Do the students understand the difference between their models, and 'real' outcomes/solutions. Do they understand how the materials used for modelling will differ from those which would be used should their idea be realised (implemented) as a technological outcome?
Developing an outcome: Signage	

• Identify kinds of information that might be helpful to the community and would make MMMR an enjoyable, safe and informative place to be for people and the estuary inhabitants.
• Visual language: explore images of signs. Identify the attributes of a good sign.
    o What are signs for?
    o What different kinds of signs are there?
• Design a sign and place it in an appropriate place on the diorama. (Note: the actual information could be displayed on a separate sheet).	

Conclusion and Evaluation	
• Students make a presentation to DOC staff and/or someone from council, to explain their ideas, and how they can help us to make the most of MMMR. Ideally have this person(s) in to the class. Alternatively this can be done in the form of an email (with photos), a letter, or video presentation. Choose one of their ideas/outcomes (model or sign) for students to self (and later class) evaluate in terms of the identified attributes.	Is the students' evaluation accurate and does it take the attributes into account? Can they suggest further improvements? Final revisit of web' or 'mindmap'(developed earlier) to check/reinforce students understandings about technological practice and what makes a technological outcome distinct from things which exist in the natural world

E-LEARNING

- Digital Learning object about protected areas
  http://www.tki.org.nz/r/digistore/protected/objects/?id=16&vers=6.0.
- Use of digital photos for display.
- Email option for presenting suggestions.
- Video presentations.
- Signage.

TEACHER REFLECTION AND EVALUATION

- What impact did my teaching have on student learning?
- What evidence do I have?

Continuation:

- What do students still need to learn?
- … do?
- … practise?
- … understand?

EDWARD DE BONO'S SIX THINKING HATS

The six Thinking Hats can be used in sequence to perform more complicated thinking tasks.

First Ideas: BLUE - WHITE - GREEN

Quick Assessment: YELLOW - BLUE

Evaluation: YELLOW - BLACK

Improvement: BLACK - GREEN

Explanation: WHITE - GREEN

Direct Action: RED - BLUE

Emotions: RED - WHITE- GREEN - BLUE

Caution: WHITE - BLACK

Opportunity: WHITE - YELLOW

Design: BLUE - GREEN - RED

Possibilities: GREEN - BLUE

Usable Alternatives: GREEN – YELLOW - BLACK

Choice: YELLOW - BLACK- RED

Final Assessment; BLUE - RED