Science alive Mātauranga

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Te Ara Ako

INNOVATION FRAMEWORK

Teacher Guide

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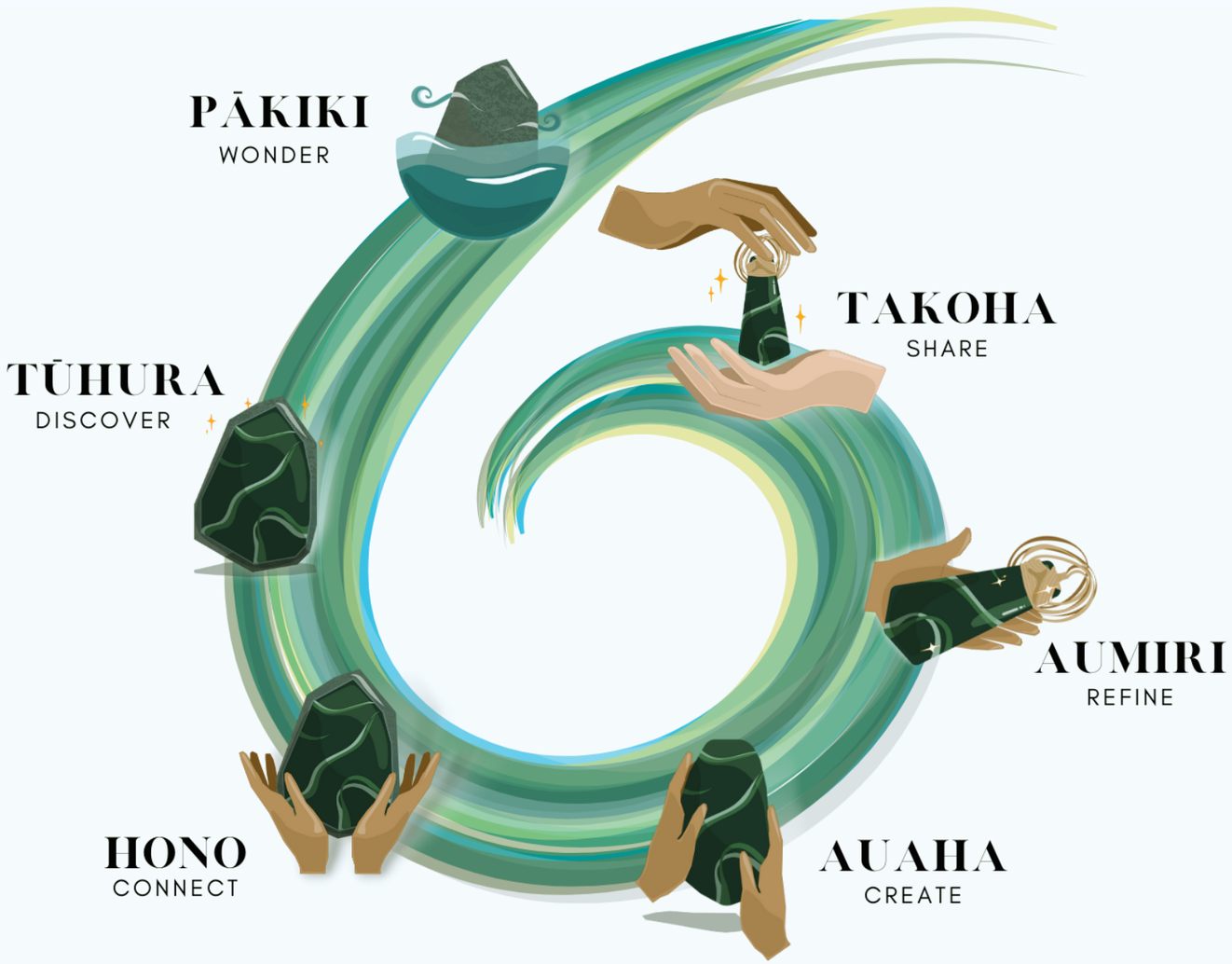
Te Ara Ako - An Innovation Framework



Design Thinking and Innovation

Project Based Learning can take many forms, inquiry approaches, problem-based approaches and design thinking models.
A rigorous template for the thinking process, Te Ara Ako is a framework of innovation, rich in opportunity for developing competencies that are vital for 21st century learners. Equipping learners with new ideas and a hunger for knowledge, project based learning and design thinking frameworks are a process-based learning models that allow for deeper, more meaningful outcomes and skills.

Te Ara Ako - Pathway of Learning

Pounamu plays an important role in Te Ao Māori. This beautiful treasure often hides among rocks, waiting for a keen eye to be discovered.
Carvers can transform natural pounamu and refine it into meaningful symbols and treasured posessions, like the toki. Toki represent strength, determination and becoming a master of one's craft.
Pounamu is often gifted as a taonga and form of strength and protection for loved ones while also becoming a valued heirloom for future generations.

PĀKIKI

WONDER

inquisitive, inquiring, curious,
questioning, analytical,
tamaiti pākiki - a curious young mind

Every great idea starts with a question, a wondering, that feeling of curiosity. A skill within itself, learners gravitate towards the unknown and begin to make sense of the world around them. A multi-faceted wondering works best here, allowing many opportunities and pathways to creative ideas and solutions. What is the big question?

Ko ia kāhore nei i rapu, tē kitea' - Those who do not seek will not find.

TŪHURA

DISCOVER

to disclose, bring to light, unearth,
open up, explore, investigate,
uncover

Discovery, a pathway lit by passion and driven by curiosity of what comes next. Learners gather knowledge and dissect information as they bring to light some of the big ideas at hand. New learning occurs as they fill their kete (basket) with research skills, learn how to communicate with experts and each other to extract meaningful and purposeful information.

'Whaowhia te kete mātauranga.' - Fill the basket of knowlege.

HONO

CONNECT

to be seeing clearly, to understand,
to know, to shine a light onto
a concept, idea, space or initiative

Learners begin to understand more deeply by connecting information as they unearth reasons for why things might be the way they seem. Lightbulb moments flicker as concepts deepen and skills sharpen. With the big question being the driving force behind this newfound knowledge, the next phase creates space for creativity, critical thinking and collaboration.

'Ko te manu e kai ana i te miro, nōna te ngahere. Ko te manu e kai ana i te mātauranga, nōna te ao.' - The bird that consumes the miro berry owns the forest. The bird that consumes knowledge owns the world.

AUAHA

CREATE

to shape, create, form, fashion,
to be innovative, allowing creative
energies to flow, unrestricted
and imaginative

Learners begin to form a new idea or create a solution, using the connections and discoveries from their research and wonderings. How could we fix this issue? What could we make that would address the problem ahead? This is an iterative process that builds resilience and collaboration as they design and create something that was not there before.

'Poipoia te kākano, kia puāwai.' - Nuture the seed and it will grow.

AUMIRI

REFINE

to smooth, buff or polish,
to make ready to be gifted/shared

Learning to give and receive feedback is an important skill that will be developed in the refining process. Learners think critically about their creations, seek feedback from a range of sources and make improvements. Communication and thinking outside the box allow ākonga to fully prepare their creation for a wider audience.

'I orea te tuatara ka puta ki waho.' - A problem is solved by continuing to find solutions.

TAKOHA

SHARE

to gift, donate, pledge, sharing your
results with others, gifting the concept,
project or taonga

Exhibitions, viewings, sharing nights–this is where learners feel the satisfaction and pride of a job well done! Whether it be sharing with the class next door, with an expert in the field or on the world wide web, these creations are shared ready for others to learn and gain knowledge in their own learning journey. What will they wonder about next?

'He manawa tītī' - A person with great endurance.

Tales of our Kaitiaki

Filming the story of a local changemaker

How can we explore and celebrate sustainability stories from our community?

Curriculum Links

Science

- Nature of Science - Investigating in Science (Levels 3&4)
  Ask questions, find evidence, explore simple models, and carry out appropriate investigations to develop simple explanations.
- Nature of Science - Participating and Contributing (Levels 3&4)
  Explore various aspects of an issue and make decisions about possible actions.

Technology

- Technological Practice - Outcome development and evaluation (Level 4)
  Investigate a context to develop ideas for feasible outcomes. Undertake functional modelling that takes account of stakeholder feedback in order to select and develop the outcome that best addresses the key attributes. Incorporating stakeholder feedback, evaluate the outcome's fitness for purpose in terms of how well it addresses the need or opportunity.
- Designing and developing digital outcomes - Progress outcome 3
  In authentic contexts, students follow a defined process to design, develop, store, test and evaluate digital content to address given contexts or issues, taking into account immediate social, ethical and end-user considerations. They identify the key features of selected software and choose the most appropriate software and file types to develop and combine digital content.

Social Sciences

- Social Studies (Level 4)
  Understand how people participate individually and collectively in response to community challenges.

21st Century Skills

- Creativity
- Collaboration
- Critical-Thinking and Problem Solving
- Communication

Key Competencies

- Participating and Contributing
- Thinking

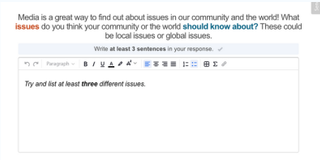
Useful Links

- Science Learning Hub Collection
- Science Alive Mātauranga Facebook community
- Education Perfect Help Centre
- TKI - Project Based Learning Information

Lesson Links

Pākiki (Wonder): Tales of our Kaitiaki

Ākonga (students) start thinking about how we share and learn about local and global issues using different types of media.

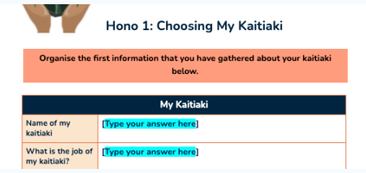


Tūhura (Discover): Tales of our Kaitiaki

Ākonga learn to identify environmental issues in their community and changemaker qualities. They discover how we can inform a wider audience about a changemaker in their community.

Hono (Connect): Tales of our Kaitiaki

Ākonga connect their knowledge on changemakers with the media. They learn to use storytelling and filming as tools to celebrate and share a changemaker's initiative in their community, leading change themselves.



Auaha (Create): Tales of our Kaitiaki

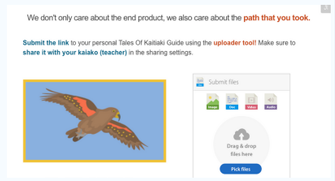
Ākonga follow a step-by-step guide for planning and producing their own kaitiaki changemaker documentary. They learn about script-writing, interview techniques, film set up, camera movements and different filmmaking roles.

Aumiri (Refine): Tales of our Kaitiaki

Ākonga study the post-production process. They learn how to edit their filmed footage. They edit their own kaitiaki changemaker documentary to be ready for screening it to an audience.

Takoha (Share): Tales of our Kaitiaki

Learners finish their filmmaking journey by thinking about ways to share their taonga. They also reflect on the process–what they have learnt and what they'll do differently next time.



Tales of our Kaitiaki

Film a Changemaker Documentary

Discovery

Pākiki - Tūhura

Students will be able to...

- **Identify** methods of acquiring information.
- **Define** different types of media.
- **Identify** local and global issues.
- **Name** pressing local environmental issues.
- **Identify** changemakers.
- **Describe** the qualities of changemakers.
- **Describe** ways of sharing changemaker stories with the community and beyond.

Connection

Hono - Auaha

Students will be able to...

- **Research** and **identify** an environmental changemaker story in their local community.
- **Plan** the steps and organise the team for making a documentary.
- **Write** a documentary film script.
- **Structure** a documentary following the story arch.
- **Discuss** their ideas in a team for feedback and re-working my idea.
- **Present** their plan to and ask advice from experts.
- **Determine** the equipment they need for their purpose.
- **Produce** and shoot film footage.
- **Document** their production process.

Application

Aumiri - Takoha

Students will be able to...

- **Use** an editing programme to create an audience-targeted documentary following the script.
- **Write** narration to help viewers follow the changemaker story in the documentary.
- B**rainstorm** ways of sharing the changemaker documentary with an audience.
- **Reflect** on their project and make changes in order to improve the outcome.
- **Give** constructive feedback to peers and accept feedback positively.

Protecting Our Taiao

Setting up an Ecological Community Survey

How can we involve our local community to develop connections to our environment?

Curriculum Links

Science

- Nature of Science - Investigating in Science (Levels 3&4)
  Ask questions, find evidence, explore simple models, and carry out appropriate investigations to develop simple explanations.
- Nature of Science - Participating and Contributing (Levels 3&4)
  Explore various aspects of an issue and make decisions about possible actions.

Technology

- Technological Practice - Outcome development and evaluation (Level 4)
  Investigate a context to develop ideas for feasible outcomes. Undertake functional modelling that takes account of stakeholder feedback in order to select and develop the outcome that best addresses the key attributes. Incorporating stakeholder feedback, evaluate the outcome's fitness for purpose in terms of how well it addresses the need or opportunity.

Maths

- Statistics - Statistical Investigation (Level 3)
  Conduct investigations using the statistical enquiry cycle.

Social Sciences

- Social Studies (Level 4)
  Understand how people participate individually and collectively in response to community challenges.

21st Century Skills

- Creativity
- Collaboration
- Critical-Thinking and Problem Solving
- Communication

Key Competencies

- Participating and Contributing
- Relating to others

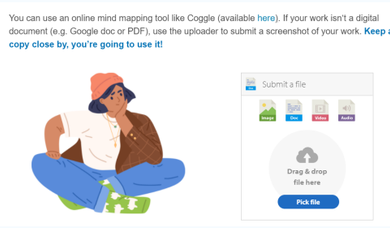
Useful Links

- Science Learning Hub Collection
- Science Alive Mātauranga Facebook community
- Education Perfect Help Centre
- TKI - Project Based Learning Information

Lesson Links

Pākiki (Wonder): Protecting our Taiao

Learners start thinking about what the environment means to them and defining threats to their community.

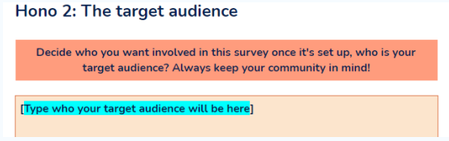


Tūhura (Discover): Protecting our Taiao

Learners explore different examples of projects where communities were involved in the protection of their environment or participated in citizen science. They focus on one local problem and try to formulate different solutions.

Hono (Connect): Protecting our Taiao

Learners review different types of survey. They use this knowledge to develop their own project and reach out to an expert for advice.



Auaha (Create): Protecting our Taiao

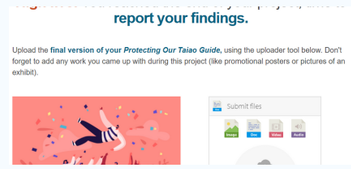
Learners follow clear steps to set up their survey which will answer what their community needs. They plan equipment and resources, but also the housing of their data. They record ideas on ways to promote their work and involve people.

Aumiri (Refine): Protecting our Taiao

Learners interpret their data, including calculating averages, checking for trends and creating visuals to communicate their results to their community. They also reflect on what their results mean for them and their environment.

Takoha (Share): Protecting our Taiao

Learners finalise their *Protecting Our Taiao Guide*. They upload it to submit their findings and think about what their next actions could be!



Protecting Our Taiao

Setting up an Ecological Community Survey

Discovery

Pākiki - Tūhura

Students will be able to...

- **Define** what a survey is.
- **Define** citizen science.
- **Describe** different types of citizen science projects.
- **Research** datasets.
- **Research** points of interest in their community.
- **Explain** the importance of community-led projects.

Connection

Hono - Auaha

Students will be able to...

- **Define** a leading question for their survey.
- **Define** their target audience.
- **Suggest** ideas to connect their community to their local environment.
- **Contact** people/organisations close to their community and ask for advice.
- **Use** experts' opinions and feedback to define my survey.
- **Describe** the steps of their survey.
- **Determine** the equipment they need for their purpose.
- **Persuade** their target audience to participate in the survey through appropriate communication.

Application

Aumiri - Takoha

Students will be able to...

- **Create** a survey that will be meaningful for their community.
- **Interpret** their data and display it with appropriate graphics.
- **Reflect** on their project and make changes in order to improve the outcome.
- **Give** constructive feedback to their peers and accept feedback positively.
- **Peer review** on their survey designs.
- **Expand** their results to call for actions in other regions or future projects.

Whare of the Future

Designing a home for a sustainable future

What could the future of sustainable living look like for Aotearoa?

Curriculum Links

Science

- Nature of Science - Participating and Contributing (Levels 3&4)
  Explore various aspects of an issue and make decisions about possible actions.
  Use their growing science knowledge when considering issues of concern to them.

Social Sciences

- Nature of Science - Participating and Contributing (Levels 3&4)
  Understand how exploration and innovation create opportunities and challenges for people, places, and environments.

Technology

- Technological Knowledge-Technological Modelling (Level 4)
  Understand how different forms of functional modelling are used to explore possibilities and to justify decision making and how prototyping can be used to justify refinement of technological outcomes.
- Technological Knowledge-Technological Products (Level 4)
  Understand that materials can be formed, manipulated, and/or transformed to enhance the fitness for purpose of a technological product.
- Designing and developing digital outcomes - Progress outcome 3
  In authentic contexts, students follow a defined process to design, develop, store, test and evaluate digital content to address given contexts or issues, taking into account immediate social, ethical and end-user considerations. They identify the key features of selected software and choose the most appropriate software and file types to develop and combine digital content.

21st Century Skills

- Creativity
- Critical-Thinking and Problem Solving
- Communication
- Citizenship

Key Competencies

- Participating and Contributing
- Using Language, symbols and texts

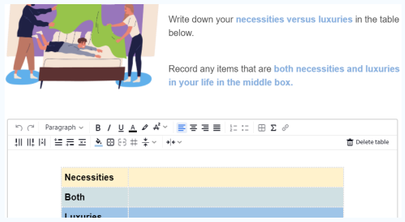
Useful Links

- Science Learning Hub Collection
- Science Alive Mātauranga Facebook community
- Education Perfect Help Centre
- TKI - Project Based Learning Information

Lesson Links

Pākiki (Wonder): Whare of the Future

Learners start thinking about the purpose of a home and how home designs change over time.

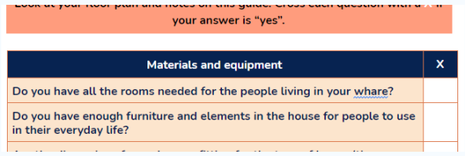


Tūhura (Discover): Whare of the Future

Learners study the environmental impacts of industrialisation and urbanisation. They explore alternative housing options, in particular tiny homes and off-the-grid living. They think about what a sustainable home could look like in 2030.

Hono (Connect): Whare of the Future

Learners review the differences between home design and architecture. They research different features of sustainable housing.



Auaha (Create): Whare of the Future

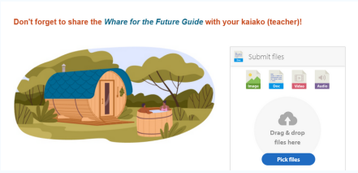
Learners follow a step-by-step to design a sustainable whare that will fit the needs of their inhabitants. They take into account orientation and sizing. They draw diagrams that lead to a floor plan. They receive feedback and adjust their floor plan if needed.

Aumiri (Refine): Whare of the Future

Learners select other important features of their whare to make it a sustainable home, including building materials and waste treatment strategies. Using all this information, they create a 3D model.

Takoha (Share): Whare of the Future

Learners finalise their *Whare for the Future Guide*. They upload it and any other materials they created during this project.



Whare for the Future

Design a Sustainable Home

Discovery

Pākiki - Tūhura

Students will be able to...

- **Identify** essential features of a home.
- **Name** necessities needed for everyday life and routine.
- **Identify** how houses have evolved over the years and why this has happened,
- **Explain** the impacts of urbanisation and humans on the environment.
- **Discuss** positive initiatives that are being introduced to decrease negative human impact on the environment.
- **Identify** differences between off-the-grid living and tiny homes.
- **Brainstorm** and design a sustainable home for the future.

Connection

Hono - Auaha

Students will be able to...

- **Compare** interior design with architecture and identify how both factors are invovled with homes.
- **Explain** sustainable features of a home and how these can benefit the environment.
- **Describe** different demographics of people and the homes that suit them.
- **Explain** how the orientation of a home matters.
- **Integrate** floor dimensions into a plan.
- **Describe** the different spaces within a home.
- **Design** their own floorplan of a home.

Application

Aumiri - Takoha

Students will be able to...

- **Compare and contrast** sustainable building materials that can be used to build their home.
- **Compare and contrast** renewable and non-renewable energy sources.
- **Analyse** waste management that can be integrated into their home.
- **Create** a 3D model of their floorplan.
- **Share** their creation with their teacher and peers.