



# The role of science education in Indigenous knowledge transfer

The global exclusion of Indigenous knowledge from education signals to Indigenous youth that only non-Indigenous knowledge is valid. This exclusion alienates students from science education and careers and potentially makes them feel unwelcome in science education. Despite this effect, Indigenous peoples continue to offer valuable insights through extensive knowledge of biodiversity and ecosystems, developed over millennia.

Intergenerational knowledge transfer — crucial for preserving culture and empowering Indigenous youth — was found to be a key conduit for cultural resilience and survival for Indigenous cultures worldwide.

## Knowledge systems within Aotearoa New Zealand

Māori — the Indigenous people of Aotearoa New Zealand — have also endured substantial damage through colonisation to cultural knowledge systems and practices, environmental relationships, identity, and health. This has led to a loss of connection to ancestral lands, and alienation from the natural world.

Co-management agreements to address historic injustices enable tribes settling Treaty of Waitangi 1840 grievances with the Crown to redress the impact of colonisation. Efforts to integrate Indigenous knowledge into education and conservation is further enhancing cultural knowledge and biodiversity conservation.

Initiatives like marae and community-based programmes aim to transform conservation biology by elevating mātauranga Māori (Māori knowledge), and challenging the dominance of Eurocentric scientific views to address the decline in ecological understanding among youth globally, and support Indigenous perspectives in science and conservation.

## Integrating Indigenous knowledge into science education

The *Indigenisation of conservation education in New Zealand* study discusses how Indigenous rangatahi (Māori youth) in Aotearoa New Zealand struggle to connect with science education that follows a Eurocentric approach. To address this, researchers explored integrating Māori knowledge and traditional teaching methods (wānanga) to enhance the connection to conservation science. Surveys were carried out to assess the students' initial scientific understanding and how it shifted over time.

Researchers also developed a bilingual gaming app to teach basic environmental concepts from Māori and non-Māori cultural perspectives. They found that incorporating Indigenous perspectives significantly increased students' interest and understanding of conservation science, and those students who had prior exposure to Indigenous perspectives retained more knowledge.

Key findings of this study identify a range of actions and interventions to:

- enable and drive inclusion of Indigenous knowledge
- increase engagement in conservation science concepts.



## Noho Taiao environmental program

The Noho Taiao, an iwi (tribal)-driven environmental programme began in 2009 within the Te Rarawa tribal area. One of the key aims of the programme is to reconnect rangatahi with their iwi marae (tribal meeting places) and strengthen cultural identity and confidence through engagement with natural environments.

Noho Taiao also aims to familiarise rangatahi with a range of cultural challenges and initiatives specific to their region, such as kaitiakitanga (guardianship of natural resources), and encourage more rangatahi to pursue careers in sciences, environmental sustainability, technology, and business.

Led by Māori principles and methodologies, Noho Taiao follows the Punaha Akoako framework developed by Te Aho Tu Roa. This framework guides the learning journey through five key stages.

1. Nō hea tātou? | Where have we come from?
2. Kei hea tātou ināianei? | Where are we now?
  - (i) Takahia te ara tuhura | Follow the path of discovery.
  - (ii) Ruku ho % hōnu | Diving deeper.
  - (iii) Rangahaua | Research it.
3. Me ahu pehea? | Where do we want to go?
4. Whakatinanatanga | Implementation / put it into action.
5. Pumahara | Reflections.

This initiative is part of a broader effort to empower Māori youth and strengthen their connection to their cultural and environmental heritage.

## Participating schools

Two schools participated in Noho Taiao: Māori language immersion school Te Wharekura o Maniapoto in the Waikato region, and Māori immersion school Te Kura Taumata o Pangaru in Northland. Te Wharekura o Rakaumanga in Waikato – a leading New Zealand kura Kaupapa (total immersion Māori language school) participated in an abridged version of the programme within their normal school curriculum. Students were aged 14–17 years, and most were of Māori or Pacific Island descent.

Students from a secondary school with a Eurocentric curriculum, Te Puke High School in the Bay of Plenty, trialled the 'Eko' game but didn't participate in the Noho Taiao programme. Students were aged 14–17 years, with an ethnically diverse enrolment including European, Māori, Pacific Island, Chinese, and Indian students.

All students trialled the Eko game developed in 2018. Eko introduces players to basic ecology principles from a Eurocentric and Māori perspective.

## Key findings

This research shows that incorporating cultural worldviews and knowledge systems makes conservation science more meaningful and accessible for Indigenous Māori students.

Using the Noho Taiao format increased student enthusiasm for environmental concepts, encouraged higher interaction with their surroundings, and enhanced learning compared to traditional European-based environmental programmes.

- » Students understood that being kaitiaki meant they were protectors, caretakers, and conservationists of the environment.
- » They understood the learning-teaching concept of Tuakana-Teina as a form of positive reciprocity between older and younger youths.
- » The concept of rāhui (where collecting and gathering of resources or using a specific space is not allowed) was understood as a Māori practice of allowing the earth to rest and recover after the completion of an event or harvest.
- » Leaving a legacy to future generations, and receiving the intergenerational knowledge passed to them, were identified by students as critically important responsibilities and duties to uphold.

The value placed on intergenerational knowledge, and the weaving of ancestral science with new discoveries, is centred around reciprocity and responsibility. These types of conservation programmes place future generations in a resilient and enduring conservation-literacy standing.

Creating a gaming app to reinforce learning was effective in engaging students, especially after exposure to environmental programmes. By approaching conservation biology through a Māori perspective, researchers concluded cultural identity was strengthened, particularly in practices like kaitiakitanga (natural resource stewardship).

The Noho Taiao approach could likely be beneficial for other Indigenous peoples facing similar cultural challenges.



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