

This assessment is based on a now-expired version of the achievement standard and may not accurately reflect the content and practice of external assessments developed for 2024 onwards.

91922R



Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Level 1 Science RAS 2023

91922 Describe features of science that have contributed to the development of a science idea in a local context

Credits: Five

PILOT ASSESSMENT

RESOURCE BOOKLET

Refer to this booklet to answer the questions for Science RAS 91922.

Check that this document has pages 2–8 in the correct order and that none of these pages is blank.

SCIENCE IDEA ONE: Rongoā in the treatment of type 2 diabetes

Diabetes is a disease that prevents people from being able to regulate the sugar levels in their blood. Dr Jonni Koia explored how rongoā could be used to treat diabetes in Māori people.

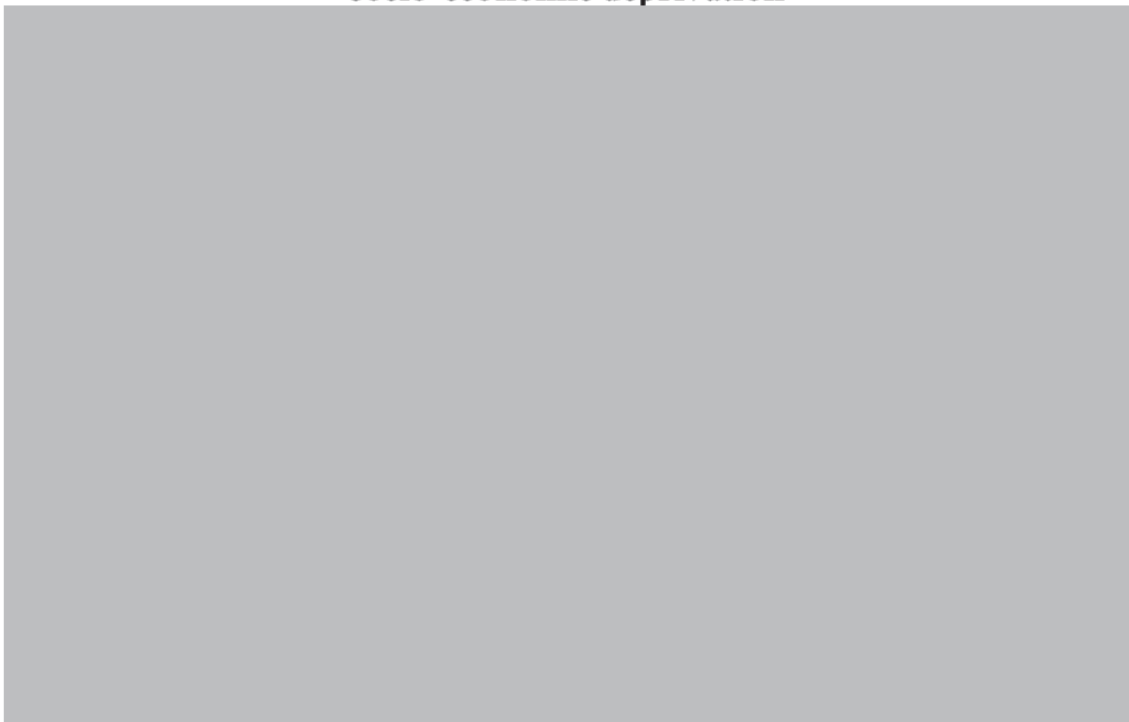
Rongoā is a traditional Māori way of treating human health. Rākau rongoā is a way to use plants that have medicinal properties for treating diseases and poor health. Traditionally, a tohunga (expert) would make decisions about each person's health needs and follow appropriate tikanga. This could involve choosing the appropriate herbal remedies and using a combination of physical therapies and spiritual healing.

Figures 1 and 2 show the rates of type 2 diabetes in Aotearoa New Zealand by age, ethnicity, and socio-economic deprivation.

Figure 1: Rates of Type 2 Diabetes in Aotearoa New Zealand by age and ethnicity



Figure 2: Rates of Type 2 Diabetes in Aotearoa New Zealand by ethnicity and socio-economic deprivation



Dr Jonni Koia (Waikato-Tainui)

Dr Koia is a researcher working to support and verify mātauranga surrounding rongoā from a molecular science point of view. She is also working with other researchers from the University of Auckland who specialise in how diseases like diabetes are caused by changes in the body.

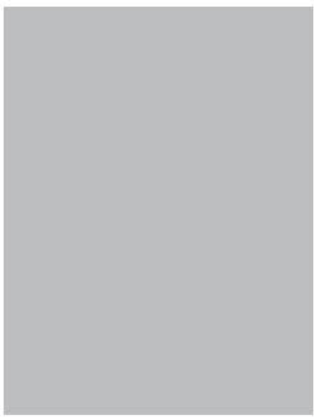
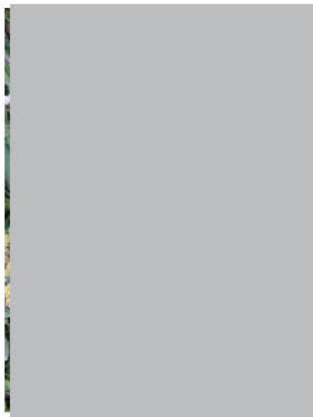
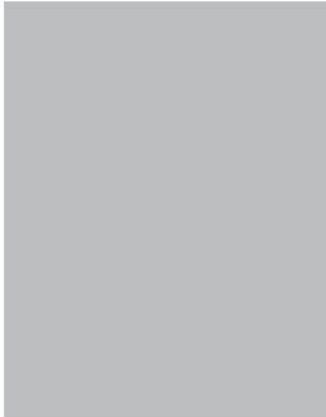
Dr Koia reviewed many published articles about rongoā. She noted that the number of people with type 2 diabetes is increasing, especially in Māori children under the age of 15. She says, “Adaptation to a Western-style diet and lifestyle is thought to have contributed towards high rates of diabetes among Māori.”

She thinks that since Māori have been using rongoā for hundreds of years, it is possible that Māori genetics enable them to process natural rākau rongoā more effectively than synthetic drugs, which could reduce the side effects that Māori patients experience.

Dr Koia studied three taonga plants that she thought may be able to help treat type 2 diabetes. Some of the active chemicals useful in treating diabetes were also found in rākau rongoā.

Figure 3 shows the three taonga plants and the chemicals found in each plant that may be useful to treat diabetes.

Figure 3: Taonga plants with active chemicals useful in treating diabetes

	Karamū	Kūmarahou	Kawakawa
Plant			
Chemicals found that can be useful to treat diabetes	Asperuloside, $C_{18}H_{22}O_{11}$	Quercetin, $C_{15}H_{10}O_7$ Kaempferol, $C_{15}H_{10}O_6$ Saponins, $C_{55}H_{86}O_{24}$	Isovitexin, $C_{21}H_{20}O_{10}$ Vitexin glycosides, $C_{21}H_{20}O_{10}$

Professor Peter Shepherd

Professor Peter Shepherd is an expert in biotechnology, and he is working with Dr Koia to try to find new prevention strategies and treatments for type 2 diabetes.

One piece of research Professor Shepherd was involved in looked at a gene found in Māori and Pacific peoples that helped prevent diabetes.

Insulin is an important hormone related to diabetes because it helps to move glucose from the bloodstream into muscle and organ cells. People with diabetes have problems making or using insulin effectively.

172 Māori and Pacific men were given a meal high in sugar and their body's responses were measured.

They found that while men with the gene produced the same amount of insulin as men without the gene, they had higher levels of insulin in their blood.

Kuputaka	Glossary
rongoā	traditional Māori remedies and healthcare
rākau	trees or plants
tohunga	an expert
tikanga	correct ways of doing things
mātauranga	traditional Māori knowledge
taonga	treasure

SCIENCE IDEA TWO: Sampling eel (tuna) numbers in the environment

Tuna (eels) are highly important to Māori as a source of kai. Important events were often scheduled around the harvesting of eels. Eels are kaitiaki of the streams, rivers, and lakes. Two important eels in Aotearoa New Zealand are the longfin and the shortfin.



Longfin and shortfin eels

Longfin eel: Coloured dark brown and black. Found throughout both the North and South Island, including in high-elevation rivers and lakes.

Shortfin eel: Coloured light brown and olive. Found in lowland areas like marshes and wetlands.

Eels are able to help iwi assess water quality and habitat diversity. As longfin eels are quite susceptible to pollution, their health is also an indication of the health of the ecosystem in which they live. Eels are examined for disease on the skin, fins, and mouth. In times of very poor water quality, the lips of the eel become completely covered with fungal growth, which may prevent it from feeding.

Eels are also important for the economy. Some businesses catch and sell eels. Eel meat is sold in Aotearoa New Zealand and all over the world as a delicacy.

Eel life cycle

An eel's life cycle starts and ends in the deep ocean near Tonga, with all adult growth occurring in Aotearoa New Zealand rivers. Young eels found in rivers are known as glass eels.



Life cycle of eels

Studying eels

The National Institute of Water and Atmospheric Research (NIWA) has been studying glass eels in several rivers throughout Aotearoa New Zealand to try to get a better understanding of their life cycle. They also want to know what environmental factors cause glass eels to choose which rivers to swim up.

Some of the factors affecting eel numbers include intensive farming, over-fishing, and the building of dams, so it is important to study eels. NIWA provides advice on how to sample eels in their natural environment on their website.

Methods of sampling eels

Electric fishing: An eel is temporarily stunned using an electric fishing machine. Stunned fish are anaesthetised, identified and measured, revived, and returned to the water when finished.

Fyke nets: These nets are designed to catch eels of a certain size and let other eels escape.

Hīnaki: Traditionally woven basket-like pots made from mangemange, a climbing fern. Bait is added to attract eels and trap them inside. Hīnaki come in several different designs.

Observation: Night-time observation can be made using spotlight equipment where there is clear, shallow water.



Fyke nets drying after being used in a lake

Hīnaki eel trap

Eel data

In one study, NIWA aimed to collect 50 longfin and 50 shortfin glass eels at different times through the year. They used fine-mesh fyke nets to catch eels. Researchers wanted to measure the eels' body chemistry and see what they are eating at sea. They also examined the eels' ear bones, which is a way to check the age of an eel, its birth date, and growth rates. Figure 4 shows how many longfin and shortfin eels they collected from July to October 2019.

Figure 4: Average length of glass eels caught using fyke-net sampling in the Rangitaiki River between July and October 2019



Kuputaka	Glossary
tuna	eel
kai	food
kaitiaki	guardian, caretaker
iwi	major Māori tribe in an area
hīnaki	a woven eel trap

Acknowledgements

Material from the following sources has been adapted for use in this assessment:

Rākau rongoā

Text

<https://www.tepapa.govt.nz/discover-collections/read-watch-play/maori/maori-medicine>
<https://www.health.govt.nz/publication/tikanga-rongoa>
<https://teara.govt.nz/en/rongoa-medicinal-use-of-plants/page-3>
<https://www.frontiersin.org/articles/10.3389/fphar.2020.00935/full>
<https://www.diabetes.org.nz/blog/rongoa-comes-to-the-fore>
<https://www.akohiringa.co.nz/education/type-2-diabetes-two-medications-offer-fresh-management-paradigm>
<https://profiles.auckland.ac.nz/peter-shepherd>
<https://researchcommons.waikato.ac.nz/bitstream/handle/10289/14551/thesis.pdf?sequence=4&isAllowed=y>
<https://link.springer.com/article/10.1007/s00125-021-05552-x#Sec3>

Images

Page 2:

Figure 1

<https://www.akohiringa.co.nz/education/type-2-diabetes-two-medications-offer-fresh-management-paradigm>

Figure 2

<https://www.akohiringa.co.nz/education/type-2-diabetes-two-medications-offer-fresh-management-paradigm>

Page 3:

Dr Jonni Koia

https://static.sciencelearn.org.nz/images/images/000/004/437/original/REPO_ART_R04_DrJonniKoia_DrJonniKoia.jpg?1674174242

Figure 3

<https://nzseeds.co.nz/products/coprosma-lucida>
<https://inaturalist.nz/observations/96757941>
<https://inaturalist.nz/photos/70850487>

Page 4:

Professor Peter Shepherd

<https://www.nzherald.co.nz/northland-age/news/opinion-professor-peter-shepherd-weighs-in-on-next-steps-for-covid-19-response/2NPV22MT3OTXGMUZHJAK4K7TW4/>

Sampling eel (tuna) numbers

Text

<https://www.doc.govt.nz/nature/native-animals/freshwater-fish/eels/tuna-a-tatou-taonga/>
<https://waimaori.maori.nz/wp-content/uploads/2020/02/Tuna-species-report.pdf>
<https://www.aotearoadive.co.nz/blog/post/83540/the-mysterious-freshwater-eels-of-aotearoa/>
<https://digitalnz.org/records/168567>
<https://niwa.co.nz/te-k%C5%ABwaha/tuna-information-resource/monitoring/sampling-methods>

Images

Page 5:

Longfin/shortfin eel

<https://www.aotearoadive.co.nz/blog/post/83540/the-mysterious-freshwater-eels-of-aotearoa/>

Longfin/shortfin eel life cycle

<https://www.aotearoadive.co.nz/blog/post/83540/the-mysterious-freshwater-eels-of-aotearoa/>

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Fyke nets

<https://niwa.co.nz/te-k%C5%ABwaha/tuna-information-resource/monitoring/sampling-methods>

Hinaki trap

<https://digitalnz.org/records/168567>

Page 7:

Figure 4

<https://atlas.boprc.govt.nz/api/v1/edms/document/A3541371/content>