



SUPPORTING SCIENCE AND TECHNOLOGY EDUCATION



**Māori Women's Welfare League
(Ruahine Branch)**

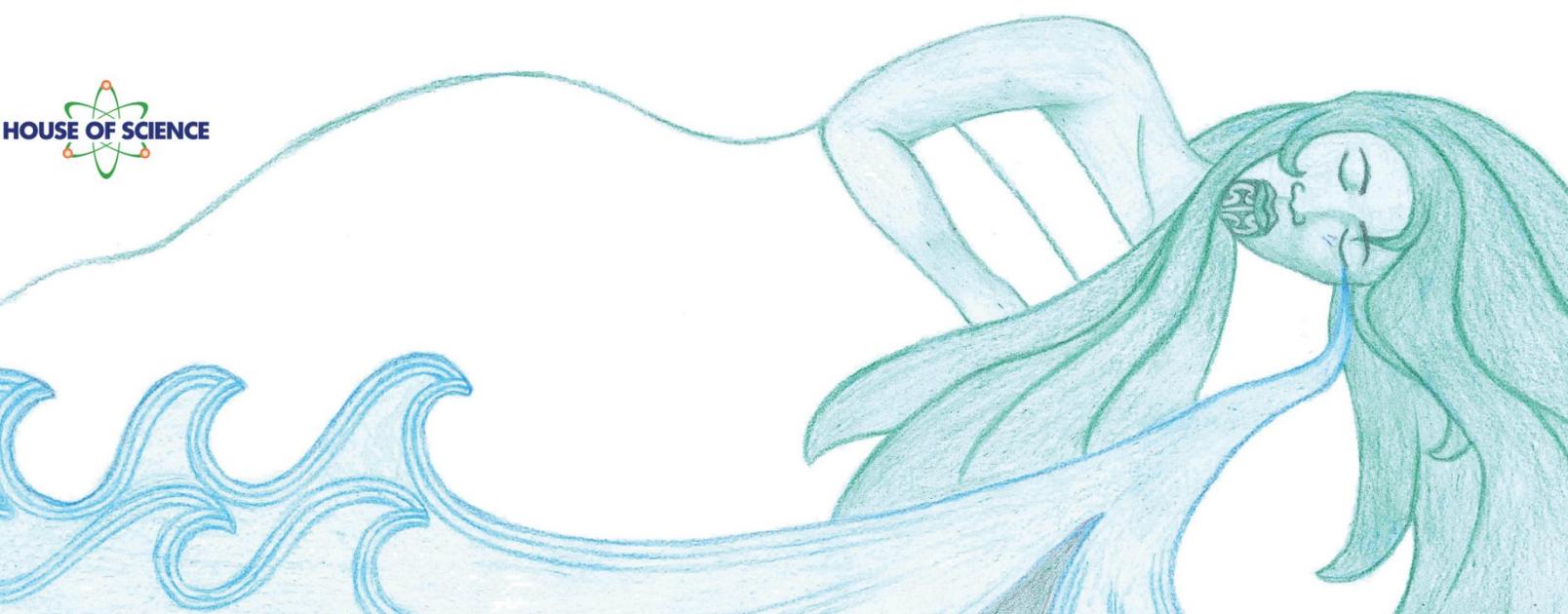
Wetlands

WATER QUALITY

Cleanse yourself at Te Paengaroa
Educate yourself at Te Paengatata

Teacher Manual

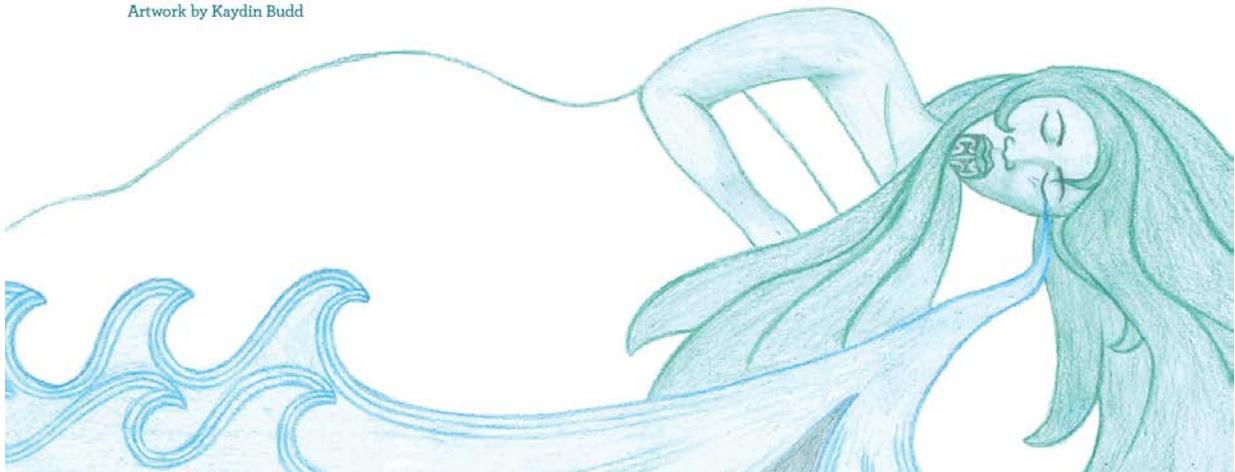
Pūtaiao



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Artwork by Kaydin Budd



KIT CONTENTS

- 1 Teacher Manual (bi-lingual)
- 10 student instruction cards for each of the 6 activities
- 30 Worksheets for the stream velocity activity
- 1 Water Clarity Tube
- 10 Sorting boxes (for bugs)
- 10 Small nets
- 10 Bug suckers
- 10 Bug ID guides
- 10 pH, nitrite and nitrate water testing strips
- 10 Plastic jars with lids
- 30m tape measure
- 1 Stopwatch
- 1 Thermometer

Acknowledgements: Thanks to the Bay of Plenty Regional Council, this kit is largely based on their 'Wai Ora' teacher resource.

LEARNING OBJECTIVES AND CURRICULUM LINKS

Curriculum Level	Conceptual Learning Objective	Procedural and Technical Learning Objective	Nature of Science Learning Outcomes
1/2	Students can investigate easily observable physical features and patterns and consider how the features are affected by people.	Students carry out practical measuring tasks using appropriate metric units, length, mass and capacity.	Students will: Explore and act on issues and questions that link their science learning to their daily living.
3/4	Students will be able to identify animals that live in waterways and describe the habitat in which they live. Students will understand that many of the animals found in a waterway are fulfilling part of their life cycle.	Estimate the amount of water flowing in a stream using the flow calculation. Check their results using an appropriate method, e.g. calculator.	Ask questions, find evidence, explore simple models, and carry out appropriate investigations to develop simple explanations. Begin to use a range of scientific symbols, conventions, and vocabulary.
3/4	Students will be able to identify some simple fresh water food chains. They will be able to identify actions or activities that will adversely affect the food chain. They will know suitable actions to prevent interference with the food chain.	Students will develop their understanding of the equivalence of units with regard to amount of water. While carrying out measuring activities with fresh water and measure water clarity.	

TE REPO PŪTAIAO - WATER

BACKGROUND NOTES FOR TEACHERS

Initial brainstorm questions:

- How clean is the water?
- What does clean mean?
- Some sources of pollution are easily seen, such as rubbish dumping, while others are less visible, such as bacteria.
- How do we know if a waterway is polluted?
- Think of a local waterway. How do we know that the water is clean or dirty?
- What could we look at to check on the quality?
- What would we do if we found that the water quality is good? Bad?
- What do we think our local stream/river water quality will be like?
- **How will we find out?**

Take student responses and record them as a brainstorm or a graffiti chart. Save it to compare with the next activities. Use the students' ideas to create the basis of your stream visit activities.

These activities are designed to give an overall picture of water quality. Although single activities will give you an indication, it is the accumulation of the results of **all** the activities that will give you a more accurate picture of the water quality of a stream. Collating data over time (several years) will give rich data that will be of great interest to the whole community.

TE REPO PŪTAIAO - WATER

STUDENT ACTIVITIES:

1. Water Quality

TEACHER SUPPORT

We can look at several aspects of the water in the stream, together they paint a picture of how clean or healthy the stream is:

A. Temperature

Information

Insects (or macro-invertebrates) are very important for a healthy stream. They like cold, fast running water with plenty of oxygen in it.

Instructions

What temperature does the water have?

- Hold the thermometer at the top.
- Hold it in the flowing water for at least one minute.
- Either read immediately on removal from the water or read under the water. Make sure that you do not put your hand over the bottom end of the thermometer to read the temperature.
- Record your findings.

Discuss the importance of repeat readings, in many parts of the stream to get reliable data. Calculate the average when back in class.

Questions

1. Do you think the temperature might be affecting the ability of some of the animals like the macro-invertebrates to live in this stream?
Invertebrates require a certain temperature range to survive as they do not have the ability to maintain their own body temperature like mammals do.
2. If you were an animal living in this stream is there a shady spot for you to get out of the sun?
Is this shade available all day? All year?
3. What might help to reduce the temperature of a stream?
Planting trees will provide more shade, cooling the water down.

TE REPO PŪTAIAO - WATER

B. Clarity

Instructions

How clear is the stream?

You need: a clarity tube with bung, black disk and exterior magnet.

- Rinse the tube out with the stream water.
- Completely fill the tube with clean water from an up-stream position.
- Place the black disk magnet into the tube and hold it in place with the exterior magnet.
- Place the bung in.
- Have one person hold the bung end of the tube while the other views the disk at the other end.
- Slowly move the magnet away from the viewing end, when the disk disappears from view, slowly bring it back until you can just see it.
- Record this measure from the side of the tube.

When emptying the clarity tube, put the water back in the stream but hold your hand over the end and **catch the magnet!** Be careful with the end of the clarity tube that the viewing screen does not get scratched.

Question

What things might alter the clarity of a waterway?

Erosion, stock in a stream, fertilizer run-off, storm water run-off, discharges from industry. This is where knowing the catchment area upstream is important; see activities in the 'Land' unit.

C. Nitrogen Content

Nutrients, such as nitrogen and phosphorus, are important for plant and animal growth and nourishment. But far too many nutrients can cause some serious problems. It can increase the growth of aquatic plants and algae. They use up the oxygen in the water and block light to deeper water. This can kill fish or even a whole lake.

Water full of nitrogen causes plants and algae to grow very fast and then die all at once when there are too many for the environment to support. Most plants get the nitrogen they need from soil. Many farmers use fertilizers to add nitrogen to the soil to help plants grow larger and faster. Both nitrogen fertilizers and forest fires add huge amounts of nitrogen into the soil and nearby lakes and rivers.

See an interactive nitrogen cycle at <http://sciencelearn.org.nz/Contexts/Soil-Farming-and-Science/Sci-Media/Interactive/The-terrestrial-nitrogen-cycle>

TE REPO PŪTAIAO - WATER

Instructions

How much nitrogen is in the water?

- Start the stopwatch.
- After 30 seconds, read the nitrite and nitrate reading.
- (see instructions on testing strip container).
- Record your findings.

D. pH

The pH-value shows whether water is acidic or alkaline. Acidic water can kill fish living in a waterway and make the water very toxic. Alkaline readings can be caused by excessive lime fertiliser or detergents in the water. This can cause too much plant growth in the waterway and block it or use up valuable oxygen in the water.

Instructions

How acid is the water?

- Put one strip in the river/stream for 2 seconds.
- Start the stopwatch.
- After 30 seconds, compare your strip with the pH-Scale in the kit.
- Record your findings.

Some students may ask you why there are 4 colours on each strip: each part has a different indicator on it; the collective result of 4 scales is more accurate than just one.

You could test some other substances to give students an idea of the pH of a variety of different solutions; $pH < 7$ is acidic, $pH > 7$ is alkaline.

TE REPO PŪTAIAO - WATER

2. WATER QUANTITY (FLOW)

TEACHER SUPPORT

*There are two sections to this to get a measure of cubic metres per second of water flow. Part 1 is the **velocity** of the water and Part 2 is the **area** of the stream.*

Together they are used to calculate water flow.

Instructions

- Measure off 10 metres along the stream bank where there is a relatively straight free flowing section of the stream. Use a student as a marker point at each end.
- Other roles are the: Stopwatch holder, apple releaser, apple catcher.
- Release the apple above the upstream mark so that it is floating with the flow as it passes the mark.
- Start the stopwatch as it floats past.
- Stop the watch at the 10m mark.
- Catch the apple.
- Record the results.
- Repeat this at least 3 times and calculate an average time reading.

TE REPO PŪTAIAO - WATER

3. STREAM BUGS (BIOLOGICAL FACTORS) TEACHER SUPPORT

Insects and other invertebrates (animals without a backbone) in the stream are an excellent indicator of the stream's health.

Instructions

What life is present at the stream?

- Hold the net into the flow so that anything disturbed or uncovered will flow into the net.
- Have students lift up small rocks and rub them with their hands to dislodge animals into the net.
- Search under the stream bank, under logs and rocks. Gently rub the substrate with one hand.
- After about 3 or 4 minutes hunting turn the net inside out into the jar that has been half filled with clean stream water.
- Decant the jar contents into the sorting box.
- Using the bug suckers gently take the bugs from the tray and place in separate spaces with a small amount of water.

Questions

1. What kinds of animals did you find?
2. What does this tell us about the water quality in our stream?
3. Is this what we would have expected to find in this stream?
4. What other factors might have affected our result?

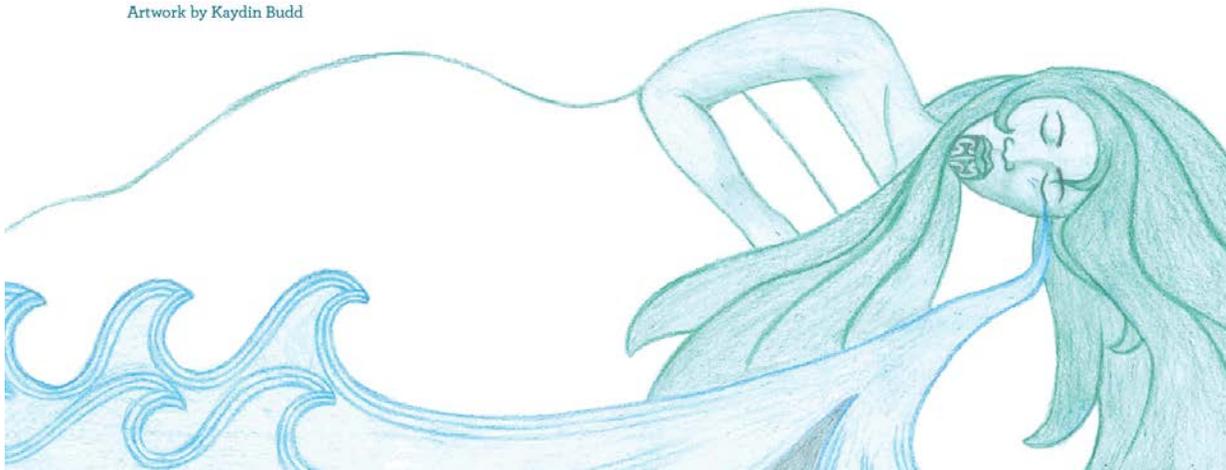
Heavy rain caused by storms can wash animals away. They should regenerate in 3-4 weeks.

TE REPO PŪTAIAO - WATER

USEFUL RESOURCES AND LINKS

Name	Comments	Websites
Science Learning Hub	NZ resource managed by University of Waikato. See the 'H2O ON THE GO' and the TŌKU AWA KOIORA contexts	www.sciencelearn.org.nz
Science kids	Another NZ resource with many quizzes, activities and ideas esp for primary students. Check out the 'WATER' topic	www.sciencekids.co.nz
Regional Council	Much of this kit was based on the BOP regional council's 'WAIORA' resource, freely available to everyone.	www.boprc.govt.nz/residents/teachers/teacher-resources/waiora-healthy-water/

Artwork by Kaydin Budd



TE REPO PŪTAIAO - WATER

APPENDIX: STUDENT WORKSHEETS

1. WATER QUALITY

STUDENT WORKSHEET

We can look at several aspects of the water in the stream, together they paint a picture of how clean or healthy the stream is:

A. Temperature

Information

Insects (or macro-invertebrates) are very important for a healthy stream. They like cold, fast running water with plenty of oxygen in it.

Instructions

What temperature does the water have?

- Hold the thermometer at the top.
- Hold it in the flowing water for at least one minute.
- Either read immediately on removal from the water or read under the water. Make sure that you do not put your hand over the bottom end of the thermometer to read the temperature.
- Record your findings.



Questions

1. Do you think the temperature might be affecting the ability of some of the animals like the macro-invertebrates to live in this stream?
2. If you were an animal living in this stream is there a shady spot for you to get out of the sun?
3. What might help to reduce the temperature of a stream?

1. Water Quality

STUDENT WORKSHEET

We can look at several aspects of the water in the stream, together they paint a picture of how clean or healthy the stream is:

B. Clarity

Instructions

How clear is the stream?

You need: a clarity tube with bung, black disk and exterior magnet.

- Rinse the tube out with the stream water.
- Completely fill the tube with clean water from an up-stream position.
- Place the black disk magnet into the tube and hold it in place with the exterior magnet.
- Place the bung in.
- Have one person hold the bung end of the tube while the other views the disk at the other end.
- Slowly move the magnet away from the viewing end, when the disk disappears from view, slowly bring it back until you can just see it.
- Record this measure from the side of the tube.



When emptying the clarity tube, put the water back in the stream **but hold your hand over the end and catch the magnet! Be careful with the end of the clarity tube that the viewing screen does not get scratched.**

Question

What things might alter the clarity of a waterway?

1. Water Quality

STUDENT WORKSHEET

We can look at several aspects of the water in the stream, together they paint a picture of how clean or healthy the stream is:

C. Nitrogen content

Nutrients, such as nitrogen and phosphorus, are important for plant and animal growth and nourishment. But far too many nutrients can cause some serious problems. It can increase the growth of aquatic plants and algae. They use up the oxygen in the water and block light to deeper water. This can kill fish or even a whole lake.

Instructions

How much nitrogen is in the water?

You need:



Stopwatch
strips



Nitrate/Nitrite testing

- Dip one strip into the stream water for 1 sec.
- Start the stopwatch.
- After 30 seconds, read the nitrite and nitrate readings.
- (see instructions on testing strip container).
- Record your findings.

1. Water Quality

STUDENT WORKSHEET

We can look at several aspects of the water in the stream, together they paint a picture of how clean or healthy the stream is:

D. pH

The pH-value shows whether water is acidic or alkaline. Acidic water can kill fish living in a waterway and make the water very toxic. Alkaline readings can be caused by excessive lime fertiliser or detergents in the water. This can cause too much plant growth in the waterway and block it or use up valuable oxygen in the water.

Instructions

How acid is the water?

You need:



pH testing strips, pH-scale

- Put one strip in the river/stream for 2 seconds.
- Start the stopwatch.
- After 30 seconds read the pH-Scale.
- Record your findings.

2. Water Quantity (flow)

STUDENT WORKSHEET

*There are two sections to this to get a measure of cubic metres per second of water flow. Part 1 is the **velocity** of the water and Part 2 is the **area** of the stream. Together they are used to calculate water flow.*

Instructions

You need:



net



tape measure



an apple (or orange, or similar)



stopwatch

- Measure off 10 metres along the stream bank where there is a relatively straight free flowing section of the stream. Use a student as a marker point at each end.
- Other roles are the: Stopwatch holder, apple releaser, apple catcher.
- Release the apple above the upstream mark so that it is floating with the flow as it passes the mark.
- Start the stopwatch as it floats past.
- Stop the watch at the 10m mark.
- Catch the apple.
- Record the results.
- Repeat this at least 3 times and calculate an average time reading.

The stream velocity

Divide the average time by the distance that the orange travelled (hopefully 10 metres).

Velocity = Time/Distance = metres/second (Using 10 metres makes the maths easy!)

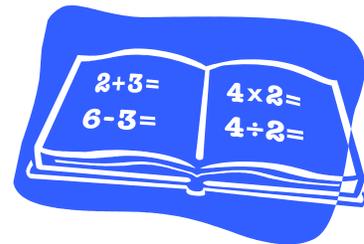
The stream area

1. Take a long ruler and measure how deep the water is at 5 different places.
2. Add together all the depth measurements (make sure that these are in metres. If the depth has been recorded in centimeters convert to metres, e.g. 41cm = 0.41m). Divide them by the number of measurements made to give you an average depth in METRES.
3. Multiply the average depth by the width of the stream to get square metres (m²).

Area = stream width x average depth (take 10 depth measurements across the stream and average)

$$= \text{_____ m} \times \text{_____ m}$$

$$= \text{_____ m}^2$$



The overall flow of the stream

1. Multiply the velocity by the area.
2. Your answer is cubic metres per second. To convert to litres multiply this by 1000.

Flow of stream = Velocity x Area

$$= \text{_____ m/s} \times \text{_____ m}^2$$

$$= \text{_____ m}^3/\text{s}$$

3. Stream bugs (Biological Factors)

STUDENT WORKSHEET

Insects and other invertebrates (animals without a backbone) in the stream are an excellent indicator of the stream's health.

Instructions

What life is present at the stream?

You need: net, sorting box , large Jar, bug sucker →



- Hold the net into the flow so that anything disturbed or uncovered will flow into the net.
- Have students lift up small rocks and rub them with their hands to dislodge animals into the net.
- Search under the stream bank, under logs and rocks. Gently rub the substrate with one hand.
- After about 3 or 4 minutes hunting turn the net inside out into the jar that has been half filled with clean stream water.
- Decant the jar contents into the sorting box.
- Using the bug suckers gently take the bugs from the tray and place in separate spaces with a small amount of water.

Questions

1. What kinds of animals did you find?
2. What does this tell us about the water quality in our stream?
3. Is this what we would have expected to find in this stream?
4. What other factors might have affected our result?



SUPPORTING SCIENCE AND TECHNOLOGY EDUCATION



**Te Roopu Wāhine Māori toko i te ora tātau tātau
(Ruahine Branch)**

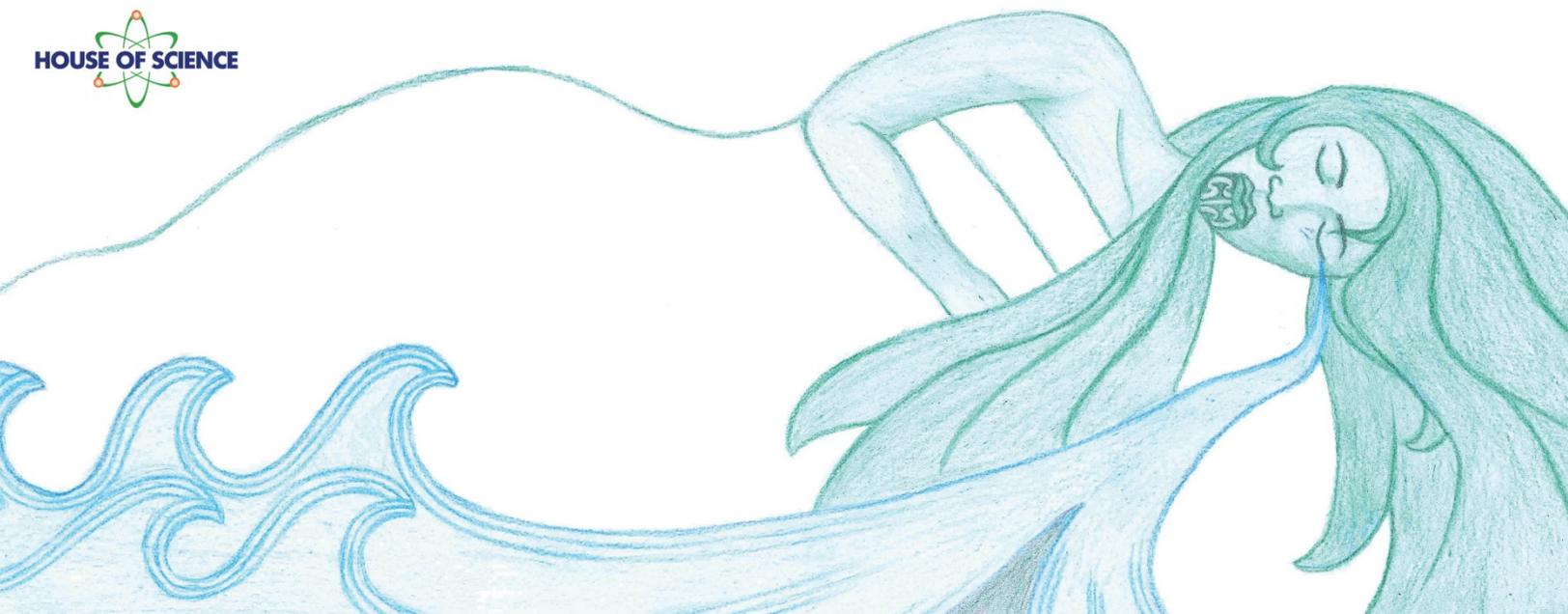
Pūtaiao

Kūkūwai

Horoia atu ki Te Paengaroa
Whakamaua ake ki Te Paengatata

Wai

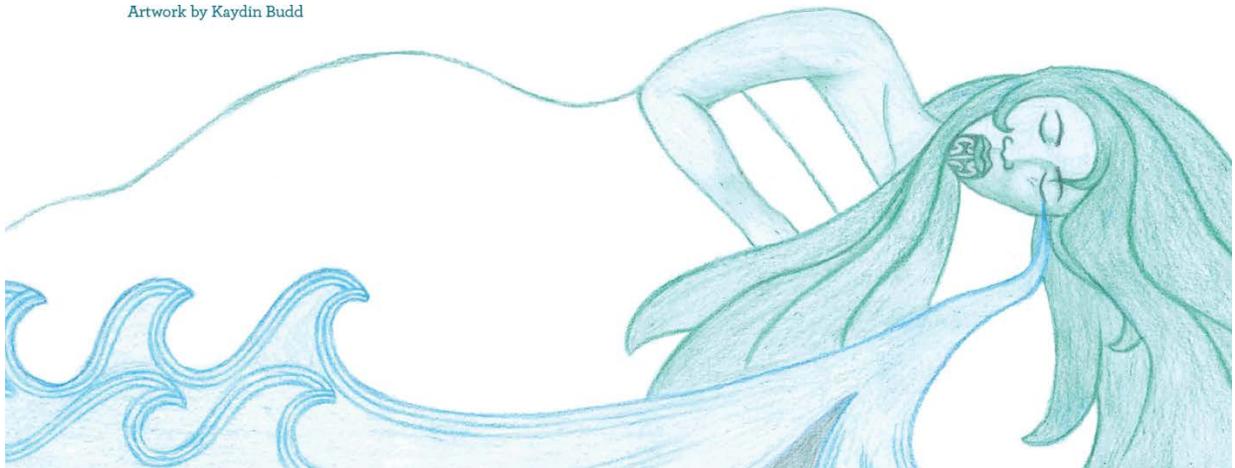
Ko Papatūānuku
Te ūkaipō o te tangata
I te ao ukiuki
A moroki noa nei!



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Artwork by Kaydin Budd



TRADITIONAL STORY: MAUAO

(FROM THE TRIBES OF TAURANGA MOANA)

There was once a hill with no name among the many hills and ravines on the edge of the forests of Hautere.

This nameless one was pononga, slave or servant, to the great chief Otānewainuku, the forested peak which stands as a landmark for the tribes of Tauranga Moana. To the south-west was the shapely form of the hill Puwhenua, a woman clothed in all the fine greens of the ferns and shrubs and trees of the forest of Tane. The nameless one was desperately in love with Puwhenua. Her heart was already won by the majestic form of the chiefly mountain Otānewainuku. There seemed no hope for the lowly slave with no name to persuade her to become his bride.

The nameless one sorrowed. In despair he decided to end it all by drowning himself in the ocean, Te Moananui a Kiwa. He called on the patupaiarehe, the people with magical powers who dwelled in the forests of Hautere. They were his friends and they plaited the ropes with their magic to haul him from the hill country toward the ocean. As they pulled on their ropes, they chanted their magic chant.

E hika tū ake	Arise you who slumber
Ki runga rā whitiki taua	Prepare ourselves
Hei tama tū	Prove our manhood
Kumea ki te uru	Heave to the west
Kumea ki te tonga	Heave to the south
Hiki nuku	Move heaven and earth
Hiki rangi	It awakens,
I arā rā	It loosens, shudders.
Ka ngarue, ka ngarue	Haul toward the stormy east
Toia ki te hau marangai	wind
Kia whakarongo taku kiri	That the skin may feel
Te kikini a te rehutai	The tang of salt spray
0 ngā ngaru whatiwhati	Of the turbulent thundering
E haruru mai nei	waves
Wī wī wī	Wī wī wī
Wā wā wā	Wā wā wā
A! hā! hā!	A! hā! hā!
Horahia ō mata ki a Meremere	Cast your eyes heavenward
Tūahiahi	Toward Venus, the evening
Hei taki i te ara ki a Tangaroa	star,
He atua hāo i te tini ki te pō	To light the path
E kokoia e ara e	To the ocean of Tangaroa,
	The god who lures many into his
	embrace,
	Into eternal darkness.
	Alas, the birds have awakened
	Dawn has come.

The patupaiarehe chanted this song and hauled the nameless one from his place among the hills from Waoku. They gouged out the valley where the river Waimapu now flows. They followed the channel of Tauranga Moana past Hairini, past Maungatapu and Matapihi, past Te Papa. They pulled him to the edge of the great ocean of Kiwa. But it was already close to daybreak. The sun rose. The first rays lit up the summit of the nameless hill and fixed him in that place. The patupaiarehe melted away before the light of the sun. They were people of the night and they flew back to the shady depths of the forests and ravines of Hautere.

The patupaiarehe gave a name to this mountain which marks the entrance to Tauranga Moana. He was called Mauao which means caught by the dawn, or lit up by the first rays of sunrise. In time, he assumed greater mana than his rival Otānewainuku. Later he was also given another name, Maunganui, by which he is now more often known. He is still the symbol of the tribes of Tauranga Moana.



Ko Mauao te Maunga (2008) by Duane Moyle

Reference: Stokes, E. (1980). *Occasional Paper No. 9, Centre for Māori studies*. University of Waikato.

HE WHAKAMĀRAMA MŌ TE HUNGA KAIKO

Ngā Pātai Whakatere Whakaaro:

- He pēhea te mā (clean) o te wai?
- He aha te tikanga o te kupu mā (clean)?
- He aha ētahi momo parahanga e kite ana ā kanohi, me ētahi parahanga e kore e kitea?
- He aha ōu mōhiotanga e pā ana ki te paruparu o te wai?
- Āta whakaarohia tētahi awa noho tata ki a koe. Ki tō mōhiotanga, he mā, he paru rānei? He aha i whakaaro pērā ai?
- He aha ngā mahi kia whakamātauria te paruparu o te wai?
- Me pēhea tātou me he wai paru, he wai mā rānei? He aha ōu whakaaro e pā ana ki tētahi awa noho tata ki a koe?

Waihoki, me pēhea tātou e rangahau?

Noho tahi ki ngā taurira me te tuhituhi me te kōrero mō ōna whakaaro, ā-raupapa nei. Tiakina, e mama ai te whakataurite. Whakamahia ngā whakaaro o ngā taurira e tau ai te tūāpapa o ngā mahi.

Kua hangaia ēnei tūmahi kia whakaatu ai i te kounga o te wai. Ahakoa tōna whakaatu mai, mā ngā whakatau o ngā tūmahi katoa koe e whakaatu tika ai te kounga o te wai, i tētahi awa. Mā te āta rangahau (mō ngā tautini) e reka ai ngā raraunga hei painga mō te katoa o te hapori.

1. TE KOUNGA O TE WAI

MĀ NGĀ KAIKO

Ka taea e tātou te titiro ki te rahi o ngā āhuatanga o te wai i roto i te awa, ka mārakerake kitea te oranga tonutanga o te awa:

A. Te Pāmahana

He Pitopito Kōrero

He mea whai tikanga te ngāngara (tonotono, - hātaretare ranei) mō te oranga o te wai. E kaingākau nui ana rātou ki te wai mātao e rere kaha ana me te hāora o roto.

Ngā Tohutohu

He aha te pāmahana e tika ana mō te wai?

- Kia mau ki te ūpoko o te ine pāmahana.
- Kia mau ki roto i te wai e rere ana mō te kotahi miniti.
- Kia tere te pānui i te ine mahana, i tō hīkaro, i te wai; ka taea rānei te pānui i raro iho i te wai. Kia maumahara mai koe, kua rawa e pā atu i te takere o te ine mahana.
- Tuhia ōu kitenga.

Kōrerohia te whai tikanga o ngā pānuitanga auau kei ngā wāhanga rerekē o te awa, e tika ai ngā raraunga. Tātaihia te pae i tō hokinga atu ki te akomanga.

Ngā pātai

1. Ki ōu whakaaro ka pā te pāmahana o ētahi kararehe rite ki te tonotono i hātaretare kia noho i roto i te awa? Ki ōu whakaaro, ka taumaha haere te oranga o ngā kararehe, ōrite ki te tonotono, ki roto i te awa?

Me tika te pāmahana mō te tonotono, kei mate rātou ki te pupuri i tō rātou ake.

2. Mēnā he kararehe koe kei tō kainga te awa, he wāhi kōuru māhou hei huna i a Tama-nui-te-ra ? Me he kararehe koe e noho ana ki tēnei awa, he wāhi kōuru hei āhuru mōwai mōu?

He āhuru mōwai mō te katoa o te rā? Mō te tau?

3. He aha te mea āwhina i te whakaiti i te pāmahana o te awa? Me pēhea te whakahekenga o te pāmahana o te wa.

Mā te whakatō rākau te wai e whakamātao.

B. Te Ariari

Ngā Tohutohu

Me pēhea te pūahoaho o te wai?

- Horoia te ngongo me te pangu ki roto i te awa.
- Whakakīia katoatia te ngongo ki te wai o te awa.
- Whakaurua te kōpae pango ki roto i te ngongo pangu. Puritia te ngongo me te aukume.
- Whakaurua te pangu.
- Kia kotahi te tangata whakamau i te takere o te ngongo, ā, ko te kōpae kei te ūpoko o te ngongo.
- Āta nekehia te aukume, neke atu i te wāhanga ka kitea, hei te whakarēretanga iho o te kōpae, āta whakahokia, tae noa ki te wā ka kitea anōtia.
- Tuhia te whanganga kei te taha o te ngongo.

Hei te whakapaunga o te ngongo pūahoaho, whakahokia te wai ki te awa, **engari whakamau te takere, ā, hopukina te aukume!**
Kia tūpato ki te takere o te ngongo pūahoaho, kei haehaea te mata whakakite.

Pātai

He aha ngā mea ka panoni i te pūahoahotanga o te wai?

Ko te horo whenua, te tōki i te awa, te toenga one me te toenga wai i te āwhā. Ko tēnei te wā me mōhio ki te wāhi aukati, tēnā tirohia ngā tūmahi i te wāhanga 'Whenua'.

C. Te Kiko o te Hauota

Ko ngā whakatupu ā-wai, pērā i te hauota me te pūtūtaewhetū, he mea whai rawa hei whakatupu hei whāngai anō hoki i ngā rākau. Ka raru mēnā ka pokea ki ngā whakatupu ā-wai. Ka whakarahi ake te tupu o te otaota rōwai me te pūkohu. Ka whakamahi i te hāora i roto i te wai, ā, ka ārai mai te rā i te wai hōhonu. Ka kōhurutia te ika, te katoa o te awa anō hoki.

Ko te wai, kua tāraia ki te hauota, ka tere puāwai ngā otaota me te pūkohu, kātahi ka mate, i te wā kotahi, mēnā kua pokea katoatia e te maha. Mō te nuinga o ngā otaota, mā te hauota kei roto i te oneone e whāngai. Ko te nuinga o ngā kaipāmu ka whakamahia te one hei tāpiri i te hauota ki te oneone e tupu kaha ai, e tupu tere ai ngā otaota. Mā ngā one hauota me te ahi ā-nehenehe te hauota nui e whakatōkia ki te oneone, tata rawa anō hoki ki ngā awa me ngā roto.

Tēnā tirohia tētahi tūmahi raupapa hauota mā konei:

Ngā tohutohu:

He aha te nui o te hauota i roto i te wai?

- Unuhia tētahi takai whakamātautau pākawa ki te awa mo te kotahi hēkona.
- Tīmatahia te wāti.
- Ka mutu te 30 hēkona, pānuihia te takai whakamātautau pākawa
- (tirohia ngā tohutohu i runga i te ipu).
- Tuhia ōu kitenga.

D. Te Āwhata pH

I whakaaturia e te āwhata pH mēnā he wai atiti, he wai hīmoemoe rānei. Ko te wai atiti he wai whakamate i ngā ika e noho ana ki te ara wai, ka huri te wai hei paitini. Ka hua mai ko ngā tuinga wai hīmoemoe nā te poke o te one raima, o te hopi rānei, i roto i te wai. Mā konā ka rahi ake te puāwaitanga o ngā hua i roto i te ara wai, ā, ka punia, ka whakapaua rānei ngā tino hua o te hāora i roto i te wai.

Ngā tohutohu:

Me pēhea te wai atiti?

- Tōua tētahi pepa āwhata pH i roto i te wai mō ngā hēkona e rua.
- Tīmatahia te wāti.
- Ka mutu te 30 hēkona, whakatauritehia ngā pepa āwhata pH ki te ine taumaha pH kei roto i te kete.
- Tuhia ōu kitenga.

Ka pātāhia pea ngā kara e whā o ia pepa āwhata e ētahi o ngā tauira: he tohu tō ia wāhanga o te āwhata; ka pai ake te whakatau a te katoa o ngā āwhata e whā i te mea kotahi.

Ka taea hoki te whakamātau i tētahi mea kē atu e taea e ngā tauira ngā āhuatanga rerekē o te āwhata pH; pH<7 mō te wai atiti, pH>7 mō te wai hīmoemoe.

2. TE RAHINGA O TE WAI (TĀRERE)

MĀ NGĀ KAIAKO

*E rua ngā wāhanga e kaute ai i te whangaoho mita i ia hēkona o te rere o te wai. Ko te wāhanga tuatahi, ko te **tere (mamao)** o te wai me te wāhanga tuarua, ko te rahi o te awa. Mā rāua tahi te rere o te wai e kaute.*

Ngā Tohutohu

- Rūrihia te 10 mita i te tahataha o te awa, i tētahi wāhi maringi noa te wai. Whakaritea ngā tauira kia riro mā rātou hei pou mō ia pito.
- Ko ngā tūranga kē atu: Te tangata kaipupuri i te wāti, he tangata tuku i te āporo me tētahi tangata whakamau i te āporo.
- Tukua te āporo kia rere mā runga i te māka tuatahi e rere ai mā runga i te rere o te wai.
- Tīmatahia te wāti i te wā ka rere haere te āporo i te māka.
- Katia te wāti i te māka 10m.
- Hopukina te āporo.
- Tuhia ōu kitenga.
-

3. NGĀ NGĀNGARA O TE AWA (NGĀ KAUPAPA KOIORA) MA NGĀ KAIKO

He tohu pai ngā ngangara me ngā tauwi-kore i te hauora o te wai (ngā rauropi karekau he tauwi) kei te wai e noho ana.

Ngā Tohutohu

He aha ngā mea ora i roto i te awa?

- Whakamaua te neti ki roto i te wai kia mau ai ngā mea whakapōraru ki te neti.
- Hikina ngā kōhatu iti nei, ā, mirimiria kia whakawāteahia ngā kararehe ki roto i te neti.
- Āta tirohia ki raro i ngā tahataha o te awa, ngā rākau me ngā toka.
- Ka mutu ngā miniti e whā, haria te neti ki te ipu nui, whakatakoto kau ana i ngā mea i roto i te neti ki te ipu. Purua he wai ki roto i te ipu.
- Āta tirohia ngā ngangara i roto i te ipu. Whiria ngā ngangara ōrite, ā, raua atu ki roto i tētahi pouaka.
- I a koe e whakamahia ana ngā ngongo ngangara, tukuna rātou i te rīhi ki tētahi wāhi e noho wehe ai ki te wai iti.

Ngā pātai

5. He aha ngā mōmō ngangara i kitea i te awa?
6. Mai i ēnei kitenga, me pēhea te hauora o te awa?
7. Ko ēnei kitenga ngā mea e tūmanakohia nei e koe i roto i te awa?
8. He aha atu ngā pānga pōraruraru i te hua?

Kei riro ngā kararehe ki te kaha o te ua, o te āwhā. Ka puāwaitia anōtia ki te 3-4 wiki.

Acknowledgements: Thanks to the Bay of Plenty Regional Council, this kit is largely based on their 'Wai Ora' teacher resource.

APPENDIX: STUDENT WORKSHEETS

Te Repo Pūtaiao – te Wai



1. Te Kounga o te Wai

Ka taea e tātou te titiro ki te rahi o ngā āhuatanga o te wai i roto i te awa, ka māraakerake kitea te oranga tonutanga o te awa:

A. Te Pāmahana

He Pitopito Kōrero

He mea whai tikanga te ngāngara (tonotono, - hātaretare ranei) mō te oranga o te wai. E kaingākau nui ana rātou ki te wai mātao e rere kaha ana me te hāora o roto.

Ngā Tohutohu

He aha te pāmahana e tika ana mō te wai?

- Kia mau ki te ūpoko o te ine pāmahana.
- Kia mau ki roto i te wai e rere ana mō te kotahi miniti.
- Kia tere te pānui i te ine mahana, i tō hīkaro, i te wai; ka taea rānei te pānui i raro iho i te wai. Kia maumahara mai koe, kaua rawa e pā atu ki te takere o te ine mahana.
- Tuhia ōu kitenga .



Ngā pātai

4. Kī ōu whakaaro ka pā te pāmahana o ētahi kararehe rite ki te tonotono i - hātaretare kia noho i roto i te awa? Kī ōu whakaaro, ka taumaha haere te oranga o ngā kararehe, ōrite ki te tonotono, ki roto i te awa?
5. Mēnā he kararehe koe kei tō kāinga te awa, he wāhi kōuru māhou hei huna i a Tama-nui-te-ra ? Me he kararehe koe e noho ana ki tēnei awa, he wāhi kōuru hei āhuru mōwai mōu?
6. He aha te mea āwhina i te whakaiti i te pāmahana o te awa? Me pēhea te whakahekenga o te pāmahana o te wai?

1. Te Kounga o te Wai

Ka taea e tātou te titiro ki te rahi o ngā āhuatanga o te wai i roto i te awa, ka mārakerake kitea o te oranga tonutanga o te awa:

B. Te Ariari

Ngā Tohutohu

Me pēhea te pūahoaho o te wai?

Ngā Rauemi: He ngongo me te pangu, he kōpae pango me te aukume

- Horoia te ngongo me te pangu ki roto i te awa.
- Whakakīia katoatia te ngongo ki te wai o te awa.
- Whakaurua te kōpae pango ki roto i te ngongo pangu. Puritia te ngongo me te aukume.
- Whakaurua te pangu.
- Kia kotahi te tangata whakamau i te takere o te ngongo, ā, ko te kōpae kei te ūpoko o te ngongo.
- Āta nekehia te aukume, neke atu i te wāhanga ka kitea, hei te whakarēretanga iho o te kōpae, āta whakahokia, tae noa ki te wā ka kitea anōtia.
- Tuhia te whanganga kei te taha o te ngongo.



Hei te whakapaunga o te ngongo pūahoaho, whakahokia te wai ki te awa, **engari whakamaua te takere, ā, hopukina te aukume!**

Kia tūpato ki te takere o te ngongo pūahoaho, kei haehaea te mata whakakite.

Pātai

He aha ngā mea ka panoni i te pūahoahotanga o te wai?

Te Repo Pūtaiao – te Wai



1. Te Kounga o te Wai

Ka taea e tātou te titiro ki te rahi o ngā āhuratanga o te wai i roto i te awa, ka māraakerake kitea o te oranga tonutanga o te awa:

C. Te Kiko o te Hauota

Ko ngā whakatupu ā-wai, pērā i te hauota me te pūtūtaewhetū, he mea whai rawa hei whakatupu hei whāngai anō hoki i ngā rākau. Ka raru mēnā ka pokea ki ngā whakatupu ā-wai. Ka whakarahi ake te tupu o te otaota rōwai me te pūkahu. Ka whakamahi i te hāora i roto i te wai, ā, ka ārai mai te rā i te wai hōhonu. Ka kōhurutia te ika, te katoa o te awa anō hoki.

Ngā tohutohu:

He aha te nui o te hauota i roto i te wai?

Ngā Rauemi:



He wāti



takai whakmātautau/ pākawa

- Unuhia tētahi takai whakamātautau pākawa ki te awa mo te kotahi hēkona.
- Tīmatahia te wāti.
- Ka mutu te 30 hēkona, pānuhia te takai whakamātautau pākawa (tirohia ngā tohutohu i runga i te ipu).
- Tuhia ōu kitenga.

Te Repo Pūtaiao – te Wai



1. Te Kounga o te Wai

Ka taea e tātou te titiro ki te rahi o ngā āhuratanga o te wai i roto i te awa, ka māraakerake kitea o te oranga tonutanga o te awa:

D. Te Āwhata pH

I whakaaturia e te āwhata pH mēnā he wai atiti, he wai hīmoemoe rānei. Ko te wai atiti he wai whakamate i ngā ika e noho ana ki te ara wai, ka huri te wai hei paitini. Ka hua mai ko ngā tuinga wai hīmoemoe nā te poke o te one raima, o te hopi rānei, i roto i te wai. Mā konā ka rahi ake te puāwaitanga o ngā hua i roto i te ara wai, ā, ka punia, ka whakapaua rānei ngā tino hua o te hāora i roto i te wai.

Ngā tohutohu:

Me pēhea te wai atiti?

Ngā Rauemi:



He pepa āwhata pH me te ine taumaha pH.

- Tōua tētahi pepa āwhata pH i roto i te wai mō ngā hēkona e rua.
- Tīmatahia te wāti.
- Ka mutu te 30 hēkona, whakatauritehia ngā pepa āwhata pH ki te ine taumaha pH kei roto i te kete.
- Tuhia ōu kitenga.

2. Te Rahinga o te wai (tārere)

*E rua ngā wāhanga e kaute ai i te whangaoho mita i ia hēkona o te rere o te wai. Ko te wāhanga tuatahi, ko te **tere (mamao)** o te wai me te wāhanga tuarua, ko te rahi o te awa. Mā rāua tahi te rere o te wai e kaute.*

Ngā Tohutohu

Ngā Rauemi:



He neti



he tieke



he āporo (ārani rānei) me te



wāti

- Rūrihia te 10 mita i te tahataha o te awa, i tētahi wāhi maringi noa te wai. Whakaritea ngā taurira kia riro mā rātou hei pou mō ia pito.
- Ko ngā tūranga kē atu: Te tangata kaipupuri i te wāti, he tangata tuku i te āporo me tētahi tangata whakamau i te āporo.
- Tukua te āporo kia rere mā runga i te māka tuatahi e rere ai mā runga i te rere o te wai.
- Tīmatahia te wāti i te wā ka rere haere te āporo i te māka.
- Katia te wāti i te māka 10m.
- Hopukina te āporo.
- Tuhia ōu kitenga.

Te Repo Pūtaiao – te Wai



Te Rahinga o te wai raumahi ākongā

Te Rerenga Mamao

Wehewehetia te wā/taima mai i te mamao o te haerenga o ngā ārani. (Ko te tūmanako ia mō te 10 mita).
Mamao = wā/tawhiti = mita/hēkona (He māmā noa iho ngā mita 10).

Te Wāhanga Wai

1. Tīkina he rūri roa, ā, tatauria te hōhonutanga o te wai i roto i ngā wāhi e rima.
2. Tāpirihia te hōhonutanga o te wai o ngā wāhi e rima. (Kia tūpato, me tātai ā-mita nei/ Mēnā kua tātaihia ā-henemita). Whakawehewehe i ngā nama inenga kia kimi i te toharite.
3. Whakareahia te hōhonutanga o te whānui o ngā rerenga mamao kia hua mai ko te mita tapawhā (m^2).

Takiwā = te whānui o te wai x te toharite hōhonu (tangohia te 10 mita o te hōhonutanga kia kitea te toharite)

$$= \text{_____ m} \times \text{_____ m}$$

$$= \text{_____ m}^2$$

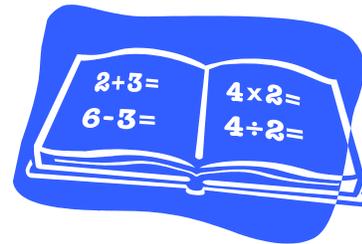
Te Rere o te Awa

1. Whakareahia te mamao i te takiwā.
2. Ko tō whakautu ko te mita pūtoru i ia hēkona. Kia tahuri ki te whakareahia ngā nama ki te kotahi mano.

Te rere o te awa/wai = Tere x wāhi

$$= \text{_____ m/s} \times \text{_____ m}^2$$

$$= \text{_____ m}^3/\text{s}$$



rita,

3. Ngā Ngāngara o te Awa (Ngā Kaupapa Koiora)

RAUMAHI ĀKONGA

He tohu pai ngā ngāngara me ngā tauwi-kore i te hauora o te wai (ngā rauropi karekau he tauwi) kei te wai e noho ana.

Ngā Tohutohu

He aha ngā mea ora i roto i te awa? Ngā Rauemi: He neti, he pouaka ngāngara, tētahi ipu nui ngāngara me, he taputapu whakamau



- Whakamaua te neti ki roto i te wai kia mau ai ngā mea whakapōraruru ki te neti.
- Hīkina ngā kōhatu iti nei, ā, mirimiria kia whakawāteahia ngā kararehe ki roto i te neti.
- Āta tirohia ki raro i ngā tahataha o te awa, ngā rākau me ngā toka.
- Ka mutu ngā miniti e whā, haria te neti ki te ipu nui, whakatakoto kau ana i ngā mea i roto i te neti ki te ipu. Ruruhia he wai ki roto i te ipu.
- Āta tirohia ngā ngāngara i roto i te ipu. Whiria ngā ngāngara ōrite, ā, raua atu ki roto i tētahi pouaka.
- I a koe e whakamahia ana ngā ngongo ngāngara, tukuna rātou i te rīhi ki tētahi wāhi e noho wehe ai ki te wai iti.

Ngā pātai

1. He aha ngā mōmō ngāngara i kitea i te awa?
2. Mai i ēnei kitenga, me pēhea te hauora o te awa?
3. Ko ēnei kitenga ngā mea e tūmanakohia nei e koe i roto i te awa?
4. He aha atu ngā pānga pōraruru i te hua?