



Te Kaha o te Hau



He Kōpaki Hangarau - Taumata 1

He rauemi hei ako i te Hangarau i te taumata 6 o
Te Marautanga o Aotearoa, i te taumata 1 hoki o NCEA.

He Mihi

He mihi tēnei ki a koutou, e ngā ākonga, e hāpai ana i te reo rangatira. Tēnā koutou katoa.
Kei roto i tēnei huinga rauemi tētahi kōpae ataata, tētahi kōpae hikohiko, ngā pukapuka e rima mā ngā ākonga, me tētahi pukapuka hei āwhina i ngā pouako rātou ko ngā ākonga e whai ana i te ara hangarau.

He mihi tēnei ki ērā mātanga hangarau katoa nā rātou i whai wā ki te āwhina, ki te tautoko i a mātou i te hanganga o tēnei rauemi. Kua aro hoki mātou ki ētahi pepa kua whakaputaina e Te Tāhuhu o te Mātauranga hei āwhina, hei tautoko i ngā kura, i ngā kaiako ki te whakaako i te marautanga hangarau. Ka taea e te katoa te aro atu ki ēnei pepa kei te Ipurangi kei te paetukutuku *Techlink*.
Kei www.techlink.org.nz/curriculum-support/links.htm te ara toro atu.

Nā Deanne Thomas ngā kōrero mō te mātaitanga i tēnei pukapuka.

Nā Nicholas Rahiri Roskrugē te whakaahua o te kai kei te uhi, mana pupuri © Nicholas Rahiri Roskrugē 2009; nā Deanne Thomas te whakaahua o te whare, me tērā o te pūrere tukuruā rāpihi kei te uhi, mana pupuri © Deanne Thomas 2009; nā Polina Outkina te pikitia kei te uhi, mana pupuri © Te Karauna 2009. Nā Windflow Technology ērā atu whakaahua katoa, mana pupuri © Windflow Technology 2009.

Mana pupuri i ngā kōrero © Te Karauna 2009

Kaituhi: Pauline Waiti rāua ko Deanne Thomas

Kaiwhakamāori: Hēni Jacob

Kaihoahoa: Jayne Verkerk rāua ko Phillip Paea

Rōpū ētita: Te Pou Taki Kōrero

I whakaputaina tēnei pukapuka i te tau 2009

mō Te Tāhuhu o te Mātauranga e

Te Pou Taki Kōrero Whāiti,

Pouaka 3293, Te Whanganui-a-Tara 6140, Aotearoa.

www.learningmedia.co.nz

Mana pupuri © Te Karauna 2009

Pūmau te mana.

Kāhore he utu mō ēnei pukapuka.

Ki te hiahia koe ki ētahi atu kape o tēnei rauemi, whakapā mai ki:

Te Ratonga Kiritaki a Te Tāhuhu o te Mātauranga

Waea koreutu 0800 660 662

Waea whakaahua koreutu 0800 660 663

Īmēra: orders@thechair.minedu.govt.nz

Tono mai rānei mā te ipurangi www.thechair.minedu.govt.nz

He Kōpaki Hangarau Taumata 1

Tēnei pukapuka: ISBN 978 0 7903 3329 8

Te kōpaki katoa: ISBN 978 0 7903 3319 9

Te kōpaki katoa: nama take 33319

Kōpae ataata: nama take 33322

Kōpae hikohiko: nama take 33328



I hangaia tēnei rauemi hei tautoko i
Te Marautanga o Aotearoa



Te Kaha o te Hau

Ngā Ihirangi

Te Whakamahi i Tēnei Rauemi	2
Te Mātautanga – Te Kaha o te Hau	4
Ngā pāmu hau i Manawatū	4
Te Marautanga o Aotearoa	12
Te Whakawhanaketanga o te Otinga Hangarau	15
Te Anga Whakaū Māramatanga ki te Tukanga Hangarau	16
Te Whakaharatau Hangarau	17
Te tārai tohutohu	17
Te mahere mō te whakaharatau hangarau	18
Te whanaketanga me te arotakenga o te otinga hangarau	20
Ngā āhuatanga matua o te hangarau me ngā otinga hangarau	21
Ngā āhuatanga matua o te hangarau	21
Ngā āhuatanga o ngā otinga hangarau	22
Ngā tauira, ngā taonga, me ngā pūnaha hangarau	24
Te whakatauiria hangarau	24
Ngā taonga hangarau	25
Ngā pūnaha hangarau	27
Ngā Āhuatanga Hangarau	29
Ngā hiahia me ngā huarahi e wātea ana	29
Te toitūtanga	29
Ngā mōhiotanga o ngā tūpuna	30
Ngā uara me ngā whakapono	30
Te pānga ki te iwi	30
Te Aromatawai	32
He aromatawai i te tukanga hangarau me te whakamahi anō i ngā paerewa paetae	32

Te Whakamahi i Tēnei Rauemi

Te whāinga

Māu tēnei pukapuka, arā, mā ngā ākonga e whai ana i te Hangarau i tētahi akoranga o te taumata 6 o te wāhanga ako hangarau o *Te Marautanga o Aotearoa*. Ko te nuinga o ēnei ākonga kei te tau 11, engari kua te katoa.

Koinei tētahi o ngā pukapuka e rima mā ngā ākonga, he kōpae ataata, he kōpae hikohiko anō e haere ana i te taha. Kia noho tēnei hei tūāpapa mō ētahi akoranga hangarau kotahi tau te roa.

Anei ngā ingoa o ngā pukapuka:

1. Te Whare Tautaiāo, Tū Ana, Tau Ana
2. He Taonga Tonu te Rāpihi
3. Nō Hea Koe, Ko Wai Koe?
4. He Kai Kei Aku Ringa
5. **Te Kaha o te Hau**

Ko te ingoa o te kōpae ataata, ko *He Kōpaki Hangarau Taumata 1*. E rima ngā mātaitanga e whakaataria ana ki te kōpae, ko tētahi mō tēnā, mō tēnā o ngā pukapuka e rima.

E whakamahia ana te kupu mātaitanga i konei hei whakaahua i te tirohanga hōhonu ki tētahi āhuetanga koia e whakaahua ana, e whakatauiria ana i tētahi kaupapa whānui e arotahia ana.

Mā te kaiako koe e ārahi ki te āta wherawhera i te pukapuka nei me te kōpae ataata.

He maha ngā wāhanga o te pukapuka. Ka whakamāramatia takitahitia tēnā me tēnā:

- Te Mātaitanga
- Te Marautanga o Aotearoa
- Te Whakawhanaketanga o te Otinga Hangarau
- Te Anga Whakaū Māramatanga ki te Tukanga Hangarau
- Te Whakaharatau Hangarau
- Ngā Āhuetanga Hangarau
- Te Aromatawai

Te mātaitanga

Kua tū mai te mātaitanga kia kite ai, kia whāwhā ai koe, te ākonga, i ētahi tauira tūturu o ngā whakaharatau hangarau – o neherā, o nāianeī anō hoki. Ka whakaaturia ētahi āhuetanga o te tukanga hangarau i roto i ngā mahi whakaharatau hangarau o te mātaitanga. Nā te āhua tonu o te whakaharatau hangarau, kāore tonu pea koe e whai wā, e whai rānei i ngā rawa e taea ai ēnei mahi te kawhe ake i te kura. Engari mā te mātaitanga ka kite wheako koe i ngā mahi e mahia ana, me ētahi mahi iti ake e āhua rite ana ka taea te kawhe i te kura.

E hāngai pū ana te mātaītanga i tēnei pukapuka ki ngā kōrero o te mātaītanga i te kōpae ataata, engari he paku rerekē ngā kōrero.

Ka kapi i ia mātaītanga tētahi, ētahi rānei o ngā Aho (ngā wāhanga hangarau) e rārangi iho nei:

- Hangarau Koiora
- Te Tuku Mōhiotanga
- Ngā Hanga me ngā Pūhanga Manawa
- Te Tāhiko me te Hangarau Whakatinā
- Hangarau Kai

He anga e mārama ai te tukanga hangarau

Ko te anga nei hei arataki i a kōrua ko te kaiako, kia mārama ai kōrua ki te tukanga hangarau. E whakaahua ana te anga i ngā takahanga katoa o te tukanga hangarau, e whakaatu ana anō hoki i ētahi tauira o ēnei kei roto i te mātaītanga.

Kei te whārangi 15 tētahi hoahoa e whakaatu ana i ngā wāhanga katoa o te tukanga hangarau, ā, ko ēhea wāhanga ka taka ki raro i Ngā Āhuetanga o te Hangarau, ko ēhea wāhanga kei Te Whakaharatau Hangarau.

I ngā whārangi 16–28 e āta whakamāramatia ana ngā tauira o roto mai i te mātaītanga e hāngai ana ki tēnā takahanga, ki tēnā takahanga o te tukanga hangarau.

Ā te mutunga o ngā wāhanga Te Whakaharatau Hangarau me Ngā Āhuetanga Hangarau, tirohia anō te hoahoa kei whārangi 16. Tāruatia te hoahoa kātahi ka tohu mai mēnā kua kitea e koe he tauira o ia wāhanga mai i te mātaītanga. Mēnā āe, e tohu ana tēnei kua mau i a koe ētahi mōhiotanga ki ngā takahanga katoa o te tukanga hangarau.

Te aromatawai – he aromatawai i te tukanga hangarau me te whakamahi anō i ngā paerewa paetae

Ko tā tēnei wāhanga, he āta whakaatu me pēhea te whakamahi i ngā whāinga paetae hei aromatawai i te mōhiotanga o te ākonga ki ētahi āhuetanga o te tukanga hangarau. Kei konei anō tētahi tauaromahi me ōna anō kupu whakamārama, e hāngai ana ki tētahi whāinga paetae. E whakaahuatia ana ngā paearu, kua takoto anō he whakamārama mō ngā mahi kia mahia, e kīia ai āe, kua tutuki te whāinga.

Ko te tukanga hangarau e arotahia ana i tēnei wāhanga, ko tērā kei te mātaītanga. E whakamahia ana i konei kia āta kite ai koe ka pēhea tō aromatawainga tūturu.



Te Mātaītanga – Te Kaha o te Hau

Hokia ki ō maunga kia purea koe e ngā hau a Tāwhirimātea.

He roa te wā kua tūhuratia te kaha o te hau hei whakaputa i te pūngao. He maha ngā *pāmu hau* kei Ūropi, kei Amerika, ā, huri noa i te ao. Engari, i Aotearoa nei, he kaupapa āhua hou te whakamahi i ngā kapohau hei whakaputa pūngao.

He aha i hiahiaia ai he pāmu hau? Tūhuratia, ka whakarārangi ai i ngā take.

Ngā pāmu hau i Manawatū

Kei Manawatū ngā pāmu hau tino nui o Aotearoa. E tū ana i te pae maunga o Tararua, i ngā taha e rua o Te Āpiti o Manawatū. E toru ngā pāmu hau, ko Te Āpiti, ko Te Rere Hau, ko Tararua hoki. I tēnei wā e 204 ngā kapohau e hurihuri haere ana i reira. Hei te mutunga o te tau 2009, kua tūtū mai ngā kapohau āhua 300 ki ōna tahataha. Ka āhei te tangata ki te tiroiro haere i ētahi wāhanga o ngā pāmu mehemea ia ka hiahia.

E kapi katoa ana te pae maunga i te kapohau teitei tonu – he hanga mīharo tonu ki te titiro atu.

E whā ngā momo kapohau.

Te V90

Koinei te momo kapohau teitei katoa.

- E toru ōna mata, e 45 mita te roa o ia mata.
- Kua whakaingoatia he V90 nā te mea e 90 mita te whitianga o ngā mata.
- E 90 mita te teitei o ētahi o ngā pou.
- Ka taea e ēnei momo kapohau te whakaputa i waenga i te 1.6 me te 3 MW o te hiko.

Te V47

- E toru ōna mata, e 23 mita te roa o ia mata.
- E 47 mita te whitianga o ngā mata.
- E 47 mita te teitei o te pou.
- Ka taea e ēnei momo kapohau te whakaputa i te 660 kW o te hiko.

Te NM72

- E toru ōna mata, e 35 mita te roa.
- E 70 mita te teitei o te pou.
- E 70 mita te whitianga o ngā mata.
- Ka taea e ēnei momo kapohau te whakaputa i te 1.65 MW o te hiko.

Te Windflow 500 (W500)

- E rua ngā mata, 16 mita te roa o ia mata.
- E 29 mita te teitei o te pou.
- E 33.2 mita te whitianga o ngā mata.
- Ka taea e ēnei momo kapohau te whakaputa i te 500 kW o te hiko.



He aha i rerekē ai ngā momo kapohau? He nui ake te whakaputanga hiko a ngā kapohau tino teitei. He iti iho te whakaputanga hiko a ngā kapohau poto. E 3 MW te pūngao ka whakaputaina e te V90, engari e 500 kW noa iho ka whakaputaina e te W500. Mō ia V90, kia 6 rawa ngā W500 ka ōrite te whakaputanga pūngao.

He hātepe kōwaehanga te whakatūnga o tētahi kapohau. Ka hangaia te nuinga o ngā wāhanga ki ngā whare umanga rerekē ki Tenemāka. Ka haria mai mā runga kaupuke ki Aotearoa nei, ka ū mai ki Ngāmotu, ki Ahuriri rānei. Ka tae mai ki Manawatū mā runga taraka nui, ā, ka honoa ngā wāhanga ki te pāmu tonu.

He nui te utu ki te hanga nā te rahi tonu o te hanga o ngā kapohau. Ka honoa ngā mata ki te pou i muri i te whakatūnga. He rahi hoki ngā wakahiki e whakamahia ana. He rahi ake i te pou!

Kei te hangahanga tonutia te pāmu hau Te Rere Hau.



He nui hoki te utu mēnā ka pakaru ētahi wāhanga o te kapohau, arā, ngā mata, te pukuhiko, tētahi atu wāhanga rānei. Ka noho tonu he wakahiki ki te pāmu, mō te tūpono ka pā he raruraru ki ngā kapohau. Ka mārama anō te kitea atu o ngā wakahiki nei e noho takatū mai ana i te pae.



E hikitia ana te narcelle, ā, ...

Nō Aotearoa ngā wāhanga katoa o te momo kapohau tuawhā, o te Windflow, te kapohau paku rawa. He paku iho hoki te whare pukuhiko. E 500 kW te hiko ka whakaputaina e tētahi o ēnei. Ka nui tēnei mō ētahi kāinga 185 mehemea ka tika te haere o te kapohau.

He māmā ake te hanga me te whakatika i te W500 nā te paku o ngā wāhanga. Ka honoa ngā mata, te whare pukuhiko me te pou i mua i te whakatūnga.

Anei e whai ake nei ngā tauritenga o ngā momo kapohau.

... ka honoa ngā wāhanga katoa.



	Ingoa o te pāmu hau	Teitei o te pou	Roa o ngā mata	E hia ngā mata	Te whaka-putanga pūngao	Te rahi	Te whenua nō reira mai ngā wāhanga
Momo 1	Tararua Vestas V90	90 m	45 m	3	3 MW	nui	Tenemāka
Momo 2	Tararua 2 Vestas V47	45 m	23 m	3	660 kW	āhua nui	Tenemāka
Momo 3	Te Āpiti Vestas NM72	70 m	35 m	3	1.65 MW	nui	Tenemāka Motu o Wight Whitināmu Ahitereiria
Momo 4	Te Rere Hau Windflow W500	29 m	16 m	2	500 kW	paku	Aotearoa

Koinei ngā rawa me ērā atu āhuatanga ka hiahiatia e tutuki pai ai te hanganga o te pāmu hau:

- ko te hau tonu;
- he whenua rahi tonu;
- te noho tata o te whenua ki ngā waea kawehiko;
- te tautoko a te hāpori mā te whakaae o te kaunihera (mā te Whakaaetanga Rawa);
- kia tika te whenua mō te hanga huarahi;
- kia tata te whenua ki ngā ratonga o te tāone.

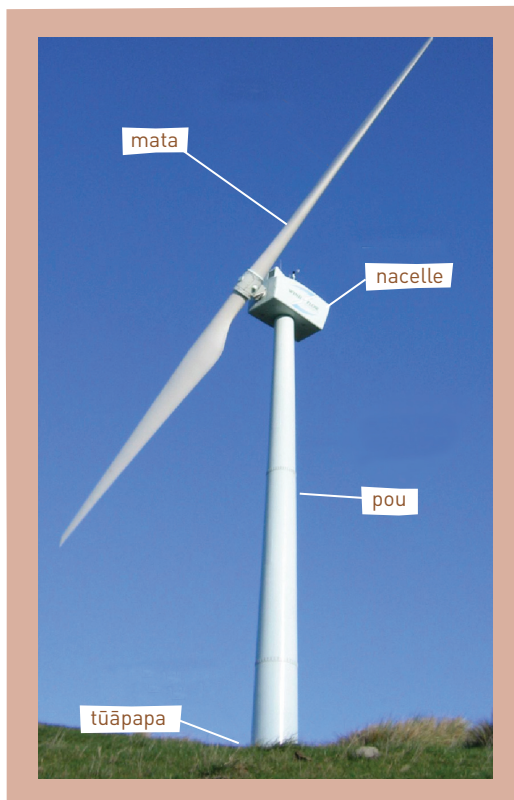
I ētahi wā ka whakatūria ngā kapohau ki ngā takiwā paripari i te takutai, ki uta rānei ki runga i ngā hiwi maunga. Engari he uaua mehemea e tawhiti ana i ngā waea kawehiko. He maha ngā whenua ka pērā te āhua i Aotearoa.

Ki ōu whakaaro, he rautaki pai te whakatū pāmu kapohau? He aha koe i whakaaro pērā ai?

He pēhea te mahi a te kapohau?

E 4 ngā wāhanga o te kapohau:

- te pou;
- te tūāpapa;
- te pukuhiko me te pouaka nihowhiti, ka kiia ēnei ko te “nacelle”;
- ngā mata.



He raima te tūāpapa. I ētahi wā kei raro i te whenua te tūāpapa kia kore ai e kitea. Mā te tūāpapa ka tū pūmau te pou i ngā wā katoa, ahakoa te kaha o te hau.

E 375 m³ te rōrahi o te raima mō te tūāpapa o te V90 me te V47.

He ōrite tērā ki te raima ka kawea e ngā taraka kawehiko e 75!

E 36 m³ te rōrahi o te raima mō ngā kapohau Windflow, arā, e 7 ngā taraka raima.

Ko te pou te huarahi ki te nacelle. Ko te nacelle te manawa o te kapohau. Kei roto i te nacelle te pukuhiko, te pouaka nihowhiti, me ngā taputapu whakatina katoa.

Ka honoa ngā mata ki te nacelle mā tētahi pū.



Ka hurihia ngā mata e te hau, ka whakahaeretia te pukuhiko. Mā te pukuhiko ka puta te hiko, ā, ka kawea ki raro mā ngā taura nui kei te pou. Atu i reira, ka tukuna ki te tukutuku hiko ā-motu. Mā te tukutuku hiko ā-motu e kawea ki ngā kāinga katoa o Aotearoa.

Ehara nā te kāwanatanga ngā pāmu hau, nā ngā kamupene kē, pērā i Meridian, i Trust Power, i Mighty River rānei.

Te whiwhi whakaaetanga

Ehara i te mea he māmā te whiwhi whakaaetanga kia whakatūria ai he kapohau. He uaua kē! He roa te tukanga kōrerorero.

Mā te rangahau, whakaraupapatia te hātepe whiwhi whakaaetanga ki te whakatū pāmu hau.

E ai ki ngā kaupapa here a ngā kamupene me ngā kaunihera, e tika ana kia whakamōhio atu, kia kōrero tahi rātou ki ngā iwi nō rātou te mana whenua. I ētahi wā ka tuhia he pūrongo e te iwi, e ētahi atu o te hāpori mō ngā pānga o te pāmu hau ki a Papatūānuku. Arā, ina tū he pāmu hau, ka pēheatia te mauri o te maunga, te mauri o te whenua? Ka pēhea mēnā he wāhi tapu, he urupā kei taua whenua? Ka pēhea anō te hunga ora e noho pātata ana ki ngā pāmu hau? Ka pēhea te wairua o te tangata ko ngā kapohau te mea e kitea nuitia ana e ia i ia rā, i ia rā? He pānga anō pea kei te taha hauora o te tangata. Koinei ētahi o ngā take kāore te katoa o te hāpori e whakaae kia whakatūria he pāmu hou.

Te Rere Hau

I whiwhi Whakaaetanga Rawa a NZ Wind Farms i te tau 2005 mō te pāmu hau Te Rere Hau. Ka whakaingoatia te pāmu ko Te Rere Hau e te rūnanga o te iwi.

E 3 ngā kamupene e mahi tahi ana ki te whakatū pāmu hau, ā, e whakahaeretia ana e Windflow Technology. Nā ērā kamupene e 3 hoki ngā kapohau i waihanga. Ko Andre Holm te kaihanganga matua o ngā kapohau.

Koia nei ētahi o āna mahi:

- te whakarite i te hanga kia tika;
- te whakarite i ngā kaikirimana me ngā kaimahi katoa kia oti pai ai ngā mahi;
- te whakahaere i ngā ture haumarua o te wāhi kia kore ai e pā he aituā;
- te arotake me te whakamātau i ia wāhanga o te kapohau kia mōhio ai ia kei te tino tika tāna mahi i mua i te hononga, i te whakatūnga.

Ko te whakararu nui, ko Tāwhirimātea. He uaua ki te whakatū kapohau mehemea e kaha pupuhi ana te hau. Waihoki, ko Manawatū tētahi o ngā tino wāhi e ākina ana e Tāwhirimātea! Nō reira, i ētahi wā ka pōturi tonu te mahi.

Ka pēhea te toitūtanga o te whenua? Ki tā Andre, he kaupapa nui te tiaki whenua ki a Windflow Technology. Ka whakaritea he mahere toitū whenua i mua i te tīmatanga o te mahi whakatūtū kapohau. Ko te whāinga, kia kaua ngā mahi e pā kino ki te whenua.

Ko ēnei ngā take hei whakaaro mā te kamupene:

- te porowhiu tika i ngā matū mōrearea;
- te āhua o te whenua i te mutunga o te mahi (kua peitangia ngā pou kia kiwikiwi, kia kore ai e kitea atu i tawhiti);
- te whakatō kākano kia tipu anō te pātītī.

Ka tatauria te nui o ngā putanga waro ka hua ake i te hanganga o ngā kapohau me te pāmu, tae atu ki ērā mō ngā waka hari wāhanga, hari taputapu hoki. Nā ngā putanga waro i penapenahia i te mea he pūngao whakahou te hau, ka noho tērā hei whiwhinga waro. I raro i te Whakaaetanga o Kyoto ka taea aua whiwhinga waro te hoko atu hei kohi pūtea anō mā te kamupene.

He aha te Whakaaetanga o Kyoto? Kimihia he whakamārama.

Ki tā Andre, he huarahi tika te whakamahi i te hau hei whakaputa i te pūngao. He rawa whakahou, arā, he hanga mutunga kore te hau, ka pupuhi mō ake tonu atu. Nā te tahuri ki te pūngao hau kua kore i whakapaungia ngā koranehe.

He painga atu anō ka puta mō ngā tāngata e noho ana ki te takiwā o Manawatū. Nō Manawatū ngā kaikirimana, ngā kaihanganga, ngā kaimahi. Ka nui ngā mahi mā rātou tae noa ki te mutunga o ngā mahi hanga i ngā pāmu. He mahi anō ka wātea mai mā ētahi i muri mai, arā hei kaitiaki, hei kaiwhakatika, hei kaiwhakahaere hoki mō te pāmu.

Ā tōna wā pea ka tae mai ngā tūruhi ki te tirotiro haere i ēnei hanga mīharo.

Ngā take tautohetohe

He maha ngā whiriwhiringa kōrero e pā ana ki ngā painga o ngā pāmu hau, huri noa i Manawatū, i Aotearoa hoki. Kātahi tonu ka whakaaetia kia whakatūria he pāmu hau ki Whāingaroa e te kaunihera o taua takiwā. Ā, kei mua i te aroaro o ngā kaunihera o Ōtautahi, o Taranaki, o Horowhenua, o Te Whanganui-a-Tara me ētahi atu takiwā he tono mō te whakatū pāmu hau hou. He maha tonu ngā pāmu hau kua whiwhi whakaaetanga, ā, he maha anō e tatari tonu ana kia rongo kōrero rātou i ngā kaunihera.

Ki tā ētahi, he rerehua tonu ngā kapohau. Nā te āta huri haere o ngā mata, ka āio te hinengaro. Engari ki ētahi atu, he weriweri. Ka mamae noa te whatu i te tirohanga atu. Kua pātaitia e ētahi mehemea e tika ana tēnei pūnaha waihanga pūngao mō Aotearoa.

He oro e puta mai ana i te hurihanga o ngā mata me te nacelle. E ai ki ngā paearu o Aotearoa mō te kaha hoihoi e whakaaetia ana, ko te 40 wae pāoro te taumata tika mō te oro e puta atu ana i ngā kapohau. Kia kaua rawa e neke atu i tērā. He ōrite tērā ki te oro ka puta ina kōrero tahi tētahi tokorua. Tērā pea ka whakaaro ake te tangata he itiiti noa tērā engari, ki ētahi, ko te paopao mutunga kore te raruraru. Ka rangona i te ao, i te pō, pērā i te heke o te pata wai i te kōrere, ka whakararu tonu i te tangata i te mea kāore he mutunga.

**Ka pēhea e mōhiotia ai mehemea ka hoihoi ake te oro i te 40 wae pāoro?
Mā wai tērā e aroturuki?**



Ko Motorimu

I te tau 2006 i tae atu he tono ki te Kaunihera o Te Papaioea kia hangaia he pāmu hau atu anō. Ko Allco Wind Energy te ingoa o te kamupene nāna te tono, nō Ahiterieria.

Ko Moturimu kē te ingoa Māori o te whenua e whakaarotia ana ki reira tū ai te pāmu, engari, ki tā te Kaunihera, ko Motorimu, nō reira i tapaina ai te pāmu ki taua ingoa. Ko te wāhi i kōwhiria e rātou, ko tētahi wāhanga o te pae maunga o Tararua, mai i Kahuterawa ki Horowhenua. Kua tonoa e Allco Wind Energy kia whakatūria ngā kapohau 129 ki reira.

Nā te Kaunihera te tono i tāpae ki ngā kaikōmihana tokotoru. Nā ētahi tāngata ngā pūrongo i whakarite, arā, he pūrongo whenua, he pūrongo oro, he pūrongo rerehua hoki. He tohunga ēnei tāngata ki te tuhi pūrongo, he mātau hoki rātou ki te kaupapa. Nā ētahi tāngata anō o te hāpori i tuku pūrongo, nā te iwi hoki.

I runga i ngā kōrero katoa i emi mai, i whakaae te Kaunihera kia tū ngā kapohau e 75 noa iho. Nā te kore i whiwhi whakaae ki te katoa o te tono, ka haria e te kamupene tā rātou take ki te Kōti Taiao. Kei mua tonu i te aro o te Kōti Taiao taua take.

Heoi anō, ko tētahi o ngā rōpū o te hāpori e kore e whakaae ana, ko He Kupenga Hao i te Reo. He rōpū hāpai i te reo Māori, he rōpū tautoko i ngā tāngata ki te kōrero Māori, ahakoa ko wai, ahakoa nō hea. Ka noho te katoa o te rōpū nei ki Te Papaioea.

Ko Ian Christensen tō rātou māngai i te wā o te tuku pūrongo. E ai ki a ia, kua rahi kē tēnei!

Ki tā Ian, “Kāore mātou e whakaae ana kia whakatūria he pāmu kapohau anō ki te paehiwi o Tararua. He tino taonga te paehiwi o Tararua, inā te kōrero whaimana, te kōrero whakahihī mō tēnei rohe e mōhiotia whānuitia ana e te motu, ‘Ko Tararua te pae maunga, ko Manawatū te awa.’ Kua paru katoa te awa i te tūkinohia o te tangata. E whakahau ana mātou kia kaua e tūkinohia te katoa o te pae maunga. He tāmi, he whakaparahako i te iwi kāinga, i a Rangitāne, otirā i te hunga katoa e hono ā-wairua ana ki tēnei rohe. E kī ana mātou, kua rahi i nāianei ngā kapohau ki ngā paehiwi o Manawatū. Mai i Te Āpiti o Manawatū ki te Ara o Pahiatua, kua tūtū mai ngā kapohau i roto i ngā tau kua hori ake nei. He anuheia ki a mātou te titiro atu ki ngā kapohau i ngā hiwi e karapoti nei i te Manawatū, he kino te āhua, he wenewene ki runga i te mata o te whenua, he tāmi i te wairua o te tangata, he takahi i tō tātou tipuna whaea i a Papatūānuku.”

Kua kōrerorero tahi a He Kupenga Hao i te Reo rātou ko ētahi o ngā tāngata whenua o Rangitāne ki Rangiotū. E whakaae ana rātou kia kaua e whakatūria he pāmu hau atu anō.

Kua tuhi pūrongo anō hoki tētahi rōpū o te iwi o Rangitāne, kua tuhia ētahi atu pūrongo e ētahi atu tāngata nō te hāpori. He pūrongo anō kua tāpaea e tētahi marae e tata ana ki te wāhi e tonoa rā hei pāmu hau.

He maha ngā āhuatanga kua whakaarahia ake e ēnei tāngata katoa. Arā:

- ko te mate o te mauri o te pae maunga, o Tatarua;
- ko te whakaparahako i te iwi kāinga, i a Rangitāne, (me te whakakore i tō rātou mana);
- he tata te wāhi kua tonoa ki ētahi o ngā wāhi tapu o te iwi;
- tērā pea ka pā he tūkinotanga ki ngā aitanga a Tāne.

Ahakoia kei te tārewa tonu te whakaaetanga, me whai whakaaro ake ki ēnei āhuatanga.

Āe rānei e takahi ana te whakaae kia tū ngā kapohau e 75 i ngā mātāpono o Te Tiriti o Waitangi?

Ki ōu whakaaro, he rerekē te titiro a te Māori ki tā te Pākehā?

Ki ōu whakaaro, me aha te hunga e whakahē ana i te whakatūnga mai o ētahi pāmu hou?

Ki te kore te hapori e hiahia kia tū tētahi pāmu hau atu anō, ka ahu mai te pūngao i whea? Whiriwhiria he rautaki anō mō te waihanga pūngao mā Aotearoa.

I te niupepa tēnei kōrero: “Kua whakaaturia e te kaiwhakahaere tukutuku hiko o te motu, e Transpower, ko te nui o te hiko kua whakaputaina e ngā pāmu hau e toru o Manawatū i ngā pō takurua, mō ngā tau e toru kua pahure, he iti ake i te 1% o tērā e taea ana te whakaputa.”

Ka puta anō hoki te kōrero: “E kore pea e whaihua te pāmu hau tuatahi ki Taranaki, engari, e tika ana kia whakatūria ki te takutai o Waverley, hei whakangata i te hiahia nui o te motu ki te hiko i te takurua.”

(Nō roto mai i te Taranaki Daily News 11 Pipiri 2008, heoi anō, he mea whakamāori mō te rauemi nei.)

Mehemea e pērā ana, he aha hoki i hangaia ai he pāmu hau?

He Kupu Taka

anuhea	ugly	rawa whakahou	renewable resource
hātepe/tukanga	process	rerehua	aesthetically pleasing
kaihanga matua	construction manager	takiwā paripari	coastal regions
kaikirimana	contractor	tāmi	suppress
kaikōmihana	commissioners	Tenemāka	Denmark
kapohau	wind turbine	tūāpapa	foundation
koranehe	fossil fuels	tukanga/hātepe	process
kōwaeahanga	modular	tukanaga kōrerorero	consultation process
mahere toitū whenua	land sustainability plan	tukutuku hiko ā-motu	national electricity grid
mata	blades	wae pāoro	decibels
matū mōrearea	waste materials	wakahiki	crane
pāmu hau	wind farm	whakatina	control
pouaka nihowhiti	generator	Whakaaetanga Rawa	Resource Consent
pū	hub	whakahou	renewable
pukuhiko	gearbox	whakaparahako	reject
pūngao	energy	whitianga	diameter
putanga waro	carbon emissions	whiwhinga waro	carbon credit
raima	concrete		



Te Marautanga o Aotearoa

I ahu mai ēnei kōrero i Te Marautanga o Aotearoa

Ko te iho o te hangarau kei te waiata e whai ake nei. Mai i te whakaharatau hangarau a ō tātou tūpuna tae noa ki ngā tukanga hangarau o te ao hurihuri, i whakatakotohia e ō tātou tūpuna he huarahi hei whāinga mā tātou.

Tikina atu i tuawhakarere
I te ao kōhatu
Ngā mōhiotanga o rātou mā
Hei kawē i a tātou i roto i te ao tūroa
Kua takoto kē te whāriki i rarangahia e rātou
Wānangahia, tuakina kia tau
Rangahaua kia maumahara
Manakohia kia whiwhi ai
Te mātauranga Māori motuhake

Kia tipu ake te kākano hangarau ki ā tātou ākonga, me whakawhiti kōrero, me raweke, me whakamātau kia mau tonu.

Te whaitake o te ako i te hangarau

Me whaitake ngā kaupapa hangarau kia kore ai e whāia mō te kore noa iho.

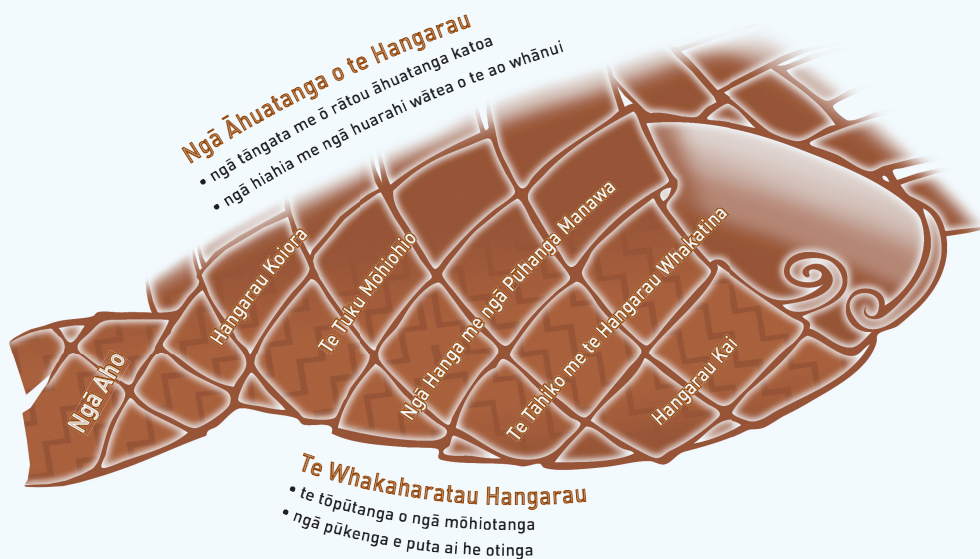
Mā te hangarau ka tū rangatira ngā ākonga. Hei whakahiato i ngā mōhiotanga hangarau, ka tīmata i te ao Māori me tōna hāngai ki te ao hurihuri. Me aro anō ki ngā uara, ngā pūkenga, me ngā mōhiotanga hangarau o te ao e taunga ana ia.

Te hanga o tēnei wāhanga ako

E rua ngā whenu, ko Ngā Āhuetanga o te Hangarau me Te Whakaharatau Hangarau. Kātahi ka taka mai ki ngā aho hangarau e rima. Ko te Hangarau Koiora, ko Te Tuku Mōhiotanga, ko Ngā Hanga me ngā Pūhanga Manawa, ko Te Tāhiko me te Hangarau Whakatana, me te Hangarau Kai.

E tika ana kia tūhuratia ngā āhuetanga o ngā momo matū kei ia kaupapa hangarau. Ā, he wāhi anō mō te āta whakaaro ki te taha hātepe me te taha whakanao. Kei roto aua wāhanga i te mahere hoahoa a te ākonga.

He rerekē ngā mōhiotanga kei ia whenu. Me hono ngā whenu e rua ki ngā aho kua kōwhiritia hei tūāpapa mō te mahi hangarau. Mai i te kaupapa whānui ka taka iho ngā aho hei āwhina. Tērā pea e rua, e toru rānei ngā aho e hāngai ana. Me hāngai te aromatawai ki ngā whāinga kei ngā whenu.



Ngā āhuatanga o te hangarau

Ka whakaahuatia te whakaharatau hangarau e:

- ngā tāngata me ō rātou āhuatanga katoa;
- ngā hiahia me ngā huarahi wātea o te ao whānui.

Ka rangahau, ka tūhura ngā ākonga kia mārama ai rātou ki ngā uara me ngā whakapono o te tangata, kia mārama anō ki te pāpātanga o aua āhuatanga ki te whakahiato hangarau.

Ka mōhio ki te tiaki whenua, ki te tiaki taiao, me te pāhekotanga i waenganui i te whakaharatau hangarau me te haporī. Ko te ira atua, ko te ira tangata e noho ngātahi nei te tangata me te whenua.

Me whakaaro ki ngā mahi toitū a ngā tūpuna tae noa mai ki tēnei wā. Me āta titiro ki te pānga o te otinga hangarau ki a Papatūānuku rāua ko Ranginui.

Toitū te whenua, whatungarongaro te tangata. Toitū te whenua, toiora te tangata.

Te whakaharatau hangarau

I roto i tēnei whenu ka pakari haere ngā mōhiotanga me ngā pūkenga hangarau. Ko te whakaharatau hangarau te tōpūtanga o ngā mōhiotanga me ngā pūkenga e puta ai he otinga.

Ētahi pūkenga hangarau:

- te whakaraupapa i ngā mahi hei hātepe;
- te tautohu i ngā hiahia me ngā huarahi wātea hei painga mō te tangata;
- te arotake i ngā hātepe me te otinga i runga i te aro nui ki te take;
- te tīpako me te whakamahi i ngā mātāpono hangarau;
- ngā pūkenga ā-ringa, ngā pūkenga auaha e puta ai he otinga.



Ētahi mōhiotanga hangarau:

- ngā mahi hangarau a ngā tūpuna tae noa ki ēnei wā;
- te āheinga ki te whakatutuki i tētahi hiahia i runga i te tika;
- kia mārama ngā ākonga ki ngā hapori, ki ngā ahurea me ngā tāngata taketake;
- kia mārama ngā ākonga ki ngā mātāpono hangarau me te tika o te whakamahi.

Ngā Aho	Hei whakamārama
Hangarau Koiora	Ko tā te hangarau koiora, he whakamahi i ngā pūnaha whai oranga hei raweke i ngā tukanga māori, hei painga mō te tangata. Tērā pea ko te whakatipu ā-wai, ko te rongoā, ko te tiaki rauropi rānei e tata korehāhā ana. Ka whai wāhi hoki ki te tūhura i ngā tini āhuatanga o te raweke ira.
Te Tuku Mōhihio	Ko te tuku mōhihio he whakawhiti mōhiotanga, arā ko te reo, me ngā toi ataata pērā i te whakairo, tae atu ki te tuhi, mā te pene, mā te rorohiko, mā te aha atu rānei. He tirohanga whakamua, whakamuri hoki.
Ngā Hanga me ngā Pūhanga Manawa	Ka tīmata te hanga ki ngā hanga māmā noa, pērā i te pouaka kawē, ka piki ake ki ngā hanga uaua, pērā i te pā tuna, i te tāwhiti kiore, i te manu aute. Ka mārama ki te hononga me te pānga i waenganui i ngā wāhanga o te hua, me te tino take o ia wāhanga.
Te Tāhiko me te Hangarau Whakatina	Ko te tāhiko te hoahoa, te hanga, me te whakanao i ngā pūnaha hiko me ngā pūrere tāhiko. Ko te hangarau whakatina te whakahaeretanga o ēnei pūnaha pūrere tāhiko.
Hangarau Kai	Ko te hangarau kai ko ngā āhuatanga katoa o te whakatipu, te hauhake, te tohu, te tunu, te rokiroki me te tākai kai. Ka tūhuratia hoki ngā āhuatanga kawekawe o ngā tūmomo kai hei whakahiato i ētahi atu kai.

Taumata 6

Ngā Āhuatanga o te Hangarau

1. Ka tirohia ngā uara me ngā whakapono o iwi kē, ka:
 - whakahāngai ki te otinga;
 - mōhio ki ngā whakaharatau;
 - whakarite ki ngā hangarau a tangata kē;
 - mārama ki ngā ārai me ngā huarahi wātea ka taea.
2. Ka tūhura i ngā āhuatanga matua o te tangata e pā ana ki:
 - ngā pūnaha, ngā tukanga rānei;
 - te hiahia o ngā kiritaki;
 - ngā rautaki whakatairanga ki te kiritaki.

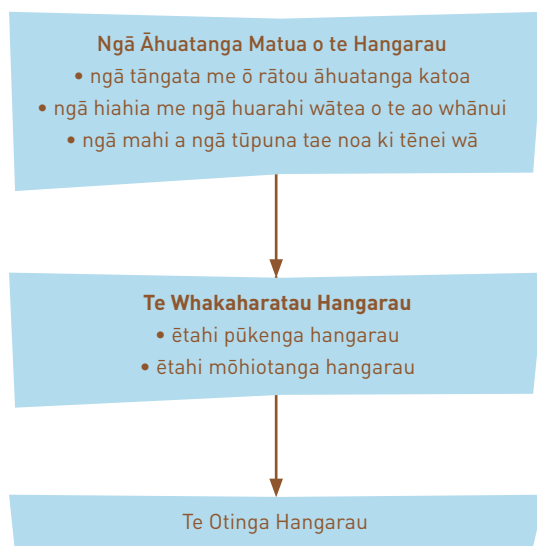
Te Whakaharatau Hangarau

3. Ka arohaehae i ngā whakatakotoranga hoahoa whaiaro, ā ētahi atu hoki, hei āwhina.
4. Ka whakamātautau i ngā raraunga me ngā mōhiotanga hou kia puta ai he otinga tika.

Te Whakawhanaketanga o te Otinga Hangarau

E whakarāpopoto ana te hoahoa i raro nei i te ara e puta ake ai he otinga hangarau. Heoi, ehara i te mea ka āta whāia tēnei raupapa i ngā wā katoa; ka āhua haere kōtuitē ki te mārama haere ki ngā āhuatanga matua o te hangarau me te whakaharatau hangarau, e puta ai te otinga hangarau ā tōna wā.

Te whakawhanaketanga o te otinga hangarau

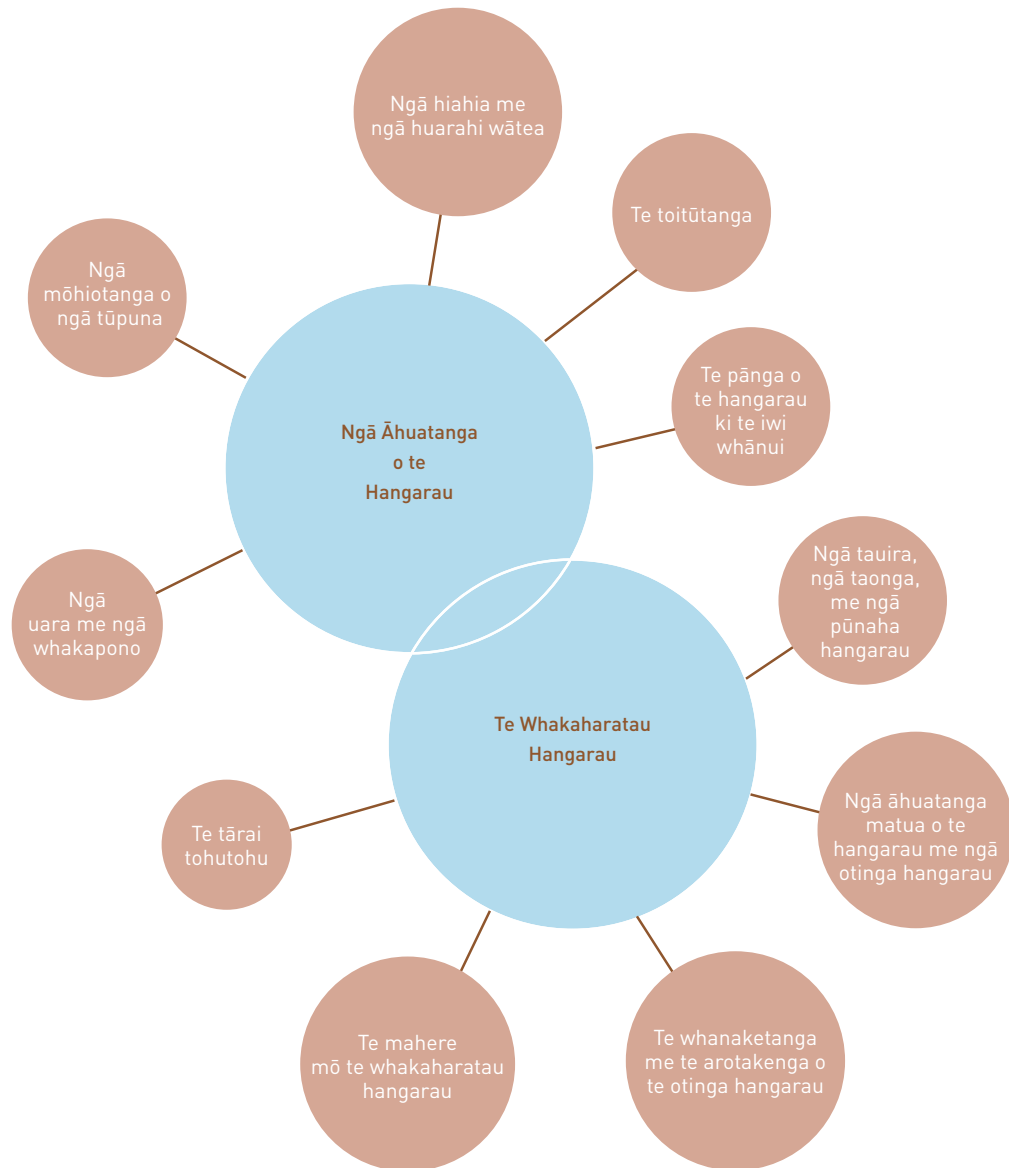


Kei te whakaatu tēnei tauira o te whakawhanaketanga otinga i te tukanga hangarau e puta ai he otinga hangarau. E whakaataria ana anō hoki tēnei i te anga e whai ake nei.



Te Anga Whakaū Māramatanga ki te Tukanga Hangarau

Ngā āhuatanga māramatanga ki te tukanga hangarau



He Kupu Taka

āhuatanga hangarau	<i>technological characteristics/features</i>	otinga hangarau	<i>technological outcome</i>
āhuatanga māramatanga ki te tukanga hangarau	<i>characteristics/features for understanding the technological process</i>	pānga ki te iwi	<i>impact on society</i>
āhuatanga matua	<i>key characteristics/features</i>	tārai tohutohu	<i>brief development</i>
arotakenga	<i>evaluation</i>	toitūtanga	<i>sustainability</i>
hiahia me ngā huarahi wātea	<i>needs and opportunities</i>	uara	<i>values</i>
mōhiotanga o ngā tūpuna	<i>knowledge tūpuna have</i>	whakaharatau hangarau	<i>technological practice</i>
ngā tauira, ngā taonga, me ngā pūnaha hangarau	<i>technological models, products, and systems</i>	mahere	<i>plan</i>
		whakapono	<i>belief</i>
		whanaketanga	<i>development</i>

Te Whakaharatau Hanganau

Te tārai tohutohu

Ka whakatakotoria he tohutohu hei āta whakaahua ā-kupu i te otinga e wawatatia ana kia puta hei whakatutuki i tētahi hiahia, i tētahi huarahi kua wātea, i tētahi take rānei. Mā ngā tohutohu e āta whakaatu ngā mahi kia mahia, ā, he aha te take me mahi aua mahi. Ka tuhia ngā tohutohu hei whakapuakitanga huatau.

I roto i ngā tohutohu, me mātua tautohu:

- te otinga e tūmanakotia ana kia puta;
- te hiahia, te huarahi rānei e wātea ana;
- he whakapuakitanga huatau;
- ngā whakatakotoranga whāiti;
- te taiao tūturu me te taiao pāpori;
- te arotakenga a ngā hunga whai pānga mai.

Āta whakaarohia tāu i pānui ai i tēnei pukapuka me tāu i kite ai i te kōpae ataata mō ngā pāmu hau. Mā te whakautu i ētahi o ngā pātai e rārangi iho nei, ka āwhinatia koe ki te whai whakaaro ki ngā tohutohu tērā pea i whakatakotoria mō te hanganga o ngā pāmu hau ki Manawatū.

Hei whakautu i ēnei pātai, me whiriwhiri anō ko wai ngā hunga whai pānga mai ki ngā pāmu hau. Ko ngā hunga whai pānga mai ngā tāngata me ngā rōpū ka puta he otinga – ahakoa pai, ahakoa kino – ki a rātou i ngā pāmu hau.

- Ko wai mā rātou?
- Mēnā e noho tata ana koe ki tētahi pāmu hau, ki tō mōhio, ka uru mai koe ki tēnei karangatanga?
- Ka pēhea te kamupene koia e hanga ana i ngā pāmu hau, he hunga whai pānga rātou?
- Ka whai pānga ngā ringa waihanga i ngā kapohau?
- Ka whai pānga te kāwanatanga?
- Ka pēhea te iwi kāinga, he hunga whai pānga rātou?
- Mō tēnā, mō tēnā hunga whai pānga mai kua tautohua, matapakihia ngā otinga tērā e hiahia ana rātou kia puta i te tūnga mai o te pāmu hau. Tuhia anō ngā take i pēnei ai ō whakaaro.

Āta whakaarohia te otinga e tūmanakotia ana kia puta me te hiahia, te huarahi rānei e wātea ana.

- He rerekē ēnei mea e rua i konei?
- Whakaarohia te hiahia o te tangata e noho tata ana ki te pāmu hau, e ahu mai ana i reira ōna pūngao, me te tangata koia e hanga ana i ngā kapohau. He pēhea nei te rerekē o ngā hiahia o ēnei tāngata, tēnā i te otinga e whāia ana?
- I āta tautohua ngā hiahia o te katoa o ngā hunga whai pānga mai i roto i ngā tohutohu? Mēnā āe, he aha rātou i mōhio ai ki aua hiahia?
- He aha ētahi o ngā huarahi i wātea?
- I pēhea tā te hunga whai pānga kapo i ngā painga o aua huarahi?

Mēnā e whakatūria ana te pāmu hau kia pātata tonu ki tētahi tāone he aha pea ngā rerekētanga?

- He aha te āhua o te whakapuakitanga huatau pea? He aha ngā mahi i tohua kia mahia? He aha i pērā ai te mahi?



- Me haere ngā kaiwhakawhanake ki hea ki te whakawhiti whakaaro mō te whakapuakitanga huatau?
- Kei te mātautanga ngā whakatakotoranga whāiti mō ngā kapohau. Mēnā i rerekē ngā tohutohu, ā, i whakatauria kia hangaia te pāmu hau kia pātata tonu ki tētahi tāone, ka pēhea te whakarerekē i ētahi o ngā whakatakotoranga whāiti?

Ka pēhea te whakarerekē i ngā whakatakotoranga whāiti mēnā e whakatūria ana te pāmu hau ki te taha tonu o te marae? (Me whai whakaaro ki te rahi o te pāmu hau, me te hoihoi anō o ngā kapohau.)

Mō te wāhi ki te taiao tūturu, ki te ao tūroa, he aha ētahi āhuatanga me mātua wānanga ina hangaia he pāmu hau?

Arā anō te taiao pāpori, e whai wāhi mai ai ngā take matatika, ngā take tōrangapū, ngā take ahurea, me ngā take ohaoha.

- He aha te pānga o ēnei āhuatanga e whā ki te whakawhanaketanga o ngā pāmu hau?

Mō te arotakenga a te hunga whai pānga mai, ka tonoa aua huinga tāngata kia arotake i te pānga (he pānga tūturu, he pānga rānei tērā pea ka ara ake) o ngā pāmu hau ki a rātou.

- Ka pēhea te whakahaere a ngā kaitārai tohutohu i tēnei momo arotakenga?
- Ki ōu whakaaro, i pēhea te whakahaerenga o te arotakenga mō ngā pāmu hau e tirohia ana i te kōpae ataata? I whaihua anō?
- Ka pēhea e mōhiotia ai mēnā i whaihua te arotakenga a ngā rōpū whai pānga mai?

He Kupu Taka

arotakenga	<i>evaluation</i>	tautohu	<i>identify</i>
hunga whai pānga mai	<i>stakeholders</i>	te hiahia, te huarahi rānei e wātea ana	<i>need or opportunity</i>
otinga e tūmanakotia ana kia puta	<i>desired outcome</i>	tohutohu	<i>brief</i>
taiao pāpori	<i>social environment</i>	whakapuakitanga huatau	<i>conceptual statement</i>
taiao tūturu	<i>physical environment</i>	whakatakotoranga whāiti	<i>specification</i>

Te mahere mō te whakaharatau hangarau

Ina whakapaua he kaha kia whaihua tonu te mahere, ka pai noa ake te whakaharatau hangarau.

Ko te mahere, ko te āta whakariterite i a koe mō te wāhi ki ngā mahi kei mua i a koe. Ko te whakamahere i runga i te whaihua, ko te āta whakatina i ngā rauemi (pērā i ngā rawa, i te wā, me ngā tāngata) kia puta ai ngā painga.

Hei wāhanga o te mahere, ka whakahuatia ētahi putanga matua kia ea i te ekenga o ia wāhanga matua o te kaupapa, āhea, ā, ka pēhea te whakamahi i ngā rauemi e ea ai aua putanga.

Arā ētahi momo āwhina ka kīia he “taputapu” mahere, koia ētahi ko: te ohia manomano, te mahere hinengaro, te tahua whakaaro, te hautaka huritao, te pukapuka kohinga kuha, te mahere whakatutuki, te tūtohi Gantt, te hoahoa ripo, te kaitātai ataata, tae atu ki ētahi tikanga whakakaupapa, tikanga hoahoa. Heoi anō, ko te taputapu e kōwhiria, ko tērā e rite ana, e hāngai pū ana ki te mahi.

Mā te whakamahi taputapu mahere, ka taea te anga whakamuri ki ngā mahi kua mahia kētia, ka whakahāngai ai ki tāu e mahi ana i nāiane, me ngā rā kei mua i te aroaro. Ko te tātari hoki tētahi wāhanga nui o ngā mahi whakariterite. Kia rite tonu te āta tiroiro i ō mahi, kia mōhio ai koe āe, e whaihua ana, pēhea kē rānei.

He mea nui anō kia tāwariwari te mahere, engari kia pakari tonu te hanga. Ko te mahere tāwariwari, ko te mahere e taea ana te kuhu atu ētahi whakarerekētanga ki roto, nā runga anō i ngā mahi arotake i te pai, i te whaihua o ngā mahi e kawea ana. Ko te mahere pakari, ko te mahere ka tū tonu, ka haere tonu ina kuhuna atu ēnei whakarerekētanga.

Tēnā, kia whāiti te titiro ki ngā kōrero me te kōpae ataata mō te pāmu hau. E mārama ana he nui ngā mahi whakariterite kia tū mai ai taua pāmu. Āta whakaarohia ngā takahanga katoa o te hātepe hangarau e puta ai he otinga hangarau.

- He aha te otinga hangarau i konei?
- He aha katoa ngā takahanga i whāia kia tutuki ai te otinga?
- He aha ngā taputapu mahere i whakamahia? Kotahi noa iho te taputapu, ki ōu nā whakaaro, he maha tonu rānei?

Pānuitia ngā kōrero mō te pāmu hau, ka mahi ki te tautohu i ētahi taputapu mahere i whakamahia. Ki te kore e tere kitea, whakaarohia ētahi taputapu e hāngai ana ki te whakatūnga o tētahi pāmu hau.

Ki tō titiro, i pai anō, i rahi anō tā rātou whakawhiti kōrero tahi ki te iwi kāinga me ngā tāngata noho tata? He aha te momo taputapu pai hei whakamahi mā rātou mō te wāhi ki tēnei?

Whiriwhiria ngā āhuatanga o te whakatū i te pāmu hau me āta whakariterite, ka tuhi mai i tētahi taputapu mahere e hāngai ana. Whakamāramatia mai he aha i rite ai taua taputapu mō taua kaupapa. Tāpiria he āhuatanga ki te tūtohi i raro nei:

Āhuatanga	Taputapu mahere	He aha i rite ai mō taua kaupapa
Te whakaatu i ngā painga o te pāmu hau		
Te whakahāngai i ngā mahi kia mahia ki ngā rā me mātua oti aua mahi		
Te hui tahi ki te iwi kāinga me ngā tāngata noho tata		

Hei āwhina i a koe i te whakakī i tēnei pouaka, pātaihia te pātai e whai ake nei: He aha te take koinei te taputapu mahere pai katoa hei whakatutuki i tēnei āhuatanga?

He Kupu Taka

e hāngai pū ana ki te mahi	<i>fit for purpose</i>
hautaka huritao	<i>reflective journal</i>
hoahoa ripo	<i>flow diagram</i>
kaitātai ataata	<i>graphical organisers</i>
mahere hinengaro	<i>mind map</i>
mahere pakari	<i>robust plan</i>
mahere tāwariwari	<i>flexible plan</i>
mahere whakatutuki	<i>plans of action</i>

ohia manomano	<i>brainstorming</i>
pukapuka kohinga kuha	<i>scrapbook</i>
tahua whakaaro	<i>idea banks</i>
taputapu mahere	<i>planning tool</i>
tikanga hoahoa	<i>diagramming technique</i>
tikanga whakakaupapa	<i>structuring technique</i>
tūtohi Gantt	<i>Gantt chart</i>

Te whanaketanga me te arotakenga o te otinga hangarau

Ko te whakamaunga atu mō te whakaharatau hangarau, kia puta tētahi otinga hangarau e hāngai pū ana ki te mahi i whakaritea māna i te tīmatanga, arā, i roto i ngā tohutohu. Tērā pea he momo taonga tonu te otinga e taea ana te whāwhā, tērā rānei he pūnaha.

Hei whakawhanake i tētahi otinga, me hihiri ake ngā whakaaro auaha, kātahi ka whakapaipai haerehia ēnei i runga i ngā kitenga rangahau, i ngā whakamātautau, i ngā mahi tātari, i ngā mahi whakamātau papanga, tae atu ki te arotakenga i runga i ngā kōrero whāiti i tuhia ki ngā tohutohu.

Me kī, ko te whakawhanake otinga me te whakaharatau ngā takahanga whakamātau, waihanga o te whakaharatau hangarau.

Tērā tonu ka puta ētahi otinga waenga i te whakawhanake haeretanga o te otinga whakamutunga. Ko tā aua otinga waenga, he tautoko i te neke whakamua o ngā mahi whakawhanake, he whakaatu rānei he pai ake kia hikina ngā mahi, kia mahia ai ētahi whakarerekētanga, me whakamutu katoa atu rānei.

He tauira ēnei e whai ake nei o ētahi otinga waenga o ngā mahi whakaharatau hangarau:

- He rangahau mēnā ka taea te mea e wawatatia ana.
- He tohutohu kua oti te tārai?
- He whakaahua hukihuki o te huatau.
- He whakaaritanga ā-rorohiko.
- He tauira pakupaku.
- He tauira taketake.

Ka pai ake ngā mahi whakawhanake otinga mēnā ka āta whakaaturia ngā whakaaro kia mārama tonu ki ngā rōpū mātāmua e whai wāhi mai ana, me te whakamahi i ngā hoahoa me ērā atu tikanga ataata hei whakawhiti whakaaro.

Tēnā, kia whāiti te titiro ki ngā kōrero me te kōpae ataata mō te pāmu hau. Ka paku rerekē te āhua o tō titiro ki te whakawhanake me te arotake i te otinga mō tēnei kaupapa.

- Ki ō whakaaro, e hāngai pū ana te pāmu hau (arā, te otinga) ki te mahi i whakaritea kia tutuki i a ia i te tohutohu? Tuhia mai ngā take i pēnei ai ō whakaaro. Me mahi koe ki te āta tūhono i te otinga ki te mahi i whakaritea māna. Ki te kore e hāngai pū, whiriwhiria he aha kē ngā mahi e tika ana kia mahia e ngā ringa whakawhanake.
- Kei te kite anō koe i ētahi tohu o te whakaaro auaha i roto i ngā mahi hoahoa, me te mahi rangahau hei whakapaipai haere i aua whakaaro?

Me haere ki hea ki te kimi i ngā rangahautanga mō ngā pāmu hau? Me pēhea koe e mōhio ai e pono ana ngā kitenga o te rangahautanga?

He pēhea tā ngā ringa whakawhanake whiriwhiri i te rawa/matū tino pai hei hanga i ngā mata o ngā kapohau?

Ki ō whakaaro, i pēhea tā ngā ringa whakawhanake whakamātau i te otinga e tūmanakohia ana kia puta?

Ko hea ngā wāhi o te ara whakawhanake otinga e tika ana kia kōrero ngā ringa waihanga ki ngā tāngata pērā i a lan Christensen?

- I pērā anō rātou, ki ō whakaaro? Āta whakaarohia ngā kōrero a lan i te kōpae ataata.

Ko te otinga e kōrerotia ake nei, arā, ko te pāmu hau, he taonga, he pūnaha rānei, ko ngā mea e rua rānei?

He Kupu Taka

arotakenga	<i>evaluation</i>	tohutohu kua oti te tārai	<i>formalised brief</i>
e hāngai pū ana ki te mahi	<i>fit for purpose</i>	whakaahua hukihuki o te huatau	<i>concept sketch</i>
otinga hangarau	<i>technological outcome</i>	whakaaritanga ā-rorohiko	<i>computer simulation</i>
rangahau mēnā ka taea	<i>feasibility study</i>	whakaaro auaha	<i>creative thinking</i>
takahanga whakamātau	<i>trialling</i>	whakamaunga	<i>ultimate endpoint</i>
tauira pakupaku	<i>scale model</i>	whanaketanga	<i>development</i>
tauira taketake	<i>prototype</i>		

Ngā āhuatanga matua o te hangarau me ngā otinga hangarau

Ngā āhuatanga o te hangarau

Ko te hangarau tētahi o ngā kawenga ahurei a ngāi tāua. He pānga nui whakaharahara ōna ki te ao e noho nei tātou, me te āhua tonu o tā tātou noho ki te ao. He whāinga kei te tūāpapa o ngā mahi hangarau, ā, he haere kōtui te hangarau ki ngā āhuatanga pāpori me ngā āhuatanga ahurea. Nō reira ko ngā kawenga, arā, ko ngā whakaharatau hangarau te hua o te kōkiri a te tangata i ngā hiahia me ngā koronga. Ka hua ake te otinga i te tukanga hoahoa i āta whakaarohia, i āta tāraia, kāore i pōkerekēhū noa te puta ake.

Mā te hangarau ka kaha ake te āhei o te tangata ki te huri i ngā matū, i ngā pūngao, me ngā mōhiotanga.

He auaha tonu te āhua o te whakaaro me te mahi a te ringa hangarau. Me āta wānanga e ia ōna whakaaro tīmatanga me ōna huatau hoahoa. Me whakaaro arohaehae ki āna mahi, ka tuketuke i ngā pou aronui, ka ako mai i ngā mahi o mua, ka āta whakaaro anō ki ngā rā kei tua, i a ia e whakawhanake ana i ōna whakaaro. Ā, me whai whakaaro anō ia mēnā ka taea anō te mea e whāia ana e ia, mēnā rānei ka paingia, ka pīrangitia taua mea.

Me aro anō te ringa hangarau ki te hanga whakatau i runga i te whakaaro whaitake, i te āta wānanga. E rua ngā momo āta wānanga, ko te āta wānanga taha whakatinana, me te āta wānanga taha painga. Ko te taha whakatinana, e anga ana ki te āhua o te kawea i tētahi mahi e tutuki pai ai. Ko te taha painga, e anga ana ki tērā e tika ana, i runga i te aro nui ki ngā āhuatanga pāpori, ngā āhuatanga matatika, ngā āhuatanga ahurea. Ka arotahingia te mea e “tika” ana, e “hē” ana rānei; e “pai” ana, e “kino” ana rānei; e whai uara ana, e uara kore ana rānei. Heoi anō, katoa ēnei, kei te āhua tonu o te titiro a te tangata nāna ngā whakatau – ōna uara, ōna whakapono, ōna māramatanga, ōna mōhiotanga.

Ko tā te hangarau, he whakamahi i te mātauranga hangarau, he whakaputa anō i te mātauranga hangarau hou. Kei te rere tahi te mātauranga hangarau me te taha whakatinana, ā, ka whai mana taua mātauranga ina kawea ake e te hapori hangarau hei whakatinana i tētahi otinga. Heoi anō, ehara i te mea ka puta he otinga hangarau i ngā whakaharatau hangarau katoa. He wā anō e whakaata kē ana te mea ka puta ake i ngā whakatau katoa i tatū taka mai ki tērā wā.



E hono tahi ana te hangarau ki ngā āhuatanga me ngā pūnaha whakaaro o roto i ngā tau, ki ngā pānga pāpori, me ngā pānga ahurea. He awe nui tō ēnei mea katoa ki ngā hangarau ka whanake ake, me te āhua tonu o te whanake ake o aua hangarau.

E tutuki pai ai te whakaharatau hangarau, me nanao atu te hinengaro ki ngā mātauranga hangarau me ngā mātauranga o kaupapa kē, pērā i te pūtaiao, i te pāngarau. Nō reira, he wā anō me mahi tahi ngā ringa hangarau ki ngā tohunga o ērā atu kaupeka mātauranga.

Ngā āhuatanga o ngā otinga hangarau

Ko te otinga hangarau he taonga ka taea e te ringa te whāwhā, he pūnaha rānei i waihangatia mā roto i te whakaharatau hangarau, hei whakatutuki i tētahi mahi, ā, ka tū mai ki tōna wāhi e tika ana. Ka arotakea i runga anō i tōna pai ki te kawewāhi i te mahi i whakaritea māna. Ko te kōrero “ki tōna wāhi e tika ana”, e mea ana kei te whakamahia te otinga hangarau e te hāpori hangarau.

He tūātitini te hononga i waenga i ngā taonga hangarau me ngā pūnaha hangarau. Ka mutu, ko te whakatau he taonga rānei, he pūnaha rānei kei te āhua tonu o te titiro ki taua mea. Hei tauira, ka taea te kī he pūnaha te waea pūkoro, ka taea anō te kī he taonga.

He otinga hangarau ngā mea o te ao mariko (pērā i te pūmanawa rorohiko, i te whakaahua ā-mati, i te aha atu), tae atu ki ngā hanga e taea ana te whāwhā ki te ringa (pērā i te rorohiko, i te arawhiti, i te waka, i te rongoā, i te aha atu).

He hanga “matarua” te otinga hangarau. He āhua taha ōkiko tōna, arā, ko tana hanga tonu tērā ā-waho, ā-roto. He āhua whakatinana anō tōna, arā, ko ngā mahi ka taea e ia. Me mōhio te ringa hangarau ki ēnei mata e rua, me te hononga i waenganui, e tutuki pai ai tana whakaharatau hangarau.

Hei tārua ake i ēnei kōrero o runga ake, ka taea te whakaahua te otinga hangarau i runga i ōna āhuatanga ōkiko, i ōna āhuatanga whakatinana, otirā, me te whai whakaaro anō ki ngā āhuatanga pāpori me ngā āhuatanga nui kua pā i roto i ngā tau.

Kia whāiti anō te titiro ki te hanganga o ngā kapohau me te pāmu hau e kitea ana i te kōpae ataata mō tēnei kaupapa, me te āta whai whakaaro anō ki ngā āhuatanga o te hangarau kua kōrerotia i runga ake nei. Ko ngā pātai i raro nei hei ārahi i ō whiriwhiringa.

- He pānga anō ō ngā kapohau me te pāmu hau ki te āhua o tā tātou noho, o te noho rānei a ētahi atu ki te ao? E hono tahi ana te kaupapa o te whakatū pāmu hau ki ētahi āhuatanga pāpori, ki ētahi āhuatanga ahurea?
- Ka rerekē ngā whakaaro o te tangata ki te kapohau tū motuhake, me te pāmu hau e tūtū mai ai ngā kapohau huhua?
- He aha te hiahia o te hāpori, ā, nō wai te hiahia?
- He aha te hiahia ahurea, ā, nō wai te hiahia?

Arā ētahi tauira o te whakaaro arohaehae i roto i te hanganga o ngā kapohau me ngā pāmu hau. Matapakihia ērā whakaaro arohaehae.

Kimihia te roanga atu o ngā kōrero mō ēnei mea e rua:

- Āe rānei ka taea, ka tutuki te kaupapa?
- Āe rānei ka paingia, ka pīrangitia e te iwi nui tonu?

Whakahāngaitia ēnei pātai ki ngā kapohau me te pāmu hau.

- Me pēhea koe e mōhio ai mēnā ka tū tonu, ka tōtika tonu tētahi hanga, ahakoa pēhea?
- Ka pūmau tonu tana mahi tika i te mahi?
- Āe rānei ka taea te whakatū kapohau/pāmu hau, ahakoa ngā here, ngā whakararu?
- Ka taea te whakatū kapohau/pāmu hau mēnā ka tino nui te utu? Ka pēhea mēnā e whakahētia ana e te mātinitini?

Ko tētahi atu āhuatanga nui o te hangarau, ko te hanga whakatau i runga i te whakaaro whaitake, i te āta wānanga. Kimihia ngā wāhi i tū ai te āta wānanga taha whakatinana mō te kapohau/pāmu hau. He māmā ake te whai haere i te wānanga taha whakatinana, i te mea e aro ana ki ngā pātai me pēhea e tutuki ai tētahi mea, ā, he aha i tutuki ai tētahi mea. He rehurehu ake te āta wānanga taha painga, i te mea ka uru mai ko ngā whakaaro o ētahi atu. Ka oti i te tangata he whakatau i runga anō i te āhua o ōna uara, ōna whakapono, ōna māramatanga, ōna mōhiotanga, ā, e kore pea tātou e mōhio pū ki ēnei āhuatanga i ētahi atu – he kokonga ngākau, he kokonga hinengaro e kore pea e kitea!

Ko ngā pātai i te tūtohi nei hei ārahi i a koe ki te wherawhera i te āta wānanga taha painga:

Koinei ngā momo pātai ka tirohia i raro i te wānanga taha painga:	
E tika ana anō kia mahia te mahi nei? >	Mā tēnei pātai ka taea te parahau te hangarau i runga anō i ngā āhuatanga pāpori, ngā āhuatanga matatika, ngā āhuatanga tikanga ā-iwi.
Hei whakautu i te pātai i runga ake, me whai whakaaro anō ki ēnei pātai. >	He aha tēnei mea te tika, tēnei mea te hē? He aha tēnei mea te pai, tēnei mea te kino? He aha ngā mea e whai uara ana, he aha ngā mea kāore e whai uara ana?
Ko ngā whakautu ki ēnei pātai katoa, kei te āhua tonu o te tangata, ōna uara, ōna whakapono, ōna māramatanga, ōna pūkenga.	

E tika ana kia taea e te otinga hangarau te mahi i whakaritea māna, i te wāhi e tika ana mōna. Kāore he take mēnā ka tika te mahi i te whare hoahoa anake, i te whare pūtaiao anake.

- Ka pēhea e mōhiotia ai mēnā ka taea e te kapohau, e te pāmu hau rānei te mahi kua whakaritea māna?
- He aha te tikanga o tēnei kōrero mō te wāhi ki te kapohau me te pāmu hau?

Ahakoa he rerekē te taonga hangarau i te pūnaha hangarau, he wā anō ka haere kōtui ēnei mea e rua i te otinga hangarau kotahi.

- E mōhiotia ana he taonga te kapohau, engari ka pēhea te pāmu hau?
- Āe rānei he taonga, he pūnaha anō?

Āta whakaarohia ngā āhuatanga ōkiko me ngā āhuatanga whakatinana o te kapohau me te pāmu hau. Whakaahuatia te otinga hangarau i runga anō i te āhua o ēnei āhuatanga, kātahi ka tuitui atu ki te horopaki pāpori me te horopaki aro whakamuri e hāngai ana. Kei raro nei tētahi tauira tuhinga.

Ka hangaia te kapohau ki _____, _____ nā runga i te hiahia o te hapori ki _____, ko ngā painga ko _____.

Whakakīia ngā wāhi wātea ki ēnei kōrero:

- ngā matū/rawa māmā, he kaha anō (ko te pukuhiko anō tētahi mea)
- hei kapo i te pūngao o te hau, e hurihia ai hei hiko

- te hiko e māmā ake ana te utu
- te nui ake o ngā moni ka wātea (i te iti ake o ngā nama hiko) hei whakapau mā rātou, me te iti ake o ngā putanga waro

Tukuruatia tēnei tāpaenga kōrero me te whakaata i te titiro a te ringa hangarau. Ka rite pū ngā tāpaenga kōrero nei? Ki te kore, he aha i kore ai? E tika ana anō kia rite pū?

He Kupu Taka

āhua taha ōkiko	<i>physical nature</i>	mahi i whakaritea māna	<i>fit for purpose</i>
āhua taha whakatinana	<i>functional nature</i>	mariko	<i>virtual</i>
āhuatanga ahurea	<i>cultural features</i>	matarua	<i>dual nature</i>
āhuatanga matua	<i>key characteristics/features</i>	mātauranga hangarau	<i>technological knowledge</i>
āhuatanga ōkiko	<i>physical properties</i>	otinga hangarau	<i>technological outcome</i>
āhuatanga pāpori	<i>social features</i>	pūnaha	<i>system</i>
āhuatanga whakatinana	<i>functional properties</i>	taonga hangarau	<i>technological product</i>
hāpori hangarau	<i>technological community</i>	tūātititini	<i>complex</i>
huatau hoahoa	<i>design concept</i>	tukanga hoahoa	<i>design process</i>
huri i ngā matū, i ngā pūngao, me ngā mōhihio	<i>transform materials, energy, and information</i>	wāhi e tika ana	<i>in situ</i>
ka paingia, ka pīrangitia	<i>desirability</i>	wānanga taha painga	<i>practical reasoning</i>
kawenga	<i>activity</i>	wānanga taha whakatinana	<i>functional reasoning</i>
mahi	<i>function</i>	whakaaro arohaehae	<i>think critically</i>

Ngā tauira, ngā taonga, me ngā pūnaha hangarau

Te whakatauiranga hangarau

Ko tēnei mea te tauira, he whakaaturanga o tētahi mea tūturu. I te ao hangarau, whakamahia ai te tauira hei whakaatu ka pēhea te āhua o tētahi mea mēnā ka whāia tonutia tētahi whakawhanaketanga hangarau. Nā runga i aua whakaaturanga, kua pai te whakatau iho me haere tonu, hei aha noa iho rānei, me whakarerekē rānei tētahi āhuatanga.

He taputapu whakawhanake matua te whakatauiranga hangarau i ngā pekanga hangarau katoa. Ahakoa he rerekē ngā mātauranga e noho tūāpapa mai ana ki ngā tauira o tēnā pekanga, o tēnā pekanga, e ōrite ana ngā huatau whānui. Hei tauira, he rerekē te tūāpapa mātauranga o te tauira i te hangarau koiora, tēnā i te tauira i te pekanga hoahoa whare.

Ko ngā poutoko o te whakatauiranga hangarau, ko te wānanga taha whakatinana, me te wānanga taha painga. Ko te wānanga taha whakatinana, e arotahi ana ki ēnei āhuatanga, “Ka taea te whakatutuki?” me “Me pēhea te whakatutuki?”. Ko te wānanga taha painga, e pātai kē ana i te pātai “e tika ana anō kia whāia tēnei huarahi?” Arā, e arotahi ana ki ngā āhuatanga pāpori, ngā āhuatanga matatika. Mā te kuhu atu i ngā momo wānanga e rua ki ngā mahi whakatauiranga hangarau, ka oti mai he arotakenga kauawhi whānui o te taonga hangarau me tōna pānga ki te ao.

Ka tīmata mai pea ngā mahi whakatauiranga i te whakaaro noa iho, me te whakawhitinga kōrero ki ētahi atu ringa hangarau. Kātahi ka hangaia pea he tauira 3-D, he tuinga rānei ki te pepa, ki te rorohiko rānei. Nāwai ā, ka tata

ake ngā rawa ka whakamahia mō te tauira ki ērā ka whakamahia hei hanga i te taonga whakamutunga. Ā, mō te tauira taketake, ka whakamahia ngā rawa tūturu. E rua ngā momo whakatauirā: ko te whakatauirā kawenga, me te hanga tauira taketake.

Ko te whāinga o te whakatauirā kawenga, he torotoro, he arotake i tētahi huatau hoahoa, nō reira ka kaha te whāia o tēnei momo whakatauirā i ngā takahanga tīmatanga o te whakaharatau hangarau. Ka kaha anō te whakawhirinaki ki te whakapae me te whakatau tata i ngā takahanga tīmatanga, i runga i ngā wheako kua puta ake i ētahi atu kaupapa. Mā te whakatauirā kawenga, tērā ka iti ake te moumou rawa, ā, ka mōhio mārire te ringa hangarau ka puta te taonga me te pānga ki te ao e āta hiahia ana ia kia puta.

Hangaia ai he tauira taketake hei arotake i te hāngai pū o tētahi taonga hangarau ki te mahi i whakaritea māna. Nō reira, ka puta te taonga, ā, ka haere ngā mahi whakatauirā taketake kia kitea ngā taunakitanga hei hanga whakatau i runga i te mōhio, e pai ake ai te taonga. Ko te arotakenga o te hāngai o te taonga ki te kaupapa i hangaia ai, ka inea i runga i te āhua o ngā whakatakotoranga whāiti e mau mai ana ki ngā tohutohu.

Pērā anō i ngā mahi whakatauirā kawenga, nā runga i ngā whakatau ka puta ake i te whakatauirā taketake, tērā ka turakina, ka whāmutua te kaupapa, tērā rānei ka kuhuna atu ētahi whakarerekētanga nui tonu.

Tēnā, kia whāiti te titiro ki ngā kōrero mō te whakatū pāmu hau.

- He aha, ki ō whakaaro, ngā mahi whakatauirā i whāia mō te pāmu hau?
- He aha te take me mātua kawhe he mahi whakatauirā mō te pāmu hau?
- Ko te whakatauirā taha whakatinana, ko te hanga tauira taketake rānei te mea e tino hāngai ana?
- He aha ngā take i whāia ai tēnā me tēnā momo?
- Kotahi anō te momo whakatauirā e rite ana mō te hanganga o te kapohau, tae atu ki te katoa o te pāmu hau?

Whakakīia te tūtohi e whai ake nei hei whakaatu i te momo wānanga e whakaaro ana koe i noho tūāpapa mai ki ngā mahi whakatauirā mō ngā kapohau, me te pāmu hau anō hoki:

Te momo whakatauirā	Te wānanga taha whakatinana	Te wānanga taha painga

He wā anō, ki ō whakaaro, i tūpono ai ngā ringa whakawhanake ki tētahi raruraru i whāmutua ai tana mahi, i kuhuna ai rānei ētahi whakarerekētanga nui? Whakaahuatia ēnei raruraru.

I whakaaturia ā ngā ringa whakawhanake mahi whakatauirā ki a wai? He aha ngā momo mea ka hiahia rātou ki te whakaatu atu ki aua tāngata, mā roto i ngā mahi whakatauirā? Ka āwhina anō ngā mahi whakatauirā i te hāpori ki te hanga whakatau mō ngā painga o te pāmu hau?

Ngā taonga hangarau

Ko te taonga hangarau, he mea e taea ana te whāwhā, ā, nā te hoahoa tangata, nā te ringa tangata i puta ai ki te ao.



He mea nui kia mārama te tangata ki te hononga i waenga i ngā āhuatanga o ngā matū me te whakamahinga o te matū, e mārama ai ia ki tētahi taonga hangarau, ā, me pēhea te waihanga i taua taonga. Ka uru mai ki te karangatanga “taonga hangarau” ngā mea kikokiko tonu, pērā i te whakaahua ka tāia ki te pepa, tae atu ki ērā o te ao mariko, pērā i te whakaahua ā-mati e noho ana ki te rorohiko, ki te kōpae rānei.

Ko te mātauranga e noho tūāpapa mai ana ki ngā ariā mō ngā āhuatanga o te matū, tae atu ki te hanganga me te whakamahinga o ngā matū, kei te āhua tonu o ngā matū ka whakamahia hei hanga i tētahi taonga. Hei tauira, ko ngā māramatanga hei whakanao i tētahi kai, ka rerekē i ērā hei hanga i te papanga, i te taonga tāhiko rānei.

Nō te ao hou nei te hangarau matū. Heoi, kei te toro atu ōna kawekawe ki ētahi atu rerenga mātauranga kua roa e tū ana, e taea ai te huhua noa o ngā kawenga matū me ngā taonga matū whakahirahira tonu. Hei tauira, ko te aranga ake o ngā matū me ngā papanga “ihumanea”, arā, ko ngā matū ka urutau atu, ka urupare atu ki tētahi akiaki o waho, he akiaki hangarau tonu pea, he akiaki rānei nā te tangata. Nā te akiaki o waho, ka rerekē tētahi āhuatanga o roto i te matū, tana mahi rānei. Ko ētahi tauira o ngā taonga ka mahia ki te matū ihumanea, ko ngā kākahu aro ki te pāmahana, ko te papanga ka horoi i a ia anō, ko ngā mōwhiti aro ki te aho, me ngā uaua horihori.

Ko tētahi arotahinga nui o tēnei wāhanga, ko te pānga o te whakamahinga, te huringa, te hanganga rānei o te matū ki ngā huringa taonga me ngā mahi whakatina i ngā rawa. Mā konei e pakari ai te māramatanga hangarau ki te toitūtanga mō te wāhi ki te whakahaere rawa, ngā huringa taonga, me te porowhiuwhiu taonga.

Kia hoki ake anō ki ngā kōrero mō te whakatū pāmu hau. Whiriwhiria he aha ngā taonga. He taonga anō te pāmu nui tonu? Whakamāramatia tō whakautu.

Me whai whakaaro ki ngā whakapaunga kaha a te tangata, ki te taha hoahoa, me ngā mātauranga e noho tūāpapa mai ana ki te whakamahinga o ngā matū hei hanga i te taonga.

- He aha ētahi āhuatanga o ngā matū ka whakamahia hei waihanga i tēnei mea, te kapohau?
- Āta whakaarohia ēnei āhuatanga, ā, ka pēhea te whakamahi hei hanga i te taonga. Ka taea te whakamahi ētahi matū kē atu?
- He wā anō ka whai wāhi mai ngā āhuatanga whakatina matū, penapena matū ki te hanganga o tētahi taonga. He āhuatanga whakatina matū e hāngai ana ki tēnei kaupapa?
- Ki ō whakaaro, he taonga anō te hiko ka whakaputaina e te kapohau?

Whakakīia te tūtohi i raro nei hei ārahi i a koe ki te whakautu i ēnei pātai:

Te taonga	Ngā āhuatanga – āe, kāore rānei?	Whakamārama
He mea hanga ki tētahi momo matū?		
Nā te ringa tangata i puta ai ki te ao?		
He hononga anō kei waenga i ngā āhuatanga o ngā matū/rawa me te āhua o te whakamahi?		
He taonga kikokiko, nō te ao mariko rānei?		
He mātauranga anō e noho tūāpapa mai ana ki te whakamahinga o te matū/rawa hei hanga i te taonga?		

Ngā pūnaha hangarau

Ko te pūnaha hangarau, he huinga wāhanga e hono tahi ana, ko tāna mahi, he huri, he pupuri, he kawea, he whakatina rānei i te matū, i te pūngao, i te pārongo rānei.

Nā te hoahoa tangata, nā te ringa tangata i puta mai ai he pūnaha ki te ao, engari ina takoto he pūnaha, ka mutu i reira ngā mahi hoahoa a te tangata e tutuki ai i te pūnaha tāna mahi. Hei tauira, ina whakamahi te tangata i ngā pereki hei whakatū i tana waka (ka oti i a ia he mahi hei whakaara ake i te pūnaha), ehara i te mea me oti anō i taua tangata he mahi hoahoa e tika ai te mahi a te pūnaha whakatū a te waka.

Ko ngā mātauranga hangarau o tēnei wāhanga, ko te mārāma ki ngā mea ka whakaurua, ngā putanga, ngā tukanga hurihanga, me te whakatina. Ko te mārāma anō ki te tikanga o te “pouaka pango” tētahi mea ka tirohia.

Arā ētahi o ngā mea ka whakaurua, ko te tangata, ko ngā taonga hangarau, ko te moni, ko te rawa māori, ko te pārongo, ko te pūngao. Ko te tino putanga, ko te otinga e tika ana kia hua ake i te pūnaha. Hei tauira, ko te putanga o tētahi pūnaha whakanao hēki Aranga, he matū ka hurihia, arā, ko te hēki tonu. Ko te putanga o tētahi pūnaha whakapāpā ā-waea, ko te pārongo ka hurihia, ka kawea, arā, ko te reo ka kawea, ka pā atu ki wāhi kē.

Ko ngā tukanga hurihanga, ko ngā tukanga o roto i tētahi pūnaha e āta hurihia ai ngā mea ka whakaurua hei putanga, me te ū ki tērā i whakaarohia e te tangata mō te pūnaha ka tahi, e kore ai te tangata e mate ki te mahi hoahoa atu anō ka rua.

Arā ētahi huatau i roto i te hoahoanga me te kawenga o te pūnaha hangarau e tika ana kia tūhuratia. Ko ētahi, ko te piki kawenga me te tōtika o te mahi.

Ko tētahi āhua o te piki kawenga, ko te hoatu i tētahi momo tāpiritanga ki te pūnaha hei āhuatanga haumarua, hei “ora kāinga rua”. Ko te tōtika o te mahi, ko te ū tonu o ngā wāhanga o te pūnaha ki te mahi i whakaritea mā tēnā, mā tēnā, mō te wā e tika ana. He mea nui te tōtika o te mahi me te piki kawenga i te ahumahi rererangi.

Ko ngā pūnaha whakanao manomano hei tauira o te pūnaha kua nui ōna pānga ki te ao. Kua noho ko te pouaka pango tētahi wāhanga o ngā pūnaha whakanao o ēnei rā. He wā anō he pūnaha iti te pouaka pango nō te pūnaha nui ake.

Ā tēnā, whiriwhiria mēnā he tukanga hangarau ka whāia hei waihanga i te kapohau. Tērā pea ka whai wāhi mai he pūnaha hangarau ki te mahinga o ētahi o ngā rawa hei hanga i te kapohau. Ki tō titiro, kotahi anō te pūnaha hei hanga i te kapohau, he maha rānei ngā pūnaha whāiti e hono tahi ana hei pūnaha nui?

Kei te rite ēnei āhuatanga katoa:

- He huinga wāhanga e hono tahi ana?
- E uru mai ana he matū, he pūngao, he pārongo rānei?
- Nā te hoahoa tangata, nā te ringa tangata i puta ai ki te ao?
- He tūāpapa mātauranga hangarau tōna?
- He mea anō ka whakaurua atu?
- He mea anō ka puta mai?

- Kei konā ōna anō tukanga panoni?
- Kei konā ōna anō tukanga whakatina?
- He pūnaha pouaka pango tōna?

Hangaia he tūtohi hei whakaatu i ngā āhuatanga i runga ake nei mō tēnā, mō tēnā pūnaha ka tautohua e koe, e puta ai he kapohau.

Hei āwhina i a koe, kimihia ngā kōrero mō ētahi atu pūnaha whakanao e kitea nuitia ana, hei tauira, ko ērā e noho mai ai he pouaka pango.

He Kupu Taka

āhuatanga o te pūnaha hangarau	<i>features of a technological system</i>	papanga ka horoi i a ia anō	<i>self cleaning textile</i>
e uru mai ana he matū, he pūngao, he pārongo rānei	<i>involving materials, energy, or information</i>	piki kawenga	<i>redundancy</i>
hangarau matū	<i>materials technology</i>	porowhiuwhiu taonga	<i>product disposal</i>
he mea anō ka puta mai	<i>has outputs</i>	pouaka pango	<i>black box</i>
he mea anō ka whakaurua atu	<i>has inputs</i>	pūnaha	<i>system</i>
hoahoa tangata	<i>human design</i>	putanga	<i>output</i>
huatau hoahoa	<i>design concept</i>	rawa māori	<i>raw material</i>
huatau whānui	<i>generic concept</i>	taonga hangarau	<i>technological product</i>
huinga wāhanga e hono tahi ana	<i>set of interconnected parts</i>	taonga matū	<i>material product</i>
huringa taonga	<i>product life cycle</i>	taputapu whakawhanake matua	<i>key development tool</i>
kākahu aro ki te pāmahana	<i>heat regulated clothing</i>	tauira taketake	<i>prototype</i>
kauawhi whānui	<i>holistic</i>	taunakitanga	<i>evidence</i>
kei konā ōna anō tukanga panoni	<i>has transformation processes</i>	toitūtanga	<i>sustainability</i>
kei konā ōna anō tukanga whakatina	<i>has control processes</i>	tōtika o te mahi	<i>reliability</i>
mahi i whakaritea māna	<i>fitness for purpose</i>	tūāpapa mātauranga hangarau tōna	<i>identified technological knowledge base</i>
mariko	<i>virtual</i>	tukanga hurihanga	<i>transformation processes</i>
matū "ihumanea"	<i>SMART materials</i>	uaua horihori	<i>artificial muscle</i>
mea whakaurua	<i>input</i>	wānanga taha whakatinana	<i>functional reasoning</i>
mōwhiti aro ki te aho	<i>light responsive sunglasses</i>	wānanga taha painga	<i>practical reasoning</i>
nā te hoahoa tangata, nā te ringa tangata i puta ai ki te ao	<i>exists in the world as a result of human design</i>	whakanao	<i>production</i>
ngā tauira, ngā taonga, me ngā pūnaha hangarau	<i>technological models, products, and systems</i>	whakanao manomano	<i>mass production</i>
		whakatauiria hangarau	<i>technological modelling</i>
		whakatauiria kawenga	<i>functional modelling</i>
		whakatina	<i>control</i>

Ngā Āhuatanga Hangarau

Ngā hiahia me ngā huarahi e wātea ana

Mā te tautohu i tētahi take me tōna horopaki e kitea ai ngā hiahia me ngā huarahi wātea tūturu. Ka noho ko taua hiahia, taua huarahi wātea rānei te whāinga whai takenga mō te whakawhanaketanga hangarau, ā, ka hāngai tonu, ka whāiti tonu ngā tohutohu ka takoto ki taua hiahia, ki taua huarahi rānei.

Tēnā, kia whāiti te titiro ki ngā kōrero me te kōpae ataata mō te pāmu hau.

- He aha te hiahia tūturu i hangaia ai te pāmu hau?
- Ko wai mā e hiahia ana kia tū he pāmu hau, ā, he aha ai?
- He rite te hiahia o te tangata nāna i waihanga ngā pāmu ki tō lan Christensen? He rite ki te hiahia o te iwi kāinga?
- Ka pēhea te hiahia o tētahi tangata mahi māra pararopi e noho pātata ana pea?

Ko te huarahi i wātea i konei, ko te waihanga i tētahi pāmu e ea ai ngā hiahia o te katoa:

- He aha ētahi o ngā mea kia āta wānangahia e ea ai aua hiahia?
- He aha ētahi mahi tērā ka taea e rātou kia āhua rata ai a lan ki te pāmu hau?
- Ki ō whakaaro, ka ōrite katoa ngā hiahia o ngā tāngata katoa, o ngā whānau katoa o te iwi kāinga?
- Ka taea anō e ngā ringa whakawhanake o te pāmu hau te whakangata ngā hiahia o te katoa?

Te toitūtanga

He mea nui te toitūtanga. Ahakoa he aha te mahi i te ao nei, i runga i te kaupapa o te toitūtanga me mātua whai kia kaua e puta he hua kino i taua mahi ki a Papatūānuku, ki a Ranginui. Me āta penapena ngā rawa māori, me āta tiaki te taiao hei oranga, hei pārekarekatanga mā ngā uri whakaheke. I te wā ki ngā tūpuna, arā ngā tikanga pērā i te rāhui hei toitū i ngā rawa māori. He tikanga pai te rāhui e whakatina ai, e penapena ai ngā iwi i ā rātou rawa.

E whakaae ana ētahi he kaupapa toitū te pāmu hau, i te mea ko tāna he kapo i te pūngao o te hau, ā, i tērā tonu kua penapenahia ngā pūngao whakahou kore. Mēnā he kaupapa toitū, he aha i whakahētia tonutia ai e ētahi?

He aha ētahi o ngā take toitūtanga e tika ana kia whiriwhiria ina taka te whakaaro kia hangaia he pāmu hau? He rerekē ngā take a ngā tāngata takitahi, tēnā i ngā huinga tāngata pērā i te iwi, i te hapori noho tāone, i te kamupene?

He mea nui kia āta whai whakaaro ngā ringa whakawhanake hangarau ki ngā take toitūtanga.

- He aha i pērā ai?
- Ka ōrite ngā take toitūtanga e pā ana ki te pāmu hau i Manawatū ki ērā atu wāhi o Aotearoa tērā ka whakatūria he pāmu hau ki reira? Ka pēhea tētahi takiwā kāore e kaha nohoia ana e te tāngata?

Ngā mōhiotanga o ngā tūpuna

Kei ngā tūpuna ngā mōhiotanga, ngā pūkenga, me ngā māramatanga ki tō rātou ao e noho ora ai rātou i Aotearoa i mua noa atu i te taenga mai o tauwiwi. Ka mutu, i āta haere kōtui ērā āhuatanga me te taha wairua.

Kāore pea i uru mai ngā mātauranga o ngā tūpuna ki te hanganga o ngā kapohau. Heoi anō, he wāhi anō mō aua mātauranga i roto i te hanganga o te pāmu?

- He aha te take kāore a lan i tautoko i te pāmu hau? I ahu mai ōna mōhiotanga i hea?
- Ka taea anō te whakatau te wāhi pai mō te pāmu hau i runga anō i ngā mātauranga o ngā tūpuna? Me whakaaro ki te wāhi ki ngā mātauranga i whakatauria ai ngā kaupapa kia kawea ki tēnā wāhi, ki tēnā wāhi taka mai ki nāiane. Ko ngā urupā hei tauira.

Ngā uara me ngā whakapono

I haere kōtui anō ngā mōhiotanga, ngā pūkenga, me ngā māramatanga o ngā tūpuna ki ō ratou uara me ō ratou whakapono. E karapotī ana ēnei āhuatanga i ngā huatau pērā i te wairua, i te aroha, i te manaakitanga, i te kaitiakitanga, me ngā kawenga e tika ana, arā, ko ngā tikanga tonu ērā.

I te kōpae ataata, ka kōrero a lan mō ngā uara me ngā whakapono.

- He aha ētahi, ā, he pēhea te pānga o aua uara me aua whakapono ki ōna whakaaro mō te pāmu hau?
- I pēhea ōu nā whakaaro i a koe ka rongō i ana kōrero mō te pāmu?
- E māharahara noa ana ia ki te kaha o te hoihoi, koia anahe?
- He tāngata anō ka ōrite ō rātou māharahara, ō rātou whakaaro ki ō lan?

Te pānga ki te iwi

He huhua tonu ngā pānga o te otinga hangarau ki te iwi, ki te hapori. Heoi anō, ko te tikanga, he pānga e taea ana te ine.

- Me pēhea te kimi mai i te pānga ki te iwi/hapori?

Arā tētahi huarahi, ko te uiui haere i ngā tāngata kua rongō i ētahi o aua pānga. Tērā pea ka whakatairitea ngā raraunga ka kohia i mua me ērā ka kohia i muri i te tatūnga o te otinga hangarau.

- I whai hua anō? He pēhea nei te kaha o te whai hua?

Mō te wāhi ki te pāmu hau me ōna pānga ki te iwi/hapori:

- Me pēhea e mōhio ai ngā ringa whakawhanake ki aua pānga i mua i te hanganga?
- I whakapā atu ngā ringa whakawhanake ki a wai mā, ki ō whakaaro?
- Ko wai atu anō e tika ana kia uiuitia?
- I uiuitia ngā tāngata katoa e tika ana kia uiuitia?

- I rongo anō rātou i ngā whakaaro o Ian me te iwi kāinga? He aha koe i mōhio ai?
- He aha ki tō whakaaro te take i mau tonu ngā ringa whakawhanake ki tā rātou i pīrangi ai?

Mēnā ka hiahia ngā rangatira ki te whakatū pāmu hau anō ki tētahi rohe kē atu, me kimi anō he aha te pānga ki ngā tāngata o taua rohe hou, ka nui rānei ngā rongo kōrero i Manawatū, hei aha te tukurua i te mahi?

- Ka puta anō he pānga ki ngā huarahi o te rohe kei reira te pāmu hau?

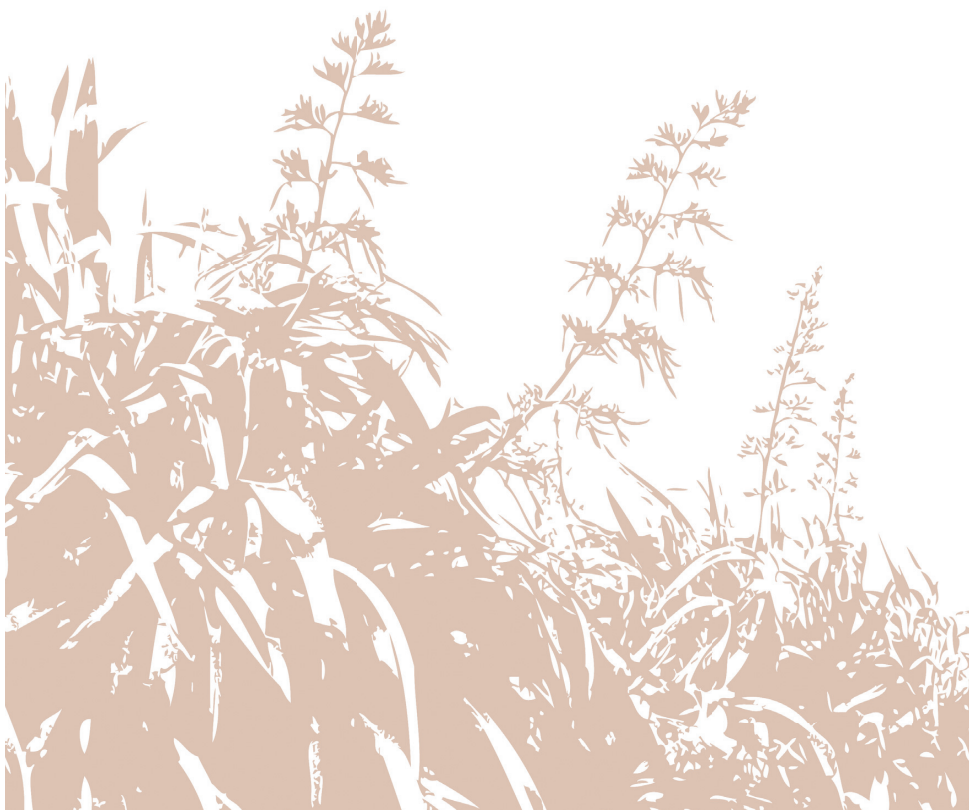
Ko ngā ara tētahi tauira o ngā hanga me ngā ratonga ka horaina hei whakamāmā i te noho tahi, i te mahi tahi a tētahi hapori. Ko te pūnaha parakaingaki, ngā ara hīkoi, me ngā ratonga pērā i te kohinga rāpihi me te tahitahinga o ngā huarahi ētahi atu tauira. Ka utua ētahi o ngā ratonga nei e te hunga whai whare, ina utua ngā reti ki ngā kaunihera ā-rohe.

- Mēnā i whakarerekētia ngā huarahi, ka puta he hua ki ngā tāngata noho tata?

Tērā pea he hua pai, i te mea ka pai ake te huarahi – he ara kirikiri noa iho pea i mua, ka meatia kia pai te hanga. Tērā rānei he hua kino, hei tauira, ka nui ake ngā waka e haere ana i te huarahi, ā, e kore pea te hunga noho taiwhenua e pai ki tērā āhua. Ā, tērā pea ka rerekē anō ko ngā reti.

- He aha ētahi atu pānga ki ēnei tūmomo ratonga hapori?

I roto i ō whiriwhiringa i ēnei āhuatanga o te hangarau, ki ō whakaaro, he otinga hangarau pai te whakatū pāmu hau?



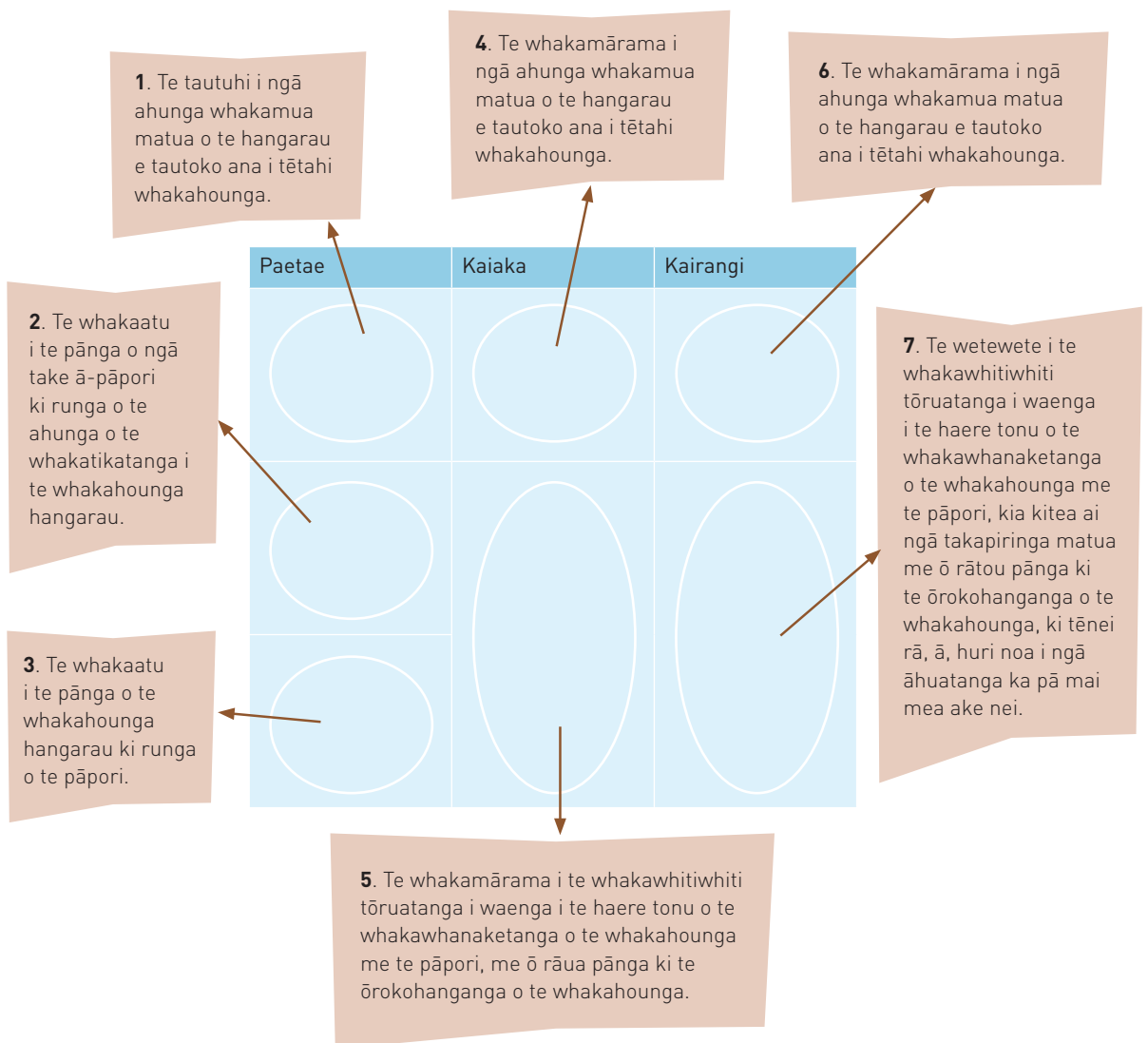
Te Aromatawai

He aromatawai i te tukanga hangarau me te whakamahi anō i ngā paerewa paetae

Paerewa Paetae 90051 (hei tauira)

Te whakaatu i ngā whakawhitiwhitinga i waenga i tētahi whakahounga hangarau me te pāpori.

Paearu Paetae



Paerewa Paetae 90051: Te whakaatu i ngā whakawhitiwhitinga i waenga i tētahi whakahounga hangarau me te porihanga

Ko tā te Paerewa Paetae, he āta whakaatu he aha ngā mea kia tutuki e kīia ai kua “eke paetae”, kua “eke kaiaka”, kua “eke kairangi” rānei te ākonga i runga i tēnā, i tēnā paearu ka whakarārangitia. Ko te “eke paetae” e tohu ana ka taea e te ākonga te mea e tohua ana i te taitara o te paerewa. I konei, ki te kīia kua eke paetae koe, e tohu ana tērā ka taea e koe te whakaatu i ngā whakawhitiwhitinga i waenga i tētahi whakahounga hangarau me te porihanga. Ko te kaiaka, e tohu ana kua neke atu i tērā te pai o tō kawae i ngā mahi, ā, ko te kairangi, koirā te mea pai katoa ka taea. (Kei raro nei te roanga atu o ngā kōrero mō tēnā, mō tēnā.)

E **eke paetae** ai koe, me tutuki pai i a koe:

- te tautohu i ngā ahunga whakamua matua o te hangarau e noho tūāpapa mai ana ki tētahi whakahounga;
- te whakaatu i te pānga o ngā āhuatanga pāpori ki te ahunga o te tārainga o te whakahounga hangarau;
- te whakaatu i te pānga o te whakahounga hangarau ki te porihanga.

He paerewa paetae mōwaho tēnei, nō reira mā tō kaiako koe e ārahi kia tutuki ai i a koe ngā mea e tika ana.

Mō te paerewa paetae 90051, ina mātakitaki koe i te kōpae ataata me te pānui i ngā kōrero e hāngai ana, mā tō kaiako koe e ārahi ki te whakatutuki i ngā paearu, me te whakamahi anō i Te Anga Whakaū Māramatanga ki te Tukanga Hangarau. Āta whakaarohia te pāmu hau i a koe e tiro tiro ana i ngā paearu. Tērā pea ka ahu mai ō whakaaro i te kaupapa tonu, tērā rānei ka whakamahia ētahi o aua kōrero hei toro i tētahi atu mea e noho whanaunga ana ki taua kaupapa.

Hei ārahi i a koe:

Ngā paearu	Te Anga Whakaū Māramatanga ki te Tukanga Hangarau (tautohua ngā wāhanga o te anga ka āwhina i a koe ki te whakatutuhi i tēnei paerewa paetae – hei tauira kei raro nei)
Te kōwhiri i tētahi whakahounga	Ngā tauira, ngā taonga, me ngā punaha hangarau
Te tautohu i te ahunga whakamua matua o te hangarau e noho tūāpapa mai ana ki tēnei whakahounga	Ngā āhuatanga matua o te hangarau me ngā otinga hangarau
Te tautohu i ngā āhuatanga pāpori e pāpā ana ki te whakahounga	Ngā mōhiotanga o ngā tūpuna
Te whakaatu i te pānga o ngā āhuatanga pāpori ki te ahunga o ngā whakahounga	Ngā mōhiotanga o ngā tūpuna Te pānga ki te iwi
Te whakaatu i te pānga o te whakahounga ki te porihanga	Te pānga ki te iwi



E eke kaiaka ai koe, me tutuki pai i a koe ngā mea o runga ake nei, me ēnei anō:

- te whakamārama i ngā ahunga whakamua matua, taha hangarau nei;
- te whakamārama i ngā whakawhitiwhitinga i waenga i te ahunga whakamua tonu o te whakahounga me te porihanga.

Ko te rerekētanga o te eke paetae i te eke kaiaka, ko te āhei ki te whakamārama i ngā whakawhitiwhitinga i waenga i te ahu whakamua tonu o te whakahounga me te porihanga.

E eke kairangi ai koe, me tutuki pai i a koe ngā mea o runga ake nei, me ēnei anō:

- te tātari i ngā whakawhitiwhitinga i waenga i te whakahounga me te porihanga;
- te whakatau i ngā āhuatanga matua kua pā me te pānga o ēnei ki te whanaketanga o te whakahounga āiane, ā, mau ake nei.

Ko te rerekētanga o te eke kaiaka i te eke kairangi, ko te āhei ki te tātari.

He Kupu Taka

ahunga whakamua matua o te hangarau	key technological advances
ōrokohangahanga	evolution
Paerewa Paetae	Achievement Standard
take ā-pāpori	societal factors
tautuhi	identify

wetewete	analyse
whakaatu	describe
whakahounga	innovation
whakamārama	explain
whakawhitiwhiti tōruatanga	two-way interaction







He Kupu Taka

āhua ā-mahi	<i>technique</i>
arotake	<i>evaluate</i>
arotautanga	<i>optimisation</i>
auaha	<i>creative; innovative</i>
hangarau kai	<i>food technology</i>
hangarau koiora	<i>biotechnology</i>
hangarau whakatina	<i>control technology</i>
hapori	<i>community</i>
hinengaro auaha	<i>ingenuity</i>
hiranga	<i>excellence; superior</i>
hātepe/tukanga	<i>process</i>
hoahoa	<i>design</i>
huarahi wātea	<i>opportunity</i>
kawenga	<i>activity</i>
kiritaki	<i>customer; client</i>
kirihou	<i>plastic</i>
koiora	<i>biology</i>
konganuku	<i>metal</i>
korehāhā	<i>extinct</i>
kōwhiri	<i>select</i>
kounga	<i>quality</i>
māia	<i>confidence</i>
matatika	<i>ethics</i>
mātau	<i>know; understand</i>
matū	<i>material</i>
matū waihanga	<i>synthetic material</i>
mauroanga	<i>durable</i>
ohaoha	<i>economics</i>
pāpā	<i>impact</i>
pāpori	<i>social</i>

parahau	<i>justify</i>
paturopi	<i>antibiotics</i>
pūhanga manawa	<i>mechanical</i>
pūkenga whakahaere mahi	<i>project management skills</i>
pūnaha	<i>system</i>
rauropi	<i>living organism</i>
rautaki	<i>strategy</i>
rawa	<i>resource; material</i>
rawa ora	<i>living material</i>
rerehua	<i>aesthetically pleasing</i>
tāhiko	<i>electronics</i>
taukumekume	<i>debate</i>
tautohu	<i>identify</i>
tauwhāiti	<i>specific</i>
tikanga haumaruru	<i>safety procedure</i>
toitū	<i>lasting; sustainable</i>
tōrangapū	<i>political; politics</i>
tūhura	<i>explore; investigate</i>
tukanga/hātepe	<i>process</i>
tuku mōhiohio	<i>information transfer</i>
urupare	<i>feedback; response</i>
utauta	<i>equipment</i>
whai kiko	<i>purposeful</i>
whai patanga	<i>purposeful; useful</i>
whaiaro	<i>personal</i>
whakaharatau hangarau	<i>technological practice</i>
whakahiato	<i>develop</i>
whakatairanga	<i>promote</i>
whakataurite	<i>compare</i>
whakawhanake	<i>develop</i>



Te Kāwanatanga o Aotearoa

