A7-OC01230

ĀMUA AO INITIATIVE

ENGINEERING YOUNG MĀORI MINDS

EVALUATION REPORT

PŪHORO & NZQA PARTNERSHIP

DEC 2020

Āmua Ao

NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

QUALIFY FOR THE FUTURE WORLD
KIA NOHO TAKATŪ KI TŌ ĀMUA AO!

PŪHORO
he waka eke noa

Naomi Manu - Pūhoro STEM Academy Director

This year without question, has been one of extreme challenges. With the advent of the novel Covid-19 virus, significant disruptions have taken place across the professional, domestic, and industrial landscapes of Aotearoa and the world.

In April of this year, we had planned through the support of NZQA to travel once again on our annual Āmua Ao overseas experience offshore. This year we selected Silicon Valley in San Francisco and a group of fifteen outstanding Year 13 Māori students - to experience first-hand leading companies in the science and technology space there. Furthermore, the tangata whenua of the Bay area were positioned to greet us, so we could exchange and build upon the uniqueness of our traditions and tikanga as indigenous peoples of our lands. Sadly, with the advent of Covid accelerating through the world during that period of time, we cancelled the trip and were able to create an additional EYM event in the Hawke's Bay region in lieu of this through NZQA support.

I am extremely proud that through our on-going relationship with NZQA we were able to pivot accordingly, add another EYM event into the 2020 calendar and once again deliver the unique experience to our rangatahi that is 'Engineering Young Māori Minds' in spite of the adversity that impacted our delivery of our Āmua Ao international initiative this year.

With all that has transpired in 2020, we express our gratitude and thanks to NZQA. Their support of our Āmua Ao initiatives over the years, has made it possible for us to design, create and implement together meaningful opportunities in science and engineering for our rangatahi to experience. Which are fundamentally by Māori, for Māori and connect to us as Māori. Their support gives voice to the whakatauki, Nāu te rourou, Nāku te rourou ka ora ai te iwi. From all of the team here at Pūhoro, we thank you!

Evaluation Report

This report fulfils milestone reporting requirements to the New Zealand Qualifications Authority (NZQA) for the 2020-2021 period agreement.

This report summarises information regarding:

a) A brief overview of the Āmua Ao San Francisco arrangements made before cancellation

b) An overview of Engineering Young Māori Minds events that took place in 2020, school participation and variances, and the six challenges created

c) A breakdown of the evaluation approach that took place across the EYM events and the initial results that have emerged from this

d) Teacher initial feedback with quotes and commentary

Āmua Ao 2020

Āmua Ao - San Francisco 2020 (cancelled)

An incredible amount of background work was completed in preparation for the annual overseas Āmua Ao experience in 2020. Fifteen Pūhoro Year 13 students were selected to participate in the trip from partner schools in Auckland, Palmerston North and Ōtaki. The following companies were contacted and through negotiation confirmed as hosts for the proposed travelling group of rangatahi and Pūhoro staff:

1. Tesla – San Francisco Factory
2. Facebook Headquarters
3. Google Headquarters
4. NASA Ames Research Laboratory – Multi-centre private group tour
5. Stanford University – Tour and session with School of Engineering
6. APPLE Headquarters – Special session with the Dean of Apple University
7. Levi Strauss
8. Allbirds San Francisco
9. Hosting with the Ohlone Indigenous people of San Francisco Bays – Cultural Exchange

Due to Covid-19 this overseas experience was cancelled. All of the above organisations have confirmed that in future should we return, they would be happy to host us. Now that contacts have been established we are well-positioned to explore these options as appropriate in the future. Due to this cancellation, NZQA reallocated support towards an additional EYM event held in the Hawke's Bay.

Āmua Ao - Engineering Young Māori Minds (EYM) 2020

Four (4) EYM day events were held in South Auckland, Palmerston North, Christchurch and Hastings in 2020. **Six hundred and thirty-two (632)** Year 9 and 10 rangatahi registered for the EYM events with **five hundred and three (503)** Year 9 and 10 rangatahi attending the events across the four locations (including a mini-EYM event held separately at Palmerston North Boys' High School). **Thirty-three (33)** schools attended the EYM events (including seven kura kaupapa Māori), and students participated in a set of six new pūrākau-based hands-on STEM challenges created by Pūhoro for the 2020 events.

This is now the second year that EYM has been realised through NZQA support, with an additional event this year held in Hastings for the first time. The Hawke's Bay is a new region for Pūhoro and the launch of the programme coincided with their inaugural EYM event.

EYM School Participation

The following breakdown provides detailed data around school participation in the 2020 EYM events.

SOUTH AUCKLAND EYM | WED 28 OCT 2020

KURA	INVITED	CONFIRMED INTEREST	REGISTERED #'S	ATTENDED #'S
Alfriston College	✓	✓	17	15
Auckland Girls' Grammar School	✓	✓	17	17
Mangere College	✓	✓	30	17
Manurewa High School	✓	✓	16	12
Onewhero High School	✓	✓	10	10
Pukekohe High School	✓	✓	16	9
Puutake Te Waahanga Māori James' Cook High School	✓	✓	18	17
Rosehill College	✓	✓	24	22
TKKM o Mangere	✓	✓	27	20
TKKM o Ngā Maungarongo	✓	✓	12	5
Waitākere College	✓	✓	16	14
		TOTAL	203	**158**

MANAWATŪ EYM | FRI 30 OCT 2020

KURA	INVITED	CONFIRMED INTEREST	REGISTERED #'S	ATTENDED #'S	COMMENTS
Awatapu College	✓	✓	18	17	
Feilding High School	✓	✓	37	31	
Freyberg High School	✓	✓	15	13	
Makoura College	✓	✓	11	7	
Mana Tamariki	✓	✓	6	5	
Ōtaki College	✓	✓	6	6	
TKKM o Tupoho	✓	✓	6	6	
Tai Wānanga Tu Toa	✓	✓	31	22	
Palmerston North Boys' High School	✓	✓	*28*	*21*	*Students attended EYM mini event held at their school.*
Palmerston North Girls' High School	✓	✓	*0*	*0*	*Pulled out from event late, citing double*

					booking with other school event.
Hato Paora	✓	✓	*0*	*0*	*Expressed keen desire to attend then became unresponsive to follow up communications.*
St Peters' College	✓	✓	*0*	*0*	*Unable to attend due to no teacher supervision available. Explored parent supervision instead but school was unable to secure parents.*
		TOTAL	158	**128**	

HAWKE'S BAY EYM | THURS 5 NOV 2020

KURA	INVITED	CONFIRMED INTEREST	REGISTERED #'S	ATTENDED #'S	COMMENTS
Karamu High School	✓	✓	22	20	
Napier Girls' High School	✓	✓	18	21	
Sacred Heart College	✓	✓	13	11	
Tamatea High School	✓	✓	20	11	
Te Ara Hou	✓	✓	23	22	
TKKM o Ngāti Kahungunu o Te Wairoa	✓	✓	17	11	
Wairoa College	✓	✓	23	10	
TKKM o Whare Tapere	✓	-	*0*	*0*	*No response to comms.*
		TOTAL	136	**106**	

CHRISTCHURCH EYM | THURS 26 NOV 2020

KURA	INVITED	CONFIRMED INTEREST	REGISTERED #'S	ATTENDED #'S	COMMENTS
Avonside Girls' High School	✓	✓	27	26	
Cashmere High School	✓	✓	24	21	
Linwood College	✓	✓	30	21	
Riccarton High School	✓	✓	17	16	
Shirley Boys' High School	✓	✓	22	13	
Te Pa o Rākaihautū	✓	✓	15	14	

Christchurch Girls' High School	✓	✓	*0*	*0*	*Unable to attend due to double booking with a school event. Interested in 2021.*
Te Kura Kaupapa Māori o Te Whānau Tahi	✓	✓	*0*	*0*	*Confirmed interest and keen to attend. Senior leadership decided to exit the Pūhoro programme and did not send a student group accordingly.*
Rangiora High School	✓	✓	*0*	*0*	*Unable to attend due to suicide in junior school that week. Interested in 2021.*
Burnside High School	✓	✓	*0*	*0*	*Sent two teachers to scout out the event. Confirmed attendance for 2021.*
Kaiapoi High School	✓	-	-	-	*No response to comms.*
		TOTAL	**135**	**111**	

EYM Attendance Variance

Due to unexpected reasons, a number of schools across the different EYM regions were unable to attend after confirming their attendance. These variances impacted our ability to reach our contractual obligations of a minimum of 150 rangatahi Māori present at each event (we were prepared accordingly to receive a maximum of 180 rangatahi Māori at each event). To explain these variances, please find the following school explanations provided by region:

Manawatū Region

1. **Palmerston North Boys' High School**

Palmerston North Boys' High School were unable to attend the EYM event and in 2021 will be adding a large cohort of 40 year 11's into the programme. Because of previous attendance at EYM, they requested if special permission could be given to hold a mini-EYM event at their school. After deliberation, Pūhoro staff ran a mini-EYM event for 21 Year 10 rangatahi where they could engage in two out of three challenges offered.

2. **Hato Paora College**

Hato Paora College have been incredibly supportive of Pūhoro events. They confirmed their interest to attend and were keen to bring a cohort. They then became unresponsive to follow up communications, which was unusual. Pūhoro staff will find ways to engage further to see if there is a way to ensure secure their attendance in 2021.

3. **Palmerston North Girls' High School**

In the final stages of EYM preparation, Palmerston North Girls' High confirmed they were unable to attend citing that they were double booked. They have also shown incredible support towards the programme and are highly engaged in Pūhoro initiatives. We hope to ensure their attendance in 2021.

4. **St Peter's College**

St Peter's College was incredibly motivated to attend EYM this year. In the final stages of EYM preparation they confirmed they were unable to attend as no teachers were available to supervise at the event. We requested they check if any parents would be able to supervise their cohort instead, which they were keen to explore. Furthermore, we reiterated the safety of the event and our Risk Assessment Management protocols in place, and offered to supervise their students ourselves if parent supervision was untenable.

Unfortunately, no parents were able to support, and the school was unwilling to allow us to supervise them solely.

Hawke's Bay Region

Hawke's Bay is a new region for Pūhoro. As such we determined to host an EYM in the region to coincide with the Pūhoro launch of the programme there. We anticipate off the back of the EYM we held that more interest will be generated in future. We hope to invite more schools to attend in 2021 to maximise the event's reach amongst our rangatahi.

Christchurch Region

1. **Rangiora High School**

Rangiora High school offered their apologies at a late stage due to an extreme occurrence in their junior school which had severely affected their students. This was the first time they were invited to attend EYM. They will be invited again in 2021.

2. **Burnside High School**

Burnside High School were unable to attend however they sent two science teachers, including their Head of Department of Junior Science, to scout the event. After conversations and being impressed with the nature and uniqueness of the event, they committed a cohort to attend in 2021.

3. **Te Kura Kaupapa Māori o Whānau Tahi**

Te Kura Kaupapa Māori o Whānau Tahi were keen to attend the event this year but due to mitigating circumstances were unable to. Furthermore, their management made the decision to withdraw from the 2021 Pūhoro programme.

4. **Christchurch Girls' High School**

Christchurch Girls' High were extremely apologetic and informed us very late in the final stages of EYM preparation that they were unable to attend due to a double booking with a school activity. They had supposed we had been informed but after follow up communication from us, it transpired that this was not the case. We will invite them again in 2021.

EYM Challenges Overview

Six new challenges were created by Pūhoro which built upon the learnings gleaned from the initial challenges designed for the 2019 EYM events. These challenges sought to achieve the following outcomes:

1. Connect rangatahi to Māori pūrākau narratives
2. Bridge together pūrākau and STEM to expand rangatahi perspectives on science
3. Are hands-on, fun and engaging and can be delivered within a short amount of time
4. Utilise cost-effective materials, that can easily be sourced and reused as required

The following table gives a brief overview of the suite of challenges created in 2020, including the associated task and the pūrākau narrative it connects to:

CHALLENGE NAME	DESCRIPTION
1) Māui me Tamanui-te-rā	Rangatahi were challenged to construct a free-standing, air-powered cannon using just cardboard tubing, pegboards, doweling, and an air blower to provide the firing power. The cannon had to be able to fire a ping pong ball to be caught in 3 separate flax baskets at different distances, and then rearranged to be able to levitate the ping pong ball for as long as possible. This challenge represented the capturing of Tamanui-te-ra with harakeke ropes and how Māui forced the sun to slow down.
2) Te Wehenga o Rangi rāua ko Papatūānuku	Rangatahi were required to design and build their own hydraulic scissor lift using Engino blocks, syringes, cable ties and tubing. Rangatahi received a small platform for the top of their scissor lift representing Rangi. Points were awarded based on how tall the scissor lift was able to extend and how much weight could be added onto the platform to test the strength of the structure. This challenge represented Tāne extending forth his legs to separate Rangi from Papa and the weight of Rangi and Papa's love that continually endeavours to bring them back together.
3) Whiro me Te Aitanga Pepeke	Rangatahi were challenged to design, name and build their own robotic insect using craft materials (popsicle sticks, rubberbands, doweling etc.), a battery pack and DC motor. The insect was then tested for movement and speed by seeing how far it could travel through 12 outlined sections on a testing table in one minute. This challenge represented the insect army of Whiro travelling through the 12 realms of the heavens as they tried to thwart Tāne's attempt at retrieving ngā kete o te wānanga.
4) Te Hekenga o Kupe	Rangatahi were required to construct a vehicle out of icecream containers, skewers, straws, paper and wheels, that could be propelled by air over both land and water. The vehicle was tested to see how much it weighed and then how far it could travel on land and in a paddling pool of water. This represented the way in which Kupe was able to use the tides and winds to complete his journey to Aotearoa as he and his crew chased after Te Wheke o Muturangi.
5) Te Pakanga o Okatia	Rangatahi were challenged to build a working trebuchet out of a kitset and use its adjustable components (height, length, weight) to aim projectiles at a foam block wall, with the aim of breaking it down completely. This challenge represented Okatia's strength and power as he smashed his way through the mountain that blocked his journey to discover where Tamanui-te-rā travelled

	every day – a journey which laid the foundation of the Manawatū river and resulted in the Tararua and Ruahine ranges being formed.
6) Te Āpiti o Okatia	Rangatahi were required to create a water filter by piecing together a water pump (including a DC motor) with a clear plastic filtration pipe, and using natural resources (stones, moss, leaves etc.) within the pipe to create an effective filter with the ability to suspend particles out of water. Points were awarded on the water filter's ability to pump water in an upward movement and to successfully purify the water. This challenge represented the upward movement of the Manawatū river as it crosses from one side of the Tararua ranges to the other – a feat attributed to Okatia's travels - and the ever-growing necessity for water purification in sustaining life.

EYM Evaluation Overview

To strengthen our evaluation approach, we formed an evaluation rubric[1] with NZQA to help measure the impact of EYM.

Our approach centred on gathering data to help us understand and quantify the following metrics:

1. To determine whether the event helped **to inspire students to study STEM**
2. To determine student **enjoyment of the challenges** in order to inform how we can continually develop EYM events that remain engaging for rangatahi
3. To collect **qualitative data** based on teachers' observations, impressions and learnings from the event
4. To collect **qualitative data** based on participant's personal experience, impressions and learnings within the event

These specific focal points of enquiry have been designed in the approach to help us gather some understanding and perspective around what students and teachers are experiencing through EYM events. With both quantitative and qualitative data being sought at each event together, it gives us a clear snapshot as to how these events are received.

As EYM events occur once a year over the course of a day only, it is difficult to measure the long-term impact on rangatahi attitudes and their desire to pursue STEM. With that in mind, our evaluation rubric offers a post-event evaluation which seeks to determine the following:

1. To measure the **impact of EYM on Pūhoro enrolments**
2. To provide futher insight into the **impact of EYM on rangatahi engagement in STEM/Pūhoro**

This is achieved firstly by determining how many EYM attendees transitioned into the Pūhoro program. Secondly, we will survey teacher attendees again in 2021 to determine whether they have discovered or observed further impacts that the event had on their rangatahi who attended. These post event analysis findings will be presented in the final overall NZQA/Pūhoro report delivered in 2021.

[1] See Appendix 1

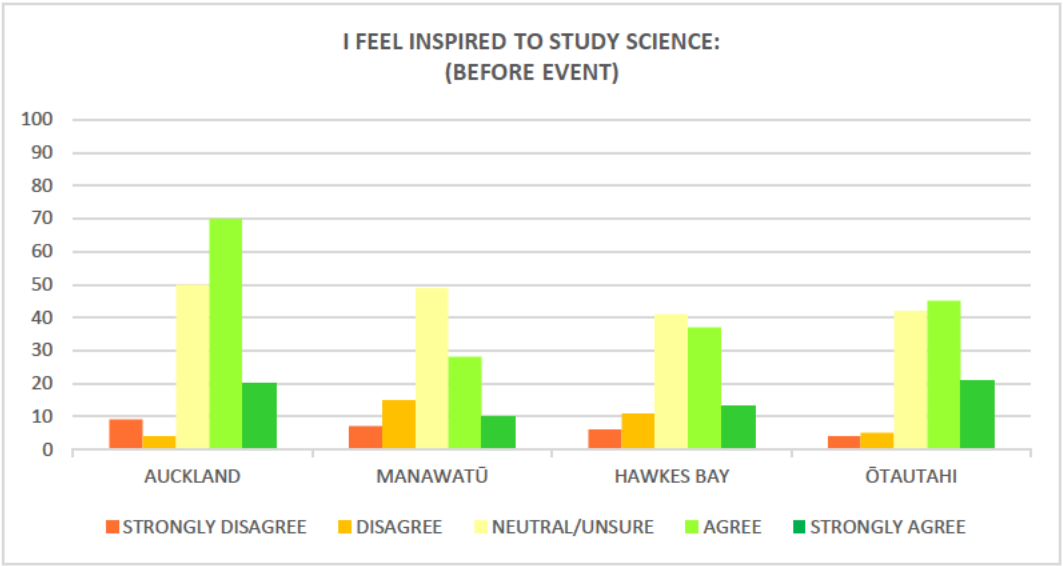
Evaluation Findings

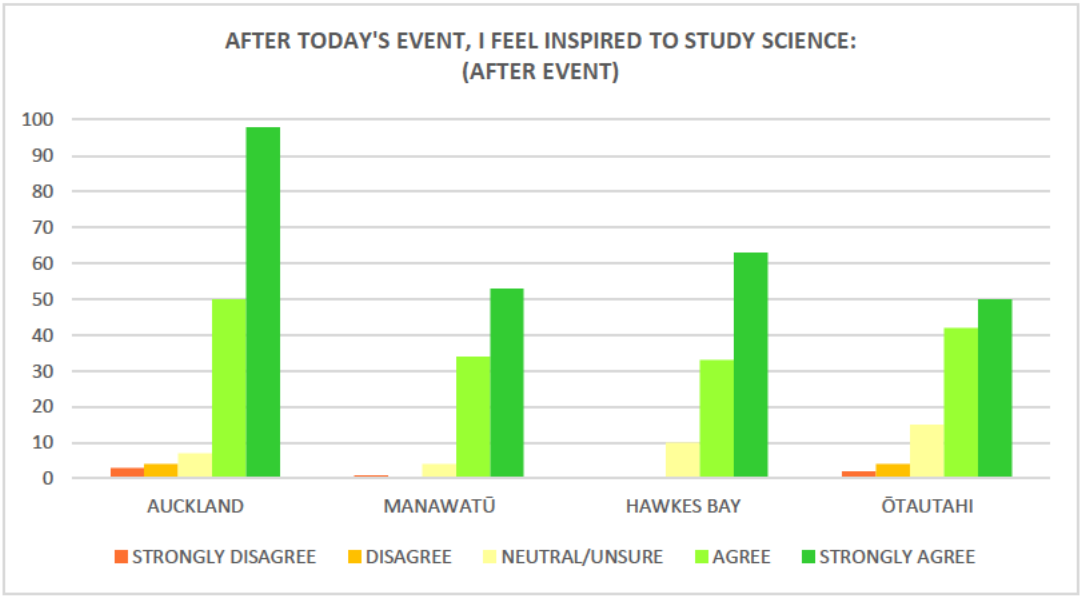
This year, the evaluation process for each EYM event was three-fold. Firstly, a bespoke 'Emoji Token Box' was created to gather rangatahi responses to a key statement. Rangatahi responded to the same key statement on entry before the event, and again on leaving the premises at the end of the day. The second approach invited rangatahi to rate how much they enjoyed each of their challenges and the third approach sought to survey teachers to understand their perspective on EYM. Finally, video interviews were conducted with rangatahi to gather qualitative data around their observations of the event.

The following data summarises the approach, and analysis/findings from these four approaches described:

Approach 1 – Emoji Token Box

The following two tables display rangatahi responses to a statement, once before the event had begun and again at the conclusion of the event. The two questions posed were *"I feel inspired to study science"* at the beginning of the event, and *"After today's event, I feel inspired to study science"* at the conclusion.





Approach 1 - Analysis

This approach was used to see if the EYM event caused a *shift in inspiration towards studying science*. The results from this approach are significant. All four regions demonstrated a seismic shift in inspiration towards studying science after engagement at the EYM events.

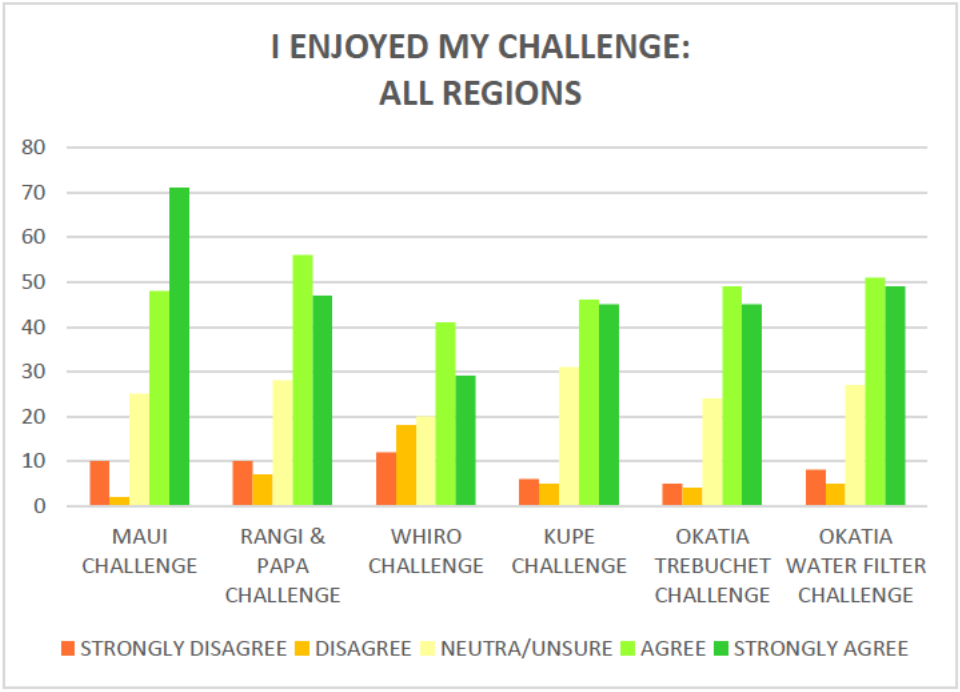
Three other significant shifts emerged from the data. Firstly, the EYM events appeared to influence most impactfully those rangatahi who were initially neutral or unsure in how they felt about science. To begin with, 37% of all rangatahi over the four regions were neutral/unsure in their responses to the key statement. After the event, only 8% of all rangatahi who participated in EYM remained neutral/unsure which demonstrates the event's effectiveness in inspiring rangatahi to study science.

Secondly, only 13% of all rangatahi felt strongly inspired to study science at the beginning of the EYM events. After the events, 56% of all rangatahi felt strongly inspired to study science which again demonstrates a significant increase.

Thirdly, when looking at the positive responses (agree/strongly agree) in general, 50% of all rangatahi felt inspired to study science to begin with. By the end of all four events, a significant 89% of rangatahi now felt inspired to study science, clearly showing how engagement in EYM events positively impacts rangatahi attitudes towards science.

Approach 2 – Challenge Enjoyment Token Box

The second approach centred on understanding rangatahi enjoyment of the six challenges that had been created for EYM in 2020. This helps us ensure our challenges are engaging, and furthermore, supports us in our development of future challenges. Rangatahi engaged in two challenges throughout the day and rated them on conclusion by placing a token to indicate the appropriate emoji in response to the key statement "*I enjoyed my challenge".* The following table demonstrates rangatahi enjoyment of each of the six challenges collectively across all four regions.



Approach 2 - Analysis

As indicated, enjoyment across each of the challenges was considerably high. Some challenges were rated more highly in terms of the enjoyment factors (Agree/Strongly Agree) and across each of the challenges, the dissatisfaction was comparably low (Disagree, Strongly Disagree). Overall, out of the responses received, 70% rated their enjoyment within the 'Agree/Strongly Agree' categories. This result indicates that our goal to achieve certain challenge outcomes is being met.

One thing to note is the relative consistency across the challenges of rangatahi rating their enjoyment as 'neutral'. The Māui challenge which had the highest overall 'enjoyment' metric, also had one of the lowest 'neutral' ratings. This information could help to inform future challenge creation by replicating or adapting the elements from high enjoyment challenges to see if this decreases the neutral rates experienced.

Approach 3 – Teacher Voices

All teacher attendees at each EYM event were asked to respond to the following questions:

1. *What has been one of your highlights from this event so far?*
2. *How do you feel EYM has been beneficial for your tauira?*
3. *What differences, if any, have you noticed about your tauira in terms of their engagement with STEM at school and at this event?*
4. *Any other observations or comments you would like to add?*

See below survey questions with a selection of responses received from teachers across the EYM events:

1. ***What has been one of your highlights from this event so far?***

Teacher response was overwhelmingly positive and they were able to clearly articulate their highlights and observations of the EYM events. Teachers mentioned the hands-on, fun and interesting nature of the challenges as being a highlight and that their student's levels of engagement were high during the event. Importantly, they also noted the connection between the activity and pūrākau Māori as a highlight, which was reflected consistently across different regions.

"More hands-on engagement, seeing ways to combine STEM and culture" – Science teacher, Waitakere College, Auckland

"My kids realising science and math is fun and applicable" – Kaiako, Te Pā o Rākaihautū, Christchurch

"Seeing the students working together to solve problems" – Teacher, Linwood College, Christchurch

"Exposure to science and engineering through a Māori perspective. Watching our kids get excited and proud at what they accomplished" – Kaiako, Te Kura Kaupapa Māori o Ngāti Kahungunu o te Wairoa, Hawke's Bay

"Kōrero pūrākau being the foundation of the learning" – Head of Department Science, Te Kura Kaupapa Māori o te Ara Hou, Hawke's Bay

"Ngā ngohe, kia whakarite, te whakamārama i te ngohe, me te pūrākau, hei whakapiki ki te ao Māori" – Kaiako, Te Pūtake, Auckland

"Attaching pūrākau/hītori Māori to each activity and seeing all tauira striving to achieve the challenges, WHAKAWHANAUNGATANGA!" – Head of Māori Mentoring, Feilding High School, Palmerston North

2. How do you feel EYM has been beneficial for your tauira?

Teachers comments across the regions focused on several key themes. Firstly, that the environment was positive and Māori centred, secondly, that in spite of any apprehension or doubts around their own capacity to achieve, students pushed through these barriers and were able to succeed and achieve at the EYM challenges. Finally, it was noted by teachers how the challenges aided in the learning of scientific principles.

"Confidence boosting, they saw that they could successfully create things that may have seemed out of reach. Non-threatening environment" – Assistant HOD Science, Awatapu College, Palmerston North

"EYM has enabled the tauira to think differently from how they think at school in their science lessons. The experience has been priceless!" – Teacher, Ōtaki College, Palmerston North

"It's opened their minds up, shown them new experiences that they may have thought they couldn't do" – Māori Liaison officer, Linwood College, Christchurch

"Having students learning in a Māori environment. (Māori first environment). Students seeing science as Māori" – Teacher, Linwood College, Christchurch

"I think many of them are surprised by their ability to solve the challenges, many have underestimated their abilities…they have been able to relax and enjoy due to the large numbers of other students and they are all among Māori" – Science teacher, Rosehill College, Auckland

"I think it creates a lot of thinking amongst the tauira. A solution can be created with a bit of trial and error. Sciences can be fun and with student's creativity and encouragement will overcome some of the barriers of science learning" – HOD Science, Mangere College, Auckland

"The students realising that science <u>is for them too.</u> The hands-on approach is also great fun!" – Head of Faculty, Karamu High School, Hawke's Bay

"Allowing students to work together, meeting new friends, whakawhanaungatanga. Developing skills to meet scientific challenges" – HOD Māori, Wairoa College, Hawke's Bay

3. ***What differences, if any, have you noticed about your tauira in terms of their engagement with STEM at school and at this event?***

This question provided an insight into rangatahi engagement with STEM as experienced through teacher's observations at school and then directly compared to their behavioural observations with the same rangatahi during the EYM challenges.

"I now have students approaching me, wanting to find out how to get into this programme" – Head of Faculty, Karamu High school, Hawke's Bay

"We don't have STEM per se but we believe that they are more engaged here at this event than they are at Maths or Science at our kura" – Te Reo Māori me te Pūtaiao Kaiako, Napier Girls High School, Hawke's Bay

"It's amazing to see how engaging they are at this event. Activities that are fun challenges, thinking and hands on motivate their enthusiasm to work to find a solution" – HOD science, Mangere College, Auckland

"Being the year it has been, gauging benefit has been difficult. However, in the context of today, they are really enjoying the activities. Thank you for the thoughtful planning and coordination" – Teacher, Onewhero High school, Auckland

"My tauira are always open-minded to give anything a crack however, the more that any task/activity is inclusive of kaupapa Māori, the keener my tauira become to get involved. Ko rātou ngā rangatira mō āpōpō otirā mō nāianei'" – Head of Mentoring Māori, Feilding High School, Palmerston North

"I've noted their confidence grow in willingness to tackle a challenge. A massive problem has been too whakamā to give something hard a go. Self-doubt. This is changing!" – Director of Innovation, Tai Wānanga Tū Toa, Palmerston North

"Engaged for longer periods of time" – Health and PE teacher, Linwood College, Christchurch

"Very high level of engagement compared to at school" – Science teacher, Avonside Girls' High School, Christchurch

Teachers across the regions commented on how they noted positive engagement from their students at EYM events, and in some cases saw a clear distinction of improved engagement at EYM as opposed to at school. Furthermore, teachers reiterated how engaging and relevant to rangatahi the challenges were which seemed to increase rangatahi engagement at EYM.

4. Any other observations or comments you would like to add?

Teachers were invited to offer further comments regarding EYM. Not all teachers responded to this question however a selection of responses are outlined below.

"One of our tauira said she wished this could happen more frequently, and maybe even include year 11 as well earlier in the year" – Kaiārahi admin kaiāwhina, Te Pā o Rākaihautū, Christchurch

"Lots of positive energy from the presenters. Overall a very positive and well worthwhile experience on all levels. Learning about the kauri and whales and that whakapapa has really piqued my interest hugely, I'm on it!!" – Assistant Head of Faculty Science, Karamu High School, Hawke's Bay

"This day has been worth the effort of getting our tauira to attend. Māori mana is embraced and tikanga often comes through the agenda on the day, and how much passion comes through each and everyone involved today. Ngā mihi nui ki a koutou katoa" – Teacher, Ōtaki College, Palmerston North

"Creating at the speed of thought is fun! Every table I look at students are talking, smiling, laughing, creating. Ngā mihi nunui ki a koutou!" – Kaiako, Te Pūtake, Auckland

Approach 4 – Rangatahi Voices

Rangatahi across each region were interviewed to help ascertain their impressions, learnings, and experiences at the EYM events. Overall, rangatahi expressed their enjoyment at the EYM events and referenced different parts of the day that stood out to them. Some highlights that emerged from rangatahi, included the opportunity to interact with different schools, the chance to have fun, the ability to open up to science and achieving in the different challenges:

_____, a Year 10 student from Auckland Girls' Grammar said:

"A highlight was working with my mates, meeting people from other schools and experiencing something new"

_____ a year 10 student from Alfriston college commented that:

"My highlight for today was just being able to have fun!"

_____ a year 10 student from Te Pūtake said that:

"My highlight was opening up to science, the technology stuff is incredible and there was heaps of opportunity for Māori"

____ from Feilding High School in Palmerston North stated that his highlight was being able to achieve in the challenge:

"My highlight was making a bug and trying to get it to the other side of the table (Whiro Challenge)".

Other students who were interviewed echoed similar sentiments around a key highlight being the atmosphere and interacting with other Māori students. For example, ____ a Year 10 student from Sacred Heart in the Hawke's Bay said that, *"my favourite part was meeting everyone and socialising".*

Rangatahi were asked to describe if there was anything that they had learnt from the EYM event. _____ a year 10 student from Alfriston college stated that *"I learnt how to develop ideas".* ____ from Sacred Heart college in the Hawke's Bay commented that she learnt to *"work as a team and take on other ideas*". Another student from Karamu High school in the Hawke's Bay commented that for her something she learnt from EYM was, *"I learnt more Māori words, we don't speak Māori at home, so it was cool to become more immersed."* _____ a Year 10 student from Tū Toa Tai Wānanga in Palmerston North commented how *"I learnt to put a motor together".* This was something that had never been attempted before, and EYM provided a unique opportunity to try something new. Another student, ___ from Ōtaki College further emphasised this by saying that *"I like doing this stuff, we don't get to make catapults in class, and I won my challenge!".*

Rangatahi offered insight into how they viewed sciences before attending EYM, and how after attending the event if they could see themselves pursuing science throughout high school and into the future.

_____ from Pūtake in Auckland said how *"I had a little interest in science but today has really opened my eyes, it's given me a good opportunity to see what I want to be when I'm older".* _____ a year 10 student from Te Kura Kaupapa Māori ki te Wairoa echoed this by saying *"I mua i tēnei rangi kāore au i te tino rata ki ēnei momo mahi, engari, inaiānei, ka rata au".* When asked, both _____ and _____ from Auckland Girls' Grammar stated succinctly how participating in EYM had strengthened their desire to pursue STEM subjects at High school.

_____ from Mangere College stated how before the event his interest in science was somewhere near the middle of the road, and that after the event he had changed his mind in regard to his interest in pursuing science further. *"I was hesitant at first because I didn't know what it would be like, it was new to me, but I liked it at first and it just got better".*

_____ a Year 9 student from Feilding High School in Palmerston North stated that:
"Before today I didn't really like science because science at school is boring, today was mean as! Everyone was having fun and even I was having fun". from Tū Toa commented similarly when asked to describe his interest in science he said, *"I don't pay attention in science*!" When asked if EYM had prompted him to give more attention to the sciences, he responded that *"definitely, it's a challenge and I like challenges!"* _____ from Feilding High school, had a similar perspective *"I didn't like science as a class, but I like the making side of it and problem-solving side."* He also commented how he would keep doing science if Pūhoro were to keep coming to his school.

_____ from Karamu High School on the other hand, did have an interest and enjoyment in science before EYM particularly in Biology. However, she said that after EYM it had inspired her to pursue the sciences further, *"because when I first heard about Māori STEM, I had no idea what it was but after the first challenge it inspired me more to get involved".* Another student, _____ a Year 10 student from Napier Girls' High school also expressed that before EYM she had an interest and enjoyed the sciences, specifically Chemistry and Biology. After attending EYM the effect that it had was that *"It made me feel a lot more comfortable working and wanting to do science because sometimes you get a bit shy and think, I'm Māori I don't know if I want to do it."*

A comment of note emerged from [redacted] a year 10 student from Tamatea High school. He said that before EYM he had no interest or enjoyment in science. However, after the event he felt that it inspired him to pursue science further, *"because it talked about how science is important for us, because in school we are told* ***to do*** *science and not* ***why we do*** *science."*

Some final comments from rangatahi included the following:

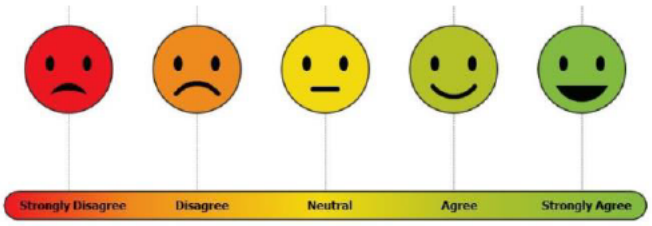
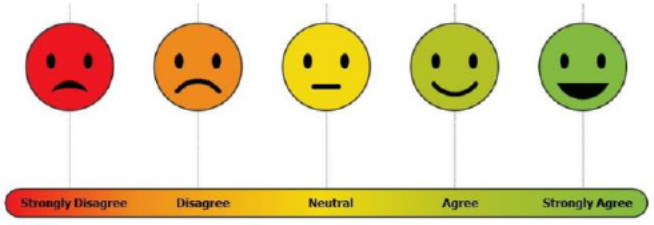
[redacted] from Karamu High school said that *"The environment is very up lifting, it's an enjoyable environment to be around, I want to stay here for longer".* [redacted] from Tamatea High school noted that something she enjoyed was *"working with people I don't usually work with".* She stated how perseverance was something she learnt, and her final thoughts were that it was *"beautiful to be around your own people and have fun".*

Overall, rangatahi interviews expressed a positive view towards the EYM events and they were enjoyed. From their comments, rangatahi expressed that after participating in EYM they had a greater desire to engage in STEM. Furthermore, a common element through the rangatahi interviews was how EYM affirmed their Māoritanga and identity. Finally, there was a clear view from rangatahi that STEM content delivered at school is very different to how they experience STEM at EYM events.

Conclusion

- Attendance at EYM helps to inspire rangatahi to pursue science.
- EYM challenges are engaging and fit for purpose as demonstrated by consistently high ratings from rangatahi across all four locations.
- Teachers and high school faculty view EYM in a positive light and as an important initiative which further strengthens rangatahi engagement in STEM.
- Rangatahi are more likely to perceive science positively after participating in an EYM event.
- Attendance variances were experienced across the regions. Further work and solutions are required to ensure participation levels on the day are maintained.

APPENDIX 1: Evaluation Rubric by NZQA and Pūhoro for EYM 2020

APPROACH	PURPOSE	METHOD
Before & After Snapshot	To determine whether the event helped to inspire students to study STEM	A single statement is posed to rangatahi **before** the event: I FEEL INSPIRED TO STUDY SCIENCE Rangatahi are asked to **rate their agreement** with the statement by posting a token in an emoji token box. A coloured token associated with the 'before' response is used (e.g. black) The following statement is then posed to rangatahi **after** the event: AFTER TODAYS EVENT, I FEEL INSPIRED TO STUDY SCIENCE Rangatahi then place a different coloured token associated with the 'after' response (e.g. white) into one of the emoji token boxes after the event. Responses on the token box as follows: 
Emoji Continuum	To determine student **enjoyment of the challenges** in order to inform how we can continually develop EYMM events that remain engaging for rangatahi	A single statement is posed to rangatahi after each challenge: I ENJOYED MY CHALLENGE Rangatahi are asked to rate their agreement with the statement by posting another token in an emoji token box. Rangatahi place a coloured token associated with their challenge (yellow, orange, red, blue, green or pink) into the appropriate emoji token box. 
Teacher Interviews	To collect **qualitative data** based on teachers' observations, impressions and learnings from the event	Ideally, 1x teacher per school (around mid point of event) is chosen to participate in a video/voice recorded interview. Conducted by Kemp Reweti, questions include: 1) Teacher intro (name, position, kura, iwi if applicable)

		2) What has been one of your highlights from this event so far? 3) How do you feel EYMM has been beneficial for your tauira? 4) What differences, if any, have you noticed about your tauira in terms of their engagement with STEM at school and at this event? 5) Any other observations or comments you'd like to add?
Student Interviews	To collect **qualitative data** based on participant's personal experience, impressions and learnings within the event	Minimum 1x Y10 student per challenge (in the second half of the day – more if time allows) are chosen by Kaihautū and/or teachers to participate in a video recorded interview. Conducted by Kemp Reweti, questions include: 1) Student intro (name, age, year, kura, iwi) 2) What has been one of your highlights from today? 3) What is something you've learnt today? 4) Before todays event, how would you describe your enjoyment and interest in science? 5) Has today inspired you to think differently about science? How? Why? 6) After today, could you see yourself pursuing science throughout high school and possibly into the future? 7) Any other observations or comments you'd like to add?

POST EVENT

APPROACH	PURPOSE	METHOD
Numbers/Data	To measure the **impact of EYMM on Pūhoro enrolments**	After the bulk registration period (which occurs early to mid Term 1), analyse Pūhoro enrolments against EYMM attendance to determine the transition rate to Pūhoro. Include findings in final evaluation report to NZQA.
Teacher Followup Questionnaire	To provide futher insight into the **impact of EYMM on rangatahi engagement in STEM/Pūhoro**	Email a follow up questionnaire, approximately 6 months post-event, to all teachers who attended EYMM. Questions include: 1) Many of your students who attended EYMM continued into the Pūhoro programme. How do you think EYMM helped your students transition into Pūhoro? 2) The following student(s) attended EYMM but did not transition into the Pūhoro programme. Could you please indicate whether they are currently studying NCEA Level 1 Science? 3) Did your students' engagement with EYMM cause a shift in their attitudes towards STEM? If so, please explain. 4) How else did the EYMM impact your students, if at all? 5) Do you have any other comments about EYMM 2020?

A8-OC01230

FINAL REPORT

PŪHORO & NZQA PARTNERSHIP

JUNE 2021

PŪHORO
he waka eke noa

NZQA
NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Āmua Ao

FINAL REPORT

This report completes Pūhoro reporting requirements to the New Zealand Qualifications Authority (NZQA) for the 2020-2021 period agreement.

The report summarises information regarding:

a. evaluation insights which pertain to Āmua Ao (EYM)
b. communication tools used to support Āmua Ao initiatives, and
c. a general overview of the impact of the Pūhoro programme on STEM participation and achievement.

ĀMUA AO DOMESTIC

Engineering Young Māori Minds (EYM)

Four EYM events were held in Manawatū, Tāmaki Makaurau, Ōtautahi and Te Matau a Māui in 2020. Five hundred and three (503) Year 9 and 10 rangatahi attended the events across the four locations. Thirty-two (32) schools attended the EYM events (including seven kura kaupapa Māori), and students participated in six pūrākau-based STEM challenges.

EYM was an initiative developed from scratch for the domestic delivery of Āmua Ao and has now run for two years in a row. 2020 was also the first time EYM was taken and delivered in Te Matau a Māui – Hawke's Bay which launched as the newest region for the Pūhoro programme at the time in November 2020.

EYM Case Study – Te Matau a Māui/Hawke's Bay

This case study provides a snapshot of how EYM has supported Year 10 Hawke's Bay attendees to transition into Pūhoro or, despite not joining Pūhoro, go on to take science at NCEA Level 1. The following table indicates the attendant schools at EYM in Hawke's Bay and the transition rate to Pūhoro/NCEA L1 science.

School Name	No. of Yr 10 students	Transition Rate to Pūhoro	Non-Pūhoro students' Transition Rate to Level 1 Science
Sacred Heart	11	100%	n/a
Wairoa	10	60%	100%
Napier Girls'	21	48%	100%
Tamatea	11	36%	14%
Karamu	20	35%	100%
Te Ara Hou *	7x Y10 3x Y11 1x Y12	73%	33%

**Te Ara Hou brought Y11 and Y12 tauira to primarily support the launch of Pūhoro. They subsequently stayed on for the EYM event and all have since joined Pūhoro.*

Table Analysis

Hawke's Bay data suggests that EYM had a generally positive impact on student transitions to Pūhoro and thus Level 1 science. Although this data provides a small snapshot, it does demonstrate a correlation between participation at EYM and engagement in Level 1 science at Year 11.

Teacher Survey

As part of the Hawke's Bay case study, teachers were surveyed to assess whether EYM may have caused a shift in student behaviour or STEM attitudes post-event, adding further depth to the EYM evaluation completed in 2020. The following demonstrates the post-event survey questions and some of the responses received.

1. *Do you have any thoughts or perspectives around how EYM may have impacted your students' views of STEM?*

Teachers commented on how they felt EYM impacted students' interest in STEM. One insight from a Wairoa College teacher was:

> *"Some students found out that science included many different fields. A couple of students said that the event day made them want to do science as a subject more"*

This was supported by observations from Te Ara Hou and Tamatea High School:

> *"Yes – I think a lot more tauira are more open/interested in STEM. [EYM had a] positive impact. Encouraged them and helped them consider all the options available to them"*
>
> *"Yes, students enjoyed trying to solve a problem, [they] felt a different energy that was fun"*

2. *Were there any other shifts that you may have seen around students' perceptions of science or any other positive impacts that may have come from EYM engagement?*

One insight into other positive impacts derived from the EYM event came from Wairoa students, where they embraced the opportunity to interact with other kura and recognise that many of their peers are experiencing the same things as them:

> *"EYM helped the students have an insight into Pūhoro. Also gave them an opportunity to interact with other students and find that the same issues facing them is the same for others"*

This point was also raised by a Tamatea High School teacher who highlighted what EYM brought to the table for their tauira and how that impacted them:

> *"Good fun activities and students had lots of fun interacting with like-minded students from other schools"*

3. *As a result of attendance at EYM, some/all of your students continued into the Pūhoro programme. In what ways do you think engagement in EYM helped your students transition into Pūhoro?*

A common narrative coming through teacher feedback was how EYM provided opportunities to build relationships with other tauira and schools before starting their Year 11 Pūhoro year. This supported tauira transition into Pūhoro as a natural progression in their engagement with each other and the sciences. This was highlighted by Te Ara Hou and Napier Girls' High School who explained:

"They had an opportunity to meet the staff and fellow Pūhoro tauira prior to their year beginning. Whanaungatanga is integral to building engagement so was awesome"

"Definitely, as they got a taster. They gained self-confidence working with the STEM activities and got to work collaboratively and meet ākonga from other kura"

This was supported by comments from Wairoa College and Tamatea High School who emphasised the importance of EYM events in supporting transition into Pūhoro:

"[EYM is] a necessary pre-requisite for entry into Pūhoro"

"Do it again"

EYM Summary

EYM is a single day event that occurs during school hours. EYM Hawke's Bay generated some positive impacts on Pūhoro transition rates and participation in STEM, however Pūhoro also recognises that much more than a one-day event is needed to influence the STEM pathway trajectories for rangatahi Māori in Year 9 and Year 10. As we grow the Hawke's Bay region and track our rangatahi there, we look forward to seeing the impacts from this event increase further. EYM attendance supports transition into NCEA Level 1 science, and more particularly, into the Pūhoro programme which further aims to increase student participation and achievement in STEM over time.

ĀMUA AO INTERNATIONAL

As previously reported, an Āmua Ao international trip for 2020 could not occur, furthermore in 2021 the option to go overseas was deemed untenable. However, rangatahi who have participated in these trips often have a higher transition rate into tertiary study than national Māori, non-Māori and even the general Pūhoro population.

Below are tables that continue to track the whereabouts of all past Āmua Ao participants including those chosen last year who were not able to go to San Fransisco, to gauge any on-going impact from Pūhoro and Āmua Ao participation.

ĀMUA AO 2020 COHORT (SAN FRANSISCO, USA - CANCELLED)	
[redacted]	Massey University – Bachelor of Environmental Science
[redacted]	Massey University - Bachelor of Food Process Engineering
[redacted]	Canterbury University - Bachelor of Engineering
[redacted]	Unitec – Performing Arts
[redacted]	NZDF - Training to become a Helicopter Pilot for the NZ Navy
[redacted]	Auckland University – Bachelor of Engineering
[redacted]	Pacific International Hotel Management School – Hotel Management & Commerce
[redacted]	Otago University – Bachelor of Commerce Majoring in Marketing and a Bachelor of Arts Indigenous Development & Minor in Sociology
[redacted]	Gap year, Bachelor of Psychology in 2022
[redacted]	AUT – Certificate of Applied Science
[redacted]	Auckland University – Bachelor of Science Microbiology
[redacted]	AUT – Bachelor of Health Science
[redacted]	Auckland University – Certificate in Health Science
[redacted]	Te Aho o Te Kura Pounamu – Rongoā (AUT – Bachelor of Health Science/Physiotherapy in 2022) Currently, involved in the NZDF
[redacted]	Employed in Logistics and Freight

Despite being unable to embark on this overseas trip, all of these rangatahi and their whānau expressed their sincere gratitude at being selected. As shown, 87% went on to transition into tertiary study and other learning. Of this group, 77% of them moved into STEM-related studies – a clear indication that these rangatahi were well deserving of their spot on the Āmua Ao trip and no doubt would have benefited from the experience.

ĀMUA AO 2019 COHORT (TAIWAN AND SINGAPORE)	
[redacted]	Canterbury University - Bachelor of Education
[redacted]	Massey University - Bachelor of Business Property
[redacted]	Massey University - Bachelor of Sport & Exercise
[redacted]	Massey University – Bachelor of Agricommerce
[redacted]	Massey University - Bachelor of Accountancy
[redacted]	Massey University – Bachelor of Animal Science
[redacted]	Otago University - Bachelor of Health Science
[redacted]	Massey University - Te Aho Tatairangi Māori Medium
[redacted]	Victoria University - Resource Management
[redacted]	NZDF (2020 info)
[redacted]	Gap Year (2020 info)
[redacted]	Gap Year (2020 info)
[redacted]	Employed
[redacted]	Employed (2020 info)
[redacted]	Employed (2020 info)

ĀMUA AO 2018 COHORT (HOUSTON, USA)	
[redacted]	Canterbury University - Bachelor of Science
[redacted]	Otago University - Bachelor of Applied Science and Activity and Health Major and a Sport and Nutrition Minor
[redacted]	Auckland University - Bachelor of Medicine and Surgery
[redacted]	Victoria University - Bachelor of Marine Biology
[redacted]	Auckland University - Bachelor of Law & Engineering
[redacted]	Canterbury University - Bachelor of Engineering
[redacted]	Auckland University - Bachelor of Health Science
[redacted]	UCOL - Electrical Engineering (2020 info)
[redacted]	Massey University - Bachelor of Engineering with Honours
[redacted]	Victoria University - Bachelor of Law Criminology Major
[redacted]	Victoria University - Bachelor of Design
[redacted]	Auckland University - Certificate of Health Science (2020 info)
[redacted]	NZ Police Force (2020 info)
[redacted]	Employed
[redacted]	Employed

ĀMUA AO 2017 COHORT (HAWAI'I, USA)	
[redacted]	Massey University - Bachelor of Science
[redacted]	Otago University - Bachelor of Medicine and Surgery
[redacted]	Canterbury University - Bachelor of Engineering
[redacted]	Massey University - Bachelor of Environmental Studies
[redacted]	Massey University - Bachelor of Science, Te Reo Māori
[redacted]	De La Salle University, Philippines - Bachelor of Commerce & Computer Science
[redacted]	Unknown (currently unable to be contacted)
[redacted]	Two-year service mission then a return to full-time tertiary study in 2023
[redacted]	Employed
[redacted]	Employed

Āmua Ao International Experience Summary

Forty (41) students out of the fifty-five (55) students who have been on or chosen for an Āmua Ao overseas experience, continue to remain in, or have transitioned into the tertiary sector. This equates to a 75% transition/retention rate for Āmua Ao students.

This is significant when compared with the national Māori and European transition rates highlighted in the table below. Further analysis shows that the Āmua Ao transition rate continues to exceed that of the general Pūhoro transition rate.

	Āmua Ao	General Pūhoro	National Māori	National European
Student transition rate into tertiary study	75%	60%	*48%	*62%

*** Latest data supplied from Education Counts**
https://www.educationcounts.govt.nz/indicators/main/education-and-learning-outcomes/1907

Āmua Ao continues to have a significant impact on students who have been part of, or chosen for these experiences. As demonstrated, Āmua Ao supports tertiary pathway transitions and also influences study in STEM significantly.

ĀMUA AO COMMUNICATIONS

Āmua Ao Communication Tools

Pūhoro has used social media (Instagram, Facebook), banners, photographs and reports to promote and document Āmua Ao related events over the 2020 – 2021 agreement period.

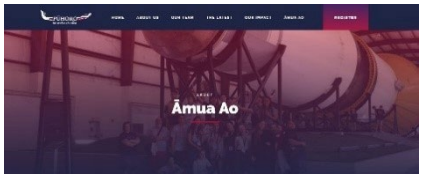
Āmua Ao Image & Video Library

An image library containing all Pūhoro generated photos and video clips of Āmua Ao related events is contained securely onsite at Pūhoro headquarters in accordance with the new Privacy Act 2020 and our updated Privacy policy. Pūhoro media consent forms authorise Pūhoro to freely share these images and videos with NZQA and other partners as appropriate. This library continues to expand as more images and videos are captured.

Website Revamp and Social Media Exposure

Pūhoro has a dedicated landing page for Āmua Ao on our website. Presently, the Pūhoro website is undergoing staged developments and upgrades to better reflect our growing team, our expansion throughout Aotearoa and the many events we hold throughout the year. Developments and upgrades to the Āmua Ao page are also planned and in due course will feature improved accessibility and latest material. At present, it features a description of Āmua Ao including the partnership with Pūhoro, a scrolling quote banner from student testimonials who have been involved in Āmua Ao initiatives, and photo galleries of Āmua Ao events.

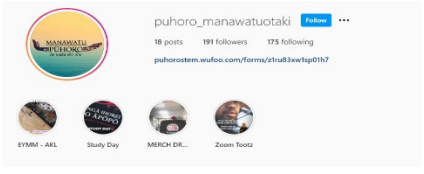
Āmua Ao Pūhoro Website Landing Page



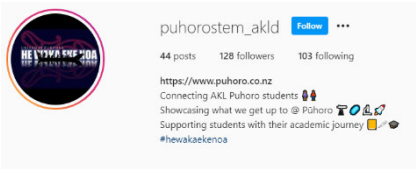
Pūhoro Facebook Page

Pūhoro Instagram

Puhoro Instagram MWT/OTK

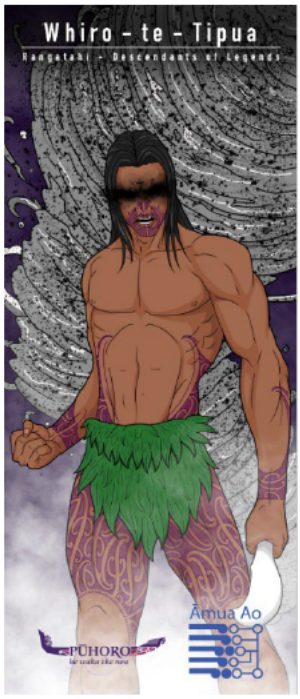


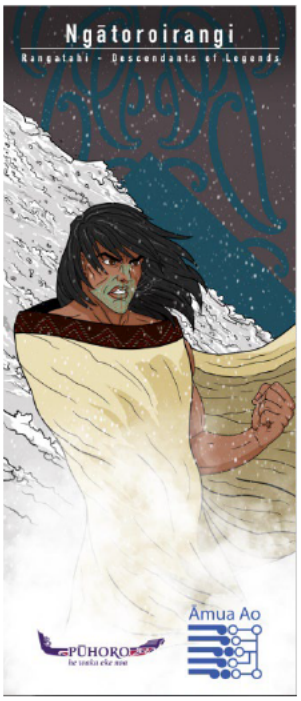
Puhoro Instagram AKL

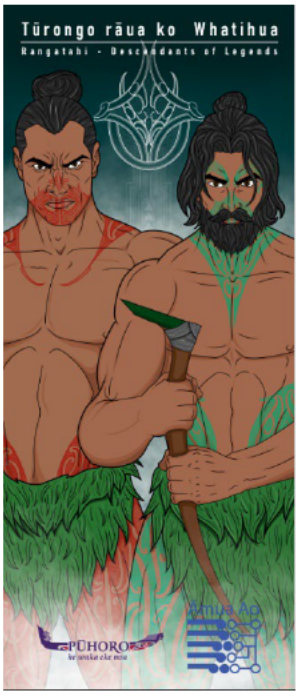


EYM Banners, Videos and Media Links

Pūhoro, in partnership with NZQA, funded the creation and purchase of 7 banners to reflect the EYM pūrākau-based challenges - past, present and future. Four banners were designed for newly designed challenges Whiro me te Aitanga Pēpeke Challenge, Kupe Challenge, Rangi rāua ko Papa Challenge, and Māui me te Rā Challenge. Two banners reflected past challenges held at EYM including Tūrongo rāua ko Whatihua Challenge and Ngātoroirangi Challenge. And one banner reflected a Challenge envisioned for use at EYM in the future – Mahuika Challenge. Pūhoro employee and qualified artist, _____ designed each of these banners and will continue to provide banner designs for all past, present, and future EYM pūrākau challenges.







Rangatahi from Awatapu College, Manawatū, in front of the newly designed banners

A media release was pitched to numerous media outlets and anticipated for the EYM event in Manawatū and Hawke's Bay but despite these attempts for promotion, these offers were not taken up by media. However, various kura from different regions felt encouraged to share their experiences with the EYM events on social media, generating even further reach than Pūhoro's capability.

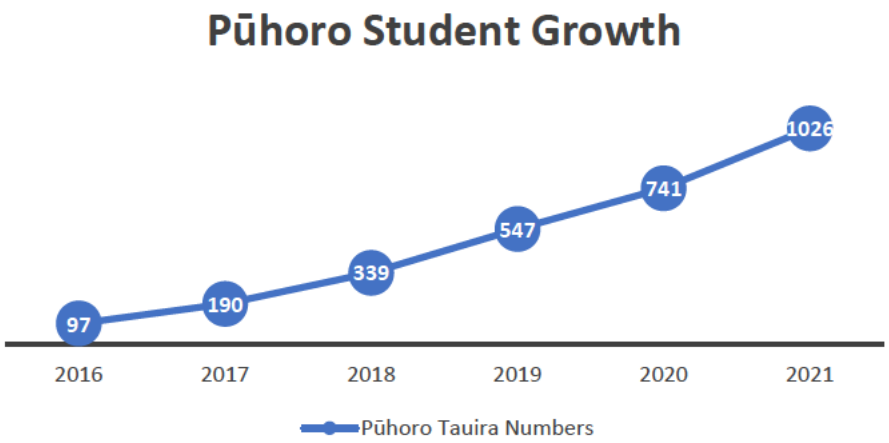
A video highlight reel created by Manawatū kura Tū Toa, promoted Pūhoro and EYM:
https://fb.watch/5Bi6zG7rV8/

Various kura from different regions documented their involvement in the various EYM events:
https://www.facebook.com/awatapu/posts/3733564173392278
https://www.facebook.com/AucklandGirlsGrammarSchool/posts/789611788253049
https://www.facebook.com/wairoacollege/posts/3504384492974790
https://www.facebook.com/PalmyBoys/posts/4015498325132960

PŪHORO IMPACT

Pūhoro Growth

The following graph illustrates Pūhoro student growth within the programme since its beginning in 2016 through to May 2021.



Pūhoro Achievement Data

Transition to Tertiary

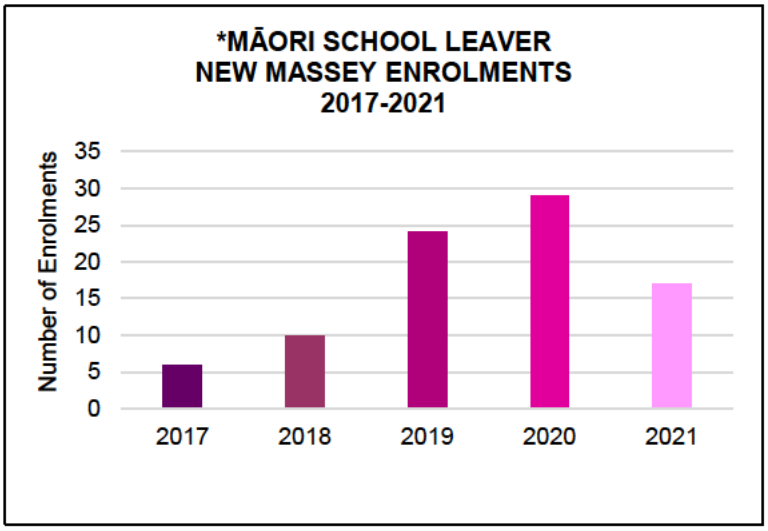
In 2020, the majority of Pūhoro students who completed Te Urunga Tū (Phase 1 High School programme) successfully transitioned into tertiary study, apprenticeships, the defence forces or employment in 2021. Te Urunga Pae (Phase 2 Tertiary programme) now have cohorts in their first, second and third years of tertiary, and we are preparing already for some of our founding cohort to move into post-graduate studies or Te Urunga Tapu (Phase 3 Employment) as they graduate university in 2022.

Given the incredible diversity of the tertiary education sector, Pūhoro now have rangatahi involved in universities, polytechs, PTE's, apprenticeships and the defence forces throughout Aotearoa. The overall transition rate for Pūhoro students into the tertiary sector currently sits at 60%. This rate continues to exceed the national Māori tertiary transition rates which sits at *48% and furthermore, is virtually on par with the national European transition rate at *62%.

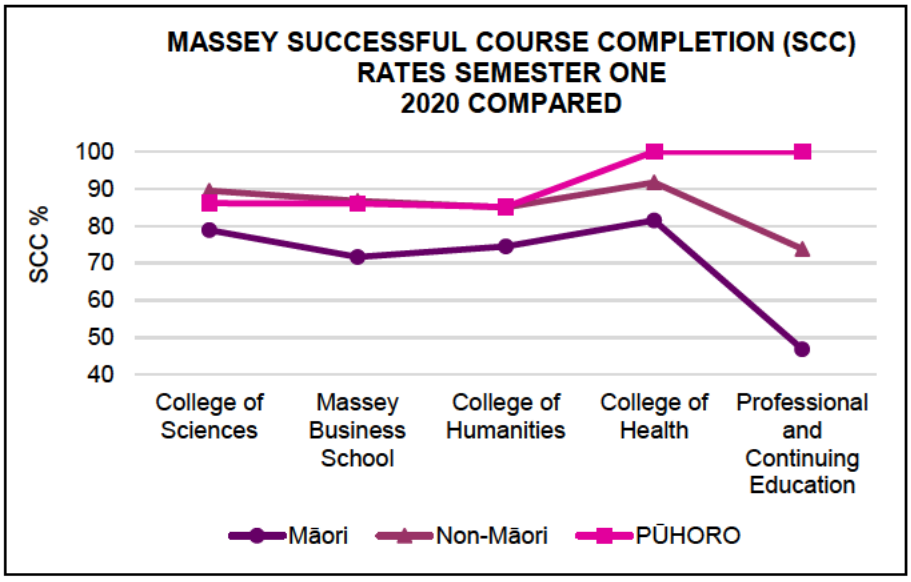
*As per latest data (2019) on Education Counts - https://www.educationcounts.govt.nz/indicators/main/education-and-learning-outcomes/1907

Massey University Achievement Data

Within Massey University we have full access to our student data. The following graphs and data points illustrate Pūhoro impact over this reporting period within Massey University:



*First time Massey enrolments from Pūhoro partner schools



- First time Massey enrolments are down in 2021 from the previous 2 years, however there are still enrolments expected in Semester 2. Additionally, scholarships were unavailable for new Massey enrolments in 2021 due to fiscal restraints and this further had an impact on students' choice to study with Massey. However, Pūhoro students are becoming involved in more and more tertiary study options outside of Massey and remain engaged in their education

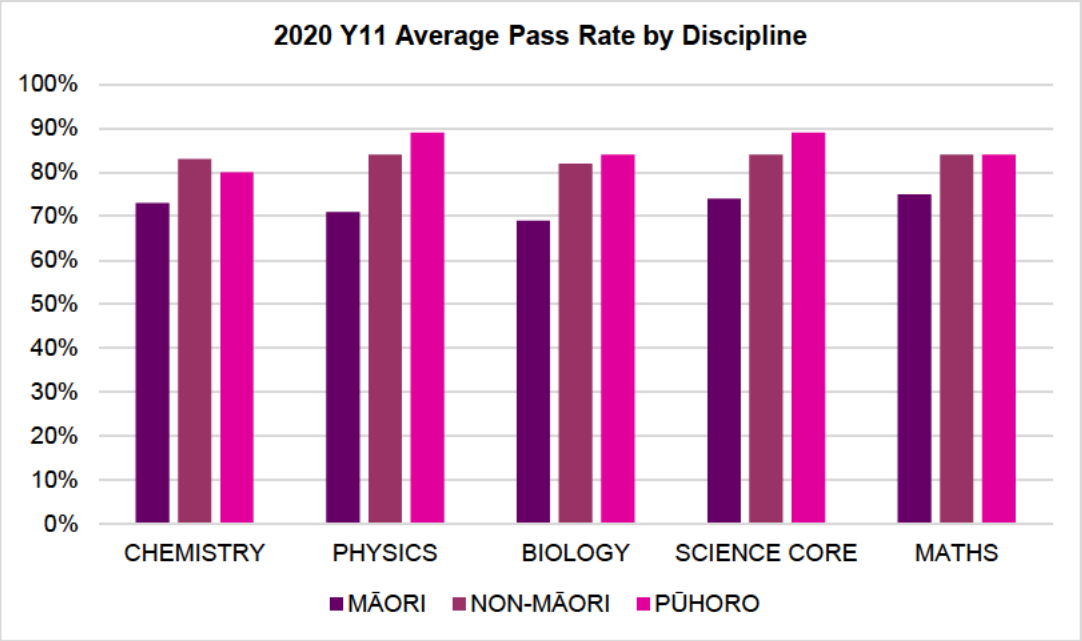
- We now have Pūhoro TUP students participating in 7 universities across Aotearoa, 1 international university, 4 polytechnics, 4 PTE's including the NZDF and a variety of paid apprenticeships and internships
- Semester 1 2020 Successful Course Completion (SCC) rates for Pūhoro students were on par with, or exceeded, SCC rates for non-Māori students at Massey University

High School Achievement Data 2020

This data represents both internal and external achievement standards within each science discipline. It is a Pūhoro expectation that **every** Pūhoro student in Year 11, 12 and 13 participates in both external and internal achievement standards.

Year 11 Pūhoro Achievement 2020

- Pūhoro students exceeded nationwide pass rates of Māori and non-Māori in Level 1 Physics, Biology and Core Sciences
- Pūhoro students came within 3 percentage points of non-Māori for NCEA Level 1 Chemistry, and achieved parity with non-Māori NCEA Level 1 Maths



Year 12 Pūhoro Achievement 2020

- Pūhoro students exceeded nationwide Māori passrates in NCEA Level 2 Chemistry, Biology and Maths and came within 4-5% percentage points of non-Māori passrates
- Pūhoro students were on par with nationwide Māori Level 2 Physics passrates and is an area that Pūhoro can further ameloriate

Year 13 Pūhoro Achievement 2020

- Pūhoro students exceeded the nationwide pass rates of Māori in NCEA Level 3 Biology
- Pūhoro students fell behind nationwide non-Māori pass rates in Level 3 Chemistry, Physics, Biology and Mathematics. This is perhaps one of the repercussions of Covid-19 on Pūhoro's ability to maintain face-to-face engagement with Year 13 rangatahi at such a critical phase of their schooling. We are eager to see how the reinstatement of face-to-face engagement with rangatahi can improve these pass rates in 2021, including focusing further Kaihautū delivery on uplifting achievement in subjects that indicate the need for further support/focus

Overall, Pūhoro pass rates for Year 11 and Year 12 were positive during such a turbulent year. While Year 13 pass rates were not on par with the pass rates of historical cohorts, we understand the disturbance to Pūhoro's main mode of delivery for a significant portion of the year, including no face-to-face wānanga for Auckland and Manawatū rangatahi, had an impact on them at such a critical time in their schooling. This is an area we are addressing and look forward to seeing how a full return to face-to-face engagement strengthens rangatahi achievement in 2021.

Internship Opportunities

During the summer of 2020-2021 (November to February) Pūhoro, in collaboration with its partners, offered an incredible 47 paid internship opportunities to Year 13 rangatahi and those already in their first and second year of tertiary study. This was an increase from the 15 paid internships offered the previous summer. It is projected that the number of Pūhoro internship offerings will increase further as we move into the next summer period.

Interns were selected to participate based on a number of factors including expressed interest, commitment to Pūhoro, STEM aspiration, and a matching process to connect them with internships/projects best suited to them. These internships achieved many outcomes including further strengthening students' motivation and aspiration, STEM career exposure, hands-on industry involvement and practical experience of contributing to the STEM sphere with their inherent Māori worldview. Similarly, internships benefited stakeholders and project managers by exposing them to Te Ao Māori through the unique viewpoints of rangatahi, and understanding the value of mātauranga Māori in the STEM industry. The following tables feature participants in Āmua Ao International experiences who were also chosen for student internships.

STEM Research Internships

Name and Iwi	Āmua Ao Trip	Project
Ngāpuhi	2020 San Fran (cancelled)	was selected and received special permission to travel to Pōnui Island in the Hauraki Gulf, accompanied by Kaihautū and . Their purpose was to track our endemic taonga, the Kiwi, by checking and collecting data from Kiwi radio transmitters, finding nests to ascertain Kiwi egg development and taking measurements of the eggs.
Ngāti Mutunga (Wharekauri/Chatham) Te Atiawa ki Whakarongotai	2020 San Fran (cancelled)	Tahi Spirulina: NZ Algae Innovations operates New Zealand's first and only spirulina farm near Himatangi Beach, and our products are sold under the name of Tahi Spirulina™. Spirulina is a super food rich in protein, antioxidants and minerals (especially iron and zinc) and is often heralded as one of the best 'superfoods. was able to discover this emerging industry that sits at the frontier between traditional farming and biotechnology and helped operators with monitoring, production, and participated in researching how to better harvest and dry the products, and food development.
Kāi Tahu	2020 San Fran (cancelled)	Central Cancer Network: These internships were created for rangatahi to explore and understand the cancer career network. Opportunities were

Tainui *Ngāti Kahungunu*		created for our rangatahi to be exposed to the industry and career activities that make up the MidCentral District Health Board.
Ngāti Raukawa, Ngāti Maniapoto, Tūhoe	2019 Taiwan/Singapore	MBIE Future Foods: Project 1: Values-based Māori Food entities are well placed to lead the development of high-value future foods. Their ingenuity, unique strengths of relationship building, storytelling and collective assets allows them to influence the whole value and supply chain. Through discussion with Māori food entities, investigated the potential product development and marketing opportunities for Māori Food entities in the global alternative protein market and the gaps in knowledge that need to be further investigated for success.
Te Ātiawa Ngāti Maniapoto	2019 Taiwan/Singapore	Green Shell Mussels: This project explored published literature of the traditional and customary uses of Kūkū / Kūtai, particularly around the impacts on health. Scientific literature states that the health of coastal Māori was extremely robust due to consumption of this seafood. The project aimed to unpack and explore that statement and further back it with the historical and scientific evidence needed. Season explored Mātauranga, indigenous knowledge and science and innovation.
Ngā Puhi, Ngāti Kahungunu	2018 Houston	Wine Science: Bragato Research Institute drives world-leading innovation for the New Zealand wine industry—from blue sky research through to the practical application of science in our vineyards, wineries and supply chain. had the opportunity to travel to Nelson for this internship. This internship was co-designed with Annaleise and Bragato and looked at viticulture, oenology, soil science, horticultural science, wine science, chemistry, food science, and food technology.
Ngāti Raukawa	2018 Houston	Pest Management: This projects intent was to safeguard New Zealand's agricultural economy and native biodiversity from the ravages of exotic pests using specified phytosanitary conditions (e.g., disinfestation with fumigants). This internship included insect rearing and method development to harvest mites from the colony and looked at the pest mortality response under the treatment conditions. A typical fumigation procedure was demonstrated to at the fumigation facility, Palmerston North. She also had the opportunity to learn some chemistry knowledge relevant in designing a fumigation trail.

Ngāti Raukawa	2018 Houston	This project was based in Taranaki, where worked on a number of TODD energy objectives which included developing and supporting the implementation of Todd's Emissions Reduction plan and low emission initiatives, developing internal and external stakeholder engagement plans, supporting the environment team with consenting projects, environmental sampling and monitoring, and supporting the design and development of a school engagement programme (educational field trip / site tours).
Kāi Tahu *Rangitāne* *Ngāti Kuia* *Ngāti Apa*	2018 Houston	Gastrointestinal Disorders: Looking at the prevalence of functional gastrointestinal disorders in Māori in Waitaha. This project aimed to understand how widespread puku issues (such as bloating, constipation, diarrhoea, or heartburn) are in Māori whanau in Waitaha/Canterbury. worked closely with primary health care providers to evaluate the prevalence of these issues. had the opportunity to do this internship in Palmerston North and also in Christchurch - returning to her whānau rohe.
Ngāti Kauwhata *Ngāti Kahungunu* *Ngāti Raukawa*	2018 Houston	TBI Health: This internship explored a case study on Māori access to spinal cord injury care. It supported understanding of the role of TBI health and provide opportunities for her to understand the TBI health team, their different roles and the important work they provide.
Ngāti Kahungunu ki Wairarapa *Muaūpoko*	2018 Houston	Food HQ: FoodHQ secured 4 different internships for rangatahi and provided opportunities to explore Karaka tree nut processing, the refrigeration of foods, exploring the state of alternative proteins around Aotearoa, NZ, and a project in collaboration with the Palmerston North City Council.
Ngāti Kahungunu ki te Wairoa *Ngāti Porou*	2017 Hawai'i	Floral Fertility: Plant & Food Research (PFR) is a New Zealand science company delivering research and development designed to grow competitive advantage for clients in the horticulture, wine, cropping, seafood and associated high value food sectors worldwide. Our research team, together with Kāi Tahu have been exploring *Gentianella* as a potential new potted and landscape plant for the international and domestic markets. Grace investigated the natural fertility of flowers derived from species and hybrids of indigenous *Gentianella* as well as *Gentiana*. The activities included hands-on use of microscopy in the lab as well as growing and pollinating plants at greenhouse and field facilities in Palmerston North, with methodologies and interpretations based on scientific literature

Ngāti Porou	2017 Hawai'i 2017 Hawai'i	Antibiotic resistant *Escherichia coli* was isolated from local waterways and compared with resistant *E. coli* previously isolated from livestock and humans. The project involved sampling from waterways, and laboratory work including bacterial culturing and identification, antibiotic susceptibility testing, DNA extractions and identification of the genes responsible for resistance using PCR (polymerase chain reaction) techniques.
Ngāti Hauiti *Te Āti Haunui-a-Pāpārangi*		Food HQ: FoodHQ secured 4 different internships for rangatahi and provided opportunities to explore Karaka tree nut processing, the refrigeration of foods, exploring the state of alternative proteins around Aotearoa, NZ, and a project in collaboration with the Palmerston North City Council.
Ngāti Kauwhata	2017 Hawai'i	Food HQ: FoodHQ secured 4 different internships for rangatahi and provided opportunities to explore Karaka tree nut processing, the refrigeration of foods, exploring the state of alternative proteins around Aotearoa, NZ, and a project in collaboration with the Palmerston North City Council.
Sha *Ngāti Raukawa* *Ngāti Porou*	2017 Hawai'i	Functional Properties of Mamaku Pith: This internship was designed to determine the potential of mamaku pith as a functional food ingredient by measuring its effects in the gut using a rat model, and by determining the expression of its properties as an ingredient in bakery products.

Cost Benefit Analysis Graphic Update

Two years ago, the Institute for Environmental and Scientific Research commissioned a cost benefit analysis (CBA) of the Pūhoro programme. This outlined the impact of the Pūhoro Academy on the lifetime earning of Māori students through continued engagement in the programme. Another CBA has been commissioned and is currently underway. More information will follow when those findings are released, meanwhile the link to the findings of the 2019 CBA is displayed below:

https://www.sustainablewellbeing.nz/puhoroacademy

Overall Summary

- Āmua Ao continues to support rangatahi transitions into the sciences at high school and also tertiary levels
- EYM is an incredible asset that allows for seamless rangatahi transitions into Pūhoro, which further wraps around tauira the relevant supports required to help them into STEM pathways
- The Āmua Ao international experience positively influences students, and even just being selected has a positive impact on students' aspiration, confidence and mindset
- Āmua Ao is a valuable collaboration between NZQA and Pūhoro, and this relatonship continues to support Pūhoro in impacting Māori achievement and participation in STEM.