

DEVELOPING ENGINEERING AS A CAREER PATH FOR MĀORI

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1 Abstract

It is commonly understood across the engineering profession that there is a lack of diversity within our industry. While there has been some progress made in the gender diversity area, there is still a significant lack of Māori voice, which is of concern given the legal status of the Treaty of Waitangi and the expectation that our industry liaise with mana whenua on water projects.

Aurecon, like many other engineering consultancies, offers its employees the opportunity to give time to the community as part of its Corporate Social Responsibility (CSR) policies. Driven by a desire to give back to our community as well as improve our in-house knowledge and understanding, Aurecon has partnered with Priority One and Toi Kai Rawa to support a local special character school in Tauranga - Te Wharekura o Mauao - and introduce engineering as a real opportunity for their students.

This initiative started in 2021 and will see our young professional engineers providing tutoring for students in STEM related subjects as well as real life examples of what an engineer does day to day. This includes providing an understanding of how important Māori views are in engineering, especially within the waters space, and how young Māori can be involved in a profession where they can learn skills that will enable them to give back to their iwi.

This initiative will also be beneficial to Aurecon staff who will receive the opportunity to engage with Māori and develop further understanding of te ao Māori by building relationships with local whānau and learning new perspectives.

The paper presents the background of the journey to date and lessons learned during the development of the program.

2 Key Words

Industry development, te ao Māori, increasing workforce

3 Introduction

New Zealand's engineering field contributes significantly to our modern-day society and is the driving force to the future we strive to live. Engineering is the practice of making ideas come to life through the application of mathematics and science. Even though engineering makes the future possible, not all New Zealanders consider engineering as a possible future career path due to the knowledge gap at school level. This is even more evident within the Māori population which has low representation in the engineering field.

Aurecon has developed a tutoring initiative to introduce the possibilities of careers within the engineering field. It is the intention of this initiative to bridge the gap of knowledge around engineering, to assist students who would like to pursue a career in engineering through academic support and mentorship as well as allowing the students to educate current engineers on Māori language and culture.

This initiative will have multiple components which it will address in the process of educating and supporting students. During the process of educating students in engineering, it is important to both parties to show students how engineering works in the real world. In that way, students will be informed of these real-life engineering problems and how mathematics and science created a solution or work-around to improve the community. This solidifies the importance of mathematics and science at school level to ensure a career in engineering. The support will help these students to consolidate their current learning with the provision of tutoring sessions and mentorship.

This program will be implemented by emerging professionals who are the future of engineering and are likely to be of an age that they are more relatable to the students. The program structure will

allow these emerging professionals to learn Māori culture and customs alongside te reo Māori – this will benefit them in their careers and encourage the emerging professionals to be more inclusive in their day to day lives. The program will allow everyone involved to build lasting relationships and continue to support each other to shape the program and make it a success - this may include future internships and graduate positions for students that continue on to engineering at tertiary institutions. When the program is setup and running to the satisfaction of both parties, the program can be open to include surrounding schools and engineering firms within the community.

4 Regional Context

A brief understanding of Bay of Plenty:

- The Bay of Plenty has the 3rd largest Māori population in the country and a higher proportion of Māori in comparison to the national average (as indicated in Figure 1 below)
- Youthful population with around 44% of all the young people in the region is Māori (nationally, over 50% of the Māori population are 25 years of age or younger)
- The Bay of Plenty has one third of the Māori economy
- There is a unique Māori profile in the Bay of Plenty with over 38 Iwi, over 230 Hapū, and more than 160 marae.

Despite these macro drivers, Māori are still over-represented in all the negative social indicators across the board. The Bay of Plenty has a relatively low proportion of people in the least deprived section of the population while the most deprived sections are over-represented as depicted in Figure 2. The transformation of our economy will require connectivity, integration, scale and an engaged workforce.

Māori over-representation in the lower skills end of the labour market is a key challenge for us all and if we are to prosper as a nation, we must invest in our young Māori population now! By 2030, Māori and Pacifica will make up 30% of the workforce age population and this is expected to increase to 50% by 2050.

Figure 1: Bay of Plenty has a higher proportion of Māori in comparison to the national average

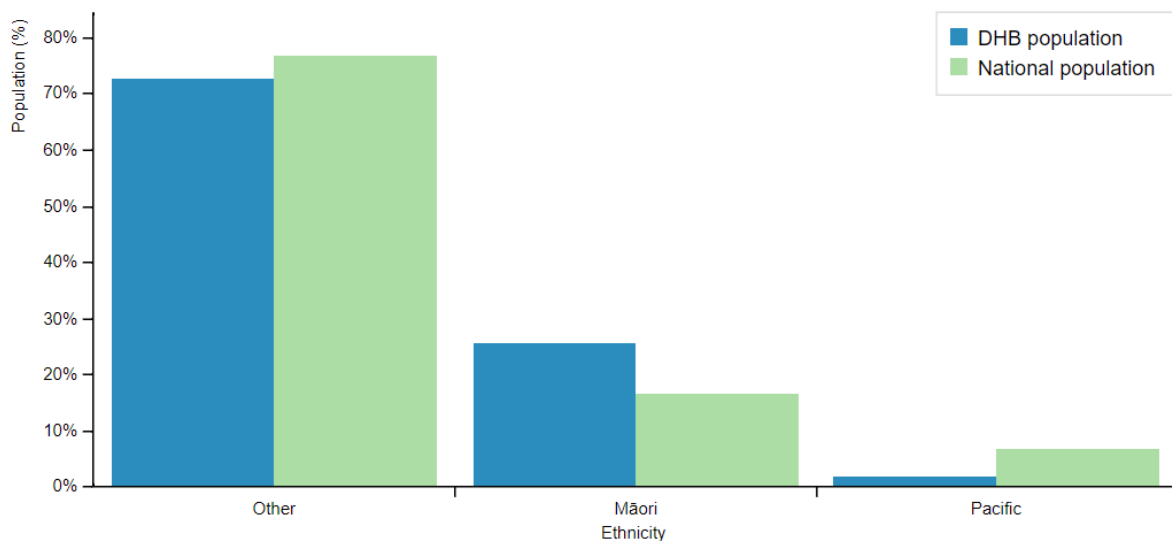
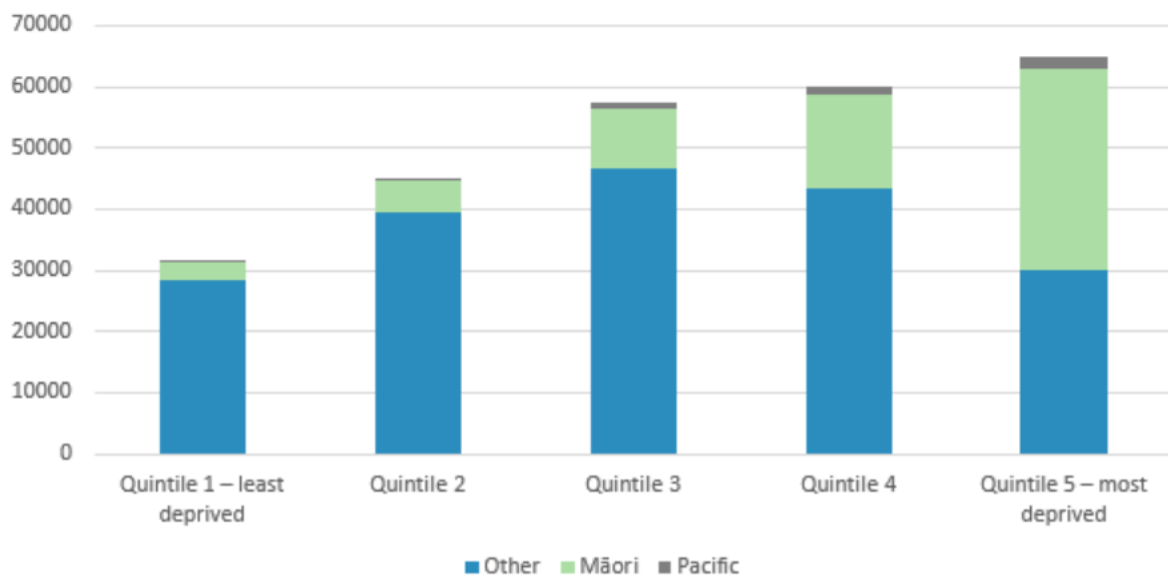


Figure 2: Bay of Plenty has a relatively low proportion of people in the least deprived section of the population while the most deprived sections are over-represented.



Source: [Population of Bay of Plenty DHB | Ministry of Health NZ](#) (Ministry of Health NZ, n.d.)

5 Need of the industry

It is widely understood that there needs to be more diversity within the Engineering profession. The introduction of te mana o te wai and changes within the NES and NPS have a role in ensuring that Māori are engaged much earlier in any projects and that this engagement is potentially more meaningful than it has been in the past.

The challenge with this is that there are very few engineers who identify as Māori. This can lead to a high level of mistrust between iwi and other parties and this can in turn cause tension within the consultation stages. It is more common for Māori to have people represent them within the science fields, but there is a difference between understanding the problem and understanding how to fix it. It was our feeling that if there were more Māori within the engineering profession there would be more people that iwi could trust to engage on their behalf on the projects which affect them.

The heightened need for early consultation through the te mana o te wai processes is likely to put a lot of pressure on iwi to engage with this process which in turn comes with time constraints for people who may currently be working other day jobs.

Aurecon, along with many other companies associated with the engineer profession, run programmes to bring on cadets and sponsor students through diploma and bachelor level degrees to support people into the industry. However, the length of these engagements often means that companies are potentially limited in the number of students which they can take at any one time, often waiting for one cadet to finish before they take on another in any given location. This pathway is too slow to build up the numbers of general engineers wanted in order to satisfy the need between the increase of work to be done and to counter the rate that engineers are leaving the industry through both retirement and for other reasons.

There is a lacking of resources that can be given to schools / others organisations that show the multiple opportunities within the water sector? This type of resource may support additional people, who may not want to undertake a degree qualified engineering pathway, into the industry and encourage engagement with the wider sector.

A survey of young engineers within the Aurecon Tauranga office highlighted that the main way that you find out about engineering is by having someone in your family who is an engineer and will direct you to this career or by having a teacher that directs you to engineering.

Many people within engineering will have been part of a presentation to a school on engineering as a profession and why you would want to be an engineer. The problem with this is that these presentations normally target students who would already understand what engineering is, be strong in science and maths, be later in their schooling years, are predominately mainstream schools and boys. While this may provide a broad-brush approach, it does not appear to be helping the Māori statistics.

In meeting with Te wharekura o Mauao, it was highlighted that their students are interested in moving into professions that can help their hapū, this is predominately building and teaching. Without exposure to engineers or engineering careers there would be no way for them to understand what the engineering profession could do for them to help their hapū and wider iwi groups.

6 Introducing the partnership parties and their key drivers and roles for this initiative

6.1 Aurecon

There is no requirement at Aurecon to identify your ethnicity when you join, therefore demographic statistics are obtained by people wishing to identify an ethnicity through our regular staff surveys.

The most recent survey results showed the following:

- 2.3% Māori (this is slightly behind the 2020 Engineering NZ figure of 3% - [Paving a diverse and inclusive way](#)) (Engineering NZ, n.d.)
- 1.2% Pasifika

We also have a female FTE of 33.2%.

Aurecon has recognised its need to have a Te Ao Māori strategy. We've recently engaged external specialists to help us to define this and develop a plan of action to make inroads to being a company more reflective of Aotearoa, understanding of Te Ao Māori, Te Tiriti o Waitangi and our people and the land.

Initial steps have included creating an Aurecon specific waiata, workshops and training with our senior staff to teach history, language and further understanding of the social environment of Aotearoa.

However, these policies only deal with people that are already part of our engineering community. And while this is an important part of understanding why diversity and encouraging Māori into the industry is important, and why we may all have unconscious bias as to why there are not higher numbers within the industry already, this does not specifically help encourage more Māori students to continue with STEM subjects right throughout their schooling to enable them to progress to engineering at university.

6.2 Priority One

By reaching out to Priority One in Tauranga, Aurecon were able to leverage the networks of the Instep coordinators. Instep provides a valuable link between local secondary schools and business by harnessing the energy and expertise from local businesses to inspire students to make informed career choices. Projects and activities that focus on leadership, collaboration and innovation are developed so school communities understand future skill needs relevant to the region's economic

growth and prosperity, and local businesses are confident that young people have the skills and aptitude employers need now and in the future.

6.3 Toi Kai Rawa

Toi Kai Rawa (TKR) is a regional Māori Economic Development Agency working across the Bay of Plenty. It is independent of government and its purpose is to advance the prosperity of Māori across the wider Bay of Plenty. TKR works across four strategic priority areas:

- Māori land development
- Māori Business networks
- Māori communities and
- Rangatahi Māori.

TKR have developed a Māori STEAM (Science, Tech, Engineering, Arts, Maths) Strategy. The strategy is part of the regional Māori capability building plan that seeks to reposition Māori as navigators in the evolving world of technology, innovation and commerce. This strategy builds on our strong rangatahi demographic and seeks to unlock opportunities across science, technology, engineering, arts and mathematics to mobilise Māori as leaders for their whānau and communities.

TKR works with industry, education sector, Māori, and government on enduring solutions to support this work and has a focus on accelerating Māori STEAM aspiration, participation, and skill attainment in which to contribute to a high value economy.

How do we create a step-change opportunity for the Engineering Industry?

- Partner with Māori to accelerate Māori STEAM aspirations
- Invest in solutions that have Māori part of the design and implementation of any development programme
- Be prepared to invest in the long hall.

6.4 Te Wharekura o Mauao

Te Wharekura o Mauao is a tikanga Māori education provider based in Tauranga, Aotearoa. They offer Year 7 – 13 taura a solid foundation to achieve their academic, sporting and cultural potential while immersed in tikanga and Te Reo Māori.

Te Reo Māori is the primary language spoken in the kura, helping rangatahi become the next generation of expert Reo speakers, and future leaders.

They have proud track record of preparing students for academic, sporting and arts success, with strong results against local and national benchmarks. Their intention is that a Te Wharekura o Mauao leaver will be a good citizen and a responsible person who contributes to their marae, hapū and iwi. They will enjoy success in their chosen pursuits.

Tauranga Moanatanga is a world-view a unique way of being and living handed down by our ancestors. This world-view encompasses our customs, our language and our history as a unique people. It is our cultural legacy. Ngāti Ranginui, Ngāi Te Rangi, and Ngāti Pūkenga are recognised as Mana Whenua. The essence of Tauranga Moana identity is its diversity of iwi. This is as strong today as it has been historically. Te Wahrekura o Mauao believe their kura must serve their marae, their hapū and their iwi in all roles. Taura are prepared to eventually take on the role of 'kaitiaki' of their own marae as successors of our cultural legacy.

Te Wharekura o Mauao has a progressive education framework, with programmes that are innovative, engaging and creative. Offering a nurturing learning environment that encourages independent thinking and aspiration to succeed.

All their taura are contributing members of the school whānau and collaborative relationships are fostered with whānau, hapū, iwi and hāpori whānui. This ensures they enhance the sustainability of Tauranga Moana Reo and enrich our rangatahi with traditional practices and values.

Figure 3: Initial hui forming partnership including representatives from all parties



7 Idea behind the Initiative

Aurecon gives its entire staff eight hours of CSR (Corporate Social Responsibility) each year to enable its people to volunteer within the community. In Tauranga one of the emerging professional engineers (Waldo Posthumous) decided that he would like to use his eight hours to help support students into engineering. The idea was that a group of our young professionals could help tutor students in maths and science so that they could continue with STEM subjects further into their schooling and progress into fields such as engineering. Initially the initiative had the following drivers:

- We wanted this tutoring to be available to students who might not have the means to access tutoring from within their current living situation
- We wanted this tutoring to be completed by our emerging professionals, so that they were more relatable to the students that some of the more seasoned engineers might be.

By workshoping our idea with Priority One and Toi Kai Rawa, it was decided that we would try to connect with Te Wharakura o Mauao in the first instance.

This partnership offered a number of further benefits:

- Starting with a small school, therefore the numbers in the classes would not be overwhelming to those emerging professionals who had not done tutoring before
- Starting with a school that was close to the office maximised the time spent with the students rather than travelling
- Working with a special character school enabled flexibility away from mainstream ideas
- Working with a tikanga Māori school meant that the emerging professional had more of an opportunity to learn as well.

We were hoping to use the principles of **Tuakana-Teina**¹ this is a Māori concept referring to the relationship between an older sibling (**Tuakana**) and a younger sibling (**Teina**). *Mā te Tuakana kā tōtika te Tēina. Ma te Tēina kā tōtika te Tuakana. From the older sibling the younger one learns the right way to do things, and from the younger sibling the older one learns to be tolerant.*

In order for this initiative to be successful it was important that this relationship be beneficial to both parties.

Our emerging professionals would help the students with their maths and science as well as introducing them to the work of engineering and the school students would assist our young professionals by teaching them tikanga principles.

Initially the idea of tutoring in the school was terrifying for some of our young professionals. While they were understanding of the need and theory behind it, the thought of having to go into a school where the main language is te reo Māori was a frightening prospect. This continued to highlight the gap in the industry of understanding Māori culture and language and the need for us as a profession to work with other parties to correct this.

Working together with the school through a series of hui, we were able to introduce ourselves and why we felt this was so important. We were able to try to understand how best to fit within the school terms and lesson structure and how we could both benefit from this process.

We will know if we are successful if we start to see more of the students from this school maintaining science and maths through their entire schooling and progressing through to STEM related university courses.

We will also see the understanding increase for our emerging professional of tikanga and have them more comfortable with attending hui on marae and other cultural events such as pōwhiri.

By utilising the CSR hours Aurecon can potentially provide over 150 hours of time each year to the kura. Should this initiative be successful the opportunities for other companies and schools to get involved could exponentially change the level of understanding of engineering and uptake of these career opportunities.

7.1 Initial feedback

Following the initial hui with the school a questionnaire was set up to understand the needs of all parties involved. The following questions were asked

- Who is completing the form?
- Details of the company (Number of taura/employees, ratio - male vs female, ratio - Māori vs Non-Māori, iwi/hapū profile)
- Please provide more information on chosen priority groups for engagement (Age range, total numbers involved, any other relevant information)
- Preferred timing of the engagements (Duration, Term, Day, Time)
- Where would you ideally like the engagements to take place?
- What are you hoping to see take place during these engagements?
 - Mentoring
 - Tutoring
 - Experiences immersed within industry
 - Cultural awareness and capability guidance
 - All of the above
 - None of the above
 - Other
- If 'Other' above, please provide more detail
- What are you wanting to achieve from this partnership?
- What is of most importance from the engagements?
- How will we know if the partnership is successful for the kura/for the company (answer as appropriate)?
- What are you willing to commit to ensure the success of the partnership?

From this we were able to focus on the key outcomes for all parties to set up a programme that would work for all involved. The following were key responses from the kura:

What are you wanting to achieve from this partnership? Real life connections for our taura with engineers, architects, surveyors, planners, etc - which provide a picture for them of a future pathway they could pursue, and someone who is interested in their academic success and wants to share their knowledge with them

What is of most importance from the engagements? relationship, knowledge sharing

How will we know if the partnership is successful for the kura/for the company (answer as appropriate)? Our taura will begin to explore engineering ideas in their project work, ask kaiako for more opportunities, and connect well with the Aurecon professionals when they visit.

What are you willing to commit to ensure the success of the partnership? *Our time and expertise in Tauranga Moananatanga, te reo me tikanga Māori, to support the cultural awareness of Aurecon staff members*

7.2 Goals and way forward

These responses enabled the initial goals for the initiative to be set up as follows:

- Educate students around engineering career opportunities
- Support students academically and through mentorship
- Exposure to real life engineering examples including problem, how solution was achieved and a site visit.
- Explore engineering through problem solving activity (termly)
- Learning te reo Māori throughout tutoring
- Learning Māori customs and culture through student story telling
- Building relationships through initiative

The tutoring program will start in Term 3 of the 2021 school year and will comprise four components:

- Two engineering real life problems: Due to the school's activities as the start of the term, the initiative will start with an engineering problem and solution presentation as well as a site visit
- Problem solving: The term will have two activity sessions which will provide the students with a problem of which they will have two session to solve
- Career presentation: Explaining the career possibilities within engineering
- Support: Tutoring session which will allow academic support and mentorship.

The setup will focus on getting the balance right between explaining and exploring engineering and supporting students to have a career in engineering. The initiative is new especially due to its long-term commitment and support where other programs are focus on exposure (mostly single point exposure). Therefore, the program will be reviewed at the end of Term 3 with feedback from students, teachers, and tutors to improve the program going forward.

The first interaction with the students was a pōwhiri held at the end of Term 2 prior to the programme starting in Term 3. This was the first pōwhiri experience for many of our staff and was an amazing experience for all involved. It helped to provide introduction to customs in a safe environment where the emerging professionals were able to be comfortable about asking questions and be coached through the custom with support from Toi Kai Rawa and Priority One.

Figure 4: Kapa haka performance (left), hongiri after pōwhiri (centre) and classroom tour (right)



7.3 What we have learnt so far

- Teachers are really busy! School is a very busy place and creating space for new initiatives can take time and needs good planning to understand the benefits for the students and how this may be integrated into the current learning and wider educational system.
- We need a system to measure success.
 - Anecdotally we may be able to observe a change in the following
 - Understanding of engineering
 - Engagement with iwi and confidence within profession
 - Other measurable items may be the following:
 - Student credit levels within science and mathematics offered
 - Students considering engineering as a career path
 - Students progressing to engineering careers / further tertiary learning
 - Enquiries / attendance with local university for engineering programmes.
- To align with the school year, we will focus on the following year groups
 - Term 2 – 3: Years 11-13
 - Term 3 – 4: Years 9-10

8 Key points

This is the beginning of a long-term partnership between all parties. We need to be prepared to be agile with the programme and adapt as we learn what works for both the kura and Aurecon to ensure success for all parties. Review meetings will be held at the end of each term to be able to adapt quickly and strengthen the programme as we go.

Learnings from the initial teaching sessions will be presented as part of the paper presentation at the WaterNZ conference in September due to the delay in starting the in-class session

9 References

- Engineering NZ. (n.d.). *Paving a diverse and inclusive way*. Retrieved from EngineeringNZ: <https://www.engineeringnz.org/news-insights/paving-diverse-and-inclusive-way/>
- Ministry of Health NZ. (n.d.). *Health.govt.nz*. Retrieved from Ministry of Health: <https://www.health.govt.nz/new-zealand-health-system/my-dhb/bay-plenty-dhb/population-bay-plenty-dhb>