CURIOUS MINDS
HE HIHIRI I TE MAHARA

# 2024 SOUTH AUCKLAND PROJECT SHOWCASE

TE HONONGA AKORANGA
COMET

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

# 2024 SOUTH AUCKLAND PROJECT SHOWCASE

*Everyone has a question: what's yours?*
*If you had MONEY and EXPERTS to help, could you answer it?*

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# INTRODUCTION

*Kia ora and welcome to the 2024 Curious Minds South Auckland Project Showcase!*

Curiosity is more than a spark; it's a force for change. Every great innovation and every breakthrough start with a question. The projects featured in this showcase are not just about learning science, technology, engineering and maths; they are about solving real-world problems.

When young people engage with challenges that matter to them — whether it's protecting biodiversity, improving food security or designing solutions for a changing climate — they develop the critical skills they need to navigate an ever-evolving world.

As students investigate, test and refine their ideas, they are developing science capital, exploring new technologies, using mathematical reasoning and applying literacy skills to communicate their findings.

I have been lucky to see firsthand students developing diverse skills and knowledge. More importantly, I have seen their confidence grow from being willing to try something to figuring things out for themselves.

These projects create opportunities for students to think deeply, take ownership of their learning and develop the resilience to tackle complex issues — skills that will serve them well far beyond the classroom.

The stories in this showcase are proof that when students are empowered to explore, experiment and create solutions, meaningful learning follows.

Thank you to the educators, scientists and community partners who make these experiences possible. Together, we are not just inspiring the next generation — we are equipping them to lead change.

Ngā mihi nui,

**YING YANG**

**STEM Project Manager**
**Te Hononga Akoranga COMET**

***Ka whangaia, ka tupu, ka puāwai.***

*That which is nurtured will grow and blossom.*

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# PROJECT CRITERIA

## PARTICIPATORY SCIENCE PROJECTS MUST BE:

### EDUCATIONALLY VALUABLE

Offer enduring educational value and two–way learning opportunities for those involved

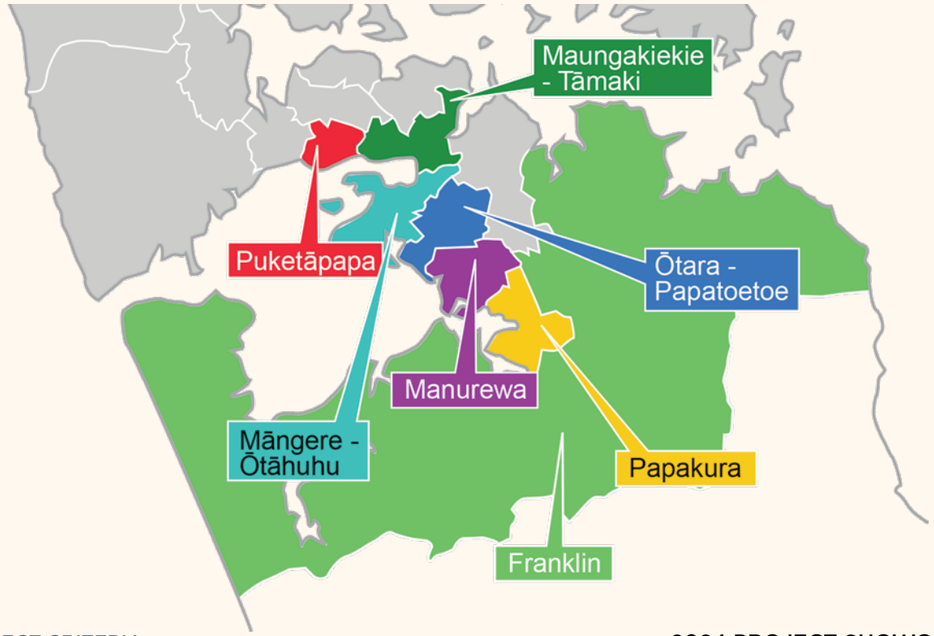
### SCIENTIFICALLY ROBUST

Tackle a research problem with STEM experts to generate new scientific and/or technological outputs

### LOCALLY RELEVANT

Involve community members in research that is engaging, locally relevant and community driven

## ELIGIBLE FUNDING AREAS IN AUCKLAND:



# PROJECT DATA (2024)

**11**
PROJECTS FUNDED

**937**
YOUNG PEOPLE ENGAGED

**11**
SCHOOLS INVOLVED

**37**
ORGANISATIONS INVOLVED

**$179,330**
IN FUNDING DISTRIBUTED

**178**
MĀORI PARTICIPATED

**521**
PASIFIKA PARTICIPATED


# CASE STUDIES


# KAITIAKI O MAUNGAKIEKIE

ROYAL OAK PRIMARY SCHOOL

*How can predator control support native bird populations in our local environment?*

***In this conservation project, students from Royal Oak Primary School investigated whether predator control efforts in their school and surrounding areas could help increase native bird populations. Working with conservationists, the students explored the connections between pest management and birdlife while also developing their scientific and environmental stewardship skills.***

Using birdsong monitors, students recorded and analysed native bird calls, comparing their school's bird population with that of nearby Maungakiekie (One Tree Hill).

By using AI-powered birdsong identification tools to track changes in bird species over time, they also learnt how technology can support conservation.

Challenges with technology — such as malfunctioning solar battery packs — led students to pivot their data collection method, experiencing firsthand what real-world fieldwork is like and the need for flexibility in science.

Beyond data collection, the students took on leadership roles, sharing their findings with their school community via newsletters and social media.

The students also explored and prototyped innovative pest control solutions. While peanut butter is a common bait for rat traps, it can be dangerous for those with severe allergies. Their challenge was to design effective traps that reduced this risk, ensuring a safer environment for their peers.

Using a structured design thinking process, they developed creative solutions while gaining experience with tools like TinkerCAD and 3D printing.

Originally planning to 3D print their completed designs, the students eventually pivoted to a more sustainable solution: repurposing milk bottles as the material of choice. Their creative thinking reinforced the importance of considering functionality and sustainability in design.

Collaboration was a key aspect of this project. Students worked alongside experts from Auckland Zoo, the University of Auckland, Tiritiri Matangi and the Maungakiekie Songbird Trust to deepen their understanding of Aotearoa NZ's native ecosystems.

A highlight was a field trip to Tiritiri Matangi island, where the students experienced what a thriving, predator-free environment could look like, inspiring them to work towards creating a similar ecosystem at their school.

This project has empowered students to become citizen scientists, demonstrating how technology, critical thinking and conservation work can have real-world impacts.

With plans to continue monitoring birdlife and pest control in 2025 and beyond, Royal Oak Primary School is fostering the next generation of kaitiaki committed to protecting native bird species.





> *[STEM in primary school] helps students get a taste earlier, exposing them to a bit of everything, giving them more confidence and a foot in the door.*
>
> ROBYN MCCONNELL, teacher
> Royal Oak Primary School

# TE KETE ROKIROKI A WHAKAOTIRANGI

MOUNT ROSKILL PRIMARY, INTERMEDIATE AND GRAMMAR SCHOOLS

***What soil composition is best for growing kūmara in Puketāpapa?***

***This tuakana-teina research project, the first collaboration of its kind on campus, saw students from Mount Roskill Primary, Intermediate and Grammar schools work together to explore the science and mātauranga behind traditional kūmara cultivation. Through research and discussions with experts, they deepened their understanding of horticulture, fair testing and Māori agricultural traditions.***

The students began by exploring the story of Whakaotirangi, the wahine credited in Te Arawa and Tainui traditions with carrying the first kūmara plants to Aotearoa NZ. Using traditional knowledge, observations and experimentation, Whakaotirangi adapted kūmara growing methods to suit Aotearoa NZ's colder climate. Her legacy is embodied in many whakataukī and karakia.

For their own horticulture investigation, the students trialled four different soil compositions to see which types would give the highest kūmara yield. Optimising growth for local conditions was a key step in the schools' long-term goal of contributing to local mātauranga and being able to share traditional growing techniques (and harvested produce) with whānau and local marae.

This project introduced the participants to key concepts in experimental design. They identified soil type as their experiment's independent variable; kūmara yield as the dependent variable; and consistent conditions (e.g. kūmara types and number of tipu [shoots]) as controlled variables.

Supported by ethnobotanist Matua Nick Roskrudge, students prepared and planted kūmara beds at Mount Roskill Primary School, where they recorded data on growth rates, soil properties and harvest outcomes. Several students also took tipu home to plant with their whānau, replicating the project on a smaller scale in home gardens.

The students then compared their findings with historical and cultural knowledge, including from traditional kūmara pits on Puketāpapa and insights from a visit to Māngere Mountain Education Centre.

Despite challenges in coordinating activities across multiple schools, the project strengthened tuakana-teina learning and created a clear, connected learning pathway for Mount Roskill students from primary through to secondary school.

The success of these trials has resulted in the schools planning to expand the project, including setting up tāpapa (kūmara seed) beds to grow their own tipu, engaging more whānau, testing different variables and sharing their findings with the wider community. Other schools in the local kāhui ako are also looking to implement this project.

By combining scientific investigation with mātauranga Māori, *Te kete rokiroki a Whakaotirangi* has created a living connection between past and present, empowering students and whānau to continue the tradition of growing and protecting kūmara in Puketāpapa.



> ***Relationships with all whānau of the secondary [school participants] — and some that go across campus — have been strengthened through this project.***
>
> DAVID SYME, project lead
> Mt Roskill Grammar School

CASE STUDIES

2023

# WAAHI WHAKATAA A PLACE TO REST

EDMUND HILLARY SCHOOL + VAKA LTD

***How can we design our senior playground seating to be safe, environmentally friendly, and culturally relevant?***

*Guided by experts from VAKA Ltd, students at Edmund Hillary School combined their engineering, digital design and cultural knowledge to create designs to improve their senior playground. The project aimed to develop a space that was functional, sustainable and connected to local purakau (stories) and tikanga (customs), encouraging students to think critically about design and environmental impact.*

With support from local iwi Ngāti Tamaoho, the students researched previous playground designs, identifying which aspects worked and which ones needed improvement.

The students designed and prototyped their own playground assets, using 3D modelling and printing to test different concepts. This approach helped them develop spatial awareness, problem solving skills and confidence in design thinking.

A key component of the project was incorporating mana whenua perspectives to ensure the students' designs reflected Māori values and local history. Through this process, the students gained a deeper appreciation for the role of place-based design in community spaces.

Moving forward, the students hope to work with the wider school community to refine their prototypes for real-world application.

The project also provided teachers with training in 3D printing, ensuring future use of the technology at the school.

Through collaborative learning and innovative design, Waahi Whakataa created a space for rest, reflection and community connection — designed by students, for students.

# OPERATION AUTOMATE CRYSTAL PALACE

MANUREWA INTERMEDIATE SCHOOL

***How can science and technology make our school greenhouse more efficient?***

*Students at Manurewa Intermediate School took on the challenge of transforming their school's old and dilapidated greenhouse (aka 'the Crystal Palace') into a fully functional, efficient and sustainable food production system. Through this student-led approach, they applied scientific and engineering principles to create an optimised growing environment.*

This project involved students designing and building key greenhouse infrastructure. The students patched walls, made custom shelving, installed irrigation systems and explored drainage solutions. They took full ownership of the design process, measuring the space, determining the best use of shelving and optimising plant-growing conditions.

Although initial plans to automate the ventilation system were delayed, the team adapted and redirected resources to other greenhouse improvements. One development that came from this pivot was an automated irrigation system,

> *Students are contributing to a bigger picture and that was a really good feeling for them.*
>
> MICHAEL WATSON, project lead
> Manurewa Intermediate School

> *It's cool to see our school changing as we go.*
>
> WANIKA, Year 8 student
> Manurewa Intermediate School

which allows users to monitor and adjust water levels in the greenhouse remotely via app.

This key innovation introduced the students to real-world applications of data analysis and technology in agriculture. By testing how different irrigation settings impacted plant growth, they could make observations and adjust their approach accordingly.

Beyond providing much-needed infrastructure for the students' seedlings, the greenhouse has become an important learning space, fostering a sense of responsibility and ownership among the students.

The school now uses the space to host a range of STEM learning experiences, including horticulture, engineering and environmental science lessons. The school also plans to use the Crystal Palace for long-term sustainability projects, such as growing produce for school and community events and for nurturing native plant seedlings.






# REWILDING AUCKLAND: RESTORING NATIVE WILDLIFE IN THE URBAN JUNGLE

CHRIST THE KING CATHOLIC SCHOOL

***How can we encourage native wildlife to return to our local environment?***

***Students at Christ the King Catholic School took on the challenge of increasing biodiversity in their school and community, creating new habitats to support native birds, butterflies and insects.***

Working with experts from Auckland Zoo, the Moth and Butterfly Trust and Sustainable Schools, the students first conducted wildlife audits to assess current biodiversity levels in their area. They then identified gaps in the ecosystem and investigated ways to attract native species back into their local environment.

Year 4 students focused on bringing back the monarch, red admiral and copper butterflies. Different caterpillars and butterflies all have different habitat needs and preferences, so the students worked together to design and build a butterfly haven with a variety of complementary plants. They hand-reared larvae in a purpose-built 'butterfly castle' and have so far tagged and released six butterflies into their school habitat.

Meanwhile, Year 5–6 students were challenged to turn a boggy part of their school field into a thriving ephemeral wetland and māra hūpara (play area).

Landscape architects from Boffa Miskell explained how good urban design can support biodiversity, and they guided students to research native flora and fauna and create robust landscape plans.

The students developed valuable 2D and 3D design skills in the process, including using Lego and 3D printed parts to create scale models of their wetland design.

The project culminated in a presentation evening at the school that attracted over 100 whānau and community members. Seeing the students' enthusiasm and confidence to share their knowledge was a big highlight for teachers and parents alike.

Working with STEM mentors was another highlight, with 70% of students surveyed reporting that they had never met a scientist or engineer prior to the project. Several mentors have committed to continuing to support the school, ensuring that even more students will gain valuable exposure to STEM role models in the future.

With two new habitats completed, the students are now eager to continue long-term monitoring to see how their efforts have contributed to increasing biodiversity. They will continue to adapt their habitats and deepen learning in future restoration and conservation projects.





> *Our families love what we do and how interested their kids are in science. They are keen to be involved in the kids' learning.*
>
> KIMBERLEY SULLINGS, project lead
> Christ the King Catholic School

## STEM LEARNING THROUGH STORYTELLING

Māori pūrākau (stories) like "Kupe and Te Weke" and "Rātā me te Rākau" provided rich inspiration for this project. Students read many stories and incorporated key ideas and environmental themes into the design of their wetland and māra hūpara.

The school also teamed up with Pacific Kids Learning to create five animated movies, with students getting involved in storyboarding, designing and script-writing. Retelling stories in their own words helped to strengthen the students' understanding of mātauranga Māori and the environment.

> *[This project] showed me that kids can have a voice too.*
>
> Year 6 student
> Christ the King Catholic School

# WHARE HAUORA: INVESTIGATING MOULD IN FLOOD-AFFECTED HOMES

TE ARARATA STREAM TEAM + I AM MĀNGERE

***Are flood-affected homes mouldier than others?***

*Fungi and bacteria are mysterious — their progress is invisible to the naked eye and some can be very harmful to human and environmental health. Led by the Te Ararata Stream Team, this project aimed to demystify these organisms through community-led research.*

Supported by their local community hub, I AM Māngere, the Te Ararata Stream Team recruited over 100 students, teachers and microbiologists to sample, incubate and identify mould samples from suburbs in south and east Auckland, including some homes affected by the 2023 Auckland Anniversary Floods.

> *When the data was authentic, the students were keen to interpret and compare graphs.*
>
> PRAGNA PATEL, project lead
> Te Ararata Stream Team

Key findings from the tests showed that flood-affected homes had higher levels of mould, including species known to cause respiratory issues. Even some 'control' homes had poor ventilation and hidden pathogens. This discovery highlighted a common issue around indoor air quality.

The team shared its results with residents, along with cost-effective strategies to improve ventilation and reduce mould exposure. Many were unaware of the lasting health risks of flood-affected homes.

The project empowered residents with simple strategies to improve the health of their homes, as well as the evidence and confidence to advocate for better living conditions.

Furthermore, the project ignited greater interest in STEM pathways for many participating students. Senior high school students particularly valued applying statistics in a practical way, and many reported that they can now see statistics as a potential career path, alongside medicine and forensic science.

Looking ahead, the team plans to continue their advocacy, sharing findings through community events, libraries and local media to empower whānau in Māngere and beyond.



2024

# EXPLORING THE MARINE ENVIRONMENT WITH UNDERWATER OPTICAL SENSORS

AUT + AORERE COLLEGE

***How do tidal currents influence the circulation and ecology of the Mahurangi Harbour estuary?***

*Year 13 biology students from Aorere College partnered with marine scientists at Auckland University of Technology (AUT) to explore oceanographic processes using state-of-the-art underwater sensor technology.*

This project centred on a research expedition to Mahurangi Harbour, where students worked aboard an AUT research vessel to collect real-time oceanographic data.

The students operated advanced underwater sensors to measure temperature, salinity, turbidity and light penetration at different depths. They later analysed this data at AUT's computer lab, using visual plots to interpret how abiotic factors shift from estuary to open sea.

This fieldwork and data analysis enabled the students to explore the connection between marine science and daily life, especially how tidal flows, climate change and pollution can impact local ecosystems.

A highlight for many participants was understanding how environmental monitoring happens over a long period of time and that different researchers (like themselves) can contribute to growing bodies of knowledge. They could also see data science and statistics in a meaningful context, alongside other STEM pathways in ecology, climate science, technology and more.

> *This project enabled the students to participate in the generation and analysis of real-world data.*
>
> DR REBECCA JARVIS, project lead
> AUT

Aorere College teacher Aidan Kiely believes this exposure to STEM careers was hugely beneficial in broadening students' understanding of pathways beyond traditional health sciences. In addition, he hoped having *"two awesome women scientists working with a mostly female class challenged students' pervasive perceptions that scientists are mostly men."*

Ultimately, this project helped inspire and prepare senior students for tertiary studies through exposure to role models, university settings and academic research. It also provided them with a deeper understanding of how scientists can address environmental challenges.

# GAMIFYING ECO-NUTRITION

MANUREWA INTERMEDIATE SCHOOL

***How can we use gaming to improve food choices for ourselves and the environment?***

***This innovative project challenged Year 7 students from Manurewa Intermediate School to design engaging gaming experiences that promote sustainability, eco-friendly food choices and nutritional awareness.***

The project's 32 participants began by embracing ecological systems thinking to trace the 'mauri' of different lunchbox foods from production through to disposal.

Supported by scientists from Clean Plate and Food for Thought, the students studied the nutritional value and environmental impact of different lunchbox choices.

Experts from The Open Fort supported the project's gamification of learning by demonstrating sustainability and educational principles through interactive storytelling and gameplay mechanics.

> *The kids did a lot of work at home, researching game designs and testing with their families.*
>
> JO MCINTYRE-BROWN, lead teacher
> Manurewa Intermediate School

Next, the students put their newfound knowledge to use by researching, designing and prototyping a dozen educational games to teach their peers about making healthier and more sustainable food choices.

This process proved hugely motivating for the students and helped to deepen their engagement and learning. They particularly enjoyed seeing their initial concepts turned into real products, as they tested and refined prototypes based on player feedback.

A surprising outcome was seeing how well the students worked together in unexpected ways, like the many gamers in the group sharing their knowledge with those who had less gaming experience.

Several completed games are expected to be published in 2025, leaving a legacy of educational resources developed by students, for students. The school expects to use gamification more as they continue working to inspire the next generation of sustainability champions in their community.

*See the project in action in this highlights video!*





# EXPLORING HOW INDIGENOUS PRACTICES INFLUENCE HAUORA

AORERE COLLEGE

***How can indigenous environmental practices support our energy, emotions and well-being?***

***In this interdisciplinary project, Aorere College Year 11 PE students explored how mātauranga Māori and indigenous Pasifika knowledge can enhance physical and mental hauora (well-being). Through experiences aligned with the maramataka (Māori lunar calendar), they investigated how reconnecting with the environment can improve energy levels, health and resilience.***

The project involved students engaging in a series of cultural and physical activities, including planting a community garden, undertaking waka ama paddling sessions and participating in traditional Māori sports like *Kī-o-rahi*. Different activities were linked to different phases of the maramataka and seasonal cycles.

Through personal reflection journals and online portfolios, the participants documented how the various experiences influenced their energy levels, emotions and connection to their culture.

They also linked their experiences to indigenous concepts of service and reciprocity, including kotahitanga (unity), kuleana (responsibility for and service to the land), tautua (leadership through service), and tuakana-teina (older and younger sibling relationship).

Despite time constraints limiting some planned activities, the students showed improved engagement and pride in their identity through this approach to learning.

Lead teacher Freya Bullock reports that the *"students connecting with their identity made them much more confident, engaged learners. They have reflected this themselves through [their journals], and it has also been evident in assessments and work throughout the year."*

The project also challenged traditional ideas of health and physical education, encouraging deeper conversations within the school about integrating indigenous knowledge into their curriculum design.

The completed community garden will serve as a lasting learning space at the school, where it will continue to support projects in sustainability, science, physical health, nutrition and well-being.

Through practical application of traditional knowledge, this project empowered young people to explore holistic well-being and cultural identity, ensuring indigenous perspectives are recognised as vital to health and education.

# MĀRA TE AITANGA PEPEKE

ROBERTSON ROAD SCHOOL

***How can we restore our school environment to support biodiversity?***

*Over three terms, 134 Year 7–8 students at Robertson Road School worked together to transform an outdoor space into a thriving biodiversity garden. They used Te Tukanga Hoahoa Whakaaro, a culturally responsive design-thinking model, to guide their projects and explore scientific concepts such as pollination, decomposition, water conservation, habitat restoration, biodiversity and ecosystem health. Their ultimate goal was to design innovative solutions to attract and support more native species back to their school.*

The students started off by researching the wants and needs of the various birds, insects, skinks and other users of their garden space. They then designed and prototyped a range of solutions including birdhouses, insect hotels, worm farms, lizard habitats and a living playhouse.

Educational trips to Auckland Zoo, Auckland Museum and the Botanic Gardens helped students to refine their ideas through seeing conservation efforts in action and having discussions with scientists.

Lead teacher Helen Wackrow says it was *"incredible for students to meet the entomologists, botanists and conservationists ... and be able to ask questions and deepen their understanding."*

The project extended beyond science, with the students also designing seating areas, play tables and educational games to create a welcoming community space.

Digital technology and science communication were important as well, with all students creating mini websites and integrating QR codes onto interactive labels to educate their peers and whānau about their work.

Through their learning, the students have built confidence, curiosity and a sense of ownership over their space. They demonstrated resilience, problem-solving and teamwork, and they developed a better understanding of their environment and their role as kaitiaki.

Alongside the biodiversity garden, the students also worked with Oke Charity to redevelop the school's māra kai (food garden) and established a pātaka kai (community food pantry) to provide fresh produce to whānau.

This has been hugely successful in strengthening whānau relationships with the school. Plans are now underway to expand the new outdoor garden spaces into a fully equipped STEM outdoor laboratory that will be open for all students and their families to explore.

◀ *Project highlights*
*A closer look* ▶








# FROM SCHOOL TO SEA: MICROPLASTIC POLLUTION IMPACTS

TREAD LIGHTLY CHARITABLE TRUST

***Does our school contribute to coastal pollution — and what can we do about it?***

***Tread Lightly Charitable Trust worked with over 80 students from Point England, Reremoana and Weymouth Primary Schools in an environmental investigation to uncover the connection between school litter and marine plastic waste.***

The project began with litter audits at each school, with students recording the most common types of waste found in playgrounds. They discovered that soft plastics, food wrappers and synthetic turf fibres were some of the biggest culprits.

Tread Lightly also installed and monitored LittaTraps at each school so the students could see what litter was washing down their schools' stormwater drains. Learning about the stormwater system helped students understand the connectivity between their local school environment and downstream coastal environments.

University of Otago microplastics researchers Dr Olga Pantos and Teresa Morrell shared how marine pollution impacts animals and ecosystems.

Taking their investigations to the coastline, students next conducted microplastics sampling at Laurie Gibbons Memorial Park, Pāpākiri St Annes Foreshore and Point England Reserve.

Using citizen science techniques like 'Marine Metre Squared', the students collected and analysed plastic fragments from the reserves.

The students also designed and tested their own prototypes for trapping microplastics in water samples.

Seeing the students take ownership of the design process was a highlight for the teachers, reinforcing for them the importance of open-ended experiences. Teachers especially noted that the girls were very engaged in problem-solving and experimentation, demonstrating creativity and confidence in developing their microplastics filters.

Students also enthusiastically turned their learning into action by ideating ways to reduce plastic litter in their school environment. By combining science, technology and environmental action, this community-led project empowered students to see how small changes can make a big difference in protecting marine environments.

This project's research will be incorporated into future Tread Lightly Caravan activities, ensuring that more schools and communities can engage in microplastics testing and waste reduction initiatives in the future.

> *[Working] with marine microplastics scientists was so valuable. The students gained insight into real-world scientific research and were very curious about how the scientists ended up in this field.*
>
> SAM BADIAS, educator
> Tread Lightly Charitable Trust

# HYDROPONICS: GARDENING WITHOUT SOIL

JAMES COOK HIGH SCHOOL

***How can hydroponic gardening support urban food security?***

***Over 300 Year 10 students from James Cook High School explored this question through the installation of seven deep water culture hydroponic kits in their school science labs. They were guided by tech specialist Krishna Khatri-Chetri, who mentored students and teachers in the installation and operation of these kits.***

The hydroponics kits gave students an opportunity to see how plants grow and to experiment with different variables, such as pH levels, nutrient concentrations and light exposure.

Many students were surprised to see plants thriving in water alone, challenging their assumptions about what plants need to grow. They observed firsthand how fast plants can grow hydroponically and how indoor growing can be more space- and resource-efficient compared to traditional soil-based gardening.

The hydroponic kits have become a valuable learning resource for the school's junior sciences as well as the senior biology and chemistry classes.

Beyond the science curriculum, this project introduced participants to engineering concepts (system design), technology (sensors and monitoring equipment) and statistics (data collection and analysis).

Problem solving was important too, as students had to continually review data and adjust pH and nutrient concentrations to optimise plant growing conditions.

Observing the effects of different variables was highly rewarding for the students and allowed them to apply practical science concepts in a low-stakes setting.

As science teacher Adiel Adams explains, the students became *"more independent learners ... reflecting on what they're doing. If they make a mistake, they're willing to have a go at fixing it and learning from it. [This project] is giving them the tools and skills to do these things."*

The project also sparked discussions about food security, the environment and urban farming, with students exploring how hydroponics could offer innovative solutions for growing fresh produce in limited spaces.

Students' growing curiosity and engagement with science has led to record numbers continuing with senior horticulture. This interest also prompted the school to introduce a specialist Year 10 course focused on hydroponics.

As James Cook High School expands its horticultural science programme, its students will continue to explore real-world STEM applications, gaining valuable experience in sustainable agriculture and scientific inquiry.



> *[This project] engaged the learners as it was fun ... It helped them understand that science teaches us lifelong skills and make us more mature in our thinking and how we do things.*
>
> NILESH SHARMA, lead teacher
> James Cook High School






# PUNA OLE ATAMAI SENSORY GARDEN

PASIFIKA EARLY LEARNING

***How does planting and eating food from the garden help our children learn about healthy food choices?***

***Setting up young children with healthy eating habits is important for long-term learning and well-being outcomes. Puna Ole Atamai, a Samoan-language early childhood education (ECE) centre in Māngere, created a project to connect their tamaiti (children) with healthy eating through gardening.***

The project saw 23 tamaiti and 5 adults engaging in activities such as exploring the textures, smells and tastes of produce; and learning about food cycles, planting and cooking vegetables.

Experiential learning at the ECE was bolstered by field trips to Auckland Botanic Gardens and Butterfly Creek, where the tamaiti learnt about the role of biodiversity in food production.

The centre partnered with local landscape architects to design and construct outdoor garden beds, which the tamaiti helped to plant and maintain.

Through this garden, children not only learned about healthy eating but also developed fine motor skills, responsibility and an appreciation for the environment.

They also documented plant growth; observed sensory changes in plants; helped to prepare and cook vegetables; and even experimented with natural dyeing techniques using radishes.

This project has sparked curiosity and enthusiasm for science, nature and cultural heritage in its participants. It is now part of an enriching curriculum laying the foundation for lifelong environmental stewardship and a healthy connection to food.

The centre hopes to provide fresh produce and 'kid-friendly' recipes to their community as part of a long-term plan to make their ECE gardens a space for community learning and connection.

# KAI 2 (KAITIAKI ACTION AND INVESTIGATION)

TĀMAKI COLLEGE

***How can schools better manage waste and adopt sustainable practices?***

***The KAI 2 project at Tāmaki College is an initiative that creates opportunities for students to address local issues and be of service to their communities. In 2024, the student-driven initiative focused on waste management and reduction.***

Through a participatory action research approach, students conducted waste audits in and around the school and identified key waste streams. This included food waste, plastic/recycling waste, textiles, hard materials (from nearby construction sites) and litter in the school gardens.

Groups of students worked with mentors from community organisations to tackle the different waste streams. They designed, prototyped and tested solutions including upcycling, waste separation, food repurposing, composting and upgrading rain gardens. A standout was the students' funny videos to spread the word about the importance of waste management and their efforts to build a culture of environmental care in their school community.

All solutions were embedded in the concept of kaitiakitanga (environmental guardianship), ensuring ideas were both scientifically sound and culturally meaningful.

One of the most impressive outcomes teachers observed was the positive shift in students' attitudes and behaviours. The practical nature of the project reduced reliance on devices, enabling students to be more engaged and collaborative. Waste management, often seen as an awkward or 'gross' topic, was reframed as an opportunity for creativity and problem-solving, with moments of laughter and teamwork emerging from activities like waste audits and rubbish collection.

The project broadened participants' awareness of STEM careers and study pathways by exposing them to various role models within environmental science, sustainability, creative industries and technology sectors. This was particularly meaningful for the Pasifika students, who were able to learn from Pasifika mentors in an uplifting, supportive tuakana-teina model.

Overall, this project has helped to build a positive culture around waste management at Tāmaki College, with participants hopeful their efforts will continue as the school's enviro club implements many of their solutions.

More than just a waste management project, KAI 2 has empowered Tāmaki College's students to become environmental leaders, instilling a lasting commitment to sustainability within and outside of their school.

*See the project in action in this highlights video!*






# ASSESSING THE IMPACT OF LIGHT POLLUTION ON URBAN ENVIRONMENTS

MARAETAI BEACH SCHOOL + SKYLABS NZ

***How does light pollution affect urban environments? What can communities do to mitigate its effects?***

***A group of inquisitive students from Maraetai Beach School explored these questions through a citizen science project measuring and analysing light pollution levels on the Pōhutukawa Coast.***

With the guidance of scientist Jordi Blasco from Skylabs NZ, students used sky quality meters, all-sky cameras and visual observations to measure light pollution levels at different locations and times of day.

The students and their parents learnt to use technology like telescopes and light sensors and embarked on many stargazing sessions as part of the project. Along the way, they also learnt how astronomical observations (and scientific research) can often be hindered by bad weather!

To protect their sensitive monitoring equipment from that bad weather (and general damage), the students even designed and 3D printed protective domes to cover the all-sky cameras, adding an element of technological design that will ensure the school can make the most of this equipment for long-term monitoring.

The students also conducted surveys to assess the impact of artificial lighting and light pollution on their local community. They were surprised to discover that over half of survey respondents reported sleep disturbances linked to excessive night-time lighting, while 80% supported local government action to reduce light pollution.

Through this project, students gained firsthand experience in data collection and analysis, astronomy, technology, design thinking and environmental science. They shared their findings in local newspapers and school newsletters and have prepared a paper to be presented at a national astronomy conference in 2025.

Jordi says it was *"an absolutely amazing experience — watching [the kids'] curiosity bloom and their interest in STEM grow has been truly inspiring. It has been a privilege to be part of a journey [that] not only ignites a passion for physics and astronomy but also connects [students] to broader scientific domains like ecology, economics and medicine."*

This work has helped to raise awareness in their community of the broader impacts of light pollution, including its effects on wildlife, human health and cultural astronomy and navigation.

To take their learning further, Maraetai Beach School plans to expand the project to incorporate long-term monitoring and working with local councils to advocate for better lighting policies.


# 2024 CURIOUS MINDS CONFERENCE

*In October 2024, over 150 students, teachers and community members came together at AUT South in Manukau to celebrate nine of the projects detailed in this showcase. Students took centre stage, presenting their research and solutions to real-world challenges, gaining firsthand experience of what it means to be a scientist for a day.*

Providing students with a platform to communicate their findings is about more than just sharing ideas — it builds confidence, strengthens literacy and fosters a sense of achievement.

Exposure to a range of projects also broadened students' understanding of STEM, sparking curiosity and new ways of thinking. Many were inspired by how others approached similar challenges, making valuable connections with peers along the way.

> *A big impact is seeing how much joy the students get by getting out of their comfort zone ... and being able to see or experience new things.*
>
> AIDAN KIELY, HoD Science
> Aorere College

Students took the stage to share their research on issues affecting their communities, from the impacts of microplastic and light pollution to rewilding school grounds and exploring indigenous knowledge. Others presented their investigations into sustainability, showcasing their experiments with hydroponics, biodiversity gardens and game design. Presenting in a professional setting gave students the chance to demonstrate their expertise and reinforced the importance of their research.

Beyond the presentations, the event featured an exhibition of models, prototypes and research posters from the featured projects, along with a guided tour of the AUT South campus by Environmental Science students.

This experience was especially significant given that less than half of south Auckland students enrol in tertiary studies after high school. Events like this help bridge that gap, giving students a taste of university life and a sense that they belong in these spaces.

A special thanks to AUT South and the Environmental Science department for their support in making this event a success. By providing opportunities for students to see themselves in STEM, we're helping build the next generation of innovators.

*See the conference in action in this highlights video!*

# TEN YEARS OF SUCCESS

*Over nearly a decade, the Curious Minds Participatory Science Platform has empowered communities, schools, and students across south Auckland to engage meaningfully in STEM (science, technology, engineering and mathematics). With a focus on authentic, community-driven projects, the programme has sparked curiosity, built confidence and left a lasting impact on thousands of young minds. This retrospective highlights the reach, outcomes and sustained changes that demonstrate the value of this investment and its powerful legacy.*

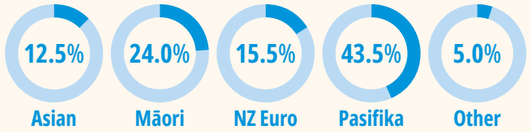
## Our reach

Since 2015, Curious Minds South Auckland has engaged over 8,000 people in STEM project-based learning.

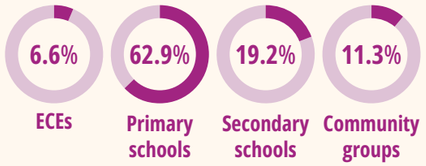
The programme has championed equity, ensuring that under-represented communities — particularly Māori and Pasifika students and those in areas with high socio-economic barriers to achievement — have had access to meaningful learning experiences.

This is evident in the distribution of projects across the PSP funding boundary and in participation numbers — with **over 67% of students** identifying as Māori and/or Pasifika.

### Participants by ethnicity

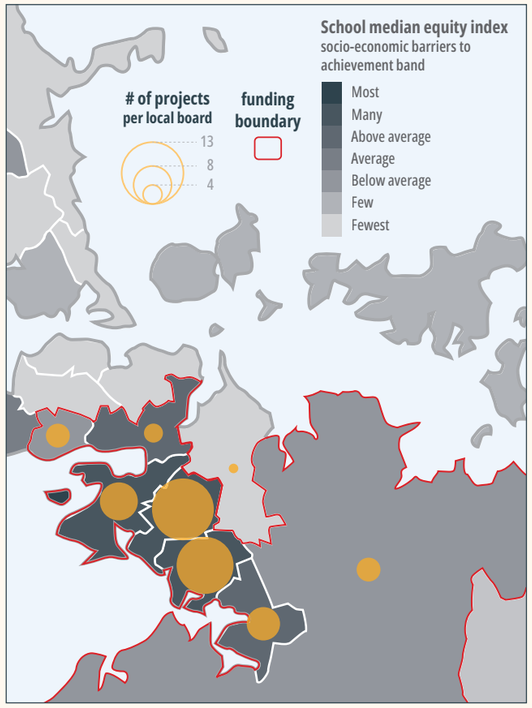



### Participants by group

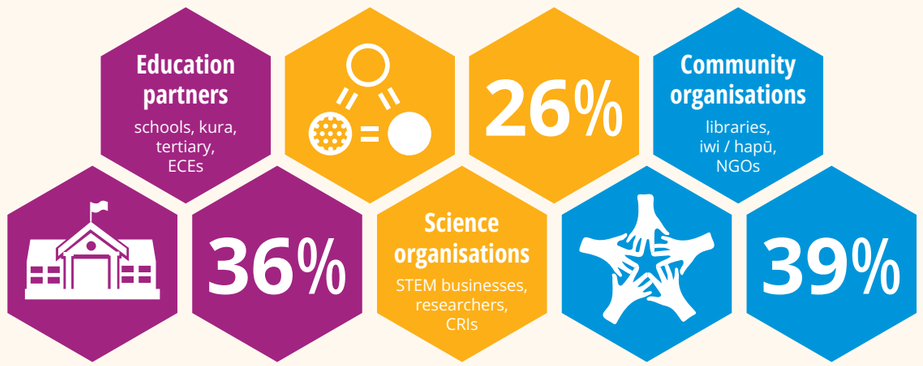



Curious Minds has reached beyond traditional science education to foster inclusion for those historically under-represented in STEM fields. The programme has achieved this by engaging with **over 180 partners from community organisations, tertiary institutions, CRIs, businesses and iwi/hapū**.

### Curious Minds participating schools v equity index




Many different collaborators from different sectors have come together to show students how STEM skills are relevant in their communities.






# Outcomes

The outcomes of Curious Minds can be seen in the experiences of students, teachers and community partners who have participated. Drawing on both quantitative data and qualitative insights, this section explores the key outcomes identified from the programme, including how it has influenced learning, built capability and supported ongoing public engagement with STEM.

## 1. Students understand the value of STEM learning

The wide range of issues and disciplines that Curious Minds projects have covered attests to the fact that STEM is everywhere.

Community-based projects have strengthened students' awareness of how STEM is relevant to their lives and how STEM skills can be applied.

By being active participants, students have seen how they can use their knowledge to speak up, foster change and be part of the solution.

**81%** of previously uninterested students **are now more interested in STEM**

**73%** of students **enjoy finding out about new STEM ideas**

> *I loved that I was able to contribute to the community and give back to the environment … Doing this [project] opened my mind to all the relevant maths and science in my everyday life.*
>
> Year 13 student
> Aorere College

> *The community understood the science … and that it could be used to advocate for change.*
>
> PRAGNA PATEL
> Te Ararata Stream Team

> *[Our project] taught me that curiosity can help us gain more knowledge. If we keep exploring and researching, any questions we have will get answered.*
>
> Student
> Manurewa High School

## 2. Students demonstrate increased confidence, capability and curiosity in STEM

The most significant shifts in STEM engagement occurred in primary school students (Years 1–8), a crucial period when young learners are developing their attitudes towards STEM.

Students in this age group showed increased enthusiasm for STEM, a greater increase in confidence in their abilities and a stronger interest in continued STEM learning.

Early positive interventions at this stage have the greatest potential for long-term impact.

> *The [children's] confidence went up, and the development of their teamwork, leadership and other soft skills was also huge. They are also using a lot more [STEM] terminology.*
>
> KIMBERLEY SULLINGS
> Christ the King Catholic School

***Survey respondents agreed that they ...***

| | Primary (Years 1–8) | Secondary (Years 9–13) |
|---|---|---|
| are now more confident with maths and science | 65% | 50% |
| learnt something new | 82% | 79% |
| would like to do a Curious Minds project again | 67% | 64% |

## 3. Students gain exposure to aspirational STEM careers and pathways

By working with STEM mentors, many students were introduced to career pathways they hadn't previously considered, broadening their appreciation of where STEM studies can lead them.

Working alongside Māori, Pasifika and female mentors helped to increased representation — students can't be what they can't see. This exposure helped to dispel common stereotypes about STEM professions and highlighted the value of bringing diverse thinking, skills and experiences to problem solving.

***Survey respondents agreed that ...***

| | Primary (Years 1–8) | Secondary (Years 9–13) |
|---|---|---|
| their project showed them more possible careers | 62% | 53% |
| knowledge of science is useful for career opportunities | 72% | 80% |


> *Doing this project has made us think about what jobs we might like to aim at in the future using the skills we have learnt.*
>
> Geek Camp participants
> Accelerating Aotearoa (Ōtara)

> *I've seen the students grow to become more independent learners. They're more confident to ask critical questions. [I hope] I'm giving them the tools and the skills to do what they need to do in that space. Students are asking, 'How can I do it better? How can I look at it a different way?'*
>
> ADIEL ADAMS
> James Cook High School

> *A group of 16 students were initially involved in [our project] ... Most have indicated an interest in a science career. Working with scientists at the University of Auckland was a highlight for them. They could see that their learning aligns with what researchers do as part of their everyday work.*
>
> CHANDAR DEWAN
> Tangaroa College

## 4. Numeracy, literacy and so much more!

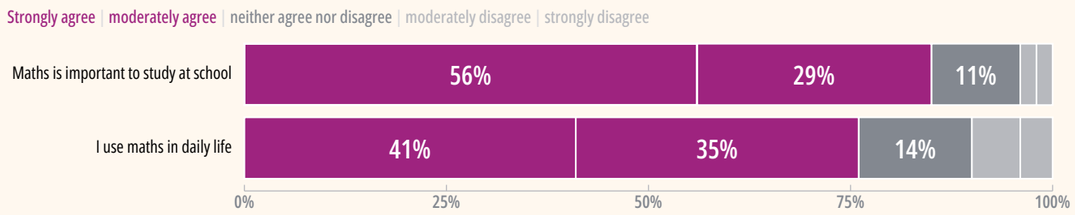
Project-based learning is interdisciplinary by nature, drawing on a wide range of STEM fields and skills — and often requiring students to research, analyse, interpret and communicate written and numerical data.

An unexpected result of the Curious Minds programme is the richness of literacy and numeracy outcomes that have come from students being immersed in a meaningful, authentic learning context.

> *This project helped engage and retain Year 12 students who were at risk of leaving without qualifications, enabling them to gain Level 1 and 2 credits and pass literacy and numeracy.*
>
> CHERYL MITCHELL
> Papakura High School

> *On top of the [STEM] aspects, students learnt financial literacy, measurement, oral language, writing and research skills.*
>
> CHYNNA SWAN
> Reremoana School

***Here's what students said about their interest in maths after participating in a Curious Minds project***



# In summary: ten years of success (2015–2024)

## Programme data

**92** PROJECTS FUNDED

**7378** YOUNG PEOPLE ENGAGED

**94** SCHOOLS INVOLVED

**181** ORGANISATIONS INVOLVED

**$1,499,286** IN FUNDING DISTRIBUTED

**1638** ~24%* MĀORI PARTICIPATED

**3018** ~43%* PASIFIKA PARTICIPATED

**These estimates are based on the total number of participants who provided demographic data.*

## Key outcomes

### INSPIRING CAREER PATHWAYS

- Many students express interest in further studies and careers in science, technology and environmental sustainability.
- Students aspire to become scientists, engineers and innovators, seeing these as achievable career options.

### ACCESS TO ROLE MODELS AND MENTORS

- Students engage with professionals, challenging stereotypes and expanding their understanding of career possibilities.
- Working alongside Māori and female experts provides valuable perspectives and representation.

### SUCCESSFUL PARTNERSHIPS

- Strong collaborations with tertiary institutions, businesses and community organisations enhance student learning experiences.
- Schools and communities gain access to industry expertise and resources, fostering long-term sustainability.

### EMPOWERING EDUCATORS

- Teachers gain confidence and enthusiasm in integrating real-world problem solving into their curriculum.
- Professional development opportunities strengthen educators' ability to inspire and support students.

### DEVELOPING PRACTICAL SKILLS

- Students develop critical skills, such as data analysis, research methods and problem solving.
- These skills prepare young people to make meaningful contributions to their communities and future careers.

### CULTURALLY RESPONSIVE LEARNING

- Projects are designed with a strong cultural lens, incorporating indigenous knowledge and community-driven learning.
- By grounding learning in real-world, culturally relevant contexts, students develop a stronger connection to their heritage and communities.



## STEM ALLIANCE AOTEAROA

Since 2015, the Curious Minds South Auckland Participatory Science Platform has consistently shown the value of collaborative partnerships for creating engaging opportunities for students to explore science, technology, engineering, maths and mātauranga in real-world contexts.

Successful project collaborations rely on the support of communities, tertiary institutions, STEM industry and businesses. Authentic learning would not be possible without connections that extend beyond the classroom.

STEM Alliance Aotearoa, an initiative of Te Hononga Akoranga COMET, was created to strengthen these collaborations across the STEM business sector.

**We connect industry with rangatahi and their communities to support and inspire careers that grow Aotearoa NZ. Our goal is to see local businesses rich with diverse, local talent.**

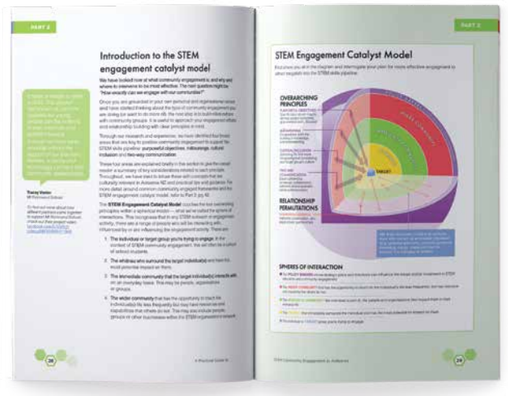
The STEM Alliance team helps organisations to "step up" their outreach and engagement efforts with strategic advice; training; outcomes mapping and evaluation; and connections to community projects. Talk to the team today to find out how we can help.

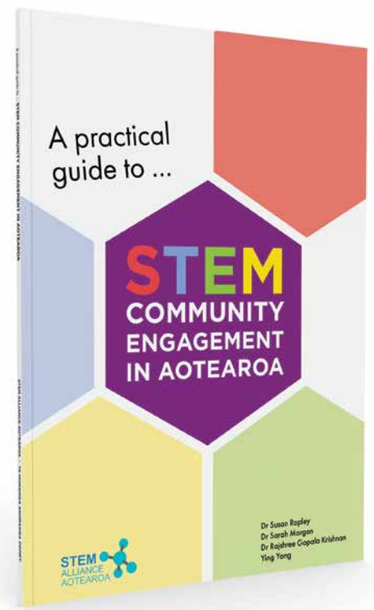
Contact stem@cometauckland.org.nz

### Practical resources for effective engagement

We know that it takes effort to make community outreach and engagement initiatives work. We've made it easier by distilling our knowledge and experience into an easy-to-use, research-based resource: *"A Practical Guide to STEM Community Engagement in Aotearoa"*.

This three-part guide offers advice, tools and guidance to help educators, community facilitators and STEM professionals collaborate to show young people the value of science and technology.




***Get your copy here:***

STEM ALLIANCE AOTEAROA

Te Hononga Akoranga COMET is an independent charitable trust championing better and fairer education, skills and lifelong learning for all Aucklanders. We provide high quality and effective research, project development and leadership for cross–sector initiatives and action.

Operating in south Auckland, Taranaki and Otago, the participatory science platform was an initiative under A Nation of Curious Minds, a government programme to encourage all New Zealanders to get involved with science and technology.

A Nation of Curious Minds was coordinated by the Ministry of Business, Innovation and Employment.

TE HONONGA AKORANGA COMET

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI