CURIOUS MINDS
HE HIHIRI I TE MAHARA

PARTICIPATORY SCIENCE PLATFORM

SOUTH AUCKLAND REGION 2019 PROJECT SHOWCASE

TE HONONGA AKORANGA COMET

SouthSci
Everyone has a question: what's yours?

New Zealand Government

PARTICIPATORY SCIENCE PLATFORM

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Everyone has a question: what's yours?

If you had MONEY and EXPERTS to help, could you answer it?

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SouthSci

INTRODUCTION

Prepare to be amazed by the SouthSci teams from our 2019-funded cohort of projects!

This showcase document will give you a glimpse into the projects SouthSci funded under the Participatory Science Platform in south Auckland in 2019, some of which continued into 2020.

We're particularly proud of this lot, as many were interrupted by the COVID-19 pandemic and online learning conversions, as well as significant interruptions to their ability to conduct experiments, meet in person and meet milestones on a planned schedule.

Every year we get to work with new schools, community groups, scientists and other STEM experts, and one thing always shines through: the extreme goodwill and willingness of all parties to work together on a collaborative project with enthusiasm and joy.

The young people contain a huge amount of potential for innovative STEM problem solving. We can't wait to see where they take us all in future.

The Participatory Science Platform is one of the initiatives under A Nation of Curious Minds – He Whenua Hihiri i te Mahara, funded by the Ministry of Business, Innovation and Employment.

Our mission is to show young people the value of science skills and to highlight career pathways through collaborations with local STEM businesses, researchers and engineers.

SouthSci funds innovative projects that give young people more opportunities to experience science and technology through hands-on activities and collaborative research. Each project can receive up to $20,000.

Our partnership with Fisher & Paykel Healthcare for the project management mentor support programme continues (see page 5 for more details).

Dr Sarah Morgan
SouthSci Project Manager

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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

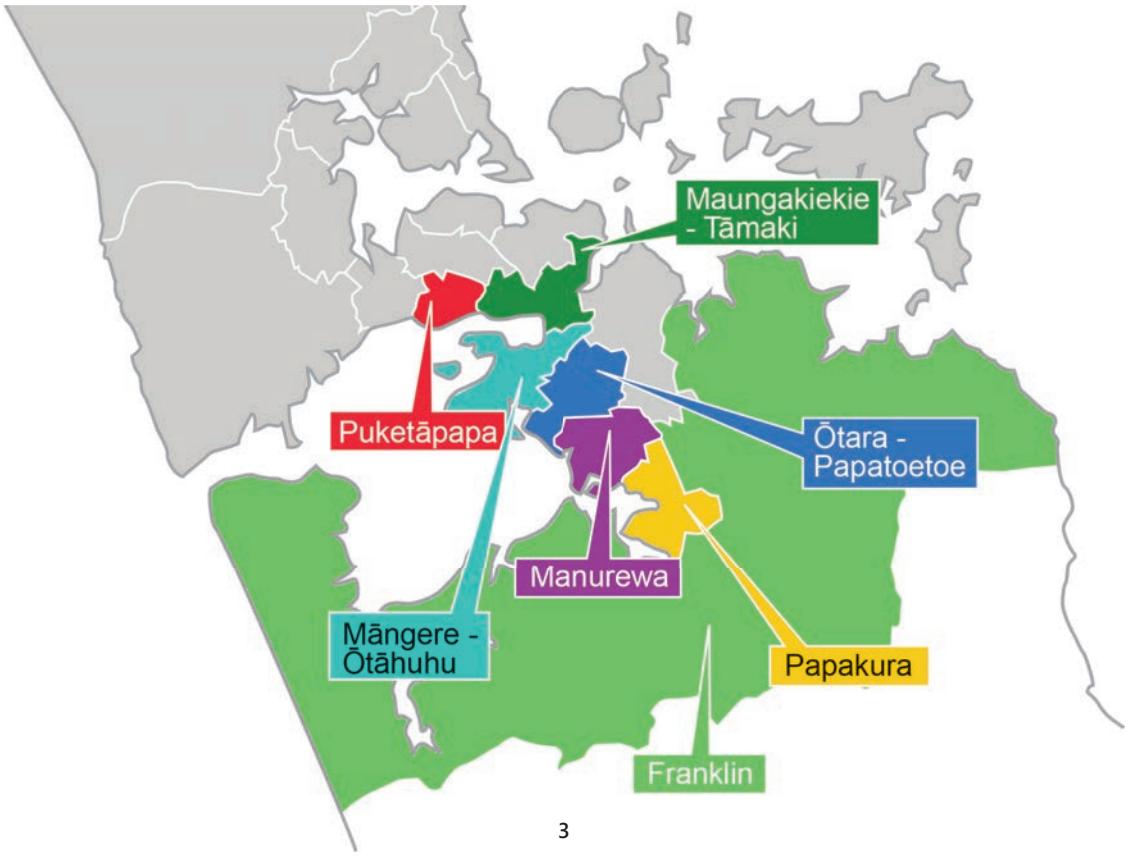
LOCALLY RELEVANT

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

SCIENTIFICALLY ROBUST

Tackle a substantive scientific question in active partnership with a scientist or tech expert

AREAS ELIGIBLE TO APPLY FOR FUNDING:



2019 PROJECT DATA

10

PROJECTS FUNDED

600

YOUNG PEOPLE ENGAGED

16

SCHOOLS INVOLVED

22

ORGANISATIONS INVOLVED

$153,588

IN FUNDING DISTRIBUTED

16

STEM DISCIPLINES UNDER INVESTIGATION

Fisher & Paykel HEALTHCARE

STEM INDUSTRY MENTORS

Fisher & Paykel Healthcare (FPH) has been a proud supporter of SouthSci since its inception in 2015. Initially we enjoyed providing a business lens to the review of new project applications. As SouthSci grew, we recognised the best way we could help was by providing dedicated mentors to support project leaders and inspire young people.

Last year, nearly 30 of our people participated as mentors, coming from all kinds of backgrounds across our organisation. For each of them, it is a commitment of time and energy. While it is often challenging, it is also rewarding, which is why the number of volunteers has grown each year.

FPH prides itself on improving the lives of people all around the world. We also love to encourage original thinking and the pursuit of innovation. SouthSci is therefore a natural fit for us as it empowers young people to answer questions that are of interest to them and that enable them to help improve the world they live in.

Being a SouthSci mentor helps our people to expand their professional skills. They enjoy the chance to present and lead, to solve problems and to support the development of young people in a field they feel passionate about. It's also a chance to work in a completely different environment, with different and unique challenges.

Our mentors also know that, for many young New Zealanders, there is no role model encouraging their curiosity in science. A spark is sometimes the difference between indifference to science and wonder. Our mentors treasure their role in providing that spark and making STEM accessible and relatable. In turn the kids of south Auckland inspire them and remind them of how much fun science can be.

Alicia Evans and **Matt Stephenson**
FPH SouthSci Mentor Coordinators

"Having the FPH mentors was extremely helpful. They were knowledgeable, approachable and easy to communicate with. The students really enjoyed their lessons. I believe they should always be a part of these projects."

– Feric Tjauw, teacher
Kedgley Intermediate School

PROJECT CASE STUDIES

A BUZZ IN THE GARDEN

Three south Auckland community libraries (Ōtāhuhu, Māngere East and Māngere Bridge) invited students from five local schools and science partners from three universities in Auckland to answer questions about how community gardens influence insect diversity and abundance and how plants interact with those insects.

Community gardens increase greenery, reduce pollution and create viable habitats for a range of insects, all of which generates immense benefits for the urban environment.

The students collected data from the three libraries' community gardens on several parameters: the plant species that provided the most improved insect diversity, the variable effects of temperature and moisture on insect life and the various types and roles of the insect species present.

The project was carried out in three key phases. In the first phase, a baseline inventory of the existing invertebrates was created. The second phase involved regular sampling to record soil moisture and air temperature, followed by setting out traps to collect insects. In the last phase, a second inventory was created to compare insect abundance and diversity in the three gardens.

The project touched various key priority directions set in the Auckland Plan, particularly in providing an opportunity for the local community groups to collaborate and utilise local resources and assets and enhance their lives.

Staff at Ōtāhuhu Library reported that it "*was an amazing experience for children to get closer to how real life researchers work and understand the process, get the guidance and make their observations meaningful.*

"*Every day children from local schools spend time at the library seeking homework help. Having a project for them meant a lot, since many of the children lack academic support at home. The SouthSci project created an opportunity.*"

The libraries' staff all hope that the children will be able to get back into the gardens to continue the work and study the evolving ecology.

"The kids got a good understanding of the mini ecosystem in the garden, and I got some great techniques to take back to school."

– Ottilie Morrison, teacher
Māngere Bridge School

MAARA WHAKAORA

Following the death of a peer in 2018, students at Kedgley Intermediate School decided to build a garden on school grounds that they could use as a quiet space for reflection. The trick was to find a way to ensure the garden could sustain itself during the summer holidays.

With the guidance of FPH mentors and experts from Waterworks Irrigation, the students solved the question by developing an automated, solar-powered irrigation system hooked up to a rainwater collection tank.

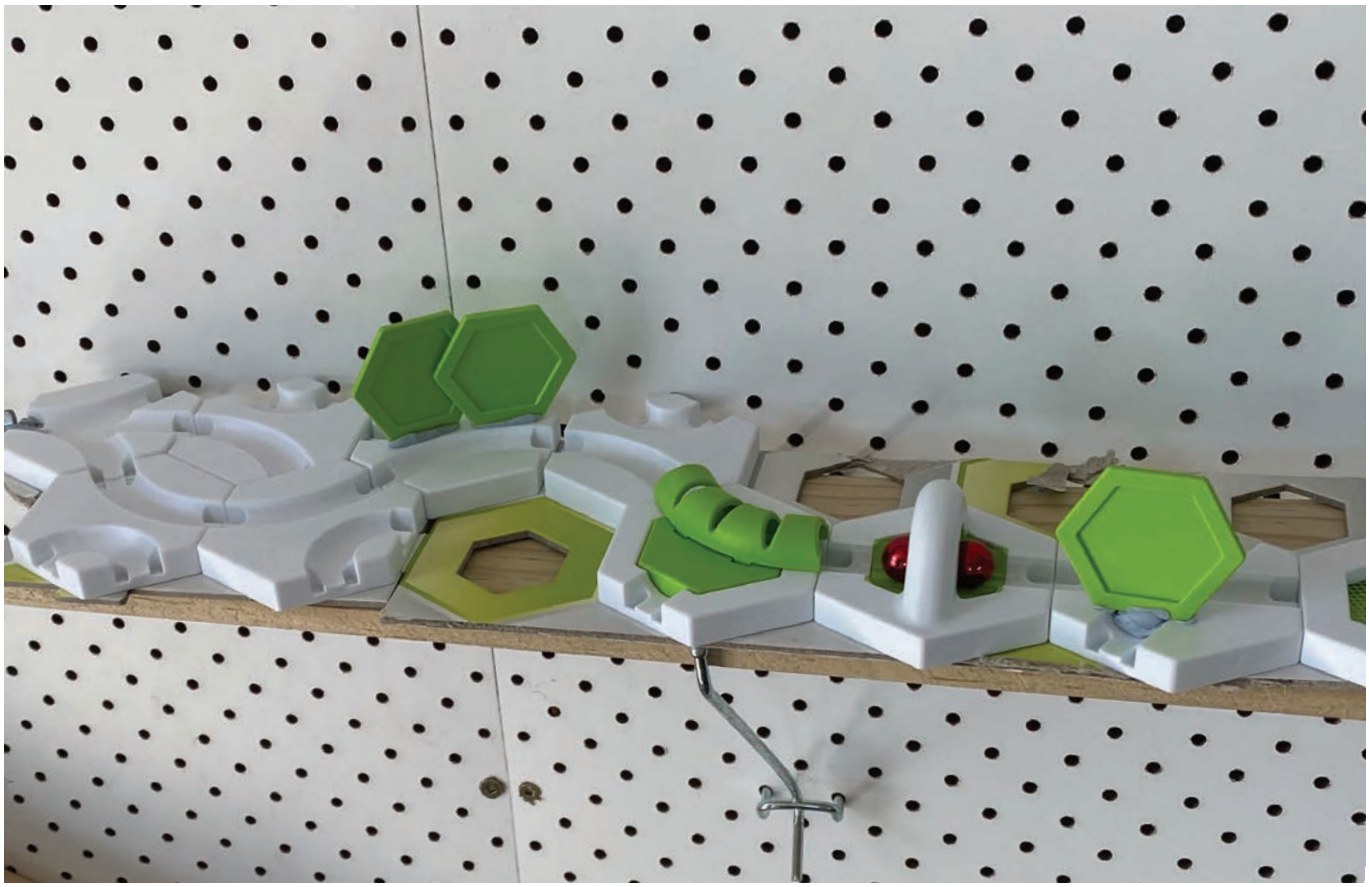
"I believe the students have gained important knowledge and experience. This project will be something they take with them through their entire lives."

– Feric Tjauw, teacher

Utilising the school's STEM design process (Ask, Imagine, Plan, Create, Improve, Present), the students were involved in every aspect of the project, from the initial designs to the construction of the garden boxes, the placement of the solar panel, the choice of water tank, the laying of the topsoil and the planting of the seeds.

According to lead teacher Feric Tjauw, the students were nervous that the water tank they'd chosen was the wrong size and shape. Fortunately the Waterworks experts assured them that it was sufficient for both the size of the garden and the length of time it would be needed for during the summer break.

Feric hopes to do further work on the project, including adding a covered area with seating and a pathway leading to the entrance of the garden. He also intends to recruit students to maintain the garden.



ROBOTIC ROLLER COASTER

With the goal of improving the learning environment in their new school building, students at Southern Cross Campus sought to design an autonomous environment-sensing robot that could sample temperature, humidity and air and noise pollution levels around the classroom.

The main challenge for the students was creating a prototype that could accurately measure the required environmental parameters by remotely taking samples from all around the space without having to move the sensor manually.

The students proposed creating a roller coaster for the robotic sensor. A trip to Rainbow's End enabled them to learn about the physics and mechanics of roller coasters, which enabled them to put together a design brief for their device.

"Hypothesising and analysing the data collected is a vital part of the students' development of their learning around a scientific investigation."

– Donna Lougher, teacher

The roller coaster is still under construction. Once it is up and running, the students plan to collect and analyse the data so they can petition the school for the installation of new infrastructure to address their concerns around their learning environment in the new building.

WATER QUALITY INVESTIGATION

Students from Ōtāhuhu College worked with experts from Wai Care and the University of Auckland gain insights into how urbanisation has had a significant impact on the biodiversity of the Seaside Park estuary.

To create a benchmark for comparison with Seaside Park, the students took a trip out to the Waitākere Ranges to visit the pristine Little Huia stream.

The students tested water quality and measured water visibility and organism biodiversity at both sites to determine the levels of nutrients present and their impact on water clarity and biodiversity. They also tested pH and dissolved oxygen levels, as well as recording air and water temperatures.

As well as gaining insight into how human growth is responsible for environmental degradation, the students learned how human intervention has helped in reversing the damage caused to biodiversity. For instance, the rāhui placed on the Waitākere Ranges has helped protect kauri trees from kauri dieback disease, while the rehabilitation of the Brady Road landfill at Seaside Park resulted in a public park.

Another important outcome has been the engagement of students in kaitiakitanga and sustainability, having had ample potential to develop their critical thinking skills through practical work in the natural environment.

The students also had the opportunity to share their findings and raise awareness about the condition of the local estuary with students at Ōtāhuhu Primary School.

"*The students showed a real excitement when they were teaching the primary school kids, and I believe that rubbed off on them,*" says lead teacher Sarah Wilson.

She concludes: "*It is important that our students are educated and made aware of any future consequences they may face because of previous generations' actions.*"

"I knew climate change and pollution were really bad, but I didn't really see it close to home. The project kind of made us feel a bit self-conscious about how our local area is really dirty and unclean."

– Harneet Singh, Ōtāhuhu College student

PROJECT DUMMY MUMMY

Students at Sir Douglas Bader Intermediate School researched and designed an automated kitten-feeding solution for the SPCA.

SPCA staff were keen not only to reduce the time and cost associated with hand-feeding orphaned kittens but also to reduce the animals' stress levels. To that end, they tasked the students with developing a device that could feed, comfort and keep kittens warm during their first eight weeks of life.

First, the students studied the development of kittens and what levels of care they needed, then they split into groups to brainstorm and sketch designs. The students wanted the kittens to feel like they still had their mum with them.

After lots of research and discussion, the project's Fisher & Paykel Healthcare mentors came up with a way to combine the students' best ideas into a single device.

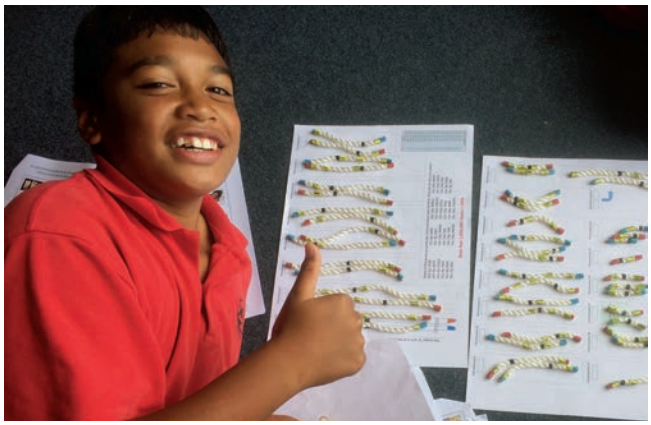
"This project has helped our students to see how useful and applicable STEM is to their lives."

– Karina Weeks, teacher

The students used Tinkercad and Adobe Illustrator to digitise their sketched designs so that the parts for their device could be laser-cut and 3D printed for assembly.

The students still need to trial their device to make sure it's safe: kittens need to suckle, and it can be dangerous if they swallow the wrong material.

These budding designers already have a lot to be proud of — they've taken a big step towards solving a real community issue by helping to relieve the strain of supporting newborn kittens at the SPCA.



MONITORING MICROBES

To understand the contribution of genomics knowledge to society, researchers from the University of Auckland are engaging with students from five local schools to explore DNA structure and apply cutting-edge genomic technology to assess how pollution impacts microbial populations in the Omaru awa.

Year 7–8 students from Glen Innes School, Glenbrae School, Pt England School and St Pius X Primary School, along with year 9 students from Tāmaki College, have investigated the cellular and molecular basis of life and will collect microbial samples from the awa, purify DNA and obtain genomic DNA sequence data.

"We seek to encourage Māori and Pasifika students into STEM careers that will give them a voice in decision-making on the role of genomics in New Zealand."

– Cristin Print, University of Auckland

The findings will provide a valuable baseline to monitor the health of the Omaru awa, for use in future efforts to measure the improvement of water quality.

Three sites along the Omaru awa have been selected for microbial sample collection. The students will use the samples to measure a range of factors to explore environmental impacts on the microbes collected.

DNA will be extracted from these microbial populations, and the Tāmaki College students will perform the DNA sequencing.

It is expected that this monitoring of the water quality and microbial ecology of the Omaru awa will add value to the local community's efforts to restore the overall health of the Tāmaki estuary and its tributaries.

SLEEP STUDY

Poor sleep behaviours are associated with adverse health outcomes and decreased academic performance. Students from Beachlands School collaborated with scientists from FPH to study sleep habits and develop strategies for better sleep health.

With the primary goal of co-designing a sleep health programme, the study's participants broke the project into three distinct phases. In the first phase, the teachers worked with the FPH scientists to develop two related subject lines in their Years 7–8 curriculum.

The *'What is Research and how it is Conducted'* subject helped the students to understand why and how the scientific method is used to find solutions to real-life issues. The second subject, '*The Importance of Healthy Sleep*', provided the students with important insights into the causes and effects of poor sleep on their physical and mental health.

In the next phase, the students developed questions about their own sleep habits and followed the scientific method to test and find answers to their questions. The students ran their own investigations, using Mi Fit smart watches to complete their data sets. They then analysed the data recorded on the devices.

In their findings, the students reflected on whether food containing tryptophan helped someone fall asleep better and what effect drinking tea before bed might have.

During the final phase, the students developed strategies to help improve sleep habits. They were very excited to share these strategies for better sleep health with their peers and the wider community at a school whānau day.

It is expected that the students' enthusiasm for their new, healthier sleep habits will inspire their extended families and help improve quality of life outcomes in the wider community.

PROJECT CITIZEN X

Researchers from AUT empowered intermediate school students from Otahuhu and Pakuranga to advocate for changes to their respective school environments to improve their peers' learning, physical activity, health and wellbeing.

The project leads recruited students from both schools and gave them the training and tools they needed to conduct the research and present their findings.

First, through a series of brainstorming sessions, the students identified and prioritised the following areas of research: physical activity, commuting to school, learning and having fun. The students then used a mobile app called 'Our Voice' to collect data on things that either promoted or inhibited their chosen research topics.

"The students' presentations highlighted what we hoped the project would achieve: building the voice of the students and having their voices count."

– Dr Moushumi Chaudhury, AUT

Next, the students participated in advocacy training sessions, during which they learned about leadership and built up their confidence, as well as their teamwork and problem solving skills.

During the advocacy sessions, the students from Ōtāhuhu Intermediate chose to prioritise bathroom upgrades and the removal of graffiti from around the school, while the students from Pakuranga Intermediate chose to focus on tuckshop upgrades and cleaning up litter.

Working in teams, the students presented their research and proposed improvements to their respective peers, school trustee boards and other community partners.

PACIFIC WAYFINDING

In an effort to foster an interest in science in their local community, Pasifika students from McAuley High School and Ormiston Junior College sought to understand how wave science informed the navigational methods of their Polynesian ancestors.

To answer their question, the students worked with experts on Polynesian wayfinding to gain a deeper understanding of their ancestors' history and the methods they used to navigate across the Pacific Ocean.

The students visited the Manukau Outrigger Canoe Club and sailed around Auckland Harbour in a traditional waka crewed by expert sailors from Te Toki Voyaging Trust. The students were able to align the crew's traditional knowledge of wave motions with modern physics.

"It was a weird, shocking feeling knowing that the history we learn in school about the voyages is not the full story, that there are missing people: the Polynesian navigators."

– Melissa Sieu, McAuley High student

The students shared their knowledge through school newsletters, social media, a scientific report and a creative maze constructed to educate people about wayfinding. They also displayed their findings on visual boards, which they used as part of their presentation at the 2019 SouthSci Symposium.

The maze was an interactive device that presented questions about wayfinding. It was based on the three main tools (sun, waves/swells and stars) that the Polynesian navigators used to travel around the ocean.

The maze also employed a sphero coded to assist with learning about Polynesian navigation. If a user answered a question in the maze incorrectly, the device would prompt them with the correct answer so they could continue. This reflected how the ancestors had to learn from their mistakes in order to find their way across the 'blue moana'.

By the end of the project, the students had learned much about the science of traditional wayfinding, the rich stories that go with it, their Polynesian ancestors who used it and the fact that it continues to have relevance to this day — in navigating lives.


The Sun Through Our Ancestors Eyes
THE BLUE MOANA
Knowing the Stars

2020 PROJECT SUMMARIES

LET IN RAIN!

Students from Reremoana School are working with experts from Watercare and Autism NZ to create a sensory garden that not only caters to neurodiverse students but also utilises a rainwater collection system for irrigation.

STORMWATER SLEUTHS

Researchers from Tread Lightly Charitable Trust will be working with students from five south Auckland schools to monitor and analyse data on the pollutants caught in LittaTraps and develop appropriate intervention methods to help reduce the pollutants entering major Auckland waterways through the local stormwater system.

MODELLING FUTURE AFFORDABLE HOUSING

Researchers from AUT will be working with students from Manurewa High School to assess the current and future projected problem of affordable housing using mathematical modeling.

PLANET FRIENDLY WATERING

Students from the Gardens School in Manurewa, with help from experts at the Auckland Botanic Gardens, plan to provide water to a difficult-to-reach community garden by way of a cost-effective and environmentally sustainable method with a low carbon footprint design.

WAR OF THE MITES!

With help from an expert at Plant & Food Research, students from East Tamaki School are testing household ingredients like Vegemite and Marmite to see which is most effective at attracting guava moths. They will then re-design efficient traps to work with their chosen bait.

WAI WE O TARA CARE

Drawing on learnings from their 2018 SouthSci project, rangatahi from Accelerating Aotearoa are investigating the status of storm and wastewater overflows in the Ōtara-Papatoetoe local board area to determine their environmental impact.

MY POWER MY SCHOOL

With help from FPH mentors, tamaraki at the Puna o Le Atamai preschool are investigating electricity production via sustainable means (or otherwise) in real time. They are also examining the role every individual can play to optimise power use and help in its conservation, protecting the environment and saving money.

HEALTHY & SUSTAINABLE LUNCHBOX SNACKS

Students from Manurewa Central School will work with researchers from AUT to encourage healthier food options in their lunchboxes and to reduce food packaging waste in an effort to become as environmentally sustainable as possible.

USE LESS TODAY … USEFUL TOMORROW

With the assistance of FPH mentors and the Manukau Beautification Trust, the Le Malelega a Le To'elau preschool is designing an efficient waste management and recycling system that is easy enough for their tamariki to use.

COMET Auckland – Te Hononga Akoranga is an independent charitable trust and an Auckland Council CCO 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.

The Participatory Science Platform is currently run in south Auckland, Taranaki and Otago. It is 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 is coordinated by the Ministry of Education, the Office of the Prime Minister's Chief Science Advisor, and the Ministry of Business, Innovation and Employment.

For more information, visit **WWW.CURIOUSMINDS.NZ**

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