

# Field Based STEM

NZASE  
resource

*We know that a local curriculum that is relevant to students is important. Field Based STEM (FBS) is a PLD provider that aims to equip teachers with the skills to take students into the field, at school or beyond, and draw out the learning in science, maths, technology and more. NZASE Science Communicator Mike Stone spoke with teachers who have worked with FBS and two of their facilitators.*

**F**ield Based STEM is the brainchild of Tony Jones, an experienced science teacher from Hawke's Bay. Begun in 2020, the organisation provides PLD for primary and secondary teachers, to help them provide authentic outdoor experiences for their students.

Tony has 40 years' experience as a science teacher, most recently at Te Aratika Academy. This new, small, special character school at Mangateretere caters for Māori boys from Y11-13. Their University Entrance programme is entirely built around field work, with students going out every second day, and overnight every second week. This integrated curriculum incorporates Science, Maths, Geography, Physical Education and English as well as Art. Here Tony honed his skills.

Tony has seen that students are not only better engaged but enjoy much richer learning experiences with real-life examples in front of them. He says: "In nature there is no single explanation, no black and white answers, but instead there are options. Students ask better questions, and have a higher quality of debate on a field trip than in the classroom." He also helps schools make the link between

taking students outside and their physical and mental well-being.

FBS has accredited facilitators across the motu as well as science experts with experience in all sorts of fields. Once signed on, schools have access to all of these experts, including:

- Ruud Kleinpaste MNZM, the bug man
- Julian Thompson and Chris Hollis, geology
- Haritina Mogoşanu and Samuel Leske, astronomy
- Mike King, forager
- Craig Hansen, drone expert
- Richard de Hamel and Sally Carson, marine biology
- Tom Coyle, forensic scientist.

Teachers apply to the Ministry of Education for [regionally allocated funding](#) for this PLD.

Tony and his facilitators work with schools according to their needs. He says, "Each school is different, and we work within their constraints." Once their co-constructed plan is decided, they can work in several ways:

- Coaching a teacher in the field with a small group of students.
- Facilitators and science experts working with teachers to incorporate science

into existing school outdoor activities, e.g. expanding the annual beach day to include learning about rock pools, seals, and geology. Where local experts are available, this can also engage with the relevant mātauranga Māori.

- Supporting teachers to explore a stream with students to find what plants, animals, rocks and chemicals it contains

*Joanne Mintoft checking out an FBS Abel Tasman walk. Photo: Tony Jones.*



*Waipahihi School's Bush School.*



**NZASE**  
New Zealand Association of Science Educators

Representing the needs of science teachers



Manue Martinez, a Whangarei marine scientist who works with FBS, and a humpback whale. Photo: Tony Jones.

(with FBS testing kits).

Tony has also developed a technique for using a graduated piece of plywood to measure the velocity head of a stream: putting the board side-on and then face-on into the stream, measuring the change in height of the water against the board and using  $E_k = \frac{1}{2} mv^2$  and  $E_p = mgh$  to calculate the speed of the stream. The whole stream study could thus include Biology, Chemistry, Geology and Physics.

- Showing teachers how to work with flora, fauna, and geology on school grounds, when students cannot go off-site. Students might learn to measure the thickness of leaves in the light and in the shade, find creatures in the leaf litter, and look at the rocks in the natural and built environments.
- Show teachers how to use indoor activities when weather or staff illness prevents outdoor trips, including kitchen chemistry, measurement, even learning how to use a magnifying glass properly.



Mount Maunganui College students doing CSI work. Photo: Jim Critchley.

## Mount Maunganui College

Jim Critchley teaches Earth and Space Science at Mount Maunganui College. The school wanted to develop a course for senior students around te ao Māori, and learn in wānanga. They applied for MoE PLD funding to support teachers through this.

Jim says, "Tony stepped us through the process and provided brilliant support. He lined up facilitators for a whole range of things."

Hari and Sam from Milky Way Kiwi worked with them on astronomy. Hari is an astrobiologist who trained for Mars missions with

the European Space agency. She has worked with Māori experts to develop a programme that engages with mātauranga Māori. They bring a solar telescope, mock-up Mars rovers, and a mobile planetarium. This includes a *Navigation* video that they produced with Jack Thatcher, a master navigator who affiliates to six iwi from Tauranga to the East Coast.

Hari and Sam showed teachers how to bring astronomy to life and the key things to get across. They took Y10 students through a programme – "it was hands-on, visual, passionate, and engaged students across the whole range of ability," says Jim. Science staff became enthusiastic about teaching astronomy, and with Milky Way Kiwi held a star-gazing evening for students and whānau.

Tom and Allie Coyle helped teachers develop a CSI unit for Y9 classes using fingerprints and DNA analysis. Teachers from the English department have asked to work with Science teachers next year on a cross-curricular unit around a crime scene as a result.

This year, Richard de Hamel showed

## Ngā Kupu

**Karu whakarahi** – Microscope  
**Te Mangōroa** – The Milky Way  
**Mātai aronuku** – Geology (field of study)  
**Matau** – Fish hook  
**Pepeke** – Insect  
**Pūrākau** – Ancient story  
**Rongoā** – To treat; remedy  
**Tairongo** – Sense, perception  
**Tere whaiahu** – Velocity  
**Whakatere** – Navigate.

Te Aka Maori Dictionary and Paekupu



**NZASE**  
 New Zealand Association of Science Educators

Representing the needs of science teachers



teachers how to test marine health. They did not find any micro plastics, but students really enjoyed looking at the life caught by the plankton trawl net. Next year Jim hopes to bring

Richard back to explore Māori fishing, making a traditional hook and testing it.

Jim says “There have been no negatives for us. FBS has helped teachers develop confidence and build skills while giving students something different. With the support of senior management our teacher relief budget has been used to give teachers time with these experts (but we also used weekends and holidays when we did not want to leave our classes). It might look daunting but it is doable. And we are applying for more hours next year.”

### Waipahīhī School

Jenny Maloney and Amanda Wilson are Deputy Principals at Waipahīhī School in Taupō. They say: “Tony met and listened to the three senior leaders. He took us into the field for the day and opened our eyes to the science on our doorstep. We were energised. Our staff were sceptical, so we replicated that experience for them, with Ruud Kleinpaste and Tony taking the 40 of them out for the day and igniting their passion.”

They applied for and received 200 hours of funding from MoE (and have since applied for more). This pays for PLD facilitators, and the

school has to cover relief. “This is not so hard for us as we have more than one teacher in each learning space,” says Jenny “For some PLD we used call-back days in the breaks, and paid for the teaching assistant to be there.”

Generally they used the trickle-down effect. Tony went out with one teacher and 15 students, the teacher learnt what to do and gained confidence, returning to share it with other staff, who then took classes out. “Our students now spend two hours a week in Bush School, a nearby gully,” says Amanda.

They have thought carefully about sustainability. The school used Ruud and Tony as well as Hari and Sam, and forager Mike King from FBS, along with local experts from Kids Greening Taupo and Taupo District Council, so when the funding runs out there are others nearby who can help.

There were lots of pluses – teachers are now taking the kids out, students are enthused and there has been a ripple effect into the community. The challenge was the lack of funding for teacher relief.

“But we are a very collaborative school,” says Amanda, “and this is highly successful. We know that when we work together and support each other, all benefit. So it was ‘tag in – tag out’, and we all built our understanding.”

### FBS facilitators

**Ria Bright** is a facilitator from Northland, who has completed a PhD on climate change education. As an FBS facilitator, she first finds out what schools want and need, which can take time if staff are unsure. She also acts as a broker, helping co-ordinate outside experts.

Ruud Kleinpaste and Kaipara Flats School students finding bugs.  
Photo: Ria Bright.



**NZASE**

New Zealand Association of Science Educators

Representing the needs of science teachers

Kaipara Flats School had a neighbouring piece of land, the pony paddock, which they wanted to develop as an outdoor classroom. Ria worked with principal Debbie Hamer co-ordinating student voice to envisage the many possible outcomes for the pony paddock. The process included maximising the expertise available through FBS.

Ruud Kleinpaste's session focused on the importance of ecosystems, waterways and insects – he helped teachers and students gain confidence in picking up all kinds of bugs.

Amelia Hadfield explored the stream with teachers and students, bringing in microscopes they could connect to computers (these are only \$100, and the school has now bought its own).

Teachers were shown how to explore pūrākau narratives and rongoā plant health from mātauranga Māori. The teachers have grown in confidence, making good use of the outdoor classroom.

**Kathy Broadhead** is a facilitator in the Bay of Plenty. Her Master's in environmental education showed that students need experiences to connect them with the natural world to care about the environment and want to look after it. Now Kathy works with teachers to help them design and create a nature classroom to get students outdoors at a school greenspace, a local reserve within walking distance or a nearby piece of bush.

She shows teachers how to link these experiences to different learning areas, incorporating Key Competencies and Values from the NZC. Recently Kathy worked with a school wanting to enhance their literacy focus on a nature theme.

Kathy showed teachers how to incorporate facets from a story into the outdoor classroom; and how to encourage students to use their senses to explore this world, talk about it together and then write or

draw in a nature notebook. This sows the seed for a kaitiakitanga approach without making that an explicit focus.

Sometimes teachers feel they are too busy to get outside. Kathy aims to show them how easy it is to get started by integrating it with what they are already doing. As well as the learning, there is a well being advantage for both teachers and students, all feeling calmer, happier and more engaged, and focused on their work as a result.



*A student participating in Kathy's Kākano Kids Programme. Photo: Kathy Broadhead.*



*Waipahihi School teachers with Ruud Kleinpaste in the pines. Photo: Amanda Wilson*



**NZASE**

New Zealand Association of Science Educators

Representing the needs of science teachers