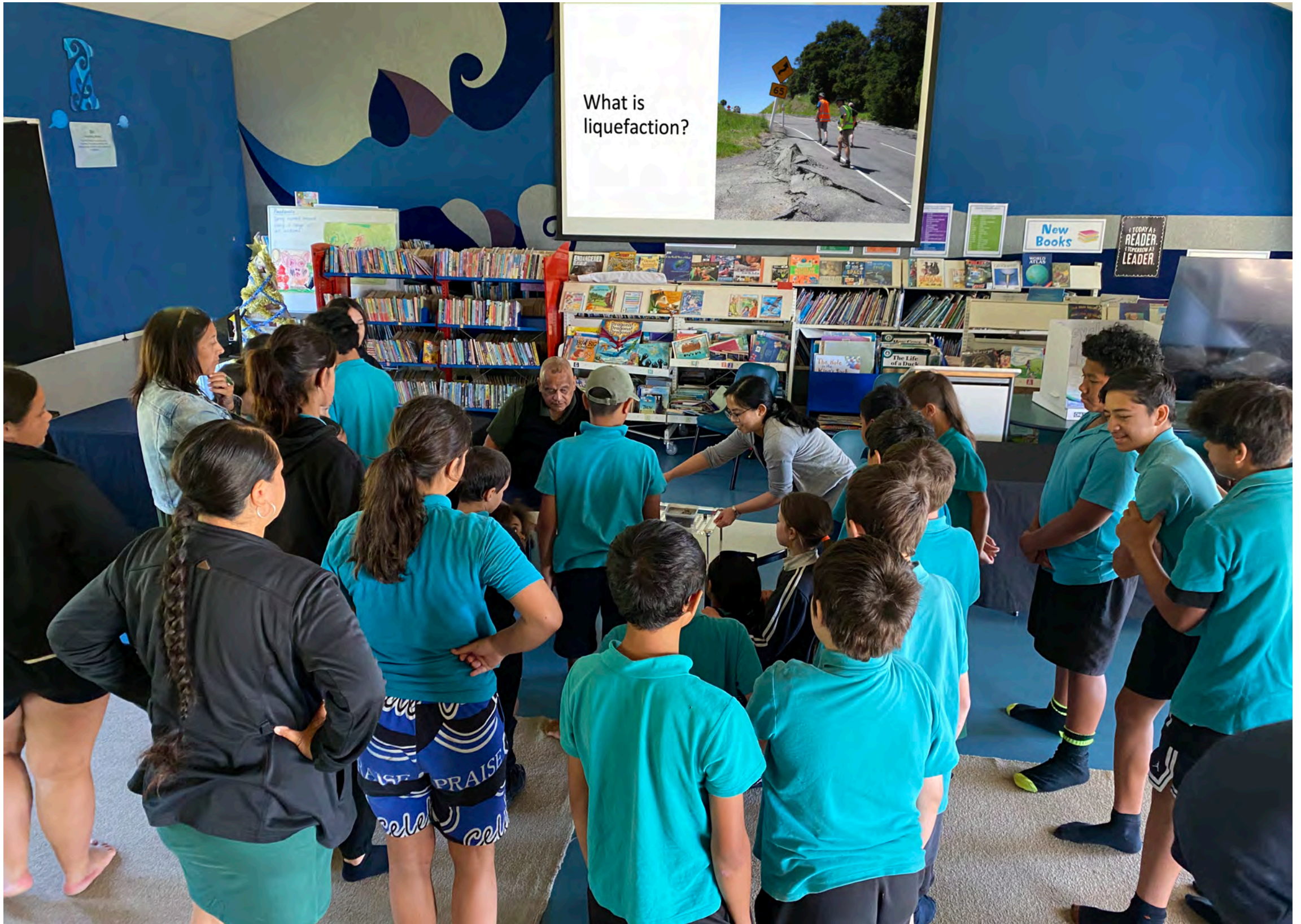

Igniting a taste for science — aligning hazards education engagement programmes with schools and communities



A participatory design project
with Bay of Plenty schools

November 2024

What is
liquefaction?



Executive Summary

This project aimed to enhance engagement in natural hazard education programmes. Using a participatory approach, the project worked with three Bay of Plenty schools—Te Kura Kaupapa Māori o Te Koutu (total immersion Māori education institution), Matatā Public School, and Pukeroa Oruawhata Rotorua Primary School. This project is primarily focussed on students in years 5–8. Schools were chosen to cover an area west to east across Te Ahi Tupua (Taupo Volcanic Zone). By reflecting on each school's unique needs and strengths, the project worked on creating relevant and engaging learning experiences about natural hazards and disaster preparedness.

Why does this project matter?

Natural hazards like earthquakes, volcanic activity and floods, and are a reality in Aotearoa New Zealand, making disaster preparedness education in schools vital. While many outreach programmes exist to enhance hazard knowledge and environmental understanding, these are often one-off engagements that may not fully connect with students. This project sought to overcome these challenges by working directly with schools in the process of designing activities and resources for learning.

This project demonstrates that effective natural hazard education requires strong support for teachers, relevant resources, and meaningful engagement with teachers and students. Schools can play a vital role in building disaster resilience in their communities by empowering teachers with the right tools and aligning hazard education with local contexts. The lessons from the participatory approach supported the ongoing need to improve hazard education.

Key results and recommendations

1. Where we learn (learning environments)

Place-based learning, grounding hazard education in the local environment and culture, helps students see themselves as part of a broader narrative of resilience. Connecting lessons to the community's land, history, and identity enhances student engagement and relevance.

2. How we learn (learning methods)

The project emphasises the importance of recognising and incorporating multiple learning methods to cater to the diverse needs of students. By offering a variety of interactive and accessible activities (e.g. hands-on activities, street maps, liquefaction maps, integration with technology, and storytelling), hazard education can be made more engaging.

3. Supporting our learning (learning support)

Teachers need ongoing support to deliver hazard education effectively. The study found that pre- and post-engagement activities help students build on what they've learned and reinforce their understanding of natural hazards. Teachers also stressed the need for culturally relevant, easy-to-use materials, use of technology, available online teacher resources suitable to the specific curriculum level, thematic learning, that fit within their existing curricula and make hazard education meaningful and enjoyable.



Introduction

Background and problem definition

Natural hazards, including earthquakes, volcanic activity, tsunamis, and extreme weather events, pose significant risks to communities. Natural hazards education engagement programmes may play a crucial role in enhancing young people's understanding of these risks and their capacity for resilience (Johnson et al., 2014; Seddighi et al., 2022). However, many initiatives may not achieve long-term resilience outcomes for schools and their surrounding communities (Johnson et al., 2014; Seddighi et al., 2022).

While engagement programmes can create meaningful impacts in the short term, they often fail to establish sustainability and continuity, leading to repeated cycles of initiating and reinitiating similar projects. This inefficiency risks the duplication of efforts and the loss of valuable resources, ultimately undermining the long-term resilience goals these programmes aim to achieve.

This report presents the outcomes of these objectives, offering insights into how natural hazards education engagements can be more effectively aligned with the needs of schools and communities.

The primary objectives were to:

1. Examine the strengths and weaknesses of existing engagement programmes in selected schools.
2. Identify these schools' specific needs, contexts, and disaster resilience goals.
3. Design and test engagement programmes in collaboration with schools to ensure they are contextually relevant and sustainable.
4. Document the process to create a set of best practices and guidelines for future engagements, ensuring sustainability and continuity.

Project scope

Scope of the research

This research was conducted with three schools in the Bay of Plenty region between Feb 2022–Nov 2023. The schools who took part in the research were: (1) Te Kura Kaupapa Māori o Te Koutu (total immersion Māori education institution), (2) Matatā Public School, and (3) Pukeroa Oruawhata Rotorua Primary. It includes the process of engagement with the schools and recommendations for future school engagements.

Limitations

The scope of this research was limited to three schools within the Bay of Plenty region, which may not fully represent the diverse contexts of other schools across Aotearoa New Zealand. Additionally, the participatory approach in engagements was constrained by various project timeline disruptions, including COVID-19, school strikes, and weather events, which may affect the ability to assess long-term outcomes.

One school withdrew from the study due to a shift in focus prompted by an external education review. Despite strong interest from the school in natural hazards education, pressure from the review led to the disengagement from this project. This underscores the challenge of sustaining hazard education engagement programmes when school priorities change, often as a result of external pressures.

Assumptions

This research assumes that active involvement from schools in the participatory process leads to better alignment with their needs. The strategies developed within the Bay of Plenty region can be adapted to other regions, albeit with contextual modifications.

Participating Schools

Te Kura Kaupapa Māori o Te Koutu is a co-educational Māori immersion school in Rotorua, established in the early 1990s (Meaney et al., 2012). The school offers education from Year 1 to Year 13 within a distinctive Māori environment, emphasising te reo Māori and tikanga Māori as central elements of its curriculum (Te Kura Te Koutu, n.d.). Students learn in a fully immersive Māori language setting, with additional instruction in English and Spanish. The school's motto, "Mahia e tōna ringa, tino kai tino mākona," reflects its commitment to excellence and self-sufficiency.

Matatā Public School is a state-funded full primary school located in the coastal township of Matatā, about 25 km west of Whakatāne. Serving students from Year 1 to Year 8, the school currently has a roll of around 80 students. Matatā Public School's vision is to nurture students into caring and creative individuals who develop a strong sense of identity, community, culture, and adventure (Matatā Public School, n.d.). The school aims to provide a holistic education emphasising literacy and numeracy as fundamental skills. The school values cultural diversity, with a significant portion of its student body identifying as Māori.

Pukeroa Oruawhata Rotorua Primary School, located in Rotorua, is a state-funded primary school that serves students from Year 1 to Year 8. Situated on the ancestral land of Ngāti Whakaeu, the school combines its rich history with modern, innovative learning environments within its historic buildings (Rotorua Primary School, n.d.). The school's vision is to provide high-quality, innovative learning experiences that prepare students in a supportive and safe environment for life's challenges. As an Apple Distinguished School, Rotorua Primary is recognised for its commitment to integrating technology into education.





Project process and evaluation

Listening to teachers and incorporating their feedback was invaluable throughout the project. Despite disruptions, including school closures due to COVID-19 (Moore, 2024) and school strikes (Franks, 2023), which highlight the broader pressures of the school system in Aotearoa New Zealand (such as staffing numbers, pay rates, and conditions) we remained mindful of teachers' priorities. We ensured that our engagement added value without increasing the burden on staff.

As one staff member from Matatā Public School observed, having external perspectives helped “connect the dots” and reveal broader implications of the work being done:

“It’s been good to listen to our teachers talking about this. Sometimes, when you’re doing things, you don’t necessarily realise what it could connect to in a wider sense. It’s good to have outside people sometimes to catch that.”

The engagement process was iterative, with at least two discussion sessions held by each school’s staff and teachers before the student engagement activities were implemented (see Appendix A for the details). Positive feedback from teachers and students highlights the importance of this participatory approach. For example, one teacher, after reviewing the developed activities and resources, expressed their enthusiasm:

“I went over your planning and ‘Wow’, it looks great.”

A liquefaction map used in engaging students at Te Kura Kaupapa Māori o Te Koutou



After conducting the engagement activities with the students, another teacher reflected on the students' reactions:

"Thank you all so much for coming and sharing your knowledge and resources with our tamariki. I have caught up with a few of them today, and they thoroughly enjoyed it and were able to explain a lot of what they learnt which showed how much they understood and enjoyed the activities. He mihi maioha!"

From our iterative visits and engagements with teachers and students, we identified three key aspects that make hazard education programmes meaningful: the learning environment, tailoring learning methods to the students, and providing appropriate support. These three key thematic areas are discussed in more detail throughout the report.



Schools visits and conversations with staff to explore engagement ideas

A holistic approach

Disaster resilience education programmes significantly impact Aotearoa New Zealand (Finnis et al., 2008; Johnson et al., 2014; Ronan & Johnston, 2005). However, the success and sustainability of such programmes hinge on genuine involvement from schools and communities. As seen in initiatives in Australia (Balfour et al., 2014) and Nepal (Subedi et al., 2020), the continued enthusiasm and participation of school staff, teachers, and community members are crucial.

Our research highlights that effective natural hazards education engagement programmes require a holistic approach, addressing the content of what is taught and where and how learning occurs, along with the necessary support systems integrating these themes into a participatory approach to engagement programmes demonstrated that a tailored, context-specific approach could lead to more sustained natural hazards education engagements in schools.

1. Where we learn (learning environments)

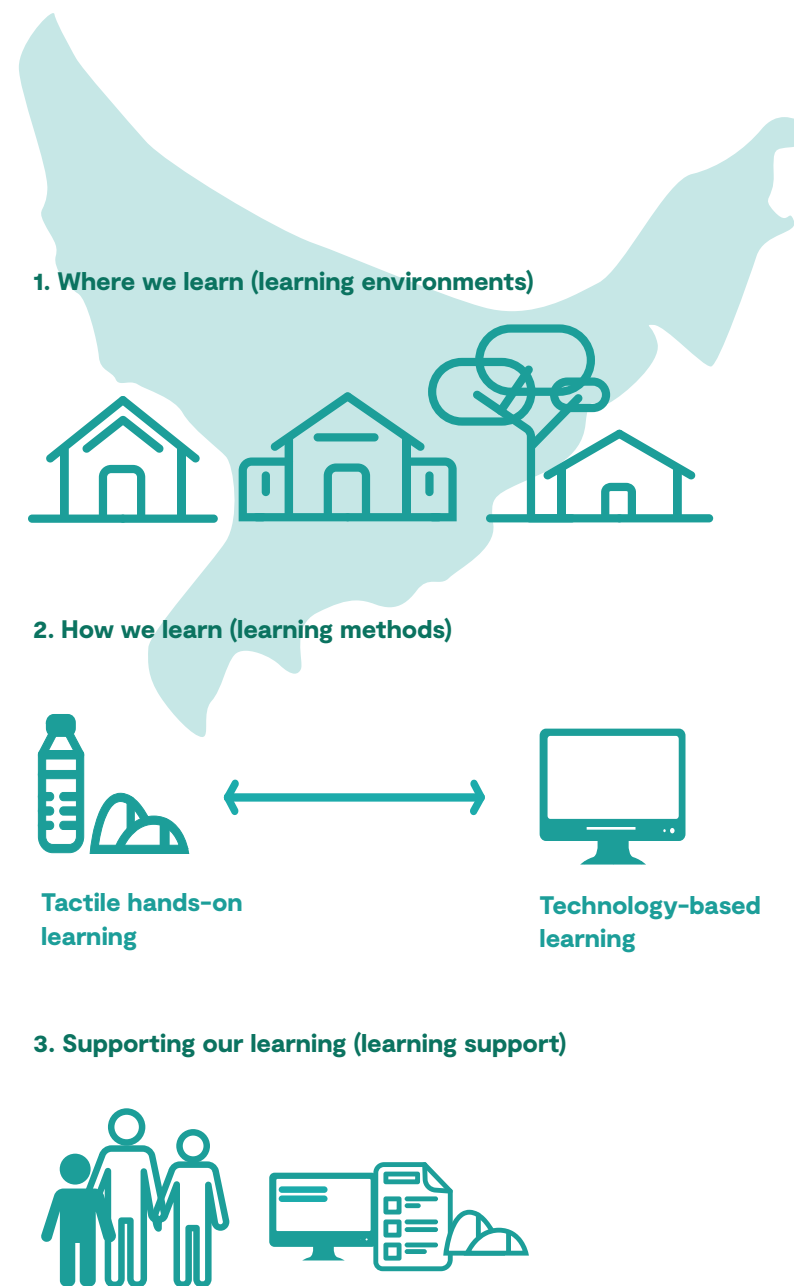
Place-based education emphasises the importance of the local context and enhances the relevance and impact of natural hazards education, making the learning experience more meaningful for students.

2. How we learn (learning methods)

Incorporating diverse learning approaches, such as hands-on activities and storytelling, caters to different learning styles and increases student engagement, leading to deeper understanding and retention of information.

3. Supporting our learning (learning support)

Ensuring teachers and students have access to the necessary resources and support systems is crucial for successfully implementing and maintaining natural hazards education programmes.





Where we learn

Learning environments

Our findings emphasise the importance of place-based learning. Connecting the students with their local environment fosters a sense of identity and deepens their relationship with the land. Without this connection, students may feel distant from, and unengaged with, their surroundings. For example, a ngāwhā, a geothermal activity in the forms of boiling spring, mud pool, fumarole, sulphur water, and geyser, can be potentially disruptive in Rotorua. Yet, such geothermal activities may often go unnoticed by students.

"I notice that the kids are deafened to nature. They don't listen to all of the sounds around them. I hear the ngāwhā by the hospital; sometimes it sounds like jet propellants going off, [and] the kids don't even notice it."

One teacher stressed that engagement activities in Rotorua should cover not only the standard topics of earthquakes or tsunami but also the unique natural processes found in the region. As one teacher put it, "Teaching in our own backyard and in the school backyard" is essential for meaningful learning experiences; deeply rooted in the local environment and whakapapa, exemplifies how localised education can connect the students to their community.

Place-based learning is an approach that connects the students with the local environment (Ministry of Education, n.d.). It is more than just taking the classroom outdoors. Particularly for indigenous contexts, it involves weaving layered concepts of language, culture, relationality and much more (UNESCO, 2021).

Photo: Pouwhenua Te Ahi Tupua (The Eternal Fire) sign portraying the Te Arawa legend of how Rotorua's geothermal area came to be. Intersection of State Highway 5 & 30, Bay of Plenty

In Te Kura Kaupapa Māori o Te Koutu, our engagement activity was set up in the school's science laboratory, marking the first time Year 8 students have entered the laboratory. We used the space to conduct experiments on geological processes, relating them to the 1886 Tarawera eruption – an event deeply meaningful to the local community. We also brought rock samples from the eruption for students to handle, bridging scientific concepts with their local environment.

The teacher's feedback reflected the impact of this approach:

"It has ignited a real taste for science for the Year 8s, so I am really appreciative, as they will hopefully be enthused when they start secondary science next year."

The experience of engaging with the three schools highlights the importance of the environment in which learning takes place in disaster resilience education. Place-based learning, particularly when it integrates local knowledge, culture, and the surrounding natural environment, fosters a deeper sense of connection and relevance for students.

By grounding educational activities in the lived experiences and unique landscapes, such as Rotorua's geothermal activity, students gain scientific understanding and a stronger appreciation for their community and heritage. This approach ensures that hazard education is not abstract but deeply rooted in the students' everyday lives, enhancing engagement and knowledge sharing.

A student enjoys a tactile experience holding a rock formed from pāhoehoe lava.





Students at Pukeroa Oruawhata Rotorua Primary doing the 'popping cap' (ngāwhā experiment).

How we learn

Learning methods

Our study identifies several effective learning methods, including hands-on activities, technology, pūrākau (stories), and intergenerational learning. One teacher emphasised that it is about “getting to know the kids’ interests — knowing how to connect to the students”.

The COVID-19 pandemic has led many schools to adopt online, in-person, and hybrid learning modalities, yet hands-on experiential learning remains the most impactful for skill development (Kline et al., 2021). Teachers in our study confirmed that hands-on experiences, such as interactive displays and science-based activities, significantly boost student engagement and foster creativity. One teacher shared an example of how hands-on exercises following field trips enhance learning:

“It would be cool to have some hands-on science-based activities to bring back to class after being out exploring. Hands-on stuff, like how rocks are formed through heat and pressure. How can we make it real in the classroom? It’s so far underground that it becomes abstract. Things they can touch and manipulate to understand things they can’t see.”

Schools are increasingly embracing technology as it has an inherent role in education (Bond & Bedenlier, 2019). Technology’s integration with hands-on learning remains highly valued. Technology encourages exploration and engagement, but teachers noted the importance of balancing digital tools with physical interactions:

“With our Tech Centre, we are all Apple teachers, so we’re able to help kids with tech. But a mix is good. Kids also like physical touch.”

“We have one-to-one devices for the kids — we would like a combination of digital and physical activities.”

Mapping, whether digital or physical resources, is another valuable tool for teaching natural hazards like flooding, liquefaction, and tsunamis. One teacher described how maps deepen students' understanding of the environment:

"We also use mapping a lot—Maui's splinters were an example of that. We have a map showing green, orange, and red zones for tsunamis, and also, the old flood zones from 2005 had a similar colour coding. What would be really great is detailed maps of Matatā that are really specific and accurate so they can see the gradient of the land, see their house, map out maunga and craters, hāpu boundaries, marae. Would the water come up that hill?"

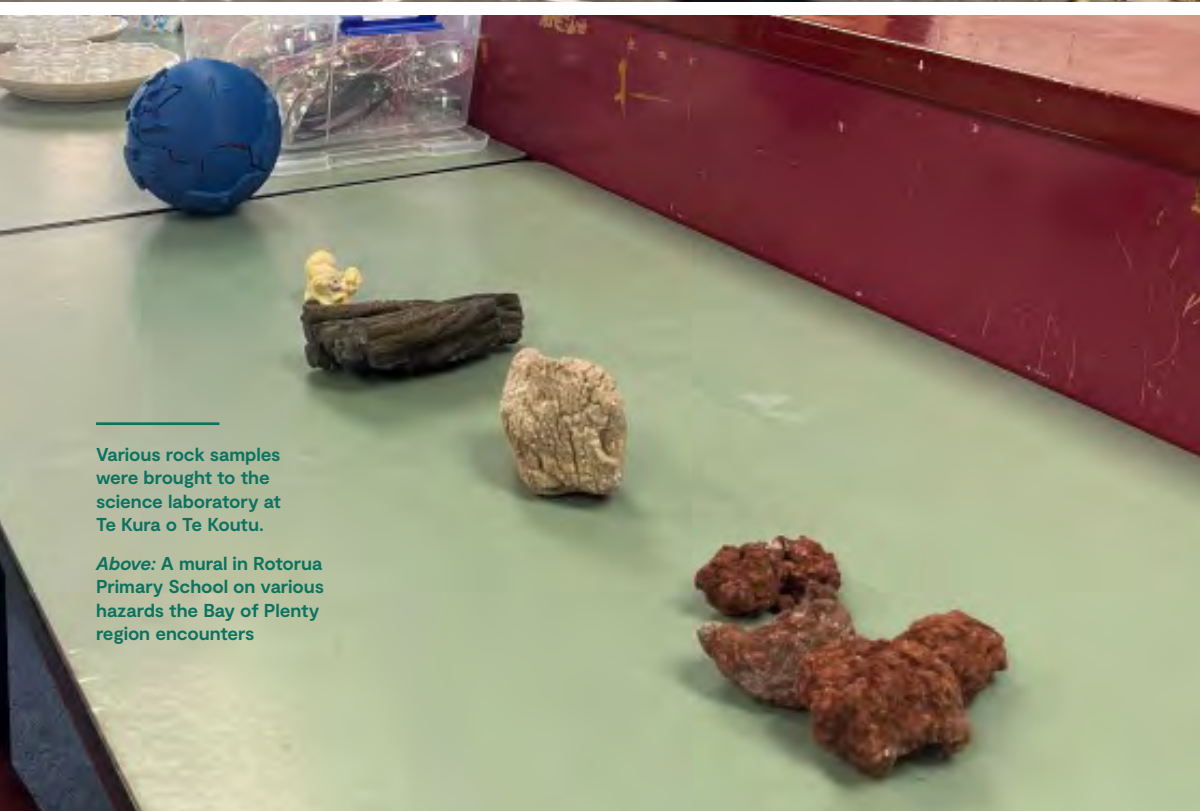
Storytelling, especially combined with intergenerational learning, also significantly promotes meaningful learning (Trujillo-Torres et al., 2023). This method is particularly powerful in Rotorua, where local knowledge is valued and passed down through generations. A teacher highlighted its importance:

"Stories are powerful. Getting the kids to interview their grandparents about what it was like to have ngāwhā in houses—intergenerational learning. [So] kids know that when the ground is yellow, it's dangerous to walk on. It looks like concrete, but you can fall through."

Our interaction with teachers and students reveals the importance of acknowledging and embracing diverse learning methods, even with shorter programmes such as hazard education engagements. Acknowledging that students learn in various ways—whether through hands-on activities, storytelling, or technology integration—ensures that these initiatives are engaging and impactful. Understanding how students learn is critical in tailoring these activities, ensuring they engage in teaching about natural hazards.

Students at Matatā Public School doing liquefaction and mapping activity





Various rock samples were brought to the science laboratory at Te Kura o Te Koutu.

Above: A mural in Rotorua Primary School on various hazards the Bay of Plenty region encounters

Supporting our learning Learning Support

A key factor in the success of hazard education programmes is robust support for teachers, who play a central role in student learning. Empowering teachers with practical tools, resources, and guidance is essential to creating engaging and effective lessons. This study highlights that teacher resilience and well-being are critical to successful disaster education, with supported teachers contributing to stronger community resilience (Fu & Zhang, 2024). Teachers in our study stressed the need for accessible, culturally relevant materials that fit seamlessly into their curricula.

One of the most effective ways to support teachers is by providing pre- and post-engagement resources that ensure continuity of learning. As one teacher remarked:

“Pre-work is huge. I go on the internet and scroll, scroll, scroll, looking for information that I can interpret and the kids can interpret so that it’s not all in one ear and out the other.”

Building resources and capability in different languages, especially in te reo Māori and Tikanga Māori, is also critical. Resources need to be in te reo Māori, and useful for schools environments not university or marae language. This was highlighted in our engagement with Te Kura Kaupapa Māori o Te Koutu:

“How do we upskill [...]to do this in this kura kaupapa setting? There is a language expectation, how do we create this opportunity using our kaupapa?”

Beyond resources, teachers need to feel supported by the programmes rather than one-off, in-and-out interactions. Providing ongoing support strengthens teachers’ capacity and fosters student engagement and resilience (Kang et al., 2024).

“It’s been good to listen to our teachers talking about this... Sometimes, when you’re doing things, you don’t necessarily realise what it could connect to in a wider sense.”

Continuous engagement, such as follow-up activities and supplementary resources, ensures students build on their knowledge over time. Teachers value the support that helps them integrate hazard education into other subjects like math, reading, and literacy, making cross-disciplinary learning more manageable and effective. One teacher shared:

“Narrating these stories is huge for us. I’m not a science person at all. I teach storybooks and use school journals; they give basic information on New Zealand, and then I find scientific information on what we’ve got. We have a cool maths programme and a structured literacy programme. The main block is maths, reading and writing, which I enjoy, if we could work this mahi into that?”

The availability of ready-made resources is crucial in helping teachers deliver hazard education, reducing the burden of sourcing or creating materials. This support makes learning more enjoyable for students while empowering teachers.

The success of hazard education programmes relies on comprehensive support for teachers. We can ensure they feel confident and prepared by equipping them with relevant resources, continuous engagement, and pre-designed activities. Simultaneously, providing students with interactive tools and follow-up activities enhances their understanding of natural hazards.

Through the participatory process, the project developed resources to ease lesson planning and delivery, including:

- an online repository of publicly available natural hazards education resources, offering a curated list of materials
- a list of natural hazard activities with learning outcomes, helping teachers use these activities with clear goals and reducing the need for additional research.

Students at Pukeroa Oruwahata Rotorua Primary engaging in the Coke and Mentos (explosive eruption) activity



Methodology

A participatory design approach

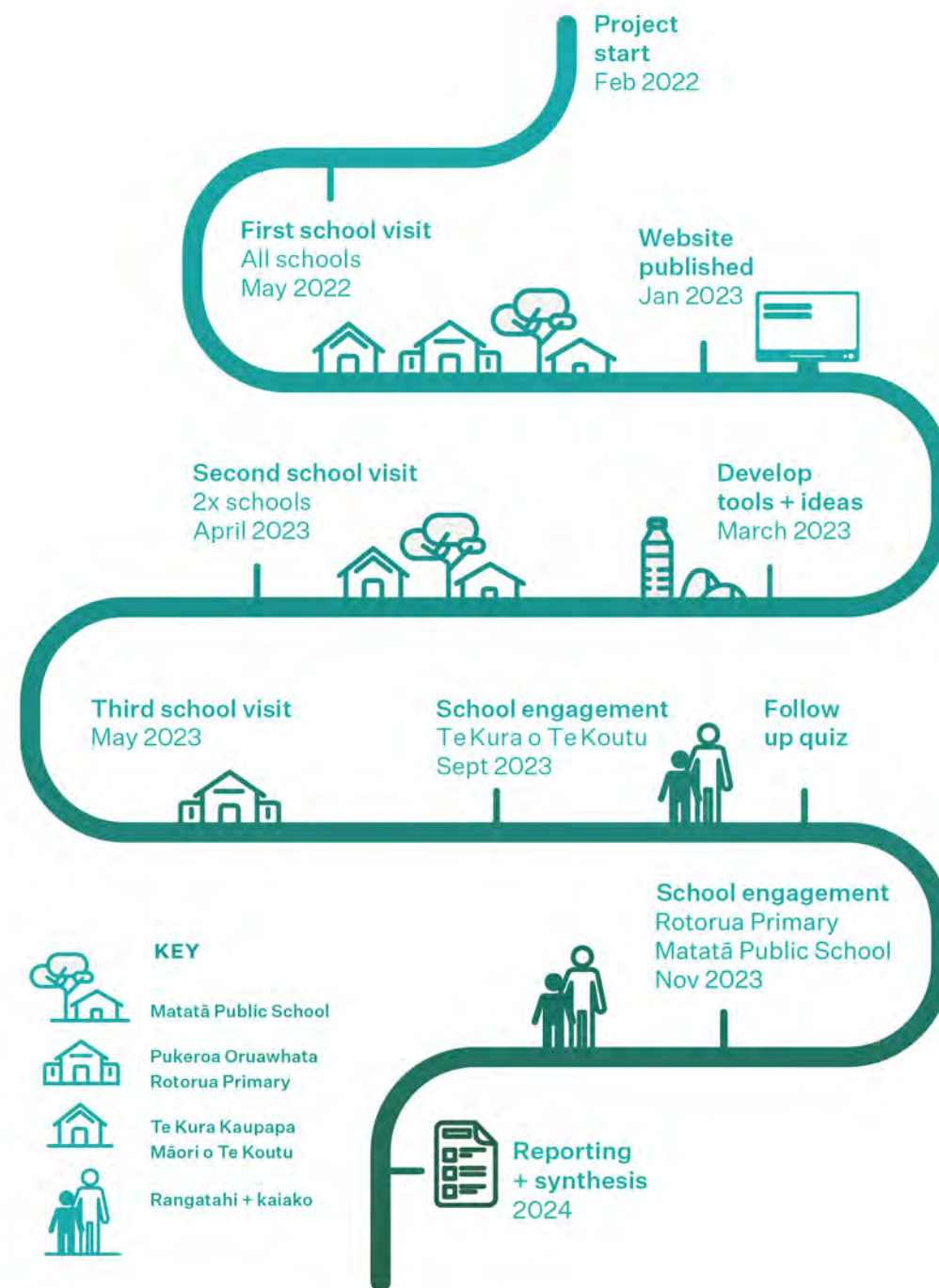
This project employed a participatory design approach to investigate the opportunities and gaps in implementing natural hazard education programmes. The focus was on finding ways of engagement that are aligned, sustainable, and continuous in their contribution to the resilience efforts of the schools. By emphasising active collaboration between researchers and stakeholders, our approach sought to identify and address key challenges to achieve meaningful and lasting outcomes.

Participatory Approach

Participatory design is a collaborative process where stakeholders — schools in the case of this project — work with the research team to develop tools, activities, and strategies that meet their needs (DiSalvo et al., 2018). Participatory design involves more than just technical development; it requires open and rich interaction between parties (Polman et al., 2017). This collective process of “reflection-in-action” creates an interaction to learn from each other’s realities, articulate mutual goals, and define appropriate methods to achieve them (Robertson & Simonsen, 2012). Genuine participation is central to this approach.

Process

The participatory design process began with in-person visits to the participating schools, where the research team met with school staff and teachers. During these meetings, we revisited past activities (from previous projects and engagements) and welcomed feedback from the school staff. In the in-person hui with each school, we discussed recommendations, barriers, and opportunities for designing natural hazards education programmes.



We shared our plans to conduct activities with their Year 7-8 students in the following year and sought contextualised and local input on their needs and preferences for such engagements. This initial stage of visits and meetings aimed to strengthen relationships and understand better the context of the schools. The initial school visits were conducted in May 2022.

Following the initial school visits, the research team developed tools and ideas for the student engagement activities, which were then emailed to the schools. Follow-up in-person visits with the school staff and teachers were arranged to demonstrate the range of possible activities and materials for the student engagements. In the second school visit, conducted in person from March to May 2023, we sought additional feedback from the school staff and teachers, further refining the design of the student engagements to contextualise the activities to the local environment of the schools.

The next engagement with the schools was implementing the hazard education activities with the students. We engaged with 15-30 students for each school, conducting a varied range of activities designed depending on the local contexts of the schools (e.g. a stronger tsunami focus for Matatā Public School, more emphasis on volcanic hazards for Rotorua Primary School, bilingual delivery for Te Kura Kaupapa Māori o Te Koutu). We observed how the students interacted with the activities and materials and sought further feedback from school staff and teachers. Through the three engagements (two in-person hui with staff and teachers and one student activity session) with each school, we compiled the findings for this report.

Schools visits and conversations with staff to explore engagement ideas



Engagement findings

Staff and teacher views

This section provides engagement findings with the three schools, focusing on the insights gathered from the various hui and feedback from school staff and teachers.

Summary of key points with the three schools

The summary below highlights common themes and insights from the schools, supported by direct quotes from teachers to illustrate their perspectives and experiences. These collective findings provide a comprehensive overview of the essential elements contributing to effective and engaging natural hazard education engagements.

1. Provide hands-on learning experiences, such as interactive displays, science-based activities that students can manipulate and touch, and practical learning opportunities to increase engagement and foster creativity.

“The kids think of science as people in white coats and all of that. We want them to see it as something that is part of who they are, not as book work. If you can, come up with some hands-on thinking connected back to preparedness and resilience.”

2. Utilise technology in learning to increase engagement and encourage exploration.

“The kids love authenticity, things that are meaningful or valuable to them. Gaming is one of those things. It helps them to understand the world, — and they know they can make a nice living out of gaming and coding.”

3. Emphasise the importance of place and connecting with the land to instil a sense of identity in students and develop a deeper connection with their environment.

“We visited the Buried Village and the kids really got into the types of volcanic rocks — obsidian, pumice. The little kids love the hands-on. They were more interested in

collecting rocks than they were in the Buried Village! I want the kids out exploring our community and our environment; that’s the experience the kids need because this is where they live. Hands on in the classroom and take them places, that’s what makes the learning sink in.”

4. Incorporate local knowledge, culture, and storytelling to enhance student engagement and help them connect with their identity.

“Our pūrākau are now being told with more conviction. These are our beliefs, we tell these stories as if they are true, this is what happened, they are our local narratives and no one can tell us any different. The kids touching the whenua with feet, hands, inviting all their senses. This is traditional knowledge they must hold so they can stand in their identity, to build their capacity and resilience.”

5. Recognise the value of an integrated programme and ongoing engagements rather than one-off experiences for creating meaningful student learning.

“With people coming in, it’s always better after we’ve scaffolded the kids with learning, like the Hawaiki fire goddesses programme. We start by mapping the journey, using x and y axes, tracking their journey to New Zealand and all the geothermal locations of interest till they arrive in Maketu. Then we go on the geothermal walk, and we use these materials from the Council to learn about the science; hazards are a part of that. A lot of it is tactile — getting steam on your face and getting a facial. Then we have reading and comprehension resources to encourage the kids to apply what they have learnt.”

6. Provide resources to support teachers in delivering fun, interactive, and applicable science education, especially for pre-work and after engagements.

“Kids love science; it’s true. They’re just starved of it. Science was next to non-existent at training college; it’s not a thing. And teachers are scared of talking about something that you feel you don’t know about.”

Engagement findings

Te Kura Kaupapa Māori o te Koutu

School Specific contextualised findings

This section covers each school's unique contexts and specific feedback. We highlight and acknowledge each school's distinct needs and characteristics, offering a nuanced understanding of how natural hazards education can be tailored to different educational environments.

Te Kura Kaupapa Māori o te Koutu

The school emphasises the importance of traditional knowledge and stories in instilling the children's identity, capacity, and resilience. The school has a language expectation and wants to create opportunities for the children to use their language skills. Resilience education efforts should weave local knowledge and te reo Māori into activities. The school acknowledges that the children have an inherent interest and proficiency in technology.



Key points to improve school engagement in resilience education are:

1. Incorporate traditional knowledge and storytelling

The school strongly focuses on Māori culture and language, and weaving traditional knowledge and storytelling with resilience education could enhance student engagement.

2. Utilise technology in learning

Students are interested in technology and are comfortable with it, so incorporating it into the learning process can increase engagement and encourage exploration.

3. Improve the resources

The school has a seismometer from previous natural hazards education engagement that is not fully utilised. Students can become more engaged in science and technology by providing means to access data and resources on how to interpret the data from the machine.

4. Create opportunities for practical learning

Students in the school are interested in practical learning, as demonstrated by their participation in the Te Ara Ahi cycling trail. Providing more hands-on learning and exploration opportunities can increase engagement and foster creativity.

5. Emphasise the importance of place

The school emphasises connecting with the land and instilling a sense of identity in students. By encouraging students to explore their surroundings, they can develop a deeper connection with their environment and become more engaged in learning.

6. Encourage collaboration and communication

The school has a dynamic and open-minded group of teachers. Encouraging collaboration and communication between teachers and students can foster a positive learning environment and increase engagement.

Engagement findings

Matatā Public School

Matatā Public School has experienced major hazards, including the 2004 floods and the recent tsunami warning on 5 March 2021. Resilience education is important to the school's values because the community needs to be prepared for potential hazards, and the school is taking steps to educate students and parents about evacuation procedures.

While the school has incorporated hazards into its teaching and learning, it can be challenging for some students to learn about these topics without experiencing fear and anxiety. To make learning more effective, the school would benefit from more hands-on resources to help students understand abstract concepts. The school emphasises self-management, respectful citizenship, connected collaboration, mindfulness, and inquiry-based learning.



Key points to improve school engagement in resilience education are:

1. Hands-on learning

The teachers at Matatā Public School emphasised the importance of hands-on learning experiences for their students. Providing science-based activities that students can manipulate and touch would be valuable to bring back to the classroom.

2. Integration of local environment

The school has a rich learning program that integrates the local environment, history, and culture into the curriculum. Providing resources that further enhance this integration would likely be well-received.

3. Connected with the community

The broader community was unprepared for the 2021 tsunami warning. Fortunately, the school had a previous exercise with evacuating students. Provide activities that incorporate engaging and connecting with the broader community to prepare for hazards.

4. Addressing anxiety

Some students experienced anxiety around learning about hazards and volcanoes. Providing resources that can humanise and demystify these concepts would help alleviate some of this anxiety.

5. Mapping

The school uses maps to help teach and learn about its community. By using various mapping approaches in teaching, students are introduced to awareness of their geographic environment and their place within it.

6. Student-centred approach

Matatā Public School emphasises a student-centred approach to learning, where students are encouraged to be self-managers and collaborate with others. Providing resources that align with this approach would be beneficial.

Engagement findings

Pukeroa Oruawhata Rotorua Primary School

Rotorua Primary School values learning and ensuring that it is woven into the kaupapa of the school. The school has a strong localised curriculum focusing on geothermal and connections to their whakapapa. The school is interested in providing tactile learning experiences. Science education can be limited at times, and teachers should be supported to deliver science education that is fun, interactive, and applicable to students' lives. The school highly values the use of technology to supplement learning.

“Geothermal is our localised curriculum because we’re working in amongst it, it’s our whakapapa. So whatever we do has to run through the school as well so it gets something going and strong throughout the whole school.”



The key points to improve school engagement in resilience education are:

1. Learning in kaupapa

The school has a strong Māori kaupapa and ensuring that resilience education is woven into this space will help with increased student engagement.

2. Tactile learning

Providing tactile learning experiences on school grounds, that build on the school's already innovative interactive outdoor displays, will continue to engage students in hazards education.

3. Geothermal topics

Incorporating geothermal education and linking to student's whakapapa will help build further connections to their local area.

4. Mapping

By using various mapping approaches in teaching, students are introduced to awareness of their geographic environment and their place within it.

5. Teacher support

Encourage and support staff with training in science and hazards-aligned topics. Provide resources to make it easier for teachers to prepare for and teach science.

6. Power of storytelling

Use stories to make learning more powerful and engaging, like getting students to interview their grandparents about their experiences with natural hazards.

7. Digital and non-digital mix

Use a mix of digital and non-digital resources to engage students in learning.

8. Integration

Recognise the value of an integrated programme and ongoing engagements (including providing pre-work and follow-up materials after engagements) rather than a one-off experience for creating meaningful student learning.

Concluding thoughts

This project has demonstrated the positive impact of well-designed, contextually relevant natural hazard education programmes on students and teachers. Through a participatory approach in engagement with schools in the Bay of Plenty region, we observed that fostering meaningful learning experiences hinges on three critical aspects: the environment in which learning occurs, the methods through which learning is delivered, and the ongoing support provided to teachers and students.

Place-based learning is a powerful approach, connecting students to their local environment and culture (Kerrigan, 2018; Smith & Sobel, 2010; Yemini et al., 2023). The schools in this study demonstrate a remarkable ability to understand and integrate their contexts into their teaching. By grounding hazard education in the community's land, history, and identity, students see themselves as part of a broader narrative of resilience, particularly within the unique natural and cultural landscape of Aotearoa New Zealand.

The importance of **multiple learning methods** was highlighted by the diverse needs and learning styles of students. Tailoring engagement activities to be interactive, hands-on, and culturally relevant proved vital in enhancing student engagement and retention of key concepts. Integrating hazard education with other subjects further strengthened the learning experience, offering a holistic approach that bridges science, literacy, and cultural understanding.

Perhaps most importantly, this study highlighted the indispensable role of **teacher support** in the success of disaster resilience education. Teachers are not only the facilitators of knowledge but also key contributors to building community resilience through supporting children and the community during disasters (Mooney et al., 2021; Mutch, 2014).

Our project reinforced the need for accessible, culturally appropriate resources, ongoing engagement opportunities, and continuous professional support to empower teachers in delivering effective hazard education.

The resources we developed, including the online compilation of hazard education materials and activity guides, represent a step toward lightening the load on teachers, ensuring they have the tools necessary to succeed. However, the success of these programmes depends not only on the resources but also on fostering sustained relationships with schools. Future efforts should prioritise continuity and long-term engagement, moving beyond one-off initiatives to build lasting capacity.

This project has shown a participatory approach towards a more inclusive, engaging, and supportive model of hazard education. By centring on place, method, and support, we can ensure that future programmes are effective in enhancing disaster preparedness and deeply rooted in the identities, cultures, and needs of the communities they seek to serve.

Future Work

While this project has made significant strides in understanding how to improve natural hazard education in schools, ongoing work is essential to ensure sustained progress. Further research is needed to refine and expand the resources developed, particularly in aligning hazard education with diverse cultural contexts and learning methods. Schools require continued support, not only through accessible teaching resources but also in terms of training and capacity-building for teachers.

Investing in long-term partnerships between research organisations, schools, and local communities will be critical for fostering resilient, disaster-prepared communities. Continued efforts to integrate place-based learning and participatory approaches will further enhance the effectiveness of natural hazard education, ensuring that it remains relevant and engaging for future generations.

Outputs and Dissemination

This project has produced two key outputs designed to enhance the delivery of natural hazards education and support teachers in providing effective and engaging learning experiences. These outputs are:

1. Online Compilation of Existing Natural Hazards Education Resources: This comprehensive online repository consolidates a wide range of publicly available educational materials related to natural hazards. It is a valuable tool for educators, offering easy access to resources that can be integrated into classroom activities. The repository is accessible at:

www.crisislab.org.nz/teachingresource

2. List of hazard activities with learning outcomes and resources: This detailed list provides an overview of various hazard-related activities previously conducted by the research team. It includes clear learning outcomes and supporting materials, making it easier for teachers to design and implement effective hazard education activities.

The list can be found at:

docs.google.com/spreadsheets/d/1SCqQb0F4wGT5oG_BVhoY6RTzI_7FL_EfMGWUtxTmi4w/edit?usp=drive_link

Publications and Communications

→ Natural hazards education classroom activities trialled at Rotorua school: Natural Hazards Commission Toka Tū Ake.

www.naturalhazards.govt.nz/news/natural-hazards-education-classroom-activities-trialled-at-rotorua-school/

→ Natural hazards education engagement in Rotorua (crisislab.org.nz) www.crisislab.org.nz/post/natural-hazards-education-engagement-in-rotorua

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