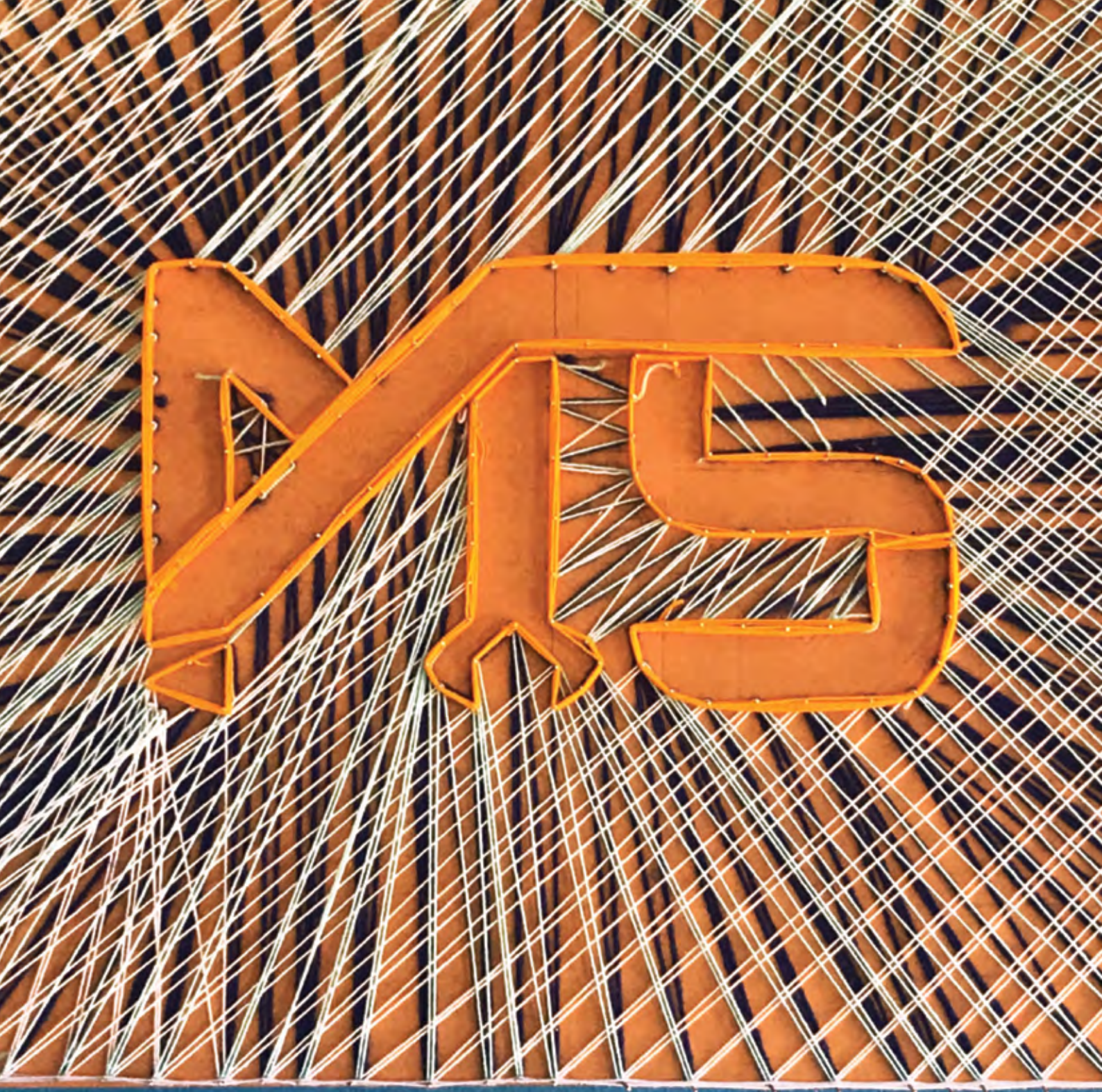

Our unique Makerspace

Partnering to prepare youth for the future of work

A snapshot

Makerspace is an initiative of the Manurewa High School (MHS) Business Academy.

Our vision

Courage, creativity and perseverance drive the businesses of the future.

Our mission

By connecting students, alumni, businesses and tertiary educators through partnerships, MHS Business Academy aims to transform the lives of MHS students, and through them, the lives of their families and communities.

Our values

We seek to 'Be The ManuREWA Way' embodied in our school values of:

- Respect
- Excellence
- Whanaungatanga
- Akoranga

What we do

As a hub for business learning and connection, we work with school staff and key partners to offer:

- **Personal development programmes**
  Mentoring for senior students
- **Business education**
  Young enterprise, business experiences, workshops
- **Further education**
  Technology opportunities and Makerspace
- **Career pathways**
  Work experiences and guest speakers
- **Teacher professional development**
  Short courses, workshops, Makerspace

Our goals

Through their education at MHS Business Academy, students will:

- Sense, value and seize opportunities to succeed
- Develop the knowledge, skills, values and attitudes needed for success in business
- Cultivate a strong sense of purpose and belief in their unique abilities, identities and cultures
- Learn to adapt to and be resilient in the face of change
- Appreciate the value of networks for enabling opportunities and solutions
- Become role models for future generations of students
- Take positive steps beyond school.

Introduction

Manurewa High School is an amazing place to test new approaches and shape the future. Progressive school leaders encourage innovation and support wide-ranging opportunities for student learning.

Our large multi-cultural community embodies richly diverse perspectives, life experiences and aspirations. We're a South Auckland school of 2,100 students, with around 25% Maaori, 25% Samoan, 25% other Pasifika cultures and 10% Asian, and in total around 50 nationalities. When you include whaanau that makes a community of around 6,000 people. As a decile one school, a high proportion of our whaanau also experience financial hardship and other challenges.

This case story focuses on The Manurewa High School Business Academy Makerspace. Recognising the innovative potential of makerspace education, Auckland Council's South Auckland champion of social and community innovation, The Southern Initiative (TSI), worked strategically in various ways to help us establish a school-based makerspace. The Ministry of Youth Development, Perpetual Guardian Foundation and The Hynds Foundation also joined forces to provide crucial innovation funding.

TSI and Perpetual Guardian Foundation commissioned this case story. These partners wanted to better understand, and enable others to appreciate, how we developed Makerspace, how it works, a mentoring approach, the benefits, key lessons, current challenges and future possibilities.

Manurewa
High School

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How Makerspace developed

At Makerspace students learn how to create and make things using technologies. Part of the broader Maker Movement that supports a culture of making, Makerspace encourages students to share ideas, collaborate on projects, develop technological skills and prepare for new and different jobs.

TSI introduced the Business Academy to the Maker Movement and a vision of South Auckland as a Maker City. Our thinking aligned and we developed a strong working relationship. Our students display tremendous creativity and entrepreneurial flair and TSI opened doors to incredible learning opportunities (such as design-led thinking, tech workshops and maker markets). TSI connected us to South Auckland social innovation networks, allowing us to become part of a strategy that's focussed on innovation and the future of work, and joins us up as a community, as a city and as a region.

Research and policy indicates the relevance of these opportunities. The 2016 Labour Party Future of Work Commission Report anticipates significant changes over the next fifteen years. Emerging technologies and increased automation will affect more jobs. Globalisation will encourage a more global workforce. Changing work arrangements will require greater collaboration. Also, New Zealand education policy requires all schools to integrate the new digital curriculum by 2020, enabling all learners to become digitally capable.

To get Makerspace up and running, TSI made a successful application for innovation funding from the Ministry of Youth Development. We knew we needed equipment, but it was smart on TSI's part to include facilitation costs. They knew we'd need a special mentor to create the culture and environment for a makerspace, so youth would engage over time.

We called on the generosity of philanthropic partners. Perpetual Guardian Foundation gave us a sizeable grant with a flexible funding structure. The Hynds Foundation invested top-up funding.

Steering away from a curriculum-driven approach requiring compulsory student attendance, we decided to offer Makerspace as an after-school programme open to all year groups. We wanted to activate student self-determination and self-discipline.

TSI connected us to Keu Iorangi, an educator and entrepreneur of Maaori and Rarotongan descent, who led a thriving afterschool technology programme at another South Auckland school for many years. Keu became our Makerspace Mentor, responsible for establishing the space; developing the culture and the environment, overseeing equipment, creating student activities, and guiding students.

From the start we set out to build a sense of ownership among the students. We wanted students to feel, 'We own this' and 'We're responsible for it'. Keu and a group of youth visited makerspace environments around Auckland and together brainstormed ideas. Everyone agreed the space had to be a place of respect and operate according to school values; it also had to be youth-oriented and fun; and students needed access to manufacturing equipment and computers.

Keu facilitated workshops to introduce students to different skills, ideas and projects. Students quickly saw the potential and began developing their own designs.

In the first year, we offered the programme every Wednesday after school for two hours. More than 50 students came through the doors, with a core group of 20 participants, including strong cohorts of Maaori and Pasifika youth, senior students and Year 9s.

To respond to student interest, this year we scheduled Makerspace three days a week; one hour on Monday and two hours on Tuesday and Wednesday. Around 18 culturally diverse students attend regularly, including a strong Year 9-11 cohort. At times numbers fluctuate due to other drawcards, such as ASB Polyfest, but that doesn't deter ongoing commitment.

How Makerspace works

Makespace offers a physical space, access to technology, a skilled mentor, and a culture of learning and making, woven together with school values.

Students and visitors are welcomed with an emphasis on whanaungatanga. Karakia starts and ends the afternoon, with kai in between.

Here, every young person is a maker, able to see and respond to real life problems. Students learn how to turn problems into projects they can work on, using technology as a tool.

Students tackle complex social problems, such as helping to address the needs of people who are homeless, or simpler challenges, like making a compelling presentation.

Students explore their own projects and help others with theirs. They learn to code (or whatever) because it's a literacy they need to bring their projects to life and do the things they want to do.

Student projects might require graphic design skills; video work; digital publications; 3D modelling and printing; machine cutting and artwork.

Making products to sell challenges students to also combine project management with business skills. They need to consider materials, the cost of goods, accounting requirements, supply chain and so on.

Putting their relationships, technical expertise and problem-solving skills to work, students teach other students and teachers how to use the equipment or trouble shoot technical challenges.

The influence of Makerspace extends beyond the programme by teaching students that learning can happen "any time, any space, any place, with anyone".

Our purposeful, intentional culture of learning and making:

- **Supports interest and play-based learning**
- **Allows for discovery**
- **Encourages freedom to learn**
- **Is creative and collaborative**
- **Fosters caring for and learning from each other**
- **Upholds student ownership of the space**

A student perspective

Year 10 student

At Makerspace we can dream up an idea and make it happen. Technology is a tool that allows us to make what we want. I enjoy seeing a project coming to life from a random idea to something we can make. You go through a number of steps. An idea might come up from a conversation or a pre-existing project, or I might redo something I've done before. Sometimes I draw digitally or on paper what I'm hoping to create, or I'll do a mind map to brainstorm my ideas and decide which one to develop. I always choose an idea that interests me or will interest others, and is doable with the materials and equipment we can access here. I model the idea or get a friend to model it for me, or we'll make a plan on paper. Then it's all down to trial and error. Sometimes you can add-on what you learn from your mistakes. You might have to take a break and put the project to the side. Taking a break helps you to relax and clears your mind, so you can return to work with a fresh perspective. I now find taking a break helps in a lot of situations, like with homework or writing essays.

A mentoring approach

Told by Keu Iorangi, Makerspace Mentor

They call me a mentor but I think of myself as part-uncle, part-coach. An uncle is someone you go to for help. He may growl you but you listen because he offers different perspectives. A coach encourages players and offers tips from the side-lines. I try not to steer because we want students to take control of their learning. But when I meet hesitancy, I say, "Get up there, man, and take that step, you've got this, go for it."

A mixed age group reminds everyone that each person has something to learn and share. The challenge is to find out what interests each individual and identify a passion they can pursue in Makerspace.

Relationships are key. To be able to share what I know with the youth, to help them and push them, I need to develop good solid relationships with them. They won't listen to someone rolling through their lives, full of information. I have to become that person who's there for them, not as a friend but with mutual respect, so they know, if ever there's anything wrong, "Bro, I'm here for you and it doesn't matter what it is."

Culture is also key. Civilisations survive because of culture. Culture is based on values. If we instil good values, our hope is this unique culture of learning and making will survive. School values keep us strong and focused.

We're building a whaanau here. How do we bring our youth together and make them feel safe? By creating whaanau and an understanding of what that means. Everyone's here for each other, to help each other, respect each other and that sort of good stuff. We offer a social place which includes karakia and kai, safety, and freedom to be yourself, all of which support learning, sharing and creativity. But it doesn't just happen; you have to work at it.

I'm sure when these kids meet in the future, they'll value their relationships and still consider themselves whaanau, no matter what. Relationships grown in this space are a tangible benefit, and I think that's true for the entire school. Students learn it's not all 'take-take', it's 'take-give'. Learning reciprocity helps to prepare them for the real world.

I'm from a community like theirs and I've walked the path they're on, so I understand the challenges in their lives. The time I have with the students is limited but valuable, and we achieve good outcomes. If there was more time, it would definitely be better. More time equals stronger relationships and more opportunities to work together. Often, it's the small questions that continue their learning.

A Makerspace story

Year 10 student

My family are from Vietnam and I've lived in Manurewa all my life. I joined Makerspace when it started and I keep coming back because it's fun!

Starting out the eye catcher for me was learning how to use the laser cutter. I've also learnt design thinking, problem-solving and digital fluency, including 3D modelling, illustrator, and photoshop. We use computer-aided design all the time and now I'm into coding.

Most of the time we do collaborative projects. Right now, we're making a non-violent game! I enjoy being able to get ideas from others and build on them. The best thing is learning from your own mistakes; I feel excited when I've created something and got there by trial and error.

What makes it work for me is the presence of others, being able to cooperate and the variety of things you can do all in one space. The atmosphere is like a family; a bond connects us. I've made new friends and my friendships are getting stronger.

Students are always happy to help you and having access to equipment enables you to learn. Because it's at school, it's easy to attend, and it's free.

What I value most is applying my knowledge to the real world outside Makerspace and the school. I love being able to share my knowledge, help others and gain knowledge from them. Learning how to have relationships and being able to ask people with specific skills for help is very empowering.

I underestimated the relevance of Makerspace; what it would give me and how I could apply what I've learnt. It's valuable for preparing yourself for the future and is helping me develop my strengths.

I'm yet to choose which tree to climb, but Makerspace has given me a sense of where I want to go. I'm interested in being a scientist or an engineer. At Makerspace I can explore my passions and learn skills I will need for whichever path I take. I feel excited for my future!

A Makerspace story

Year 12 student

My family are from Fiji, so I'm a Fijian Indian. We moved to Manurewa when I was five. I came to Makerspace to learn how to combine technology and science.

Before Makerspace my form group did a project making lockers for people who are homeless. I brought that project to Makerspace because it combined problem-solving, creativity and technology. Using the 3D printer, we figured out how to design and install space for storing documents in the lockers. Seeing people use something we built was great. A different type of fulfilment comes when doing projects that benefit others; you know you're making a difference because you can see the change.

The beauty of Makerspace is you're free to choose what you want to do and how far to take your project. You can make mistakes and what do you do with what you learn in the process is what matters.

Our mentor helps us achieve our goals. He's not above us but alongside us, so it's easier to learn from him. He teaches us how to use the machinery and stay safe, and how to be together so the space works for everyone.

I came to Makerspace with friends, but we didn't know the majority of people and have built relationships across the years. We look after each other and help one another. Senior students are now thinking about how to pass on what we know to junior students, so the family-like environment remains.

I've absorbed a lot through Makerspace. I've learnt simple things I thought were impossible at first. I've been able to combine subjects, which has helped my curriculum studies. I've clarified my interests and two possible career pathways. I earned an incredible opportunity to present at a technology conference in New York and realised I do have skills. I've discovered my leadership style and taken on responsibilities, but can still have fun. Knowing I'm a hard worker, have great relationship skills and can lead in my own way tells me I will survive and thrive at university.

I don't know where I'll go in the future, but the adaptability I've learnt in our community, at school and in Makerspace is something I know I will rely on. I'll be free, like I am at Makerspace, to make the most of where I land.

Makerspace stories

One student was in Makerspace for a year before using the laser cutter. For her, it was this big machine in the corner of the room and she didn't want to go near it. When she finally learned how to use it, she turned it into a factory production line. She learnt how to work with the software to get as many of her turtles on one piece of MDF to optimise production. When the learner is ready to learn, the learning will happen.

Leanne Gibson
MHS Business Academy Executive Director

TSI organised a pop-up Christmas market at Te Haa o Manukau and invited MHS Makerspace students to sell their products. Youth bursting with creativity and enterprise jumped at the opportunity to become entrepreneurs. Using technological tools, they translated their ideas into products they could make and sell – Christmas decorations and key chains. One student was fundraising for an overseas school trip and made $800! That event showcased their talents and enabled them to experience the excitement and pride of success.

Joel Umali
TSI Innovation and Technology Lead

North American Professor Mitchel Resnick at Media Lab, the innovative Massachusetts Institute of Technology research laboratory, explains the opportunity to access technologies and creativity using the idea of a house with low floors, wide walls and high ceilings. Low floors refer to existing skills enabling people to step up to the opportunity. Wide walls represent space to learn and create. High ceilings suggest future potential and endless possibilities. Here's how this idea works for me. We had a problem in Makerspace. Students would arrive and throw their bags everywhere, making it hard navigate your way around the room. When I raised the issue, a student with skills in 3D modelling stepped onto that low floor. He modelled a wall hook within 40 minutes, then asked, "What do I do now?" We widened his walls by offering him the opportunity to learn how to use the 3D printer. Seeing unlimited potential, he's now excited by the idea of being able to manufacture something he created. He also solved our problem by creating hooks for students to hang their bags on.

Keu Iorangi
Makerspace Mentor

The benefits we see

The programme is in the early stages of development but preliminary observations are promising.

For students: Youth are exposed to experiences, materials, ideas, opportunities and relationships that they may not otherwise encounter. They have fun, learn relational and technical skills, build friendships across year groups, cultivate self-confidence, develop critical thinking and grow leadership capabilities. Sharing what they know with other students and teachers is wonderfully empowering; it enhances self-esteem, relational connections, knowledge, skills and strengths. Students become clearer about their interests, helping to inform future study or work options. They also grow the resilience needed to pursue their goals.

For the school: Makerspace enriches the school by extending its offerings and reducing barriers to engagement. It provides vertical engagement among students from different year groups. It's now sparking growing interest among teachers wanting to learn creative ways to implement the new digital curriculum. It's extending the school's reach by developing partnerships with community, businesses, government, council, and interested others.

> My parents know Makerspace is a place I love to go. They want me to go to places I love because they know I'm doing something good there.
>
> **Year 12 student**

For community: The whole community benefits when students are engaged in productive learning, live the school's values-based 'REWA Way', and enjoy strong friendships. Whaanau are proud of what their children create and grateful for opportunities that encourage their passion.

For South Auckland: TSI observes that people in the broader innovation eco-system now recognise that South Auckland youth and communities have a lot to offer. TSI, the school principal, feeder schools and business partners want others to experience and learn from Makerspace. They constantly bring visitors through, broadening our connections and extending our sphere of influence.

For the nation: Makerspace contributes to the changing face of work by preparing diverse South Auckland youth for 21st Century education, training, enterprise and employment. It also nourishes an empowering narrative of South Auckland that encourages youth in our decile one school to pursue their dreams.

Looking back

Key lessons

The importance of a guiding presence

Keu, the Makerspace Mentor, has taught us that a guiding presence allows students to be at the centre of their own learning. A student said of another tutor, "Miss, he just took over when I asked for help." That student wanted guidance and the minute someone took over he knew he missed out on critical learning and lost control of his project. 'A Keu' would never take over.

Deep learning at a slower pace

Makerspace is not a treat that students earn but rather a programme they commit to that offers deep learning. Makerspace students want deep engagement over time and relish the student-centred, student-driven approach because it's so wonderfully freeing. The only demands placed on students are the demands they place on themselves. This unique learning opportunity requires a slower pace but also delivers outcomes that matter to students, their whaanau and the school.

The significance of culture

Focusing on culture sets us up for the long game by creating a sustainable model of engagement. A student talked about how he likes helping people. A visitor hears 'how nice that he likes to help people', but seeing this student helping others we observe relational connection, shared responsibility, self-determination and self-fulfilment. Over time the technology and tools will change, but if the culture is right, we'll be able to move with the change.

What sustains students

Technology is the drawcard, but whanaungatanga, safety, acceptance, wellbeing, friendship and a sense of purpose are reasons why students commit to Makerspace. In other words, the aroha (unconditional love and concern) practised daily in this relational learning space is a critical factor in sustaining student commitment. Makerspace education may offer possibilities for the wellbeing of youth living in under-resourced communities.

Valuing the community's own measure of success

What matters most is what's right for the community of learners and their whaanau. The school did a TSI project last year to help inform curriculum design. Empathy interviews illuminated that what whaanau want most is happy, confident, proud children. We use those criteria as critical measures of success.

Looking forward

Key challenges

Breaking new ground

Makerspace is, itself, a developing prototype that we're constantly adapting. When you're breaking new ground, it can be hard to know what progress you're making. Wise decisions were made to purchase enough equipment (without going overboard) and hire an experienced mentor. Indications suggest that funder investment in Makerspace has been worthwhile, but is nowhere near complete.

Accepting innovation takes time

Innovations like Makerspace take time to establish strong foundations. It may take at least five years to hit its stride. By that time a cohort of students would have moved through Year 9 to Year 13 and become Makerspace leaders and mentors. Ongoing investment during this period would maximise early gains, strengthen footings and enable growth.

Growing understanding

Many teachers are unfamiliar with makerspace concepts and culture. A makerspace is not like a library space, computer room or technology area that teachers can book so their students can use the laser cutter to produce a key chain. Teachers need opportunities to learn what a makerspace culture can offer, how to make it work for their subjects and how to keep up with technologically advanced students.

Keeping an eye on sustainability

The Business Academy's Executive Director and Makerspace Mentor are talented, hardworking, practical and visionary. Both have a pivotal role to play in catalysing interest in what sustainability looks like for the MHS Makerspace. Both are committed to the programme and want to be part of its future. They see strategic opportunities, over time, to grow future mentors from the community and generate revenue that can help sustain the programme longer term.

Becoming more flexible

Schools offer structured learning from 9.00 am-3.00 pm, five days a week, ten weeks a term. Students want access to Makerspace at weekends or during holidays. Opening up the space after hours presents a staffing issue but also creates opportunities for student leadership and challenges us to become more flexible.

Future possibilities

Given progressive school leadership and high calibre Business Academy staff it makes good sense to consolidate and grow the MHS Makerspace programme over the next five years.

The Business Academy and TSI see potential to enhance, adapt and scale Makerspace, so its unique culture of learning and making can, over time, stretch out across the school, into the community and maybe even to other schools.

Covering the mentor's contract and operational costs is key. Purchasing a bit more equipment would expand opportunities for making, such as wiring, soldering, and programming with physical things.

We could roll-out makerspace across the school, enabling teachers to apply makerspace culture and concepts across a range of subjects. Science teachers might want students to solve problems to develop new knowledge, whereas the Business Academy might encourage students to solve problems through an enterprise that develops income, resilience, sustainability for them and their whaanau.

We could consider a Year 14 transitional programme for youth who have participated in Makerspace, left school but haven't decided what to do next. We could also offer evening or weekend programmes for whaanau so they can experience Makerspace.

Our community of learning Kaahui Ako o Manurewa (which is made up of six local state schools, including Manurewa High School) has a focus area on STEAM learning – Science, Technology, Engineering and Maths with Arts. We could offer pop-up STEAM-based learning opportunities for Manurewa Intermediate School students to support Kaahui Ako goals and help facilitate their positive transition to high school.

MHS Makerspace could become a prototype for others to experience. Eventually, we could advise other schools in our Kaahui Ako, and beyond, how to go about creating a makerspace in their community.

> What the Business Academy is doing at MHS is cutting edge and they can't keep it to themselves! We have to find a way to share it. I say that not only because it's working with emerging technologies but also because it's trying new things inside a school setting and framework.
>
> **Joel Umali**
> TSI Innovation and Technology Lead

We could potentially develop a revenue stream for the programme by taking products to market.

These ideas show a dynamic, forward-looking, strategic impulse at work in MHS Business Academy. If carefully developed and properly resourced, Makespace has potential to earn influence across a wide sphere.

Arguably, it deserves that chance. Makerspace is preparing students for the future realities of work and supporting them to venture further in their own journey. Of critical importance, it engages youth unlikely to be able to access the kind of learning opportunities offered through Makerspace without strong school support, philanthropic generosity and the Business Academy's highly productive partnership with TSI. This story, while still in-the-making, demonstrates the value of a partnering approach in forging a unique and valuable school-based innovation.


FURRYS are gay
UWU
OWO
MALO
HOLA
NAMASTE
xD Desian
I wanted to design a sun with doodle art but I also wanted to add the school into it so, I added some sports equipment and the word "Dance" so we can get the feel for school and how it is here aswell as street art /doodle art.
Art By: Caleb Lionel Barnes






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