



Grass Roots Project Report

The Makerspace

Version 1.1



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Introduction

Background

There is an over representation of Maori and Pasifika students underachieving in New Zealand (Education Review Office, 2014). Our school is a decile three school that caters for a diverse range of learners including many with special needs. Many of our students do not have exposure to the technology that prepares them for future career opportunities or offers an innovative teaching approach which is needed to engage them in school. This project focused on how a Makerspace in the school setting would support increased motivation, engagement and achievement of students at risk of not meeting their potential.

A “Makerspace is a general term for a place where people get together to make things. Makerspaces, might focus on electronics, robotics, woodworking, sewing, laser cutting, programming or some combination of these skills.” RoSlund and Rodgers, 2013.

Whilst our Makerspace would be accessed by the whole school, the project focussed on the creation of a Maker group of at risk students. 12 students at year 4 working at L1 of the NZ Curriculum from Maori and Pasifika backgrounds were selected. These students would experience a project based learning (PBL) approach in a withdrawal program with links to the classroom curriculum. The Design Thinking process (Wells, 2017) was used as a framework for the execution of the projects. Using the Grass Roots funding we were able to have a teacher (Savelina Lepou) work one day a week taking groups and managing this space.

Provision of resources from the Grass Roots funding also allowed the projects to include:

- Film and production.
- Robotics and electronics.
- Modelling and 3D printing.
- Music recording

The future vision is for the Makerspace to become a source of ongoing and often self-directed learning and exploration. Once set up, it can become a forum for other school groups, for example Coding Club.

Objectives / Inquiry questions

The inquiry question addressed was -

How can a Makerspace in the school setting support increased motivation, engagement and achievement of Maori and Pasifika learners at risk of not meeting their potential?

The benefits of this project were anticipated to include but not be limited to:

- Development of 21st century learning skills.
- Promotion of STEM.
- Provide collaborative learning opportunities.
- Provide real world, practical learning opportunities.
- Provide multidisciplinary learning experiences.
- Create links with our other campus schools and community.
- Provide an alternative pathway for achievement and success in school.
- Become a leader in this field with respect to the other schools in our Communities of Learning.

Background reading/literature review

The concept of creating a Makerspace in a school setting is a relatively new and unknown one. We did not find literature to inform our project. We consulted with the Auckland Library and looked at number of websites but our inquiry is largely based on trial and error and good teaching practice that we have developed over a combination of 20 years of teaching.

Fullan and Langworthy (2014) outline three forces that will could potentially change teacher pedagogy and lead to deeper learning tasks. This literature is currently being used to guide the planning of deeper tasks across the school. That deep learning tasks, that are personalised and meaningful to the student, underpins the process of project based learning and why we anticipate that this approach may be successful for our students.

Richard Wells (2016) describes the freedom and possibilities within the use of the NZ curriculum. He also discusses education reform and success stories within the NZ education system. It is permissive of us exploring alternative models of teaching and learning for our students such as those this project outlines.

Wells (2017) have a number of guides we provided for our learners to refer to. Particularly the poster shown below to identify how well our learners are using the key competencies. This poster was used when assessing how well the students were using each competency and at what level. We also trialled using the Design Thinking process to guide my learners through the PBL process.

Fig 1- Key Competencies and Design Thinking Process Posters





Assumptions / theories / definitions

Assumptions	Definition/explanation
The use of a project-based learning (PBL) approach will enhance learning and engagement in the NZ Curriculum	Project based learning occurs when students learn through experiences that enable them to gather knowledge and skills through authentic contexts that are challenging, complex and engaging. Students can have agency over the project topic, how they inquire and how they share their learning (BIE, 2017).
Our learners would develop 21st century skills	21st century skills refers to the skills that learners need to develop to better prepare for life and work in the 21st century. At Mt Roskill Primary School we often use Fullan's (2014) 6 Cs as key future skills that we believe our learners should possess to succeed. We are also working towards the planning of deep learning tasks that include these skills. These are character education, citizenship, communication, critical thinking and problem solving, collaboration, creativity and imagination (p. 22).
Our intervention will improve engagement and achievement of students	We made the assumption that our intervention would improve the engagement and motivation of our learners in the curriculum and in learning in general. We believed that this increase in engagement would lead to improved achievement outcomes for our Maker group.
Working within the Makerspace would encourage collaboration and lead to the development of better collaboration skills.	This work is embedded within a Social Constructivist paradigm. This describes the theory that learning is socially situated and that learning comes from the interaction between individuals (Palinscar, 1998) Therefore our assumption that collaboration is important in facilitating learning.

<p>By carrying out projects in the Makerspace, our group would gain more experience in Science, Technology, Engineering and Mathematics (STEM) and consider these areas when choosing future pathways/subjects in education.</p>	<p>STEM curriculum is based on the idea of teaching and integrating four specific curriculum areas: science, technology, engineering and maths. The four areas are linked using real-world problems and tasks.</p> <p>We made the assumption that these four subjects were curriculum areas that our learners needed to experience in order to open up future pathways in education.</p>
<p>Develop key competencies</p>	<p>The NZ Curriculum (NZC) describes 5 key competencies which cover the attitudes, values, knowledge and skills that support the vision of the NZC to be “ confident, connected, actively involved, lifelong learners” (Ministry of Education, 2007, Pg 8)</p> <p>The key competencies are:</p> <ul style="list-style-type: none"> • Thinking • Relating to others • Using language, symbols, and texts • Managing self • Participating and contributing <p>(Ministry of Education 2007)</p>
<p>Develop growth mind-set</p>	<p>A growth mind-set is the understanding that a person talent or ability is not fixed. Therefore one's achievements or capacity to learn is determined by effort not one's fixed ability. Understanding this encourages students to show determination and expend effort to achieve. Those persons with a fixed mind-set believe their capacity to learn or talent is fixed and therefore can't be improved with effort (Dweck, 2006)</p>

Methodology & Design

Methodology

This project used a mixed methods design. The methods for the study were primarily qualitative in that the study focused on the reported experiences and perspectives of the participants and did not seek to create findings that could be generalised. The qualitative data that was collected included student voice, anecdotal reflections from the teacher and teacher observation. In addition some quantitative data was collected. This included student achievement data and quantifying of the statement sorting.

Project Design

The participants were selected from students in Year 4 in 2017. The reason for choosing this cohort of students was so that we could build leadership capacity and expertise in this group. After participating in the project for one year it was anticipated these students would have skills to share with other students, could act as leaders in the Makerspace and therefore be a role model to others.

Maori and Pasifika students are overrepresented in those students underachieving in education both nationally (Education Review Office, 2014) and at our school. In addition, current school interventions may not have resulted in significant academic gains for some of these students. It was hypothesised that an alternative education experience might indirectly lead to improved achievement for these students. Consequently Maori and Pasifika students who are at risk of underachieving due to learning or behavioural needs became the targeted group. National standards data and teacher knowledge of this group was used to select 12 students to participate in the project. 12 students were chosen as it was believed to be a manageable size.

The provision of the Grass Roots funding allowed these students to be withdrawn for up to 1 day a week into the Makerspace.

The initial project the students undertook was a guided project on "What is a Makerspace?". The teachers running the project initially began this work themselves then reflected that this was invaluable learning that the students would benefit from and would then give them ownership of the space. The group then visited technology rooms and the Makerspace at a Central Library before designing and creating their own Makerspace. This project involved designing and planning the space and costing the materials. The group also upcycled old furniture from around the school and learnt how to hook up computers and 3D printers that were sitting unused in the school.

Fig 2- Student brainstorm and planning of Makerspace

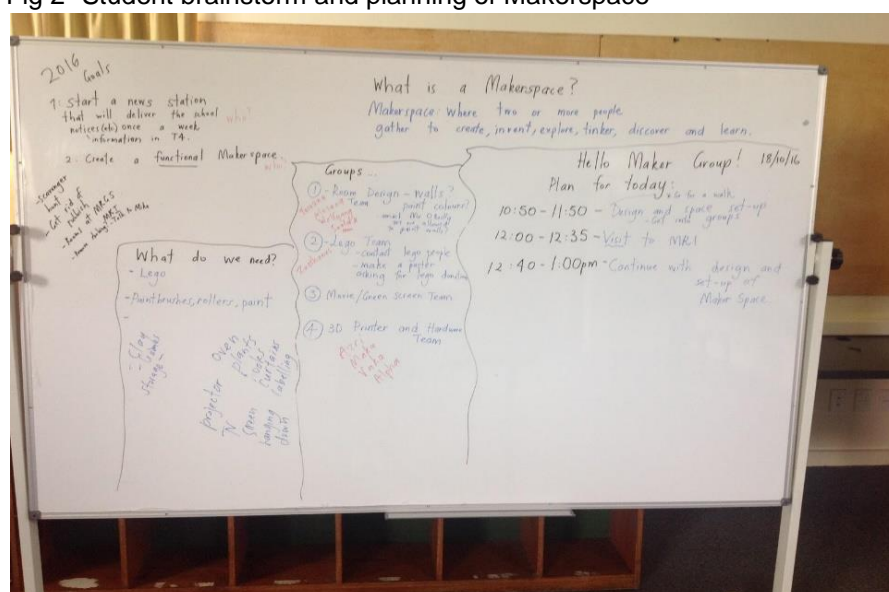


Fig 3- Students working on creating the Makerspace



Fig 4- A panoramic shot of the completed space



In order to scaffold the students to be successful in Project Based Learning it was decided to guide the students through the project. This would enable specific skills and processes to be learnt. Many of these relate to the development of the key competences for example managing self and were noted by in the teacher's anecdotal notes. The selected project was to fulfil the students' desire to set up a TV station. The students explored other school news stations and decided on what content they would like to include. The teachers visited two schools to look at how they organise their stations. Our objective was to create a weekly news bulletin that would include news, events, sports and notices at Mt Roskill Primary School. There was also a group that wrote and produced a song to be used as the theme song for Roskill News.

Fig 5- Students filming and music making for Roskill News

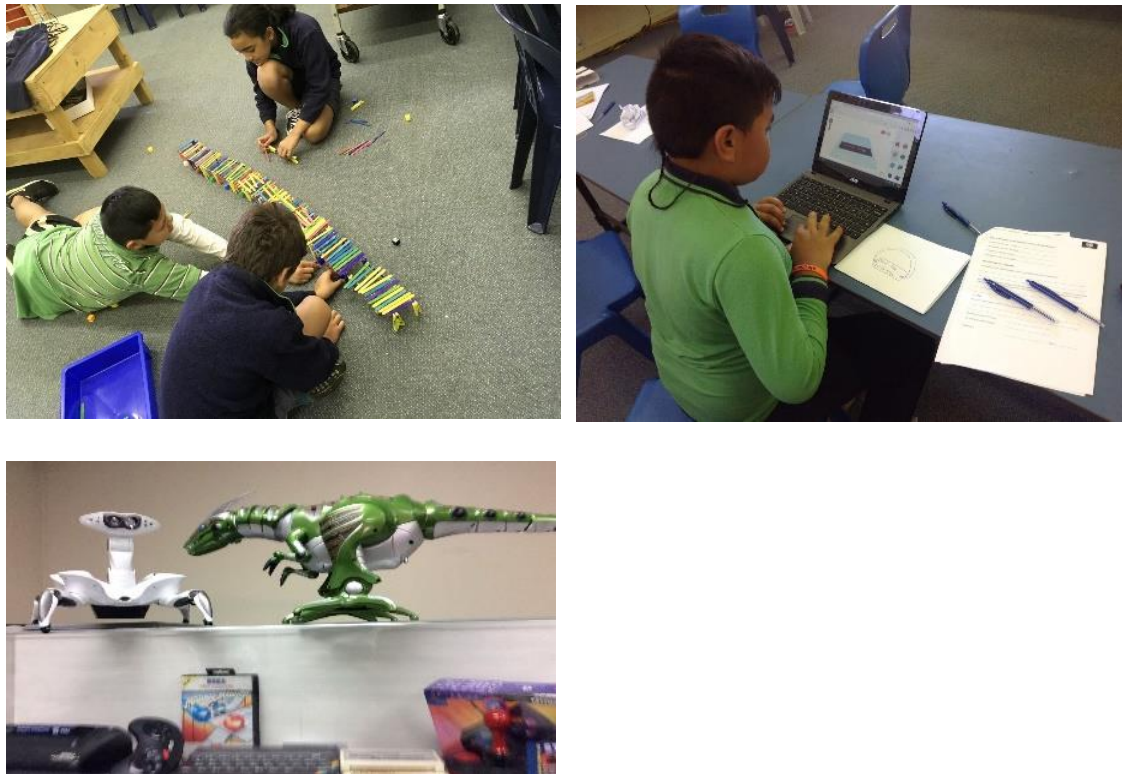


Throughout the project, we tried to expose the group to a number of experiences that would open up their eyes to the range of projects they could undertake within the Makerspace. All of these trips and experiences were free of the charge for the Makerspace group.

Fig 6- Makey-makey at the Auckland Library, Computer Programming at MIT, Unmaking at MIT



Fig 7- STEM challenges, 3D Printing, Robotics at MOTAT



The final stage of the project was to use the new space to carry out project based learning. The group was split into teams of 2-4 based on the projects/tools they were interested in. Each group used a Genius Hour planning sheet and weekly plan to organise their projects. Genius Hour “is a movement that allows students to explore their own passions and encourages creativity in the classroom” (Kesler, 2017). It is an iteration of project based learning. We chose to use some of the web-based Genius Hour teaching resources available to students. It was the student’s responsibility to manage their time effectively and get their projects finished within the given time frame.

Fig 8- Genius Hour Templates

Genius Hour Planning Sheet

Mission of project:

What will you be learning about?

What materials will be needed?

How will you present your learning?

Genius Hour Weekly Plan:

Week:	Describe what you will do?	Weekly Reflection

3D Printing

Fig 9- Generating ideas for 3D designs. We made links to the topics being studied within the learner's classrooms. At the time, this group were studying Ancient Egypt.

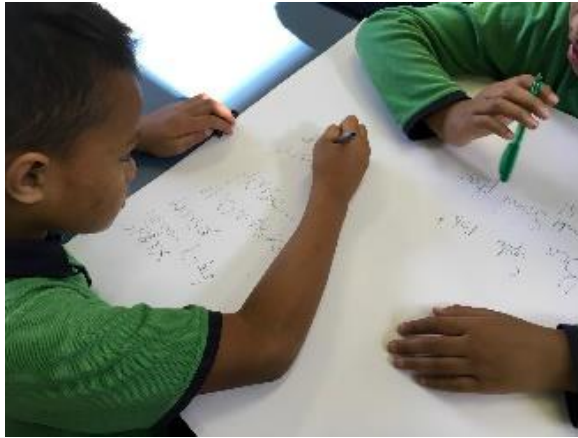


Fig 10- We used modelling clay to come up with an initial design. This is a model of the Egyptian god Anubis



Fig 11- We used the web-based programme Tinkercad to design and print our 3D models.



The group are now working on designing a new senior playground and have been learning from an engineering company in Christchurch who are currently helping them to learn how to use a more advanced 3D design tool called Design spark. There is a possibility that the company will help us to design and build a climbing wall for the new playground in Term 4. We are also exploring a possible collaborative project with Mt Roskill Grammar Students next year.

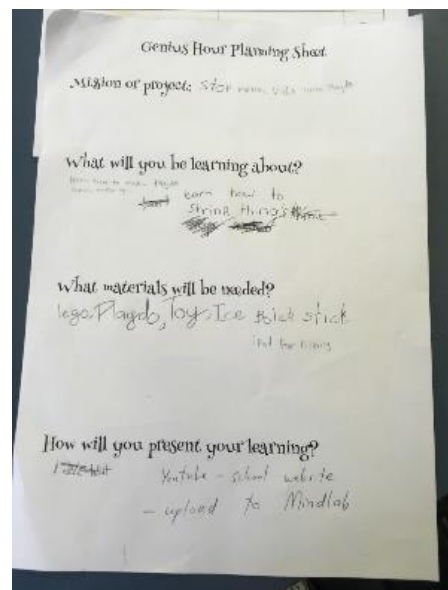
Fig 12- Skyping with Justin from Swarm Intelligence.



Stop-motion

The stop-motion group's project was to create an animation based on a challenge set on the <https://www.mindlabkids.com/> website to make a ball of playdough roll and increase then decrease in size.

Fig 13- Project planning and execution.



Makerspace Cooking

Fig 14 - The cooking group decided that they would like to create a cooking show that they could make as part of Roskill News. They found their own recipes, came up with shopping lists and provided costings for their ingredients.



Music Group

The Music Group's first project was to create the theme song for Roskill News. They also created and produced a music video to go with it. Their second project was to write and record a song and they chose to write a song about the school.

Fig 15- Music group generating ideas and planning their project



During the recording of their first song, we realised that we did not have the best equipment for recording quality music so we decided to buy some music making software. Once we had made this purchase, the group became aware that they needed a recording booth to get the best sound for their music. The project then switched to designing and building a little recording studio. We employed a teacher with the skill to do this with the group over four days. He worked with the group to design and build the studio which is now part of the Makerspace.

Fig 16- Building the recording studio.

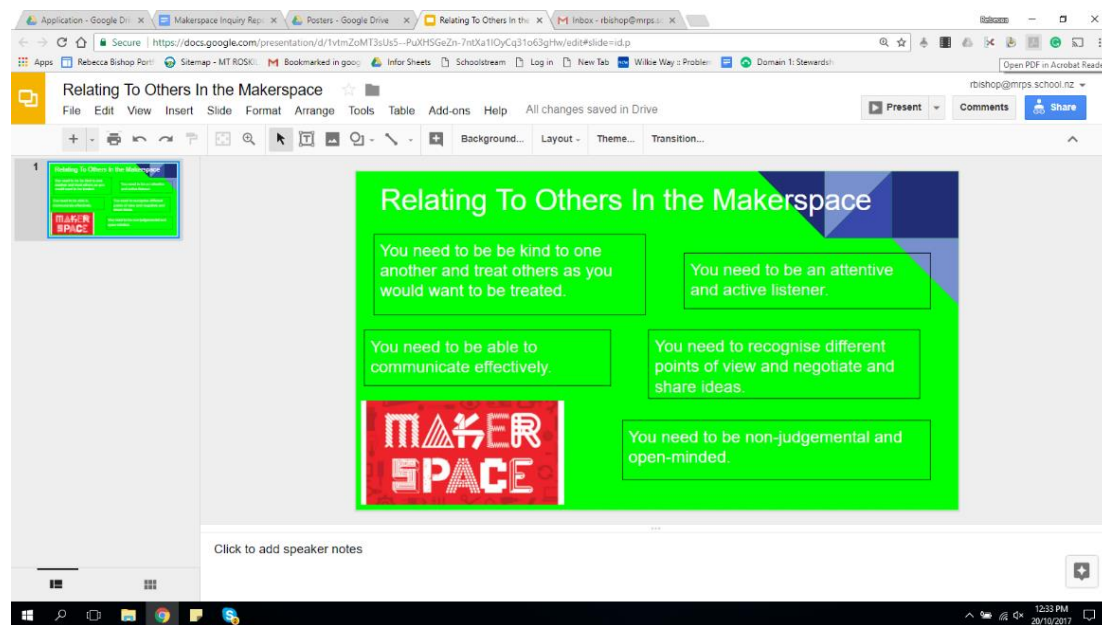


Fig 17 - We also enlisted the help of a local community member Tupua Tigafua, to help us with the producing and recording of the second song.



After the first collection of student voice it was noted that the children did not make explicit links between the skills and dispositions they had developed in the Makerspace and how that could be used in the classroom. Consequently a focus in the second half of the project was to try and make these links explicit and increase metacognition as to how and why these children were successful in the Makerspace.

Fig 18- Example of poster made by students to demonstrate and reflect on understanding of managing self.



Data generation/collection

Achievement data was collected by the classroom teacher and reported on our Student Management System eTAP. National Standards achievement levels are based on a teacher Overall Teacher Judgement (OTJ). OTJ's are made using a range of summative and formative assessment evidence the teacher has collected over a period of time. Prior to each reporting session the OTJ's are moderated at team meetings to ensure consistent reporting of judgements. The data was analysed by looking for increases or decreases in student achievement.

Due to the reporting schedule of the school this data was collect in mid 2016 and mid 2017. The project ran from October 2016 to October 2017. Consequently the 2016 achievement data collected is from slightly before the project began and the concluding time point in 2017 is just before the project concluded.

At two points in the project student voice was collected. This occurred at the end of Term 1 and end of Term 3 at the conclusion of the project. To provoke student voice and to gain some quantitative data a statement sorting activity was used. The students needed to independently sort 16 statements as to whether they agreed or disagreed with the statement.

Students were subsequently asked to participate in a bus stop activity where students were able to write responses to prompt questions. During a bus stop students had the opportunity to roam around the prompts and discuss in their own time.

The question prompts included:

Warm up

- Tell me what you like about the Makerspace?

- What is challenging or difficult about the Makerspace?

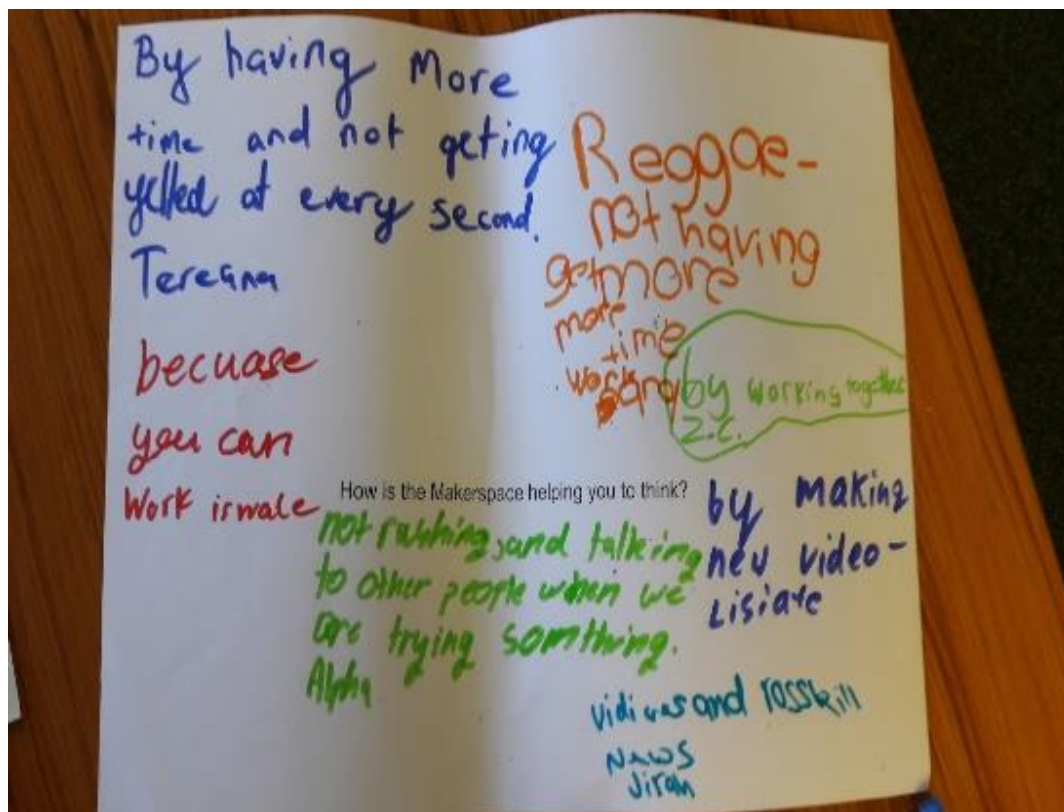
Pedagogy

- What skills do you think you have gained?
- How do you think the Makerspace will help you with your schoolwork?
- How do you think the Makerspace will help you with your future?
- What is different about the Makerspace compared to the class?

Thinking

- How is the Makerspace helping you to think?

Fig 19- Example of responses to bus stop activity.



The responses to the statement sorting and bus stop activity was then used as prompts for an informal unstructured interview with the whole group of students which was recorded. Two teachers known to the students facilitated this process.

The Makerspace teacher came details planning and notes of the Makerspace program, refer Appendix B for an example.

Data Analysis

The quantitative data was analysed by using percentages and looking for percentage changes. Although a small sample size can give ambiguous percentages it does allow different sample sizes to be compared. For further analysis total numbers are also presented.

The qualitative data was analysed looking for recurrent ideas that are both confirming and non-confirming. This was done by first listening to the transcript and identifying key words. The transcripts

were then listened to again and a tally chart used to measure the recurrence of each idea. Ideas with three or more marks were identified as key themes.

Findings

Achievement Results

The three subject areas assessed were reading, writing and maths. Seven students made accelerated progress in one or more subject areas. Overall, accelerated progress was made on 10 occasions. Expected progress was made on 17 occasions. Three students made less than expected progress in one subject area. The subjects in which the most progress was made was in reading and writing. By the end of the project period, 11/12 students were at or above expectation in reading and writing.

	Mid Year NS 2016	Mid Year NS 2017	Mid Year NS 2016	Mid Year NS 2017	Mid Year NS 2016	Mid Year NS 2017
	Maths	Maths	Reading	Reading	Writing	Writing
Student 1	Achieved	Achieved	Achieved	Achieved	Achieved	Achieved
Student 2	Developing	Achieved	Developing	Achieved	Developing	Achieved
Student 3	Developing	Achieved	Developing	Achieved	Developing	Achieved
Student 4	Achieved	Developing	Achieved	Achieved	Achieved	Achieved
Student 5	Developing	Developing	Developing	Well below	Developing	Developing
Student 6	Developing	Developing	Achieved	Merit	Achieved	Achieved
Student 7	Developing	Well below	Achieved	Achieved	Developing	Achieved
Student 8	Developing	Achieved	Developing	Achieved	Developing	Achieved
Student 9	Achieved	Achieved	Achieved	Achieved	Achieved	Merit
Student 10	Developing	Developing	Achieved	Achieved	Developing	Achieved
Student 11	Well below	Developing	Developing	Achieved	Developing	Achieved
Student 12	Developing	Achieved	Achieved	Achieved	Achieved	Achieved
	3/12 25%	6/12 50%	7/12 58%	11/12 92%	5/12 42%	11/12 92%

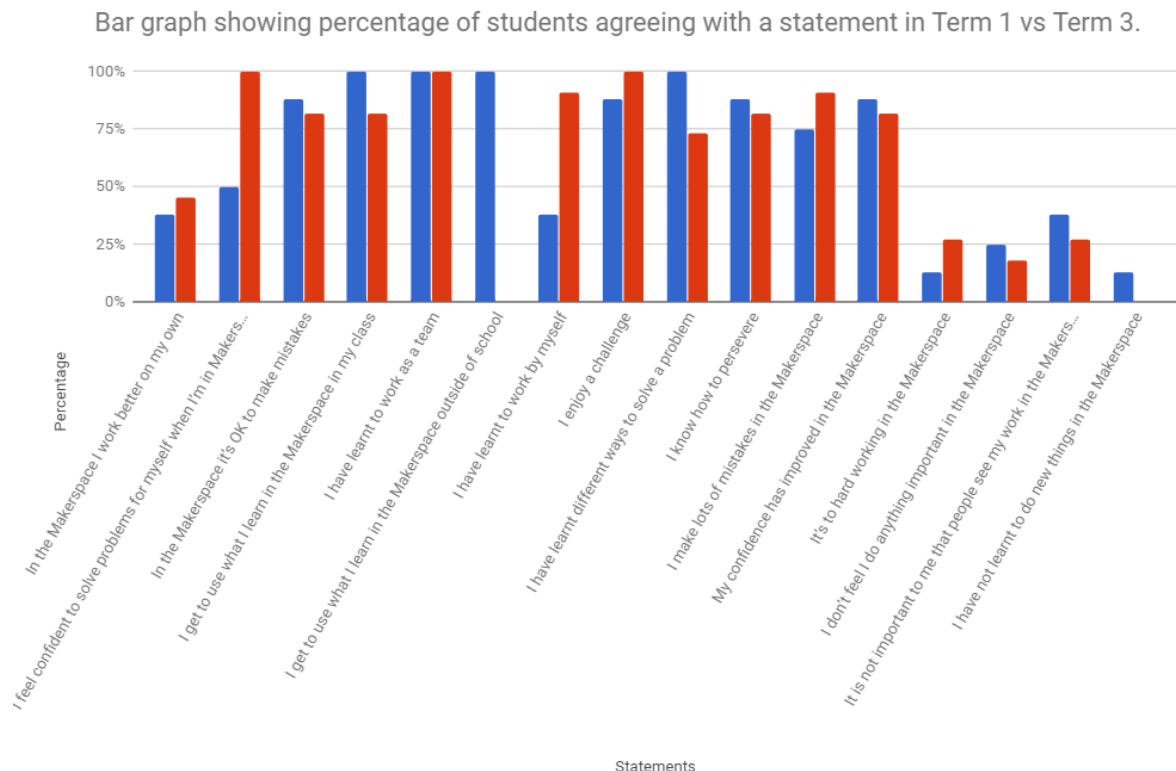
Green represents accelerated progress- Greater than 1 year expected progress.

Black represents normal progress- 1 year expected progress.

Red represents less than normal progress- Less than 1 year progress.

Student Responses to Statement Sorting

Prompt	Agree				Disagree			
	T1		T3		T1		T3	
In the Makerspace I work better on my own	3	38%	5	45%	5	63%	6	55%
I feel confident to solve problems for myself when I'm in Makerspace	4	50%	11	100%	4	50%	0	55%
In the Makerspace it's OK to make mistakes	7	88%	9	82%	1	13%	2	55%
I get to use what I learn in the Makerspace in my class	8	100%	9	82%	0	0%	2	55%
I have learnt to work as a team	8	100%	11	100%	0	0%	0	55%
I get to use what I learn in the Makerspace outside of school	8	100%	0	0%	11	138%	0	55%
I have learnt to work by myself	3	38%	10	91%	5	63%	1	55%
I enjoy a challenge	7	88%	11	100%	0	0%	0	55%
I have learnt different ways to solve a problem	8	100%	8	73%	0	0%	3	55%
I know how to persevere	7	88%	9	82%	1	13%	2	55%
I make lots of mistakes in the Makerspace	6	75%	10	91%	2	25%	1	55%
My confidence has improved in the Makerspace	7	88%	9	82%	1	13%	2	55%
It's too hard working in the Makerspace	1	13%	3	27%	7	88%	9	55%
I don't feel I do anything important in the Makerspace	2	25%	2	18%	6	75%	9	55%
It is not important to me that people see my work in the Makerspace	3	38%	3	27%	5	63%	8	55%
I have not learnt to do new things in the Makerspace	1	13%	0	0%	7	88%	1	55%



Summary

There was an increase in students who agreed:

- They had grown in confidence in the Makerspace.
- They had learnt to work as a team in the Makerspace.
- They had learnt to work independently.
- They make lots of mistakes in the Makerspace

There was a decrease in students who agreed:

- Working in the Makerspace was too hard.

Most students felt in the Makerspace:

- They were able to make mistakes.
- Enjoyed challenge.
- They had learnt different ways to problem solve.
- They had learnt to persevere.
- The work they do in the Makerspace is important.
- It was important for people to see the work they did from the Makerspace.
- They had learnt new things in the Makerspace.

Themes from student voice

Student Voice sample 1

Time

Students reported that a benefit of working in the Makerspace was that they felt they had longer periods of time to work on a task, they did not feel rushed and they got time to complete tasks.

Choice

Students reported that they had more choice than the classroom on how to go about completing a task and how to present their work. This often presented opportunities that they felt were more engaging than the classroom.

Support of technology

Students reported the opportunity to access technology made tasks more accessible and easier to achieve.

Challenge

Whilst the students reported being able to demonstrate resilience and persist with challenge in the Makerspace they did not feel that they could manage challenge in the classroom. The skills they had developed with respect to this in the Makerspace were not being transferred to the classroom. There was also lack of metacognition around how they had learnt to manage challenge in the Makerspace.

Lack of connection to classroom learning

The students did not make connections between the learning in the Makerspace and how it could support them in the classroom.

Student voice sample 2**Future focus**

The students reported that they now had the potential to use the skills in the Makerspace in their future life. For example that careers in technology were now an option for them.

Link to classroom learning

Students reported examples of how the skills they had learnt in the Makerspace were being useful to them in the classroom. For example persisting with hard tasks.

Findings from anecdotal notes and planning

Skills learnt as a result of project based learning	Learning Strategies
<ul style="list-style-type: none"> • Making music videos • Using new technologies, e.g. stop motion movies, making music in Garageband, musical timing • How to write raps • Creation and design skills in Tinkercad • Teamwork • How to cook food by ourselves • How to make playdough • How to create tutorial videos • How to write news stories 	<ul style="list-style-type: none"> • Keep trying • Focus/think - talk to yourself, "Stay on task," "You can do it." • Communicate with others - ask for help (experts or friends), talk to someone about what to do (collaborate) • Don't be selfish • Give your brain a rest • Try working on a different part of the task and then come back to the challenging part • Be proactive - take action, don't sit back and watch • Make connections with what you already know • Activate your prior knowledge

Unexpected and Unplanned Findings

The school recognises achievement in leadership through its termly citizenship assemblies.

It was noted that during the period of this project five students were successful in receiving citizenship awards (the school recognises achievement in leadership through its termly citizenship assemblies). Two students received an award for leadership. Other students received an award for perseverance, involvement, friendliness and cooperation.

Teacher voice was gathered outside of this project by the school to determine what was different for these students so that they consequently received awards.

Teacher voice for Term 1 leadership awards

Student 1 Leadership	Takes initiative not just for himself but his class mates. Encourages his classmates, not to look down on each other when they cannot complete a task but to help each other.
Student 2 Leadership	Organising himself and others for extracurricular activities e.g. Makerspace and Pasifika. In the Makerspace he has taken a lead role e.g. was able to go do interviews for adapted sports day by himself. Actively focusing on his leadership abilities - asked to be a Pasifika Young Leader and has been conducting some research on how he can achieve that.

Discussion

Student achievement for the students in the project did accelerate. The gains were greater in literacy whereby the number of students achieving at or above the National Standards in reading increased from seven to 11, and in writing from five to 11. The results in Maths were less where the numbers of students who made accelerated progress increased from three to six. For this project group there was a greater improvement in student achievement in reading and writing compared to maths. Whilst we cannot claim cause and effect, we believe this is linked to the kind of projects the students worked on that demanded more literacy skills than mathematics. For example the creation of Roskill News was dominated by reading and writing activities including script writing and reading to source information. Some projects did include maths; for example 3D printing and building the recording booth but the connections to learning in the class may not have been so explicit.

We believe the most gains were made by the students in the development of the key competencies. Anecdotal evidence and student statements report improved confidence, concentration and perseverance. The students learnt skills to work independently and as part of a team. They also learnt a wide range of practical skills including 3D design, music making, stop motion and using design software.

The students were able to articulate some reasons for their success in particular having time, choice and access to technology.

Whilst there was some improvement in the ability for the students to articulate the learning strategies they used to be successful in the Makerspace and to transfer this to the classroom; this remains a significant area of weakness and will become an area for future inquiry.

The recognition of so many students in the school citizenship awards is also an indication of the growth of these students.

Limitations

A limitation of the project findings is to establish causation that the project led to the improved achievement and development of key competences in the students. Other variables that may have contributed to this was the students' individual teacher and other programs both academic and extracurricular that the students are involved in. For example some students participate in English as a Second Language class or are part of the Pasifika culture group.

As the project progressed we observed many of the changes in the students were not going to be measured by our pre-established measures. In addition these changes are challenging to measure. For example an observation was that three of the Makerspace students were awarded citizenship leadership awards during their time in the Makerspace. We have been unable to quantify this change in leadership or understand what factors may have facilitated this occurring.

There is a gap in the research on how Makerspaces can be used in schools and a theoretical framework on what practices might be of benefit. Therefore many assumptions were made about what practice might be of benefit based on research outside of the Makerspace and school context. For example the hunch that PBL might be of benefit to students. Assumptions were also made that this type of learning ie collaboration would be a more culturally responsive approach for our target students.

It was also challenging to make connections to expertise in the community to support the work. We proceeded in the first three terms without such input. An outcome of the project is that now we have begun to make connections with other schools and a business in Christchurch.

A flaw in the project design was that we chose to begin work with the students in Term 3 2016 and thought our official data collection or project start would be Term 1 2017. We did not anticipate the way in which the students responded in the first term of the project. As a result we have missed an opportunity to collect important data from before the student started in the project.

A challenge of the project was the collection of student voice. Although we have observed changes in the students the students found it difficult to articulate these changes in themselves. Our first attempt at collecting student voice straight from an interview was largely unsuccessful and elicited very few responses. For this reason the interviews to gain student voice were scaffolded and began with the statement sorting and a bus stop to provide a discussion starter for the students. This may be considered leading or biased.

The project initially was designed to make strong links between the Makerspace learning and mainstream classroom experiences. However this largely unsuccessful and will lead to a new inquiry in 2018 on how the positive learning from the Makerspace can be transferred and replicated in the mainstream classroom.

Recommendations

We believe the balance of evidence shows that participation in the Makerspace has been of benefit to the students both academically and in the development of the key competencies. The recommendations of this project are twofold.

It was a strategic move to choose Year 4 students as the subjects for this project as if successful they would become the leaders to expand the scope of the Makerspace. In 2018 these students will be Year 6 and have built considerable expertise and capacity to be a leader in the Makerspace and share their learning with others. Therefore it is our intention for the Makerspace group to be expanded to include more students with these students as leaders

Secondly, it proved challenging to make connections for the students between classroom learning and the Makerspace and also for the skills and dispositions the students developed to be transferred to the classroom. Consequently, we wish to scale up the inquiry so that the principles learnt in this project can be of benefit to students in the mainstream class. This will involve our project leader leading a group of teachers so that their pedagogy can be developed to suit the mainstream classroom yet achieve similar benefits to the withdrawal groups.

Conclusion / Additional comments

The Grass Roots funding afforded our school the opportunity to explore innovative learning practices as a means to raise student achievement for at risk Maori and Pasifika students. Our project to create a Makerspace whilst risky due to the lack of established models to follow also presented a unique opportunity to bring together knowledge and expertise from a range of sources to create our own model of a Makerspace. Although we cannot prove cause and effect we note the increase in student achievement for our target students. Most importantly however we are proud to report significant gains in the key competencies, practical skills and learning behaviours that will prepare these students to be confident learners. We also gained some key insights into strategies that might benefit these students. For example having choice and control in what and how to learn and giving extended time to our target learners. We are excited at the opportunity in the future to be able to expand the use of the Makerspace to other student groups in the school in the future. We also seek to be able to transfer some of the findings and teaching strategies learnt through the Makerspace project into the mainstream context through further inquiry next year.

We are thankful to our school principal for supporting the vision of the Makerspace and providing a dedicated space for it to be situated. Thank you also to our students' teachers who support them throughout the project. Lastly we are thankful for the Grass Roots funding that allowed us to pursue this inquiry.

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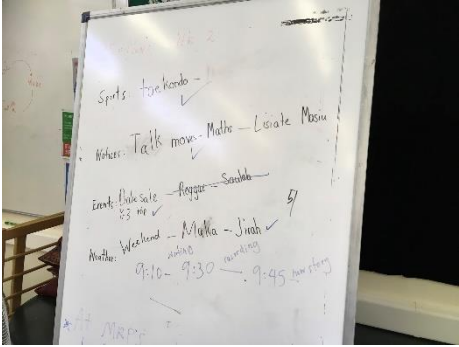
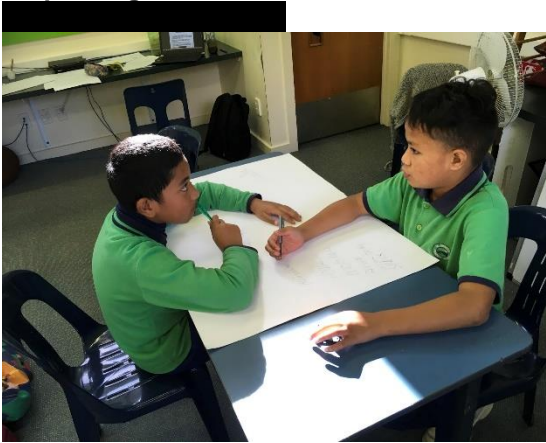
Appendices

Appendix A - Examples of Student Work

Publication of Roskill News can be found at <http://www.mrps.school.nz/syndicate-webpages/mrps-news>

Appendix B - Example of teacher planning and reflection.

Week 2/ Term 2 2017 Names have been blacked out

<p>Block 1:</p>	<p>News team [redacted] - 16, [redacted] - 15, [redacted] - 15, [redacted] - 16, [redacted] - 14, [redacted] - 15 Get group to start owning process. [redacted] to write down ideas organised into headings: sports, events, notices, weather</p>  <p>Came up with a timeline in order to get the news finished before the end of block 1. [redacted] and [redacted] completed two news stories and helped film another. [redacted] put the news together. This newsgroup is a bit slower than the other but working to a timer worked.</p>
<p>Block 2:</p>	<p>With all groups, discuss the purpose for carrying out projects and the pedagogy behind it. Demonstrate how to plan project using plan: Genius Hour Weekly Plan 3D printing</p>  <p>This group had fantastic ideas.</p>
<p>Block 3:</p>	<p>Stop-motion [redacted]</p>



<http://teachingmama.org/super-soft-playdough-recipe/>

Of all the groups this was the least productive. They did not collaborate very well. They would benefit from exploring what working in a team and collaborating means. They are ready to make their playdough. [REDACTED] stayed all lunchtime storyboarding her ideas for the stop motion.

Music making



This group has a lot of energy that at times needs to be reigned in. They are very enthusiastic about the project and are determined to work as a team. They need to explore what it means to work as a team in more depth. Stayed for the whole lunchtime to work on their music.

Block 4:

Cooking team

<http://www.foodinaminute.co.nz/Recipes/Easy-Fruity-Ice-Blocks>

Both are very quiet. It was a good idea grouping them together as they were both forced to participate and contribute (particularly [REDACTED]). [REDACTED] does not have a lot of confidence but she clearly feels comfortable with [REDACTED].

Reflections/notes

Next week revisit the pedagogy behind project based learning (record on a chart).

Discuss what worked well: Not giving up, great ideas, trying to work as a team, some learners staying focused.

What didn't work well: Not everyone participating and contributing, some learners were off task or being silly, putting down/dismissing other's ideas.

Perhaps use [this chart](#) as a guide for working on projects.

Have playdough ingredients and ice-block ingredients. I could take these two groups together to cook at the same time.