# Let us walk you through the problem.

**NEW ZEALAND**

NORTH ISLAND

Auckland

Hamilton

Palmerston North · Napier

TASMAN SEA

Nelson · Wellington

SOUTH ISLAND

Milford Sound · Wanaka

Queenstown

· Dunedin

Invercargill · Stewart Island

PACIFIC OCEAN

· Christchurch

There are 800 Deaf secondary school students in Auckland, NZ's biggest city.

These Deaf students are enrolled with Kelston Deaf Education Centre but attend a number of satellite schools throughout the city.

MISSION HEIGHTS JUNIOR COLLEGE | KELSTON BOYS HIGH SCHOOL | KELSTON GIRLS' COLLEGE | ORMISTON SENIOR COLLEGE

**Temporary**

Our school, Mission Heights Junior College, in a newly developing suburb, is a "temporary" satellite school until the permanent junior college satellite school is constructed.

## No one is owning this problem!

As the students are not officially on its roll and it receives no funding, the MHJC Board has no mandate nor the responsibility or expectation to pay for an alarm system.

FEAR

WORRY

INADEQUACY

CONFUSION

ANXIETY

BEWILDERMENT

**AND THE RESULT FOR THE DEAF STUDENTS IS..**

NOT VALUED

UNEASE

FRUSTRATION

14 deaf students attend our school and have done so since 2010

Mission Heights Junior College KDEC 2013

The Ministry of Education will not fund an expensive visual alarm system as MHJC is only a temporary school for KDEC students,

MINISTRY OF EDUCATION

The students are officially enrolled with Kelston Deaf Education Center which receives all government funding for the deaf students. The MHJC board has agreed to have them in the school with no financial return.

Kelston Deaf Education Centre

In every NZ school fire alarms are of course compulsory, but because MHJC is a temporary satellite there are no visual alarms for deaf students.
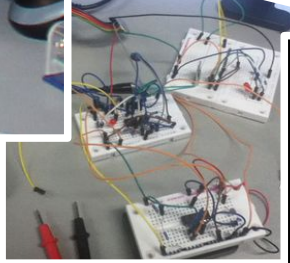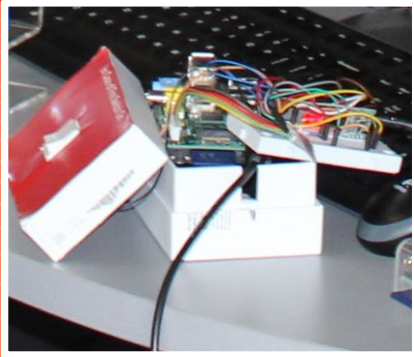
## Whose problem is it?

We interviewed the KDEC students on this issue. They told us that in an evacuation they have to rely on their teachers telling them what to do. This is unreliable and unsafe.

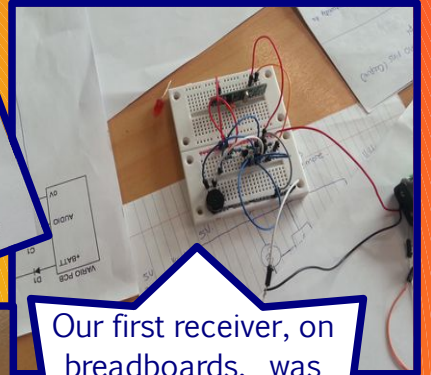# Making our Plan a Reality

## We Designed our first Transmitter
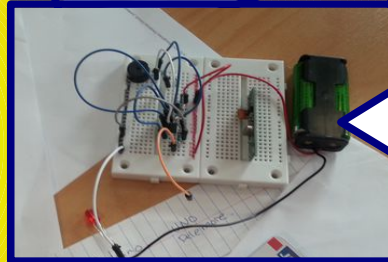
## And Our First Receiver

We researched on the web, then designed and built a transmitter on two "breadboards" which sent out a signal when a switch was pressed in the case of a fire alarm. We were later able to reduceits size to one breadboard.
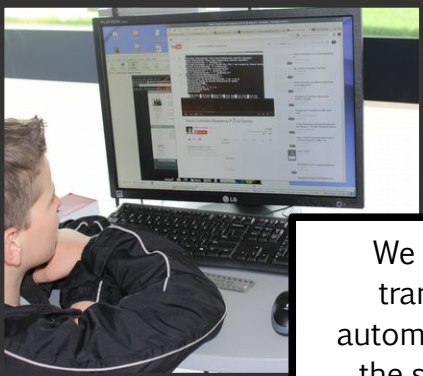
Our first receiver, on breadboards, was too big to carry around but our first priority was designing a model which would work!

## Prototype 2 Transmitter

```
#!/bin/bash

echo "4" > /sys/class/gpio/export
echo "out" > /sys/class/gpio/gpio4/direction
echo "17" > /sys/class/gpio/export
echo "in" > /sys/class/gpio/gpio17/direction

INPUT='/sys/class/gpio/gpio17/value'

while [ true ]
do

RESPONSE=`cat $INPUT`
```
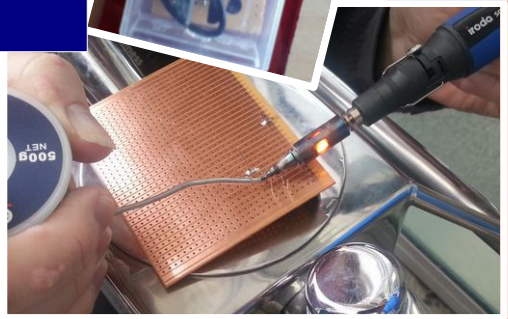
We programmed our 2<sup>nd</sup> transmitter to respond automatically to the sound of the school fire alarm. This removed the concern that someone might forget to activate it.

## Prototype 2: Receiver

Once we knew it worked we soldered our components onto veroboard
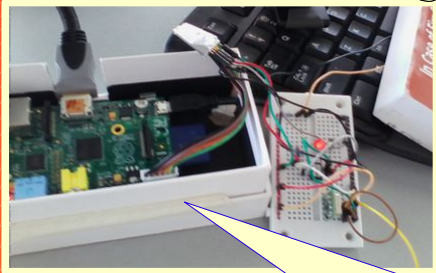
Our receiver was now small enough to fit in a Tic Tac box!

## We Created a Working Portable Alarm!

# Our Work Goes On!

## Increasing Safety

## Improving Reception

We added a better antenna to improve reception but ensured we kept the device small

We had a functioning alarm but we wanted to make it fool proof. You don't take chances with fire!
We added an encoder chip to the transmitter to ensure that the correct signal was sent to the receiver. This would reduce the chance of false alarms.
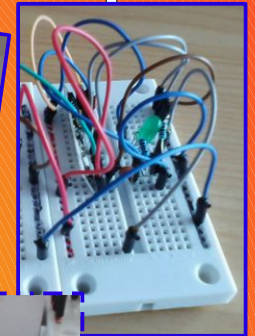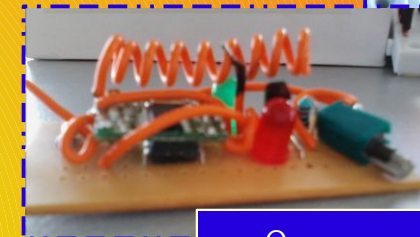
## Future Plans

We hope to make our device even smaller by using a printed circuit board.

We are very happy with our device but would like to make it look more professional. We want the deaf students to have the best alarm possible!
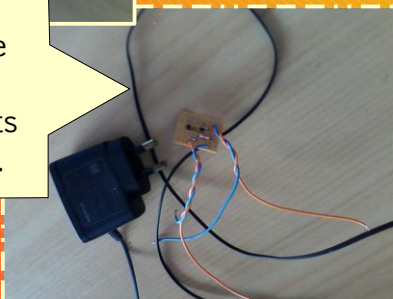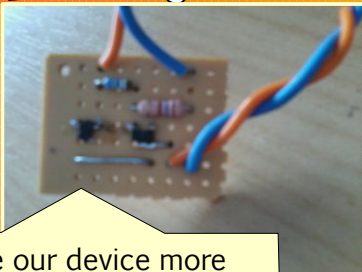
Once we were sure it worked we transferred our new design onto veroboard.

## Improving Sustainability

## Improving Reliability

To make our device more affordable, and reliable, we added a recharging circuit so the deaf students can recharge their devices.

We are now working on a circuit to ensure that the rechargeable battery maintains a constant voltage output even when it is losing its charge. This will mean the battery will last longer between charges and improve reliability.
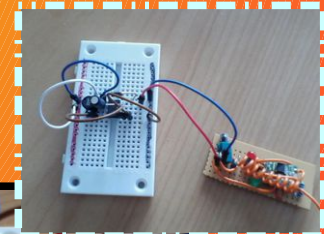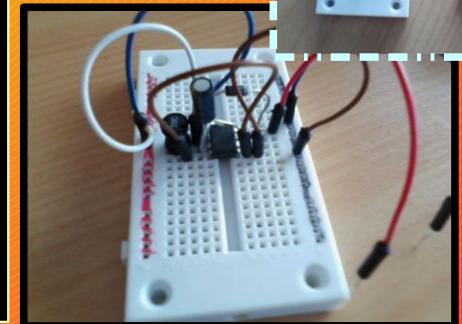
# Keeping the Wheels Turning: Obstacles and Responses

*Obstacle: How will we fund 14 devices?*

We used prize money, fundraised and sought sponsors. Businesses were happy to support our project.

*Obstacle: We faced a steep learning curve as we lacked experience in coding and electronics*

*Obstacle: Our alarm was unreliable when the battery was not fully charged.*

maxell
CR2032
3 V
Hitachi Maxell, Ltd. Japan

We redesigned our receiver to use rechargeable batteries .

We sought advice from experts and used the internet as a learning tool.

We believed in ourselves and convinced others we could succeed with their valuable assistance.

*Obstacle: When the transmitter was off, we sometimes still got a vibration!*

We had to reprogramme because we found the receiver was picking up background interference.

*Obstacle: We initially lacked credibility as Year 9 students*

*Obstacle: We made technical errors eg we soldered the resister the wrong way and what had Worked before no longer did.*
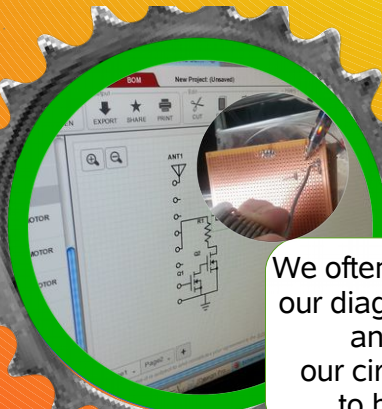
We often had to test, check our diagrams and our work and then rework our circuits. We learned to be very patient!

*Obstacle: We considered using text alerts but couldn't. Our school is in a flight path and the "hush" glass blocks cell signals*

We did some trials and found using radio signals was reliable.

"The benefits of your innovation are almost incalculable and potentially extend far beyond your School. It has the capability to enhance the safety of members of the Deaf community in an inclusive way, throughout our country- and beyond."
*Phil Faidley, Fire Risk Management Officer, NZ Fire Service*

The NZ Fire Service and Kelston Deaf Education Centre both strongly endorsed our project

"The vibrating alert mechanism has, in my opinion, the potential to influence awareness and improve access for Deaf people throughout the community and country and without exaggeration could have impact worldwide if marketed correctly."
*David Foster CEO KDEC*

We contacted Vodafone about our project and they donated old phones to us, which we used for their batteries and vibrators.

We applied to Orion Health for a Raspberry Pi miniature computer made by Orion Health. It is now used to power the transmitter.

Reaching out to the community for assistance.

# Community Support

We worked with Mr Doughney, our IT Manager, when we needed advice – especially when it came to programming.

Our first fundraiser to support our project was at our local supermarket Countdown, who gave us a $500 voucher to raffle. Pip Burns, the winner, then offered to sponsor team

We gained a lot of knowledge about computer coding and electronics from Brendan Vercoelen, an Engineer from Fisher and Paykel

# Recognition

Our project was featured in local and national media

*1st Place in Regional Science Fair*

### NIWA
### Taihoro Nukurangi
### Regional Science & Technology Fair
### First prize
is awarded to
**Cailey Dayu**
**Courtney Powell**
**Krishin Rama**
Project
**Alert**
Category
Years 7, 8, 9 & 10 Technology / Innovations
School
Mission Heights Junior College

Congratulations on your success

*1st Place in National Transpower Neighbourhood Engineer Awards (IPENZ)*

**Senior Winner – Mission Heights Junior College, Auckland**

Mission Heights Junior College in East Auckland has won the senior section of the...

Challenges to solve:

Our project featured in the local paper and in National Online News Service "Stuff"

### Innovative new fire alarm
ROSE CAWLEY
Last updated 05:00 11/10/2013

SILENT SAVIOUR: Project Alert members, from left, Dylan Townsend,13, Krishin Rama, 14, mentor Brendan Vercoelen, Courtney Powell, 14, and Cailey Dayu, 13, set off the silent alarm which helps alert deaf students to the possibility of a fire.
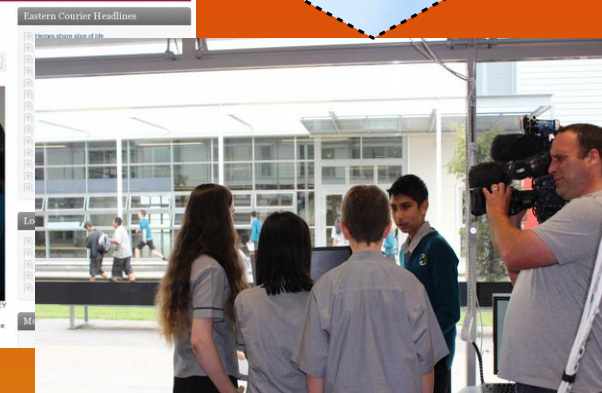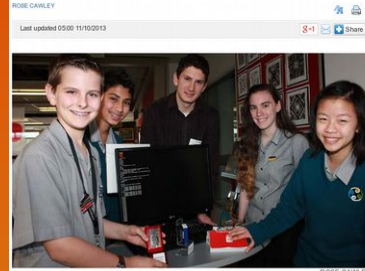
*We were featured on National Prime Time TV 3 News*

### codeworx
### ORION HEALTH
Congratulations to the 2013 Codeworx Challenge Winners!
Team category winners
Individual category winner
Project ALERT - Year 9 from Mission Heights Junior College     Rubik's cube solving robot - Year 13 Burnside High School

*1st Place in National Codeworx Challenge*

*CmPS 1st Place Winners*

*KDEC Students gave our work a vote of thanks*

Our project was recognised with a number of regional and national awards and was featured in professional engineering magazines.

Members of the Deaf Community and those who work with them showed their support.

*Mr. Faidley From NZ Fire Service was excited by our work*