

## Case study 1: St Johns College Hamilton

“One of the best projects ever ” says Technology teacher Steve Andrew about EVelocity. Collaboration, competition, community support and credits proved to be a potent mix for student engagement and learning.

The Waikato region came on board with the EVelocity project this year. Steve shares how he integrated this into a year 13 technology programme.

### Start up

An initial discussion in the Waikato region indicated that teachers were pretty excited about this project - 30 teachers from 15 schools around the region attended the first two meetings. The programme startup was launched in March at Wintec. Waikato University and [Waikato Engineering Careers Association](#) also supported this event. Each school brought along a mountain bike. To get the students hooked into the project, a competition was run to see which team could fit an electric motor kit and get their bike going the fastest.

### Student voice

Right from the beginning the year 13 students at St John’s College were very keen to be involved. When the project was outlined to the students the key attractions were that they would get to work together with others to produce an outcome, and that they would get NCEA credits. None of their other classes offered such an attractive incentive.

Three electric cart groups were formed.

The teams had to complete their cart to meet the scrutineers requirements in a timely fashion - and then there was the race! Students acknowledged that participating and contributing (one of the key competencies in *The New Zealand Curriculum (2007)*), is essential in a team project such as this. The project provided multiple teaching moments around team building. There are already plans afoot for next years classroom guests (e.g. teams from within the school and industry) to share their experiences of effective teamwork.



### NCEA

When planning a group project at NCEA level, it is important to structure the assessment in such a way that it allows the teacher to assess individual work within the context of the group project. To enable this, each student developed a different component of the kart.

For a group of four students, the areas of responsibility were:

- the front suspension and the steering system

- the chassis and the seating system
- the rear drive system and brakes, and mounting the electric motor
- the body - cover and nose cone.

The components were constructed as flat modules and were bolted together on assembly. This allowed for ease of transport of the vehicles if they won the regional competition, and wanted to attend the national events in Christchurch. It took 1 hour to bolt the components together on assembly.

Where there were groups of three students, they did not make a body cover.

If a larger group wished to work together on a cart, the areas of responsibility could be arranged in a different way.

Two schools could even collaborate and use this approach to work on making one cart.

It was very straightforward for students to declare explicitly which part of the work was their own and their contribution to the completed cart. Where they collaborated in research, students recorded evidence as their interpretation of group material.

The standards offered for assessment purposes were:

AS 91611 Develop a prototype considering fitness for purpose in its broadest sense (6 credits)

AS 91609 Undertake project management to support technological practice (4 credits)

AS 91620 Implement complex procedures to integrate parts using resistant materials to make a specified product (6 credits)

AS 91359 Demonstrate understanding of material development (4 credits)

Achievement standards from, for example, Design and Visual Communication(DVC), sustainability, digital technologies and physics could also be explored as possible assessment tools for these projects.

When the EVelocity project is embedded in a class programme with NCEA generic technology credits attached, it is important that the race day is set early. In March the race day for Waikato was set for Friday 16th September. This allows students to complete the project, collect feedback and make a final evaluation of their prototype before they finish school in mid November.

### **Key competencies and values**

As already noted this group project provides multiple opportunities for both teaching and students practicing and reflecting on the key competencies. Self management, relating to others and participating and contributing are all required for a successful outcome. Critical and creative thinking is required as students develop their prototype cart. The project also allows students to develop capabilities in the use of language, symbols and texts as they design,construct and trial the electric cart.

Electric cars are trending in discussions around sustainable environments. The EVelocity project gives students an opportunity to engage with this technology and hence explore the values of others.

Students are required to make informed decisions to ensure that the cart is fit for purpose in its broadest sense. They need to weigh up the functional and aesthetic values of materials against their environment cost . When working as a group there will be on-going discussions and negotiations about the students own values, how they may differ from others and how these are used to justify decisions.

## Project management

Former technology students who now work as engineers at Stafford Engineering in Hamilton visited the School and ran a session on project management. They emphasised to the students how helpful the project management skills they had practiced in their technology courses at school were in their current roles. The EVelocity project requires students to make a vehicle within a defined timeframe, to a brief, and within resource limitations.

The students set up project management in a way that is not dissimilar to an industrial engineering project.

They established an overall plan and documented this in Google Gantt. Each component of the cart was seen as a separate contract. The student who was responsible for that component was also responsible for the associated planning.

The students also used a planning system similar to the SCRUM methodology commonly used by Software engineers. Post it notes were placed in columns on a noticeboard in the workshop to identify tasks, what was needed to be done next ,and who was responsible.. Students were often seen congregating around these and discussing progress, crossing off jobs done , sorting problems and next steps - real live planning!

*I really enjoyed the planning side of this - bouncing ideas off each other - if you ever had a problem there were multiple suggestions and you could then sort out the best ones. We definitely had an advantage over other teams - we were organised and knew about the importance of planning.*

*(Jarrod Gellert, team member, The Volt)*



## Resourcing

The school purchased the motor kit from EVelocity.

These kits can be reused -in following years.

A local steel manufacturing business has supplied the technology department with offcuts for a number of years.

The class also visited a local recycling centre and collected materials that could be useful.

Old bikes were donated to the class.

[Stafford Engineering](#) assisted with the folding of specific components that require specialist equipment.

Two teams took over a lockable shed out the back of the workshop as their own space for construction. Younger students often came and hung around at lunchtime to check progress on the cart. A great marketing tool for technology as a subject choice!

Stewart Lister who built a cart for the [World Solar Challenge](#) from Darwin to Adelaide lives in Hamilton. Stewart was keen to help and mentored one of the three groups. He came to class each day!

The class also had a tour of Waikato University's engineering department. They looked at their electric cars and met with the student who designed The Waikato University Formula SAE team (WESMO) racing car. [Formula SAE](#) is an international competition where students must design and build their own car.

Funding for the trip to the nationals came from the school, EVelocity and the students themselves.

**The project generally opened up opportunities to draw on community expertise. People from interesting backgrounds readily engaged with the students providing authentic links to industry.**

## Winners

Lewis Hamilton may have had his run of bad luck this year in Formula 1 racing but this is nothing compared with the steering column breakage that the team behind [The Volt](#) faced on regional race day! With a bit of number 8 wire mentality and a competitor's drill, the team still managed to take out multiple awards and win overall prize for the kart division. As this is being written they are making their way through earthquake torn Kaikoura to the nationals in Christchurch.

These students have had an unforgettable learning experience. They have begun on their lifelong journey of navigating through the nuances of teamwork, all achieved their NCEA credits, and STEM careers are on the horizon.

*I look forward to coming to tech to work on the cart - I spend a lot more time on this and am often here at lunchtime. (Connor Brennan, team member, The Volt)*

*One of the boys I knew a bit - the others I have got to know better and their skills..pretty cool.*

*(Jarrod Gellert, team member, The Volt)*

*I have an electrical apprenticeship next year ... looking for an apprenticeship in welding ... I am going to do the Diploma of Mechanical engineering at Wintec*



