Student 2: High Merit

NZQA Intended for teacher use only

1

Please note: The evidence presented in this exemplar provides snapshots of student evidence. The commentary aims to link the student evidence which for this standard was 40+ A4 pages.

The student brief was confirmed by the teacher:

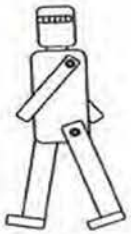
"To develop a conceptual design of a sturdy toy that would entertain a young cousin at his grandparent's house.

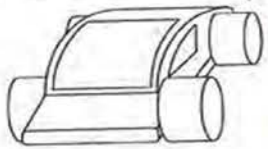
Specifications included:

- *Sturdy*
- *Can be manoeuvred*
- *Remote controlled*
- *Battery powered*
- *Can be used indoors or outdoors*
- *Can be easily stored*

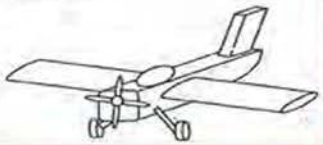
All of the products move in a different way. The cars drive, the helicopter flies and the dinosaur walks. All of these ways of moving would suit a solution I make, but some are easier to do than others. A flying solution would defiantly look good but I don't think that it would be practical for young children. Again walking would look quite good but wouldn't be practical for young children. I think I shall take driving further as it would still look good in action but it will be a lot more practical for young children, and be easier to make.

Concept 2





Concept 3



Concept 1

2

The student provided evidence of the following steps in his practice:

He talked with his grandparents to establish any constraints and so he had a personal understanding of the problem

⇓

Researched existing remote controlled toys and gained feedback from his grandparents and then used this research to inform his design ideas.

⇓

Presented first design ideas in the form of 2D sketches to his stakeholders and gained feedback by using a concept screening chart

⇓

Based on stakeholder feedback developed the selected design idea by freehand sketching his ideas for the toy and then made a cardboard model to test proportion and size.

⇓

From his research the student discovered that colour and simplicity were two factors in children's toys. He explored a range of materials to look at possibilities of materials as the type and performance property of the material may constrain the design of the toy itself.

2

Please rank my 6 designs in order of importance:

Which concept appears to be the sturdiest?	2	6	5	1	3	4
Which concept do you think will appeal to your grandchildren?	3	2	5	6	1	4
Which concept is best suited to indoor and outdoor use?	2	5	1	6	4	3
Which concept would be easiest to store?	4	2	6	3	1	5

From the results of this screening I will develop design 2

1

Concept development

Car shape

The shape of the car is very important as if the car looks good then it will attract the attention of my cousins. This is why I need to make sure my car is looks very good. I have researched pictures of sports cars and will incorporate designs into my car. I could sculpt the design into wood or foam quite easily then attach it to the basic design of my car which I will probably make out of plastic.

There are three main parts of a car that makes it look good. The shape of the roof, the shape of the spoiler and the shape of the front of the car. I have drawn concepts for what the shape could look like. I will decide which one is best and why, and then I will model it.

The model is half the size that the actual outcome will be. The model shows the basic shape the car will be and allows me to get a deeper understanding into how I am going to build the car. Modelling the car also helps the stakeholder see if this outcome fulfils the issue.

2

High Performance Thermoplastics (HPTP):
Plastic materials fall into two basic categories:
Thermosets, which can be molded only once, and
Thermoplastics, which can be reheated and remolded several times

High Temperature Performance
Maintains properties when exposed to a wide range of temperatures.

Mechanical Strength and Dimensional Stability
Excellent strength, stiffness, long-term creep and fatigue properties.

Wear Resistance
High abrasion and cut through resistance combined with low coefficient of friction.

Chemical Resistance
Resistant to a wide range of chemicals at elevated temperatures in harsh environments.

Hydrolysis Resistance
Low moisture absorption, resistant to steam, water and brine, with low permeability.

Electrical Performance
Naturally flame retardant with electrical properties which are maintained over a wide frequency and temperature range.

Purity
Inherently pure with low particle generation and low outgassing for reduced contamination.

Recyclable
Fully recyclable providing environmental and regulatory benefits.

Ref: http://www.victrex.com/en/products/victrex-peek-polymers/properties/properties.php

Having researched a range of materials I have decided to use plastic for the main body as it is easily accessible, light, durable and comes in a range of colours. We have a plastics former at school so if this idea goes in to production I will need to make a mold to form the plastic."

2 3

Concept Development – Car mechanics

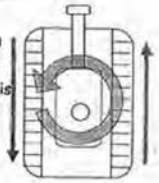
Steering

There are two ways I can see to steer the remote control car. One way is to use servo's to change the direction of the wheel and the other way is to have one wheel move forward and the other on the opposite side move back.

A servo is a component that can rotate its star shape top when programmed to. I could make an axel which I would attach the servo to, which would then turn the wheels.

This way would be a bit trickier than the second way as it would involve a lot of moving parts. This would mean the car would require more maintenance and there far not meet the issue. Also the car would become harder to use as with the second method the car could spin on the spot, greatly increasing its manoeuvrability, whereas the servo method requires the car to move forward or backward to turn. I don't think this method suits the location.

The second method is very much like how a tank is steered. One side of the car moves forward and the other side moves back, this turns the tank on the spot. See right.



This method will require four motors, rather than the two that would be needed in the servo design. I think this is better though as I think the car will need the power of four motors instead of just two. This will also minimize the amount of fiddly moving parts I would have to construct making less amount of maintenance needed. This design will also be easier to control, as I explained before. This method of steering would fit the issue much better than the first method. For these reasons I shall use the motor method of steering instead of the servo method.

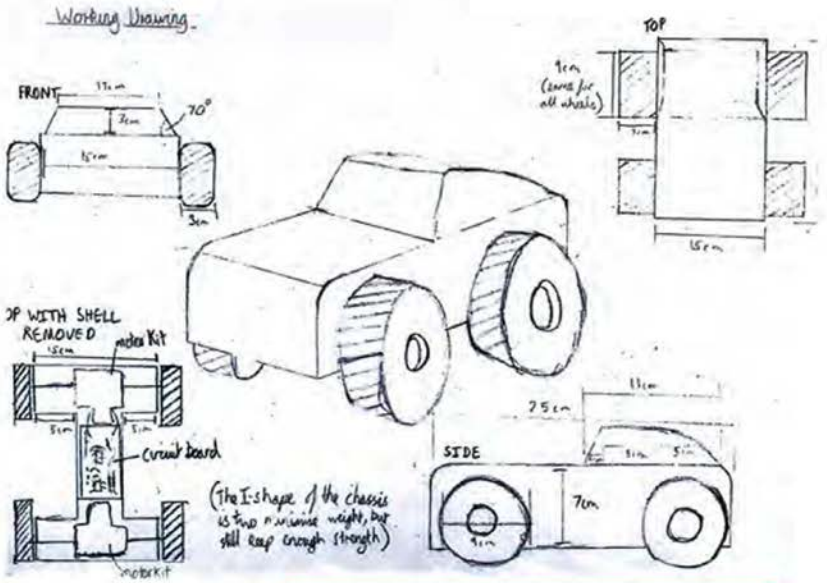
The student then identified other factors that would require further research: steering, motors, power and reverse relays. An example is shown of his research and evaluation of the steering needs, however the stakeholder was not involved in this decision making.

The student then provided evidence of his transmitter and receiver circuits and wiring diagrams and produced a working drawing of the toy.

The student produced working models of the car and and the remote control device and was able to allow his stakeholder a 'hands on' experience of testing the model for fitness for purpose.

The student evaluated the potential of his conceptual model to meet the brief.

3



3

4

4

"I took my car model and remote to my grandfather's house and he was very pleased with it. None of the controls were labelled so it was a bit 'hit and miss' as to what he could get the car to do so I must think about labelling the controls. He also thought the car was a bit plain for my cousin as he did not understand that it was just a model and that is something I will develop when I manufacture the solution. We both thought the wheels could do with some traction on the rug.

I have met my brief by communicating my idea of a sturdy car that is remote controlled. The car can be steered around chair legs and other obstacles and will go forward and backwards. I tried the car on several indoor surfaces and it worked well (it was too wet to go outside). The transmitter circuit and 3v battery easily fits inside the controller."