



National Certificate of Educational Achievement
TAUMATA MĀTAURANGA Ā-MOTU KUA TAEA

Exemplar for Internal Achievement Standard Technology

This exemplar supports assessment against:

Achievement Standard 91610

**Develop a conceptual design considering fitness for purpose in the
broadest sense**

An annotated exemplar is an extract of learner evidence, with a commentary, to explain key aspects of the standard. It assists teachers to make assessment judgements at the grade boundaries.

New Zealand Qualifications Authority

To support internal assessment

	Grade Boundary: Low Excellence
1.	<p>For Excellence, the student needs to develop a justified conceptual design considering fitness for purpose in the broadest sense.</p> <p>This involves synthesising evidence from ongoing research and functional modelling, including feedback from stakeholders, to substantiate the potential of the proposed outcome to meet the brief.</p> <p>This student's brief was to develop a conceptual design for a wetsuit top to be worn by someone with restricted shoulder movement. Consideration of the wider social and physical environment in which the technological development occurs is integrated throughout the evidence.</p> <p>The student has synthesised evidence exemplified by the connections between the initial research into the stakeholder need (1), ongoing research (2), modelling of conceptual designs (3), feedback (4) and modelling of refined components of the developing design (4). All of these have been used to develop a single conceptual design (5) for final modelling (6).</p> <p>The student has supported the potential of the proposed outcome to meet the brief via measurable specifications (7) and a final conceptual design (not shown here).</p> <p>For a more secure Excellence, the student could address further issues of fitness for purpose in the broadest sense, such as sustainability and ethical testing practices.</p>

Student 1: Excellence

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Dad's injury:

Unfortunately, Dad was involved in a serious surfing accident when he was 19 years old. He broke the C5 vertebrae in his neck and after some time in hospital he was confined to a solid neck brace for 6 months. He was extremely lucky as the break was only millimetres away from his spinal cord which would've left him tetraplegic. After a long recovery, he has been able to resume a normal life, however has been left with limited movement in his neck and shoulders due to the stiffness caused by the injury. As shown, the C5 vertebra has a significant effect on the nerves in the arms. As a result, Dad is now unable to rotate his neck sideways or reach his arms above his neck to the same degree as others.

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Dad's Existing Attire:

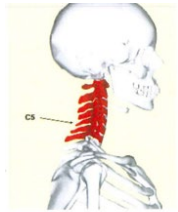
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This is the wetsuit Dad currently wears which he wears on top of a rash top and underneath a lifejacket.

- **PROS:** The material it's made from and the tight fit makes it insulated and warm against his chest. He likes this wetsuit because the short legs are much more comfortable than a full length wetsuit.

- **CONS:** The fact that it is short sleeved means it is not sun protective at all. To get the desired neck height, Dad layers it with a rash top underneath which prevents insulation from being effective in keeping his chest area warm. As there is no colour on the sleeve/shoulder area, it has poor visibility. It functions with a zip and velcro down the back which means he cannot undo it himself due to limited movement in his arms. However once it is undone, it is easy for him to take off and put on again.

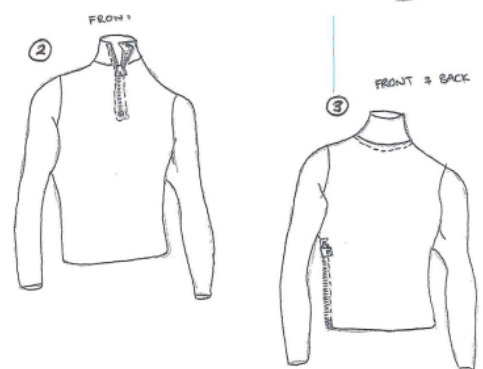
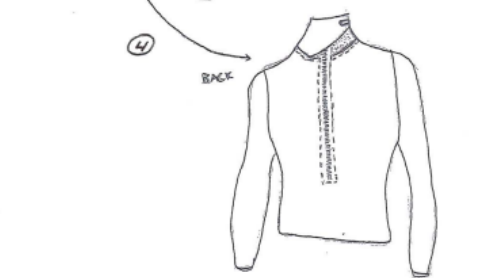
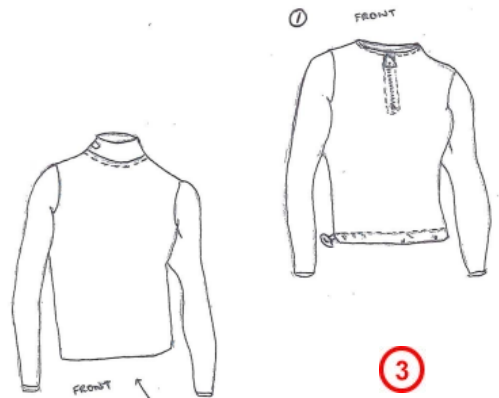


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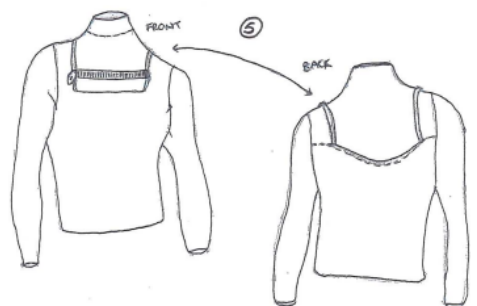
The first type of chest zip comes from the back, over the head and then zips across the front. It looks easier and more manageable to construct than the second type of chest zip. These chest zips that come over from the back are less common and more predominant in junior and girls wetsuits.



This function comes from the right side of the head, over sideways and zips across on an angle. This is the most common form of chest zip however it looks more complex to manufacture.



I also borrowed a chest zip wetsuit from my friend who is a keen surfer to have a look further into the design and see how it has been made. This particular chest zip function is the more common one used by many brands today. The headpiece comes from the right side, over the head sideways and zips across the chest. As shown in the photos, the design is very complex with layers and joins. After seeing this function in real life, I would need to make this design less complicated and more manageable if I wanted to do a form of chest zip.



Key Decisions Made	Next Steps
<p>After analysing existing watersport garment functions, I think that a zip is the best functional aspect. However, both the traditional back zip and chest zips are not good options due to accessibility.</p>	<ul style="list-style-type: none"> - I know now that sleeves will be an important factor so I will also look into existing sleeves on garments and different materials that could be used for them.
<p>After sketching possible tops with different functional features, I need to come up with a design that makes use of a zip function and placement that does not interfere with Dad's restrictions.</p>	<ul style="list-style-type: none"> - I need to research fabrics and their properties to find the best fit for my outcome. - I will also need to test these fabrics under certain conditions to see how they perform. - Seam tests will also be beneficial as the fabrics I use will be complex to sew.

Initial Ideation feedback 4

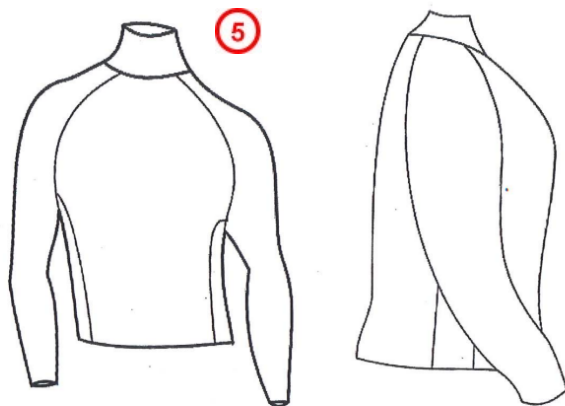
1) Having two forms of function may be unnecessary and the drawing isn't a very practical function. The neck is affected by the half zip and therefore prevents optimum sun protection.

2) Maintains sun protection with the high neck, although I think the collar could be uncomfortable with a zip up the neck. It also wouldn't be very insulated or snug fitting around the neck.

3) I like that the neck has been left without a function so it remains fitted without and discomforts and there is maximum sun protection. The zip down the side is a good place, although when seated it may roll and cause discomfort under a life-jacket.

4) I like that the zip opens a long way to allow lots of room for easy access, however as the zip is at the back Dad isn't able to use it. The way the neck can be adjusted to different tensions is a good way of allowing Dad to choose how tight he needs it. Sun protection is also still maximized with this neck.

5) This function will be too difficult for Dad to get into due to the way he will have to pull it over his head from behind. The manufacture of this is also much more complicated. The positioning of the zip is likely better than the other places.



I spent some time with the design teacher at school and together we made this drawing

4 When I took my design drawing and the toile to my expert stakeholder XXXXXX she suggested a zipper function involving some form of gusset, placket, or godet. I researched these features further.



Gusset: A gusset is a triangular or rhomboidal piece of fabric that is added to a seam to add breadth or reduce stress from a tight fitting garment.

2



Placket: A placket is an opening at the neck or sleeve of a garment. Majority of the time, plackets are used to make putting on or removing clothing easy. Modern plackets often have attached facings or bands to surround or reinforce fasteners (e.g buttons or zippers).



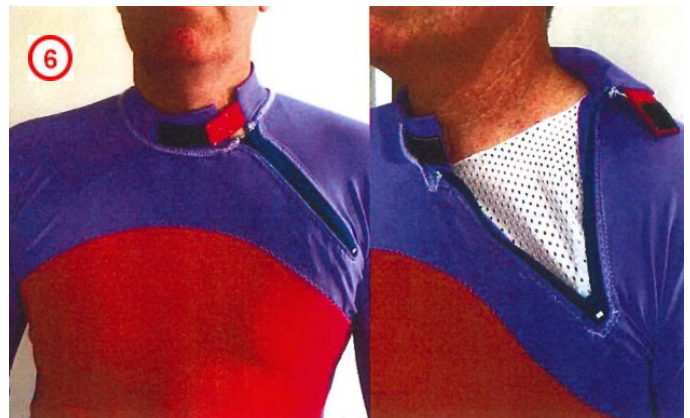
Godet: A godet is an extra piece of fabric which is sewn into the garment, causing flare by adding width and volume. A godet also gives the wearer a wider range of motion.

After speaking with XXXXX I decided to model something that included a combination of favourable functional features which include

- Frontal placement zipper, allowing easier access
- Placket/gusset, allowing an opening
- Velcro neck fastener



This gusset function with the Velcro would work perfectly as Dad can access it easily and it opens wide enough for him to pull the top over his head with ease. The Velcro tab allows him to tighten it to any desired tension which is ideal around his neck as it is the area of injury. The neck or collar height is also good for sun protection.



Final Specifications:

After researching, testing, trialling, modelling and obtaining feedback, I am able to put together my final specifications which are as follows;


I will be making a

- Fitted long sleeved lycra and merino neoprene top
- Sleeves will be made from white Nylon Lycra which is flexible and moves with the body
- Front and back panels made from merino backed neoprene for warmth/insulation
- White and blue colours for high visibility when on the water
- Long sleeves and 5cm high neck collar provides protection from the sun
- 12cm Velcro tab at collar allows custom tightening
- Mesh gusset provides wide opening at neck for easy access
- 18cm open ended heavy duty plastic zipper at side neck allows for easy accessibility
- The garment will be made using the varilock stitch (comines zig-zag and straight stitching to allow for flexibility of seams).
- 1cm seam allowances throughout garment as I sewed the seams by overlapping the two fabrics for comfort

	Grade Boundary: High Merit
2.	<p>For Merit, the student needs to develop a refined conceptual design considering fitness for purpose in the broadest sense.</p> <p>This involves:</p> <ul style="list-style-type: none"> • ongoing exploration and evaluation of design ideas to determine their suitability for inclusion in conceptual designs • using evidence from ongoing research and functional modelling, including feedback from stakeholders, to evaluate the potential of the proposed outcome to meet the brief. <p>This student has developed a conceptual design for a Point of Sale system for a local business. Consideration of the wider social and physical environment in which the technological development occurs is integrated throughout the evidence.</p> <p>The student has researched (1) and explored a range of design ideas to determine each one's suitability for inclusion in conceptual designs (2). One of the ideas has been developed further into concepts, and aesthetics and functionality (3) have been modelled (4) to determine which aspects of the conceptual design will be explored further.</p> <p>Extensive stakeholder feedback is used to evaluate the development process (5). The student has evaluated the potential of the conceptual design to meet the brief (6), considering fitness for purpose in the broadest sense (partially shown here).</p> <p>To reach Excellence, the student could conduct additional ongoing research to determine the suitability of design ideas for inclusion in conceptual designs.</p> <p>The student has addressed a range of factors related to fitness for purpose in the broadest sense, such as ethical considerations (7), safety (8), technical feasibility (9) and social acceptability (10).</p>

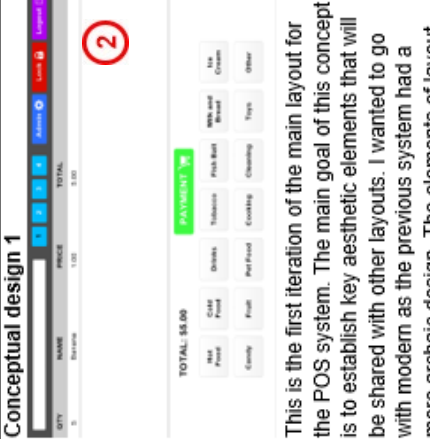
Student 2: High Merit
Intended for teacher use only

Conceptual design 1



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Conceptual design 2

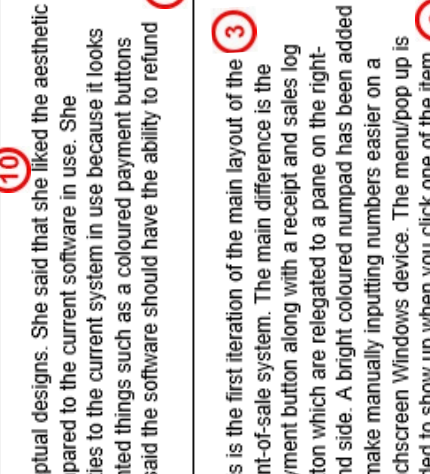


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This is the first iteration of the main layout for the POS system. The main goal of this concept is to establish key aesthetic elements that will be shared with other layouts. I wanted to go with modern as the previous system had a more archaic design. The elements of layout such as button placement is still a work in progress. All conceptual designs must be socially feasible, in the sense that the designs must not contain any culturally insensitive or offensive materials such as symbols and phrases as the software could be used by people from varying cultural backgrounds.

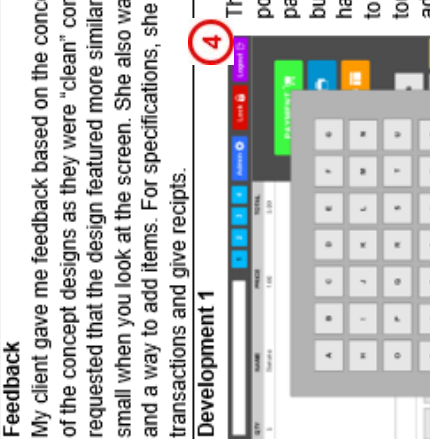
Feedback
My client gave me feedback based on the conceptual designs. She said that she liked the aesthetic of the concept designs as they were "clean" compared to the current software in use. She requested that the design featured more similarities to the current system in use because it looks small when you look at the screen. She also wanted things such as a coloured payment buttons and a way to add items. For specifications, she said the software should have the ability to refund transactions and give receipts.

Development 1



4

Development 2



10

This is the first iteration of the main layout of the point-of-sale system. The main difference is the payment button along with a receipt and sales log button which are relegated to a pane on the right-hand side. A bright coloured numpad has been added to make manually inputting numbers easier on a touchscreen Windows device. The menu/pop up is added to show up when you click one of the item category buttons at the main layout. From here the user can add an item to the order by tapping/clicking on the buttons. These changes are the result of client feedback requesting that it look like the current POS system in use. The dimensions of the layouts are now 1024 x 768 which is the resolution of the current machines.

Feedback
The client was pleased with the changes to the main layout, as it shares more similarities with the current system in use. She said that the bright buttons were easy to read but a little too bright. For specifications, the client said that she would like to have the ability to change the login passcode of the software or another form of account modification through the user interface.

Research Article #1.

<https://www.softwareadvice.com/resources/what-is-a-point-of-sale-system/> **1**

The article explains what a Point-of-Sale system and lists its components out such as having a monitor/tablet, cash register, EFTPOS, and barcode scanner. If I want to develop a functioning POS system these components will need to be taken into consideration. The article lists down important feature sets that are needed by Point-of-Sale systems such as being able to do inventory management, process payments and customer management. It also points out the physical components of a POS system that I should I accommodate for my system such as a monitor/computer, barcode scanner, cash register, credit card reader/EFTPOS Machine, receipt printer and cash drawer.

Research Article #2.

<https://usabilitygeek.com/user-experience-barriers-pos-systems/>

This article provides important information for designing my user interface and experience of my POS system. According to the author of this article, the key aspect I should focus on when designing my software is reducing the average time of a transaction, as providing fast and good customer service should be the main priority, as ultimately the transaction is between the cashier and customer itself. A new piece of information I will need to take into consideration during the design process of my software is that the focus should be cutting down the time of each transaction

Research Article #3.

<https://medium.com/uxjournal/the-design-principles-in-the-pos-system-pos-design-guide-part-2-57d1bcb30ac0>

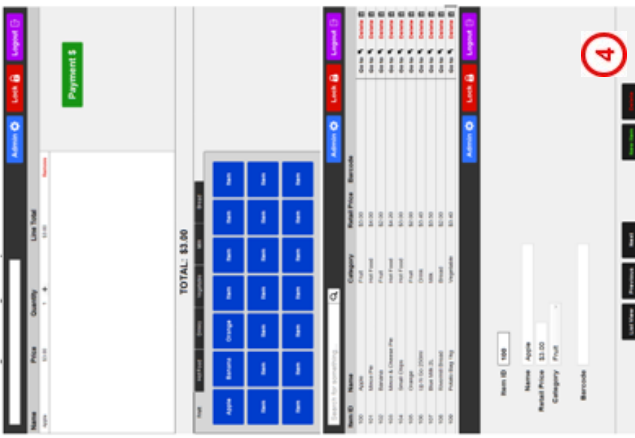
The article provides important information for designing the user experience of a POS system. According to this article, an important aspect to consider when designing the interface is the trade-off between an aesthetically pleasing and an ergonomic and functional design. Also, that updates to the user interface/experience when it has been used for a decent amount of time may provide a challenge to the user, as they must overcome their muscle memory of the aspects of the previous design.

Further Analysis of Research

After talking to my client and reading the articles I had these specifications

- complete a transaction securely, quickly, and efficiently.
- inventory management, process payments and give receipts.
- process and record transactions from EFTPOS machines.
- generate sales reports and refund transactions.
- switch between orders through the interface
- be easy to read with no unnecessary buttons.

Development 2



The final iteration of the program allows the user to easily process transactions from the main layout, this design has also revamped the category buttons to be not such bright colours. Instead of using pop-over buttons tabs are now used for selecting a category of items in the main layout, this change was made as during modelling it was determined that the pop over style buttons were not adequate. The ability to search and delete items from the inventory has been added. Users will now be able to navigate through all layouts with buttons.

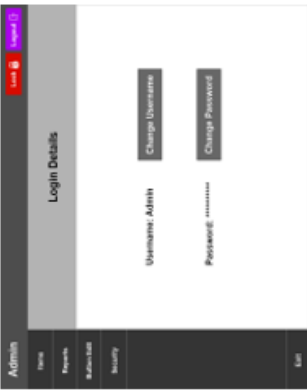
Feedback

The client was happy with the blue colours and wanted further security. A way to validate transactions, the ability to split payments into cash or EFTPOS, display change given.

4

5

Conceptual design



This is a conceptual design for the layout for changing the security details. It only allows the user to change their username and password which are used to login into the software.

Feedback

My teacher suggested it should be a two-step process to change the login details as it makes it more secure.

Refined design



The final iteration of the program adds a lock screen accessible from any layout, the ability to change the login username and password and the ability log out/exit from any layout, without having to close the application externally.

10

Testing and Feedback

To evaluate if the program is fit for purpose, it was tested by allowing the client and other users of the current point of sale system. The tests involved the users' completing objectives in the program such as navigating through menus and layouts, adding items to orders, processing orders, and adding new items to the inventory. The purpose of these tests was to gather feedback from users to determine if the program is fit for purpose and criticism to improve it. All testers will not be named in this document and will remain anonymous for privacy reasons.

Task	Client	User 1	User 2
Login	✓	✓	✓
Add items to invoice	✓	✓	✓
Change the quantity of an item	✓	✓	✓
Remove items from an invoice	✓	✓	✓
Process an invoice	✓	✓	✓
Split payment between EFTPOS and Cash	✓	✓	✓
Add item to inventory	✓	✓	✓
Delete item in inventory	✓	✓	✓
Exit the application	✓	✓	✓

Feedback

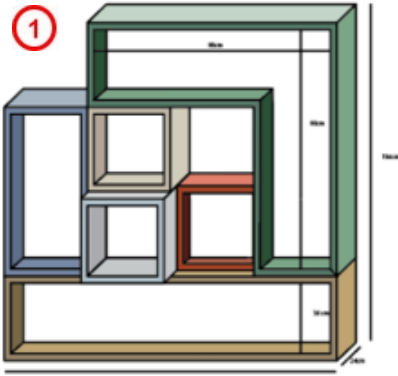
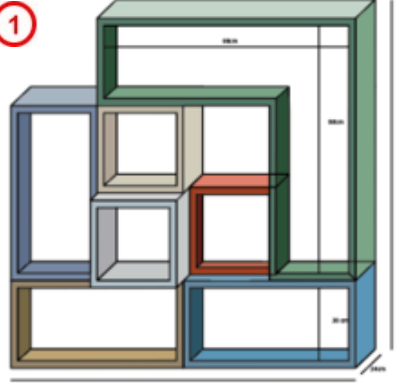
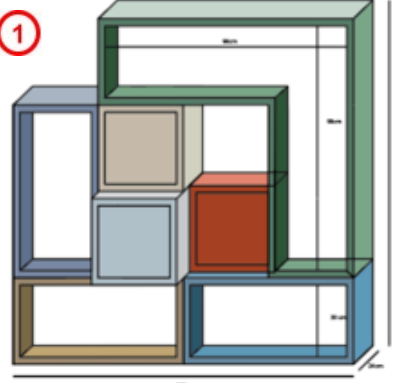
Feedback	Proposed Change	Notes
The purpose of some layouts in the concept is not clear enough	Adding text to the layouts that signify their purpose (e.g., sales log layout has "Sales Log" text)	This will be added in a future iteration of the program, as it does help users identify what the purpose of layouts are without being confused.
There is no easy way to return to the main invoice layout when on the sales log button	Adding a button that goes to the main invoice layout in the sales log layout	This will be added in the future in a future iteration program, as it solves the navigation issue of going to the sales log without having a convenient way to return to the menu.
The admin portal layout has too much empty space	Adding miscellaneous things such as the current time and date or a welcome message.	This proposed change is added but may not necessarily be implemented in future version of the program as it is a miscellaneous change despite my agreement that the portal has too white space as well.

From the feedback and test results I received from the testers including the client themselves, I have made some changes already to some of the layouts of the design, examples being a button that allows a user to return to the main invoice layout from the sales log layout. Text has also been added to all layouts which signify their purpose to make it less confusing for new users.

9

	Grade Boundary: Low Merit
3.	<p>For Merit, the student needs to develop a refined conceptual design considering fitness for purpose in the broadest sense.</p> <p>This involves:</p> <ul style="list-style-type: none"> • ongoing exploration and evaluation of design ideas to determine their suitability for inclusion in conceptual designs • using evidence from ongoing research and functional modelling, including feedback from stakeholders, to evaluate the potential of the proposed outcome to meet the brief. <p>This student has developed a conceptual design for a bookshelf. They have produced an ongoing exploration (1) and evaluation of design ideas (2) to determine their suitability for inclusion in conceptual designs.</p> <p>Evidence has been used from ongoing research (3) and functional modelling (4), including feedback from stakeholders (5), to evaluate the potential of the proposed outcome to meet the brief (6). Fitness for purpose in the broadest sense and context considerations are embedded in the evidence (7).</p> <p>For a more secure Merit, the student could provide further evaluation of the potential of the proposed outcome to meet the brief in terms of fitness for purpose in the broadest sense, considering the outcome and practices used to develop the conceptual design. For example, the potential for the bookshelf to be safe and stable on a range of surfaces, and design for deconstruction to ensure the bookshelf can be repaired as opposed to going to landfill.</p>

Student 3: Low Merit
Intended for teacher use only

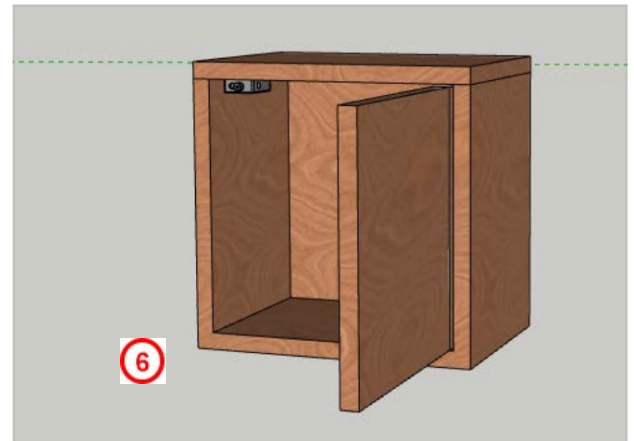
<p>7</p> 	<p>2</p> <p>Taking this design from my initial ideas I gave it measurements which would fit the size needed in the environment, my sister's bedroom. The middle three shelving areas are each at different depths with the one sticking out being 26cm deep, the one flush with all other pieces remaining 24cm and the one intruding being 22cm. This design choice was to create a cool and different design while being able to hold many books which was the main problems of the old bookshelf. After showed my stakeholder and the feedback was that the bottom piece looks too weak to hold the mass that is above it. So, in future designs of this concept, it must be changed so it is more secure and won't bend, bow, or break with the weight on top of it.</p> <p>5</p>
<p>1</p> 	<p>7</p> <p>This development adds much needed support to the lowest section of the bookshelf by splitting then into two pieces and making them share the weight for the rest of the pieces on top of them. It was at this point where I was happy with the basic structure of the bookshelf but to make it suit the room it needs more advanced design elements to make it really stand out. I thought of the idea to make it be able to come apart easily and then be put back together in a different design using the same 7 main pieces of the shelf. So, I went to XXXXXX (expert stakeholder) to see if he had any ideas on how this could be possible, and he said that I could have some predrilled holes in some areas and some dowels sticking out of others so it could be taken apart. I went back to my sister who said "Also maybe you could maybe make a couple of cupboard things mixed in with the shelves to hold books that I am planning to read or even hold special belongings. This was when I came up with the idea to design some flush push latch cupboards into the middle square areas.</p> <p>5</p> <p>2</p>
<p>1</p> 	<p>2</p> <p>These cupboards would have around 5mm gap so it can open and close with it looking decent. The cupboards I found made the design look like it was flowing around the central cupboards which I really liked (reminding me of the chrome logo). I did some research and found that there are couple different latches I could use to make this possible.</p>

RESEARCH - on push to open latches I researched and found out about 2 main types out latches, the first type was a mechanical hook based latch, the second was a ball and socket design and the third was a magnetic spring loaded one. After further research I talked to my dad's friend who has had experience with all three types of latches with his professional furniture making. They were often used in kitchens for seamless and minimalistic cupboard designs. He explained that the most effective and reliable latch was latch 3, the magnetic push latch. This was due to less mechanical pieces, less things that can break, and ease of installation, the end of it can be twisted so it can sit perfectly flush. This is the latch I will use in my final conceptual design.

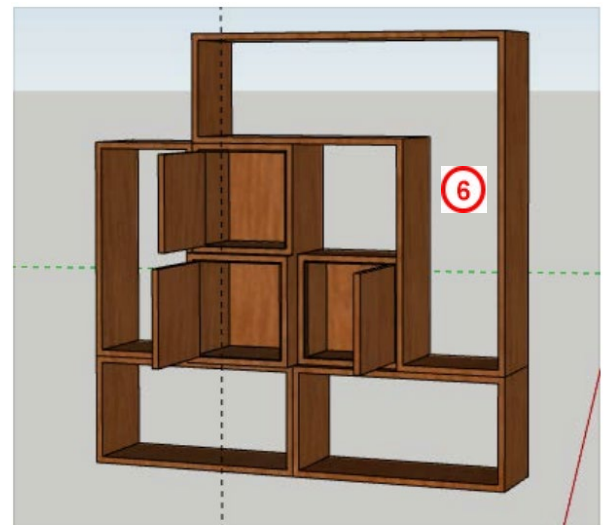




After trialing the biscuit joint I have decided that this is a good joint to use as I found it fairly fast to construct and with the use of glue and clamps this will make the joint very strong.



Cupboard is open position showing the magnetic push latch. Once the front of the cupboard is pushed inwards the latch will pop the door open (shown) and once it is pushed back into place it will hold there with the magnet in the matching position on the door.



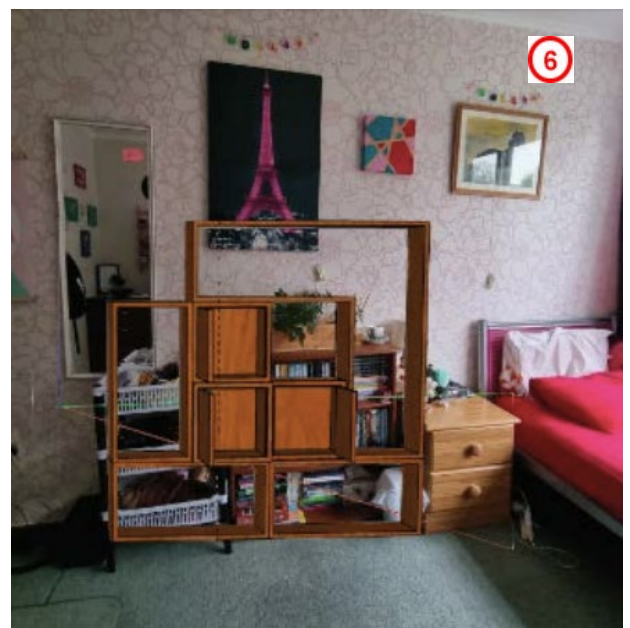
This model shows what the cupboards look like when they are in the open position.

Fitness for Purpose Evaluation: I believe this design should meet the requirements of my brief as it states that it must be sturdy and not go out of fashion, must be able to hold many more books than the current small bookshelf, it must fit in her room as a direct replacement for her old bookshelf. This final conceptual design meets all the above criteria as design changes have been made to increase the structures stability and strength, it has been made over 1 metre larger than her old shelf and it has 7 different shelves and cupboards which can store many extra books, the measurements have been visualised in her room to make sure the design isn't too big for her room and lastly my research has led to include 3 cupboards in the design with magnetic latch. The colour will be a natural timber wood, probably recycled timber and that will no go out of fashion.

Feedback: My final feedback is client feedback, I felt this was most important because this area is regarding the client and her bedroom. "I think that the design for the bookshelf is very good for the storage of my books

as it has much more space than my old, small one. Also, I really like the looks of it as it is interesting to look at. I believe this is a reasonably good size for my room as it meets the requirements to solve the issue and isn't too big for the space. I think I could use the vertical shelf space to stack books horizontally on top of one another, maybe biggest to smallest would look good.

Overall, this looks like it would be a great solution to my 'too many books' problem."



	Grade Boundary: High Achieved
4.	<p>For Achieved, the student needs to develop a conceptual design considering fitness for purpose in the broadest sense.</p> <p>This involves:</p> <ul style="list-style-type: none"> • establishing conceptual designs through generating and evaluating design ideas informed by research, including the analysis of existing outcomes and the context considerations • using evidence from research and functional modelling, including feedback from stakeholders, to evaluate conceptual designs • communicating a final conceptual design for an outcome • explaining the potential of the proposed outcome to meet the brief. <p>This student has developed a conceptual design for an electric powered cart.</p> <p>The student has established conceptual designs (1) through generating and evaluating design ideas informed by research (2), including the analysis of existing outcomes (3) and considerations of context (4).</p> <p>Evidence from research (2) and functional modelling (5) has been used to evaluate conceptual designs. The final conceptual design for an outcome has been communicated (5), and the potential of the proposed outcome to meet the brief has been explained (6). Fitness for purpose in the broadest sense is embedded in the evidence (7).</p> <p>To reach Merit, the student needs to show more evidence of ongoing exploration, ongoing feedback and evaluation of possible design ideas to determine their suitability for inclusion. For example, additional research and functional modelling, which investigates potential fitness for purpose in the broadest sense.</p>

Student 4: High Achieved

Intended for teacher use only

1

→ This first design meets our brief by its lightweight and low centre of gravity and also it has front and back axle sitting higher than the frame. This design also meets our safety features of having a strong roll cage. Not a lot of room to fit the motor as well as not having a bumper to protect the vehicle from damage.

3/5

This design has our gearing requirements of a three gear cassette which will allow us to start off quickly and it also has more room to store the batteries. This design also has an aero frame plus a front bumper to stop the wheels and tire rods from being damaged.

1/5

This design is quite similar to our first design but we designed more room on the back for the motor and the batteries. Better design for low centre of gravity. Batteries could be moved lower to improve this. Would suit a dual transmission system. (0.6-20 RPM).

3/5





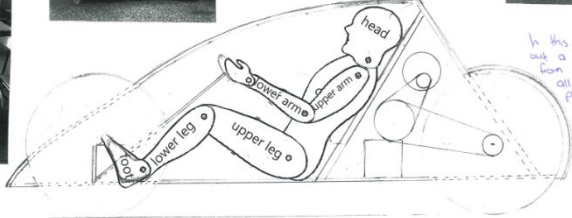
A suitable frame design that would be low cost and relatively easy to fabricate. Bump wheels would be good for stability but wouldn't be good for top speed.

On this final design, it has a bumper to stop the wheels and tire rods from being damaged. It is also meets our requirements of being lightweight.

3																																																								
Motor – 350w	Motor – 350w	Motor – 350w																																																						
Gearing – Bike cassette and jockey wheels with a push bike chain	Gearing – single speed	Gearing – bike cassette with jockey wheels and push bike chain																																																						
Voltage – batteries - 24	Voltage – batteries - 24	Voltage – batteries - 24																																																						
Brakes – Bike brakes	brakes – bike brakes	brakes – Bike Brakes																																																						
Steering & suspension- No suspension that is visible. Standard go cart steering with the tyre rods going through the front of the chassis	Steering – standard go cart steering that goes down under the frame and up through his legs	Steering – standard go cart steering with tyre rods																																																						
Weight – Lightweight with stainless steel	Weight – very heavy due to timber wood	Weight – lightweight																																																						
Safety – Safety looks pretty average with not much of a roll cage	Style – recumbent bike	Wheels – cambered wheels																																																						
Style – based off a Bugatti front (Rocketship)	Safety – very poor due to their being no roll cage and body is completely open to contact. (crash)	Safety & style – Safety is very high with solid roll cage and based off front of f1 car																																																						
7	4	7																																																						
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Attributes</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>Motor</td> <td>Yes</td> <td></td> </tr> <tr> <td>Gearing</td> <td>Yes</td> <td></td> </tr> <tr> <td>Voltage</td> <td>Yes</td> <td></td> </tr> <tr> <td>Brakes</td> <td>Yes</td> <td></td> </tr> <tr> <td>Steering & suspension</td> <td>Yes</td> <td></td> </tr> </tbody> </table>	Attributes	Yes	No	Motor	Yes		Gearing	Yes		Voltage	Yes		Brakes	Yes		Steering & suspension	Yes		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Attributes</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>Motor</td> <td>Yes</td> <td></td> </tr> <tr> <td>Gearing</td> <td></td> <td>No</td> </tr> <tr> <td>Voltage</td> <td>Yes</td> <td></td> </tr> <tr> <td>Brakes</td> <td></td> <td>No</td> </tr> <tr> <td>Steering & suspension</td> <td></td> <td>No</td> </tr> </tbody> </table>	Attributes	Yes	No	Motor	Yes		Gearing		No	Voltage	Yes		Brakes		No	Steering & suspension		No	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Attributes</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>Motor</td> <td>Yes</td> <td></td> </tr> <tr> <td>Gearing</td> <td>Yes</td> <td></td> </tr> <tr> <td>Voltage</td> <td>Yes</td> <td></td> </tr> <tr> <td>Brakes</td> <td>Yes</td> <td></td> </tr> <tr> <td>Steering & suspension</td> <td>Yes</td> <td></td> </tr> </tbody> </table>	Attributes	Yes	No	Motor	Yes		Gearing	Yes		Voltage	Yes		Brakes	Yes		Steering & suspension	Yes	
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This photo shows the length of frame for motor and gear box in the front.

This picture we are working out the length and height of steering wheel.

In this picture we are working out a correct length of kart from axle to axle to fit all the gearing and motor parts other components.

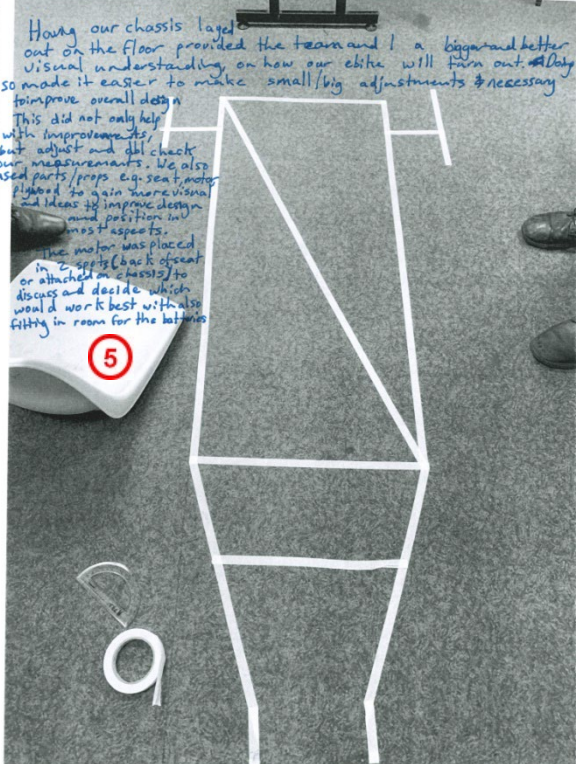
In this photo we are working out the correct angle of the seat for our driver to fit in. And we also worked out the fitting of the motor behind the seat.

2 7

Having our chassis laid out on the floor provided the team and I a bigger and better visual understanding on how our elite will turn out. Daily so made it easier to make small/big adjustments & necessary to improve overall design.



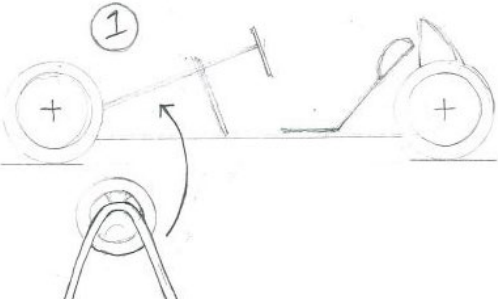
This did not only help with improvements, but adjust and double check our measurements. We also used parts/props e.g. seat, motor plywood to gain more vision and ideas to improve design in most aspects.

The motor was placed in 2 spots (back of seat or attached on chassis) to discuss and decide which would work best with also fitting in room for the battery.

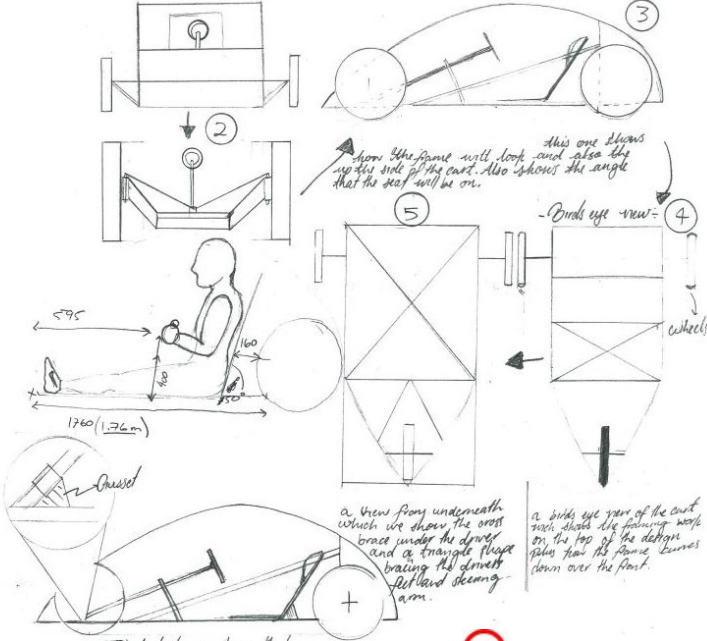


5

In this picture we are working out the correct angle of the seat with a laser sitting comfortable.

1



This one shows how the frame will look and also set up the side of the kart. Also shows the angle that the seat will be on.

- Birds eye view -

wheels

a view from underneath which we show the cross brace under the driver and a triangle shape bracing the driver's feet and steering arm.

a birds eye view of the kart which shows the front wheel on the top of the design going from the frame down over the front.

1760 (1.76m)

595

160


6

6

Our design has everything in it that we need and wanted. We said we wanted a design that has 2 chain set-up for gearing and we also wanted it to sit low to the ground which it does as the frame sits lower than the axles on both ends (front & back). We also wanted an aero kart and we've done that with the slope over the kart for the top of the frame. I think that we have designed a great 3 wheeled electric powered kart to compete in the 'head to head drag & deceleration' race as part of the Eureka regional competition to be held at _____ at the end of term 3. I am in charge of designing the steering system which will be your normal go kart steering which is the Ackermann steering system or the steering knuckles system. This is where the axles are mounted on knuckles out away from the kart. The wheels rotate around these knuckles and cause these wheels to turn. There is a relationship in the wheels movement to a turned centre. We have decided to make the steering rods to go behind the wheels to reduce the chances of damage if a crash happened from the front.

7

	Grade Boundary: Low Achieved
5.	<p>For Achieved, the student needs to develop a conceptual design considering fitness for purpose in the broadest sense.</p> <p>This involves:</p> <ul style="list-style-type: none"> • establishing conceptual designs through generating and evaluating design ideas informed by research, including the analysis of existing outcomes and the context considerations • using evidence from research and functional modelling, including feedback from stakeholders, to evaluate conceptual designs • communicating a final conceptual design for an outcome • explaining the potential of the proposed outcome to meet the brief. <p>The student has developed a conceptual design for a versatile skirt that could be worn by a teenager.</p> <p>Conceptual designs (1) have been established by generating and evaluating design ideas informed by research including the analysis of existing outcomes (2), and the consideration of context (3). Evidence has been used from research (4) and functional modelling (5) to evaluate conceptual designs.</p> <p>A final conceptual design for an outcome has been communicated (6), including feedback from stakeholders (7). Feedback from stakeholders (not shown) was used to evaluate the developing conceptual design. Fitness for purpose in the broadest sense is embedded in the evidence (8).</p> <p>For a more secure Achieved, the student could have explained in more detail the potential of the proposed outcome to meet the brief, considering fitness for purpose in the broadest sense. The student needs to make judgements that consider aspects such as the sustainability of resources, the cultural appropriateness of the outcome, and health and safety.</p>



Skirt Inspiration

2

Based on the visual ideas I have gathered, some key elements that I would like to work with in my designs are


- elasticated waist bands
- Chunky buckles
- Buttons
- Cargo pockets vs slim pockets
- Statement zips

I would also like to design a variety of lengths of skirts to cater to the demands of everyone.

My colour palette is autumn inspired and generally more muted but still bold colour choices.

This initial design features a diagonal zip. this adds versatility in the sense that it is both aesthetic and functional.

3 Another feature is the pockets which feature the same fabric colour as the opposite side which adds cohesiveness.



This initial design features an adjustable waist which is cinched in with ribbon. This allows the design to be more versatile in the sense that it can reach a larger size market.

The pockets are a visual feature instead of being sewn into the seams, they are more like cargo pockets with a button closure. This adds more practicality as more items are able to be carried.

The length of the skirt is very casual but may not necessarily be best suited for teenagers due to active lifestyles. **3**

This skirt is a wrap around skirt which is draped over the figure and cinched in with a ribbon.

This adds further comfort as the tightness of the garment is increase and decrease able by the wearer. This also has the effect of reaching a larger size demographic without wasting more materials on creating more sizes, which is ultimately more sustainable. **8** **3**

Fabrics with a wide variety of thickness will have to be sampled to see which gives the best draped affect. **8**


One thing about this design which makes it less practical is that the flowiness could get caught in things while doing physical activities and the wrap around design doesn't allow for pockets. **8**

This skirt is actually a set of shorts with belt loops and a panel which buttons in the front to give a skirt like appearance.

This adds versatility as it functions as a skirt but protects from chaffing and allows for more activities that a skirt usually accommodates.

To increase comfort, the back side of the belt loops could be elasticated. **3**

As this is a different style than what is currently popular in the target market, I need stakeholder feedback to determine how the market would react.





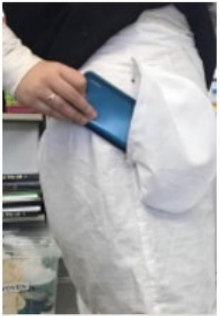
5 I want to add in-seam pockets with the interior fabric matching the alternate side to add contrast.

A key aspect that I want to make sure is done effectively in the design is that the pockets are big enough to hold my hands and phone without adding unnecessary bulk to my hips.


8

4




smaller scale




Fitness for Purpose
Did I reach the criteria for my specifications of the design?
Based on the following factors I believe that the answer is yes.

Aesthetics.
The skirt features the intentional **stylistic** design choice of asymmetric design lines. This was chosen to compliment and contrast the linear fabric. The intersecting visual lines allows the wearer to feel like the skirt is simultaneously professional and sleek while also being fun and **appropriate for the age demographic**. A coloured zip adds contrast with the design and creates visual flair which is an essential part of modern teenage fashion.

Function.
The purposeful inclusion of deep functional pockets which have the ability to hold both a phone and hands at the same time allows the design to be more wearable for the average busy person. This is because the practicality of the design allows them to have no them what is required without having to carry around extra (and unnecessary) bags.

8



This design is absolutely fit to be worn by any 15 to 19 year old who prioritises the versatility and practicality of their clothing choices.
I had multiple 15 - 19 year old members of stakeholder feedback, including [redacted] describe my final design as something they would "purchase in a store". As [redacted] is a 17 year old she fits within the target audience, confirming that I have achieved my goal of appealing to the age bracket of 15-19 year olds.


7

[redacted] informed me that the colour scheme worked well but the straight seam in the back breaks the rhythm created by the diagonal zip. To make sure the seam is neater I would consider using a stabiliser like paper.

7

[redacted] I believe that the back straight seam adds the perfect amount of symmetry to balance out the asymmetric front and the contrast in colours mesh really well but you should make sure to sew the bias with paper to prevent stretch and warping.

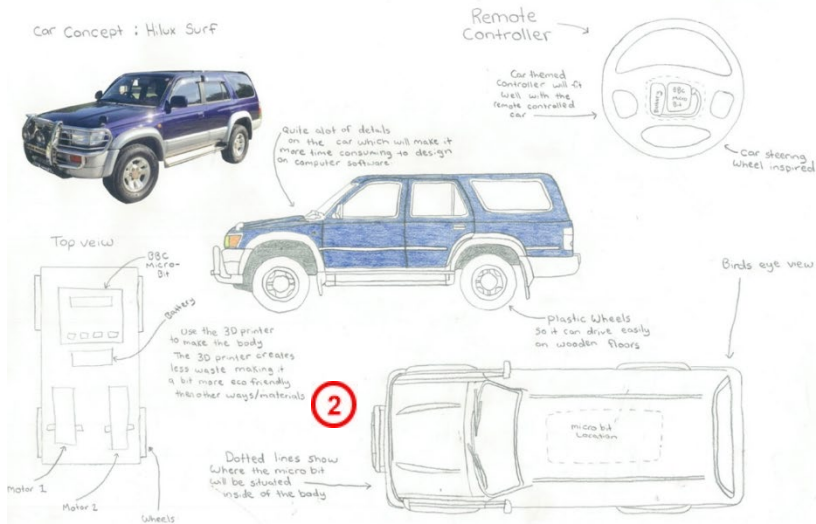
6



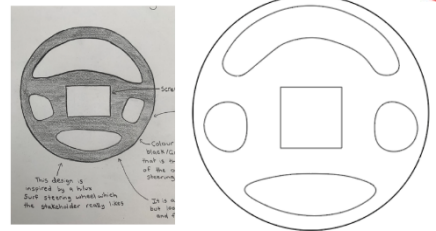
7

	Grade Boundary: High Not Achieved
6.	<p>For Achieved, the student needs to develop a conceptual design considering fitness for purpose in the broadest sense.</p> <p>This involves:</p> <ul style="list-style-type: none"> • establishing conceptual designs through generating and evaluating design ideas informed by research, including the analysis of existing outcomes and the context considerations • using evidence from research and functional modelling, including feedback from stakeholders, to evaluate conceptual designs • communicating a final conceptual design for an outcome • explaining the potential of the proposed outcome to meet the brief. <p>This student has developed a conceptual design for a remote control toy.</p> <p>The student has established conceptual designs (1) through generating and evaluating design ideas informed by research (2), including the analysis of existing outcomes (3).</p> <p>Evidence from research (2) and functional modelling (4) has been used to evaluate conceptual designs. A final conceptual design for an outcome has been communicated (5) and the potential of the proposed outcome to meet the brief has been explained (6).</p> <p>To reach Achieved, the student could further explain the potential of the proposed outcome's fitness for purpose in the broadest sense, and generate additional research to inform design ideas. Further evidence from feedback used to evaluate the conceptual design is also required.</p>

Student 6: High Not Achieved
Intended for teacher use only

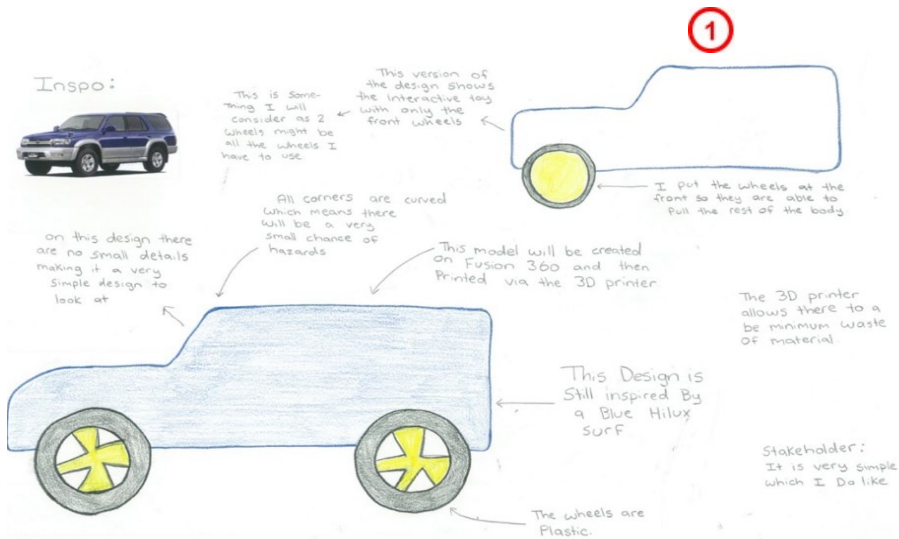


Development - Remote ①



I used inspiration from the drawing I sketched to produce the design.

I have created a remote-controlled via using illustrator. Originally, I was going to make the controller through Fusion 360, but I think laser cutting it will work better with how much time I have.



Specifications Points	Hilux Car Design	rate
Aesthetics -	This design is navy blue which fits in with specifications of the neutral colours.	5/5
Customers -	This design is suitable for all ages	4/5
Environment -	The wheels on this design are a good fit for the wooden floors in the stakeholder's home.	5/5
Safety -	This design has all rounded corners.	5/5
Durability	The way this product is constructed should be durable enough to not break after being driven a little crazy.	5/5
Size	This design would be around 20 x 13 cm	

Existing product analysis 1 (secondary research)

Client
- The recommend age for the Hell Rider is 6 years or over. Therefore this product can easily be used for my client but the design of it is specifically made for a younger market.



③

Size
- 40 cm long monster truck
- 40cm long is quite long. Having a toy this size for my stakeholder may be a bit large and possibly suited for younger ages

- This remote controlled monster truck has racing body that is light, flexible and stable with full suspension. The Hell Rider goes up to approx. 9 km/h and able to be thrown around a bit when using.

Aesthetics—A dark get and black creating a sense on evilness. The whole truck gives you a sense it wants to crush you.

Cost
- \$72

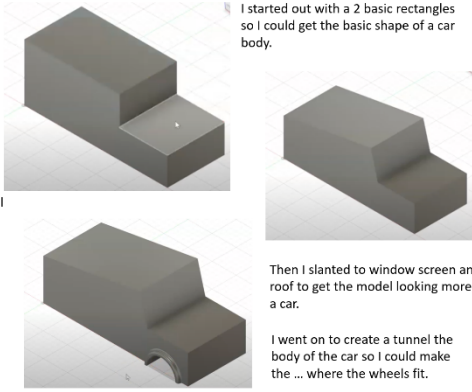
Environment
- This remote controlled monster truck uses 6 x AA batteries which is quite a lot of batteries which may not be great for the environment. The rest of the product is made from

Conclusion
- Overall this product has helped me to gather information about an existing product on the market that I can learn from through my analysis.

Concept 1

1

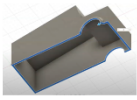
This process was all done on Fusion 360. I firstly design the shell of a car.



I started out with a 2 basic rectangles so I could get the basic shape of a car body.

Then I slanted to window screen and roof to get the model looking more like a car.

I went on to create a tunnel the body of the car so I could make the ... where the wheels fit.



So that I can fit all the inside parts into the body I had to make the inside hollow.

This car design is very simple but was a good place to start. I can now add to it to make it the design that best fits all specifications and what the stakeholder wants.

Development

4

I designed this development so that the wheels are inside the the body of the interactive toy. I did this because I thought the it would add more support, but it didn't really provide that.

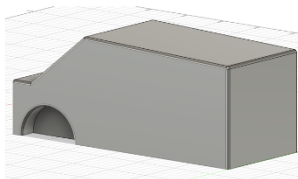
I started this development by measuring the size of the wheels and then marking that up on a piece of foam board. I then cut out where the marking said. I had to ensure that there was still room for the wheels to be able to spin without getting caught on the sides.

This design would mean that I would have to make the scale of the interactive toy body big which would not meet the specifications of the wanted size.



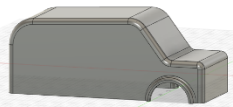
Concept 2

1

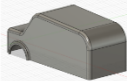


For this development, I started to curve the corners to see if I could get the shape that is inspired by a Toyota Hilux Surf.

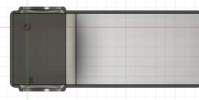
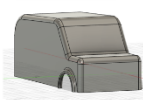
The picture up above is where I had only curved the corners a bit and the model looked a bit strange so need to develop that error.



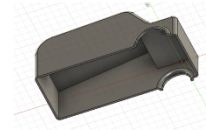
This was after I curved the edges more. These curves create a much better shape for the design I'm going for.



This design will only have two wheels, so I did not add holes for wheels at the back like the ones at the front.



The length and width of this model is 195mm x 78 mm



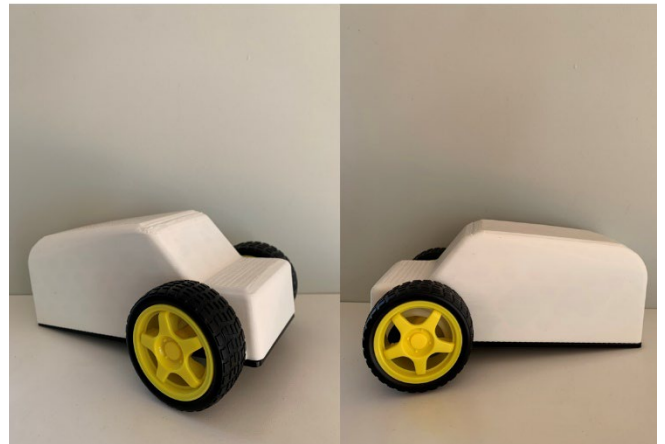
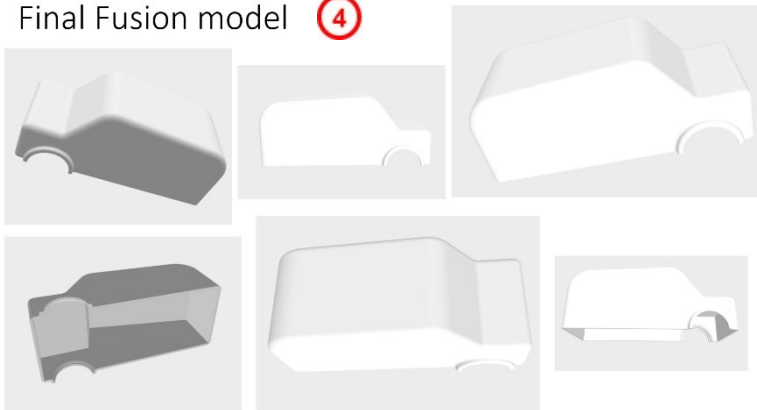
This is a snapshot of the bottom view. It has been hollowed out to allow the technology parts in.

Interactive Toy Mock up

5

Final Fusion model

4



Evaluation against the specifications

Specification points	Specific criteria	YES/NO	Justification
Aesthetics 6	A neutral colour palette so the product doesn't look stressful. Stakeholder requested either blue or grey.	Sort of	The end model was white which is a neutral colour palette and is a few shades lighter than grey which is one of the colours the stakeholder requested.
Cost	The product would probably range at about \$115 due to the cost of all the resources and if I wanted to be ethical during the potential of manufacturing, I would want to pay the employees the correct amount and not underpay.	Durability	The materials chosen have a good amount of strength so the durability of the toy should be great.
Customers	The interactive toy is designed to appeal to the eyes of 40-50-year-olds but people 11 years and above would still enjoy using it making it suitable for those ages as well.	Material	The car will be made from 3D printer plastic and acrylic to hold the micro-bit in. The remote is made from acrylic.
Environment	The wheels on this are perfect for wooden floors inside a house.	Function	Design is super easy and fun interactive toy that can keep the user entertained during free time.
Safety	Yes, all the corners on the final design have been rounded and there are no small details giving it a 5-star safety rating.	Size	The car is 83 x 19cm and the controller is 15 x 15 which meet the size specifications.