



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

## **Exemplar for Internal Achievement Standard Technology**

This exemplar supports assessment against:

**Achievement Standard 91611**

**Develop a prototype considering fitness for purpose in the broadest  
sense**

An annotated exemplar is an extract of student 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 prototype considering fitness for purpose in the broadest sense.</p> <p>This involves synthesising evidence from ongoing testing (included prototyping) and stakeholder feedback to optimise the prototype and justify the prototype's fitness for purpose against the brief.</p> <p>This student has developed a justified prototype for a sustainable, structurally sound and minimalist style side table for a home environment.</p> <p>The student has considered the context when selecting and evaluating suitable materials, tools and equipment, and applied suitable techniques and process to make the prototype (not shown here).</p> <p>Evidence from ongoing testing and trials (1) and stakeholder feedback has been synthesised (2), and the wider context has been considered (3).</p> <p>The student has evaluated the final prototype against the specifications (4), and fitness for purpose in the broadest sense is embedded in the sample (5).</p> <p>The completed prototype has been constructed, trialled and evaluated in its intended social and physical environment (6).</p> <p>The synthesised evidence from the testing, prototyping and feedback justifies the prototype's fitness for purpose (7).</p> <p>For a more secure Excellence, the student could have further addressed issues of fitness for purpose in the broadest sense by considering the life cycle and ultimate disposal of the outcome, and further justification of how decisions were made when consulting the stakeholder.</p>

**Material Decision** After conducting testing as well researching aspects of the different type of woods. I have made the decision of using pine solid timber for both my tabletop and table legs. The reason for this is it has lightweight qualities as well being able to withstand drilling and screwing without fracturing or breaking. These aspects are important as they both are required for the assembly of my table. Another reason I decided to use solid pine timber is because it is biodegradable which means I am taking sustainability into consideration. In comparison to MDF and plywood, solid pine is far stronger than both these types of wood and is recommended for furniture building. If I had to choose a backup material, I would choose plywood because also passed the testing that I had conducted on it. Also, it can be considered stronger and more sustainable than MDF due to MDF being made from sawdust and being held together by toxic glues.

1

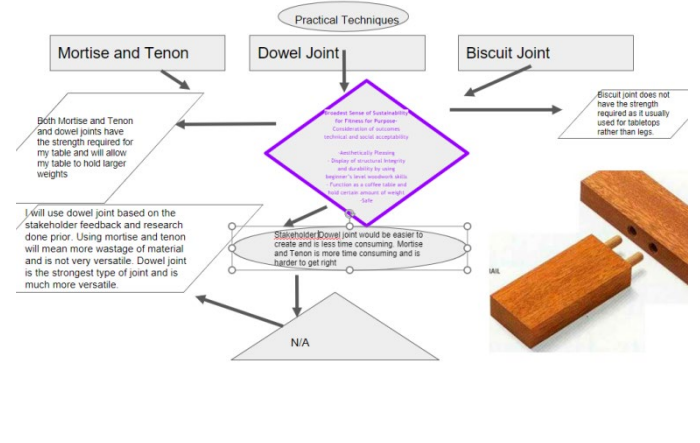
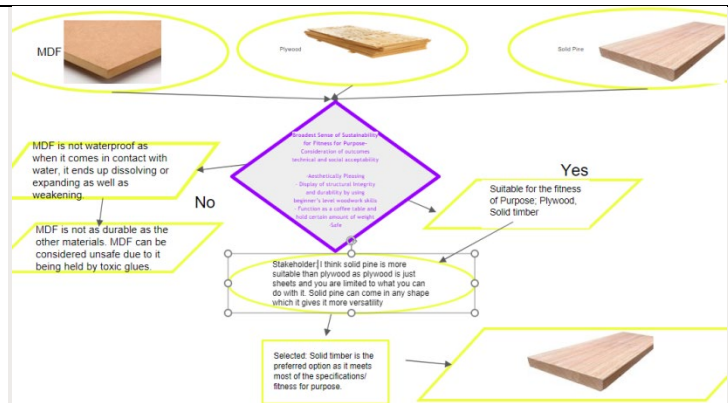
5

**Student 1: Low Excellence**  
Intended for teacher use only

**Wood joint decision**

After conducting research on the three types of joints: mortise and tenon, dowel and biscuit joint. I have decided to use dowel joint. The reason for this is because it is a versatile joint and requires less practice and difficulty to make and get right compared to mortise and tenon joint. It is also a joint which provides good security and high strength when compared to biscuit joint but just as fast as making a biscuit joint. If I had to pick a backup joint to use, then I would choose to use mortise and tenon joint for its high strength and durability as well as its good stability and watertight capability. All these qualities are present in a dowel joint.

1



**Consideration of fitness for Purpose; Physical Environment**

Carpet. Table's legs must be a size in which it won't leave a massive impression on the carpet. Hardwood, tile and concrete. The table must be movable on all flooring without it being damaged (plastic or foam pads at the bottom of the leg). Table must be of a certain weight so the tile isn't damaged.

3

**Consideration of fitness for Purpose; Social Environment**

- People:-Family members-Manufacturer-Guests- Myself
- Easy to understand and build.
  - Table must be able to be disassembled and rebuilt in case of repairs.
  - Must look aesthetically pleasing.
  - Can be used for more than one purpose.
  - Recycle/Landfill-Materials must be mostly biodegradable or recycled

3

5

In this photo, I have drilled one set of wood. This is now ready to be joined together. I have tested the joint for misalignment and no misalignment was found. For future steps, I will drill the rest of the pieces of the wood and once they are drilled, I will begin gluing the dowels into the holes.

1





① After trialling both methods of screwing in my tabletop and stakeholder feedback “Doing an angled screw from the bottom will result in the screw sticking out. This is a violation of safety codes. Try to do diagonal screwing from the side of the wood. Countersink from the bottom will still be effective.” The countersink method proved to be more successful. This is because in angled screwing method, the ends of the screws were poking out, this classes my table as unsafe and not complying with codes of practice as someone could hurt themselves if they were to touch the aprons of the table. Screwing the screws in more would result in the top of the table being pierced. These problems did not exist with the countersink method .Therefore, the countersink is a more reliable method to screw in my tabletop.

In this photo, I have cut the dowels that I had attached before and sanded them. The reason I had done this is because my method of measuring and marking resulted in the joints had misaligned. To avoid wasting material as a part of my sustainability specification. I will reuse this piece of wood for my table.



①

Materials applied;

**Stakeholders Feedback:**  
Well done. Prime pine is selected.  
1. It is suitable for the woodwork because of the weight and intensity of the grain.  
2. It is at affordable price

②

Components applied:

**Stakeholders Feedback:**  
To meet the purpose of structural integrity, I applied minimal structure and execute as components. The components I have is tabletop, 4 aprons, 4 stretchers and 4 legs.

②

Practical Techniques applied

**Stakeholders feedback:**  
Each stage used best option out of your knowledge and skill and it is well executed

②

Process applied

**Stakeholders feedback:**  
Followed the code of practice with right process and appropriate techniques.

②

My Technological Outcome

⑥

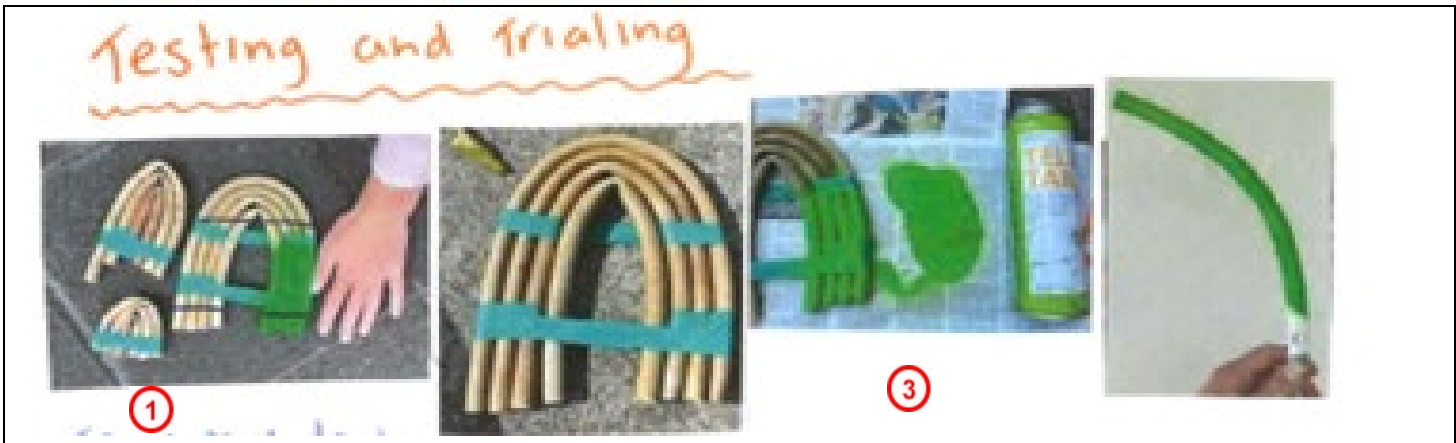
The dowel joints worked well on solid pine, and I was able to have good and strong joints/connection. My feedback confirmed this to be the better choice of technique to make my table and when she used it this was confirmed. All my techniques I chose really allowed the table to truly come together and be an outcome that achieved fitness for purpose. Therefore, creating a successful outcome.

④ Specifications	Not met	Met	Above	Modify	Stakeholder feedback	⑥ ②
Must function as a coffee table, must be able to support certain weight					The table made is functioning as it works as a coffee table and can support more than the required weight which is useful	
Must be aesthetically pleasing; structural integrity because it gives feeling of balanced, minimal structure and simplicity				In the future, I could apply varnish or stain to my table to give it a more aesthetic look.	The table gives a simple look to it as well as a solid look to it as everything is thick giving it a aggressive look, the table looks great without any stain as it has a natural look but could look nice stained or burned	
Must be safe for everyone to use.				I could smooth out some of the edges more.	Table is safe for all ages to use but the sides could be sanded down to be smoother in case of someone running into it	

	Grade Boundary: High Merit
2.	<p>For Merit, the student needs to develop a refined prototype considering fitness for purpose in the broadest sense.</p> <p>This involves evaluating the way the combination of selected materials and/or components and practical techniques and processes work together to ensure their effectiveness in making a prototype.</p> <p>This student has developed a refined prototype for a wearable arts garment inspired by rainbows.</p> <p>The student has considered all aspects of the context (not shown here).</p> <p>They have addressed fitness for purpose in the broadest sense during testing and trialling of the prototype (1), e.g. considering social acceptability (2), technical feasibility (3), life cycle (5), ethics (4), sustainability of resources (7) and life cycle (6) throughout the development.</p> <p>Stakeholder feedback has confirmed and informed the making and trialling of the prototype (7).</p> <p>The way that the combination of selected materials and practical techniques and processes work together (8) to ensure their effectiveness in making a refined prototype is evaluated.</p> <p>The prototype is worn by the model under lights to gather evidence for the evaluation of the outcome's fitness for purpose in its intended physical and social environment (9).</p> <p>To reach Excellence, the student could have shown further evidence to justify all the decisions they made to create the prototype. Additional evidence of trialling, testing and evaluating aspects of the wearable art ensemble is also required.</p>



Student 2: High Merit  
Intended for teacher use only

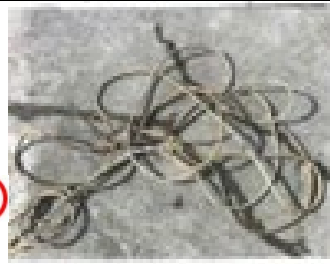


Rainbows look effective but won't have tape to secure it. I will probably drill holes and thread wire through the side, so you won't be able to see it. One problem is that if they are too large, they won't sit probably on a curved edge. If I use small ones there won't be a large overhang just a small one which is fine. If I use small ones there will just be a lot more to make. **S.F. This method could be very time consuming, your ideas of using recycled objects is very creative and worth pursuing.**



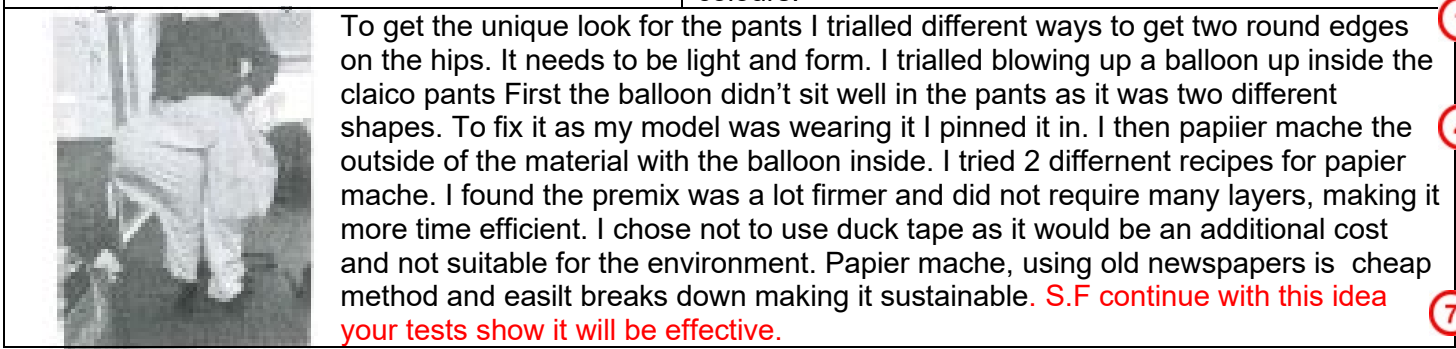
Using different thicknesses and length of hose and hot gluing it down will look effective as they are very small but because there is so much repetition it will look effective on stage. **Broadest Sense: recycling old farm hose that don't get used or have holes or broken. Will need to wash and clean dirt and cow dung off them.**

For a thicker hose I tried using wadding. It made the hose thicker by quite a lot although it has its cons like time consuming. Doesn't look very tidy and when it comes to painting the wadding will absorb and waste the paint which is not good in terms of sustainability. **S.F. You could always try to seal it first, so the paint does not get absorbed.**







Old hose I found in my garden shed that could no longer be used anymore as it has a hole and is cracked. It would be making its way to the rubbish bin to go to the dump. I could use this in my wearable art garment in multiple ways. I can give this hose a scrub and clean to get all the muck off so it could be painted bright rainbow colours.

1 4 5



To get the unique look for the pants I trialed different ways to get two round edges on the hips. It needs to be light and form. I trialed blowing up a balloon up inside the claiico pants First the balloon didn't sit well in the pants as it was two different shapes. To fix it as my model was wearing it I pinned it in. I then papiier mache the outside of the material with the balloon inside. I tried 2 different recipes for papier mache. I found the premix was a lot firmer and did not require many layers, making it more time efficient. I chose not to use duck tape as it would be an additional cost and not suitable for the environment. Papier mache, using old newspapers is cheap method and easilt breaks down making it sustainable. **S.F continue with this idea your tests show it will be effective.**

	<p>Trialling gathered strips and colour combinations. Used calico with a stitch length 4. I also tested other materials for colour, material, texture, thickness and also stitch length to gather them.</p>		<p>9</p>
<p>Stakeholder feedback one preferred the bright colours to show up on the stage under lights the other preferred a mixture of cold and warm colours.</p>	<p>4</p>		
<p>I decided to go with bright colours to maximise the audience attention and to emphasise the shapes. I then experimented with satin fabric.</p>	<p>7</p>		<p>8</p>

<p>Fitness for purpose</p>	<p>2</p>
<p><b>Health and Safety:</b> one of the biggest hazards when making the garment was using the hot glue gun. I just needed to be very careful making sure I did not burn myself. My model also had to be able to wear it without harming herself when wearing it on stage. The head dress was not heavy so won't cause neck strain when wearing it on stage.</p>	
<p><b>Ergonomics/ ease of fit.</b> I have an invisible fastening to the pants. I gave her hand every time she would wear them just to make sure. My model said she was very comfortable wearing them as the inside was soft as it was calico with no sharp edges. She could walk around easily as they were regular pants with no restrictions. And they bent and moved as regular pants with nothing restricting her. This may not have been the case if I had use hose piping, cans or stiff cardboard or other recycled objects. She needed to move around freely, and we practised this before the show. She could do most things when wearing the garment.</p>	
<p><b>Ethical/cultural appropriateness.</b> I believe I have respected all cultures and my garment is appropriate. I haven't used anything inappropriate that may have offended anyone. I believe I have considered the wider social acceptability by using my own ideas by not using others artistic copyright.</p>	
<p><b>Stage presence</b> Due to Covid we now must send photos of our garment. Normally wearable arts would be on a stage with big lights and the crowd and judges will be viewing the garment from a distance so little fine details is a waste of time and big and bright is important to be seen on stage. I need to make sure there are no small errors that will show on a photo, like hanging threads or hot glue. I need to ensure everything is perfectly in line and slick. My photos show this.</p>	
<p><b>Overall</b> my garment is successful as it has met the requirements of the brief. My garment turned out to simple but effective for the stage with the use of colour, texture, shape, and size. It will be great under the spotlights.</p>	
<p><b>Functional.</b> My pants are strong because I chose to use calico for the base. I overlocked every seam to ensure that it did not fray, this is important because material is stuck on the top which makes it slightly heavier and there will be a lot of tension on the seams. This means the pants will be long lasting as it is going to be entered now in the competition next year. Obviously, my pants had a lot of strips (ribbons) to cut to cut for the pants. I noticed when cutting/ripping the satin it started to fray easily and there were lots of threads hanging off, making it look messy. For a tier finish I trialled overlocking the edges and using zig zag scissors. I found that the overlocking was the safest option as it lasts longer than the zig zag scissors plus the overlocking looks neater for the competition. The pants will be worn on stage, so the pant needed to be easy for my model to walk in. It was important that this was a priority as she had to be comfortable when walking under the scrutiny of the judge sand audience. I made sure the inner thigh/crutch was not too bulky as this would have been uncomfortable when walking. The pants and top need to be comfortable physically but also socially needs to be comfortable when wearing it, all garments were secure and would not displace themselves. I wanted my garment to have a point of difference, the essence of the competition, It is unique and my testing made sure they were fit for purpose. I chose to use satin for the ribbons because of the bright colour choices and the shine of the weave which looks great under lights.</p>	
<p><b>Stakeholder feedback.</b> I got this throughout my testing and trialling, choosing techniques and what equipment to use. For example how to finish the ribbon, do I use zig zag scissors, overlocker, rolled hem or just leave a ripped edge. Our conclusion was to use the overlocker as it was time efficient plus the use of white thread added to the overall effectiveness of all the ruffles.</p>	

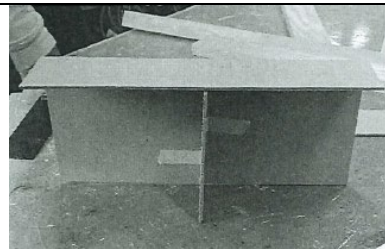
	Grade Boundary: Low Merit
3.	<p>For Merit, the student needs to develop a refined prototype considering fitness for purpose in the broadest sense.</p> <p>This involves evaluating the way the combination of selected materials and/or components and practical techniques and processes work together to ensure their effectiveness in making a prototype.</p> <p>This student has developed a refined prototype for a portable desk.</p> <p>The student has considered the context when determining the suitability of materials (1), components (2) and practical techniques (3).</p> <p>Suitable materials, tools and equipment were selected for the testing and trialling undertaken during the development (4).</p> <p>Stakeholder feedback was gathered to inform the making and developing of the prototype (5).</p> <p>The folded table has been photographed in its intended physical and social environment, demonstrating evidence of fitness for purpose (6). The student has reflected on what worked and what modifications could be made to ensure the prototype meets all specifications, and considered how it is fit for purpose in its broadest sense (7).</p> <p>The student has provided evidence of evaluating the combination of materials, practical techniques and processes, and described how this combination is effective in making the prototype (8).</p> <p>For a more secure Merit, the student could provide further evidence of evaluating how the combination of selected materials and/or components, techniques and processes worked together effectively in making the prototype. Additional exploration of fitness for purpose in the broadest sense is also recommended, e.g. providing the implications for ongoing product maintenance or ultimate disposal of the prototype.</p>



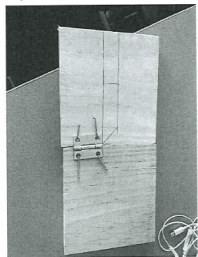
**Student 3: Low Merit**  
Intended for teacher use only

**Testing which method of holding up my foldable desk is the most stable and versatile.**

I am investigating the method of using hinges to connect the legs to the table and allow it to fold up and down when necessary. This method does work very well and would be fit for purpose with no hidden problems. This method allows the legs of my table to be folded and let out whenever necessary without any complications, The only issue I could think of concerns is it a complex technique. It would suit both the intended environment and the identified issue as it would help provide a solution to my issue plus also fit in with my bedroom aesthetic



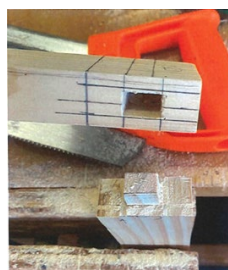
Testing another method to hold up my table. to ensure it is fit for purpose. Although this method does in fact work in terms of holding the desk up and folding back down it is too bulky. It would take up too much room under the desk, it would also take up too much wall space when folded out. The panels needed for this are too big and there is no way to make the panels smaller, as the smaller they are the less stable it becomes. This method does not suit the environment or the specifications as it would not allow the desk to be as small as possible and it would take up too much wall space. It would also be unappealing and not suit the user's aesthetic



**Stakeholder feedback:** When this technique is done to a high technical standard, I think it could be very good. This technique is also not so obvious and would allow the product to be more simplistic to suit the aesthetic you are after – minimalist.

**Stakeholder feedback:** This technique is also good but might mess with the seating of the desk as it looks like it will stick out too far into the space required for your legs. It might also not be best when looking at the design as it would not be accommodating for the back shelf and the legs that would also be needed, If the desk was going to be wall mounted it could look very good.

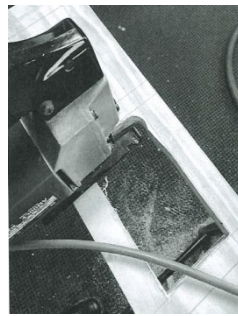
Here i am cutting the biscuit joint used for legs and frame using the biscuit joiner machine and clamps. I am using this joint to create a more seamless look. Throughout this process i have taken all safety precautions for using a machine including having my hair up, closed toe shoes, safety glasses and earmuffs. I have also made sure the extraction is on to help minimise the amount of dust in the air. I have also chosen to use pinewood for my product and this process as it is one of the most sustainable and environmentally friendly materials to use. The biscuit joint works well with the pinewood as pine is a strong that is more unlikely to crack when a biscuit joint is being pushed into it. Other woods such as plywood might crack or split as there are multiple layers to them held together with glue. As mentioned before, i decided to use this joint method for the legs and some of the frame to create a more aesthetic appearance for the product. My stakeholder also mentioned that they thought this type of joint was the most reliable and safest when trying to create a reliable and accurate product.



Here i am making my mortise and tenon joints for my back frame using the tenon machine, a hand saw a file and a chisel. When making this joint i have to consider the safety precautions when using machines including hair tied up, hard toed shoes, safety glasses, ear muffs and ensuring the extraction is on. In the process of making this joint i have strived to not waste any materials by making my joints accurate the first time around and making sure i don't need to make it again using more material. Again i have also used pinewood to make this joint which is considered a very environmentally friendly, sustainable wood. I chose to make this joint as it is a complex joint and was recommended to me by my stakeholder as it is a complex joint that can also be pulled off well while giving the product the same clean look as the biscuit joint. I was also recommended by my secondary stakeholder (Mr Allan) to use a hand saw for more accuracy for the tenon rather than using the scroll saw. I did use this advice and it turned out well. (much more accurate)

Part	Material	Social context Environmental factor	Physical context (what are the properties)	Advantages and disadvantages	Will I use it? Why?
Legs, supports and shelf	Radiata Pine	This wood matched my environment as well as being suitable for NZ's environment as it is sustainable	Radiata pine is a plain wood without any additional layering or stacking to hold it together. It is 18mm wide and comes in many different sizes and lengths. Radiata pine is very strong and durable wood that is relatively easy to work with and cuts well.	Radiata pine is sustainable and produced in an environmentally friendly way. When producing the product, Radiata pine is easy to work with in terms of cutting, sanding and moulding. The only disadvantage of using Radiata pine is the fact that it is easy to dent and scratch and can be easily damaged.	I will be using this wood as it is very malleable and easy to work with. Radiata pine works well in the school workshop with the available tools. It also creates a nice finish to the product with its grain. It suits the environment, other furniture. It will reside in. <span style="float: right;">2</span>
Tabletop	Plywood <span style="float: left;">1</span>	In terms of the surrounding environment, plywood would have the constraint of not matching the physical environment to how I would like it. The multi colour aspect of the wood would throw off the colour scheme I am trying to create. I am trying to create a product that is one colour and authentic in appearance. <span style="float: left;">1</span>	Plywood can come in any size in terms of length and width but in terms of thickness in 18mm. Plywood has been designed with the crossover technique of layering thinner pieces to create the larger wood. This technology allows for added strength while remaining relatively thin. Plywood is also very easy to cut and sand to needed size while also being easy to work with as it is lightweight.	The edges of the wood give off a sort of messy feel and can be more difficult to cut than other wood I have used. It comes in many different sizes that would match the sort of product I'm making. It also claims to be sustainable and have a low impact on the environment.	I will be using plywood for my tabletop as it contains a grain that allows for big quantities of parts to not warp. It is also very easy to work with in the workshop. It finishes cleanly and is very strong. <span style="float: right;">2</span>

4 In this photo i am testing the technique of using the saw blade to cut out the cut outs in my desk holder to find out if it is the most efficient and suitable way of doing it. From this test i was able to conclude that it was the easiest and most efficient way of cutting the rectangles out of the wood. I have chosen to do this technique as no other technique would have left the cut outs looking smoother and more efficient. There are also no problems that come along with it the machine is fairly easy and straight forward to use. 1 This technique will also work with the environment the desk will eventually be in as it will as to the clean aesthetic i am striving for. Although this technique is not complex i will still be using it.



**Stakeholder Feedback**  
This technique looks good! I like the look of the cut outs and think this would be perfect for the final product. I also like the shape and size of the cutouts as it allows for a range of objects to be held. It also looks like this machine is the best choice for this process as it would be very hard to do it without it. 5

**Fitness for Purpose**  
Once my product has been unfolded, it works as a desk and plant/ stationary holder.  
The desktop section of my product has been specifically designed to hold an object the size of a laptop or book with arm space along the side for arms to rest when working. It also holds objects like books, plants and stationary. The plants sit on top of the small shelf with room for small to medium plant pots. Stationary can be held in the cut out i made specifically to hold a small to medium pencil/ pen holder. The pen holder slots into the hole. The next hole in the shelf is designed to hold books in it sideways. The hole can hold up to 4-5 books at one time.  
Yes, it think my product holds the right amount as anymore and it would look cluttered and get in the way of the use of the product. The product holds enough to help with studying at the desk, like the right amount of pens and books for studying.  
My product is easy to use as it sturdy and provides a good space for study or hobbies like drawing or reading.  
The size of my product has been purposefully designed to be as small as possible to not get in the way of the other furniture in my room, but being big enough that it is comfortable to work at. My product has just the right amount of room for me to have both arms on the desk when studying but not too big that its bulky and gets in the way when walking around or into my room.  
The function of my product is to allow for me to study when needed to, but be foldable enough so i can put it away when its not in use without taking up too much space.

**How and why**  
*Explain how/why it meets your specification (or not, it can be no, just explain why). You may need to state the obvious a bit.*

My product can be used safely as a desk without any issues. I have tested my product to make sure that it is sturdy enough to work on and it is. It does not shake when writing on a computer or paper on any surface in my house. 7

My product is aesthetically pleasing as it has been designed to match the surrounding aesthetic of my house. It has been designed to not be bulky or too big as to not interfere with the surroundings. My product has also been sanded and varnished to give it a good finish.

My product was purposely built to be smaller in size and fit where needed. My product fits perfectly into the area in my room that i designated for my product. I can also make my product fit in smaller areas when folded down to be out of the way.

My product does not take up much room when it is in use or when it is folded down. The design of my product allows for me to have enough room for everything else in my room that was already there.

My product fits in my room without any issues and has a small enough width that anyone can fit around it at any time. My product also fits in well with my other furniture and doesn't get in the way of anything else already in the room.

Before taking my product home, i made sure to sand away any sharp edges that could cause damage to people or the surrounding environment. If you were to brush past my product it is very likely that you will not get caught or hurt on it.

I specifically used plywood and radiata pine for my product as they are very strong and sturdy woods that do not break easily. I tested the strength of the woods i used before i used them to make sure that they would hold the weight of someone leaning on them before i used them. 8



	Grade Boundary: High Achieved
4.	<p>For Achieved, the student needs to develop a prototype considering fitness for purpose in the broadest sense.</p> <p>This involves:</p> <ul style="list-style-type: none"> <li>• considering the context when determining the suitability of materials and/or components, and of practical techniques and processes</li> <li>• selecting suitable materials and/or components; tools and equipment; and applying techniques and processes to make the prototype</li> <li>• using results from testing and stakeholder feedback to inform the making and trialling of the prototype</li> <li>• prototyping to gain specific evidence of fitness for purpose</li> <li>• explaining any decisions to accept and/or modify the prototype based on a judgement against the brief.</li> </ul> <p>This student has developed a prototype for laminated dehydrated pasta for teenage athletes to provide energy, iron and a convenient food product.</p> <p>Context considerations are reflected upon early in the project (1), and continue to be referenced as evidence of fitness for purpose.</p> <p>Results from stakeholder feedback (3) informed the selecting of ingredients and equipment (2) for the making and trialling of the prototype (4). Not shown is the extensive stakeholder testing: shape, colour, flavour/taste and texture.</p> <p>A completed outcome is developed (5), and a decision made to modify the prototype based on feedback and considering the brief's specifications (6).</p> <p>Judgements of fitness for purpose in the broadest sense are embedded throughout the generation and selection of the developing prototype.</p> <p>To reach Merit, the student could refine the prototype by evaluating the way that the combination of selected materials, components, practical techniques and processes work together to ensure an effective laminated pasta for the target market. Evidence of how the prototype meets the brief in terms of fitness for purpose in the broadest sense could have been further explained.</p>



### Context considerations

**Sustainability of resources:** A process in which it is sustainable is recycling, reusing and upcycling ingredients. A possible solution would be to feed any cooked pasta wastage to chickens that in turn will produce eggs that can be used in pasta, creating a sustainable cycle. The eggs that are used in making pasta also leave shells, which can be put into compost which can be used as soil to help herbs and vegetables that can be used in the making of the pasta, also being a part of the sustainable cycle. For my product I will need to make it quick and easy to make, not requiring much time, so as to increase its allure in buying easy and fast food to make. By dehydrating the pasta, and packaging it, it will increase the pasta's sustainability, and allow it to be used whenever it is needed, instead of having to go through the trouble of making fresh pasta, which cannot stay fresh for long.

**Ethical:** I will need to be sensitive to social and cultural needs so I will need to recognise and respect the different cultural identities of others and safely meet their needs. This means that "Modification of plans, where and when necessary, following discussions with participating groups; Approval and/or support by ethnic group(s) involved in the study must be sought before fieldwork begins" If participants decided to practice in Jainism I would need to cater to the vegan diet, as Jains do not eat meat or animal products. This would also mean that I should take into account who I am working next to, so as to prevent cross contamination with the foods.

**Testing:** First step to making the pasta I got 100 grams of flour and put it on the bench in which I made a well in the flour. The egg was then put in the well and mixed slowly adding flour into the egg, so it started forming into a mixture. Before fully mixing it into a dough I added 2Tbs of tomato paste into half of the mixture and pureed spinach into the other half. Then put them in the fridge for the next day. 4

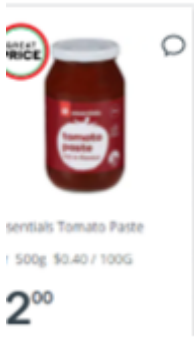


From the fridge the pasta dough was quite damp, so I had to get a cup of flour, so it didn't get stuck when rolling out in the pasta machine. once the tomato paste dough was rolled out till the 5th thinning I cut the rolled out dough in half and lay basil leaves on one side of the pasta where I then put the other layer on top of the basil layer and put it through the pasta roller machine, I however made the mistake of putting the spinach layer in between the tomato layer, instead of having it as the backing side as I had originally planned. as it was already in between the layers, I would not separate them, so instead the pasta was given a darker brown kind of red as the green made the red appear this way. I had plenty of leftover pasta, so I experimented to see if red pasta was easier to see in green pasta, and the other way around. 4

**Equipment:** making pasta I will need to select suitable materials and/ or components and apply techniques and processes I have learnt to make the product. From the sessions with Tilda, I have learnt how to shape pasta into penne, how to roll it through the machine, how to make ravioli and gnocchi, as well as been inspired to add ingredients into the dough. 2

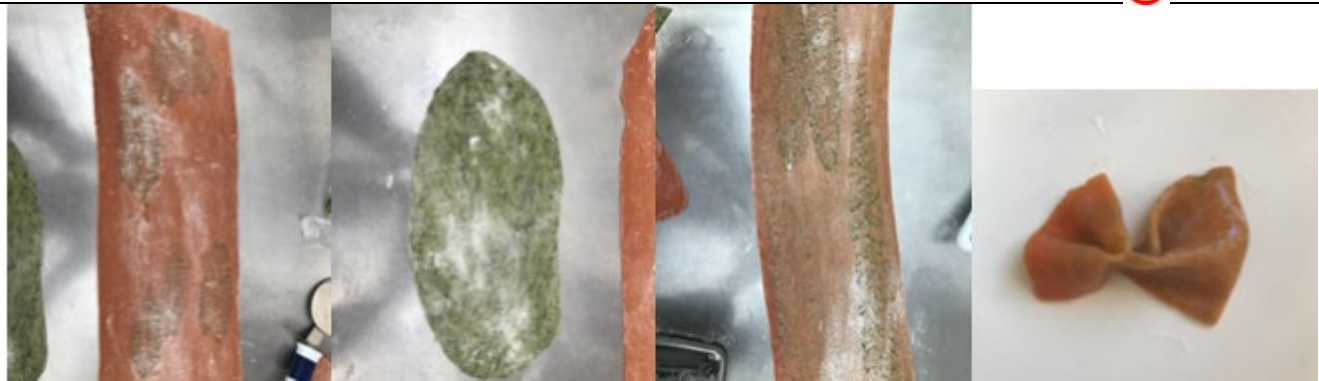
At school there are all the required equipment needed for making pasta, such as a pasta roller machine, as well as fettuccine cutter attachment, forks, wooden paddles as well as butter paddles, there are also all the ingredients, such as high grade flour, semolina, eggs, and other ingredients needed, like spinach, tomato paste, mixed herbs etc.

**Tomato paste**



A possible ingredient I could use is tomato paste. It has health beneficial properties, as it is an antioxidant. And as it is red, it should give the pasta a red tinge. The ingredient will be from Countdown, at a cost of \$2:00. (2)  
 Tomato is an antioxidant, which can help protect the body from diseases and certain cancers, so adding it into the pasta can help with their health. Tomatoes are also full of vitamin b which “has a direct impact on your energy levels, brain function, and cell metabolism.”<sup>4</sup> This is extremely beneficial to my target market, as it can provide them energy for their sports they do.

Once cooked the pasta turned from a red colour to an orange colour, however there was too much flour on the spiral pasta, so therefore once cooked some of the flour was still on the spiral in the creases. This will be something I will need to control in the future as from my target market's feedback, I found it did not taste very nice because of the flour content, therefore I must make sure less flour is added. (4)



**From my Target markets feedback:** I also discovered that the majority doesn't like the orange with green underneath because once cooked it had an odd orange colour, they also didn't like the green with the orange as it was unappealing, therefore is not socially acceptable. So when finalising my product, I will need to make sure not to add a green colour to the pasta, however, from looking at more of the feedback, they said they quiet liked how the basil was in the layers of the pasta, so instead of adding a green colour to the pasta, I can put basil, and spinach in the layers of the pasta. (3)

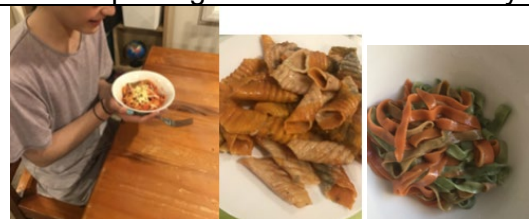


I cut the herb dough in half and put half of the tomato paste dough in the fettuccine cutter and wider strip of pasta. I grabbed one strip of fettuccine and the strip I cut myself and put it on top of one of the herb dough layers and then I put the second layer on top where I then put it all through the pasta machine. (4)

**Fitness for Purpose - Feedback**

When asking my target market for their thoughts on the final pasta having dried herbs or fresh herbs, they preferred the appearance of the fresh herbed pasta, but the taste of the dried herb was better. This was because you tasted all the herbs together, whereas in the fresh herb pasta you would taste the singular herb which can overpower it. I identified that there was a lot of fresh herbs wasted also so I decided I would modify the recipe in the future to use dried herbs as dried mixed herbs have less waste and keeps longer so can be used many more times. (3)

It was decided that for the product, it will have tomato paste, basil and dried mixed herbs so it still gives the flavour of a pasta sauce, which means some cheese, or butter, can be added if you are in a hurry. All three natural additives each have health benefits, basil which can alleviate stress that can help with competitions, tomato paste is full of nutrients and antioxidants that protect against disease, which dried mixed herbs are also full of. (2)



(5)



	Grade Boundary: Low Achieved
5.	<p>For Achieved, the student needs to develop a prototype considering fitness for purpose in the broadest sense.</p> <p>This involves:</p> <ul style="list-style-type: none"> <li>• considering the context when determining the suitability of materials and/or components, and of practical techniques and processes</li> <li>• selecting suitable materials and/or components; tools and equipment; and applying techniques and processes to make the prototype</li> <li>• using results from testing and stakeholder feedback to inform the making and trialling of the prototype</li> <li>• prototyping to gain specific evidence of fitness for purpose</li> <li>• explaining any decisions to accept and/or modify the prototype based on a judgement against the brief.</li> </ul> <p>This student has developed a prototype for a radio telescope.</p> <p>The student has tackled a complex project with in-depth testing and a high standard of trialling (1). Context considerations of the physical environment are referred to when determining suitability for making the prototype (2).</p> <p>Suitable materials, components and equipment to make the prototype are documented throughout the project (3). Stakeholder feedback has informed the construction of the electronic system (4).</p> <p>The final prototype is shown in its physical environment (5), and the student has explained their decisions to accept and modify the prototype based on the brief/specifications (6).</p> <p>For a more secure Achieved the student could have considered the social environment (as well as the physical environment) when determining the suitability of materials and components.</p> <p>Further evidence is also required of how the prototype took the brief/specifications into account during the development (as well for the completed prototype) in order to judge its fitness for purpose in the broadest sense.</p>

**Student 5: Low Achieved**

Intended for teacher use only

I now brought my components. I brought three motor controllers for a sum of \$66.69. Which I think is an attractive price as the convenience of having support if they break and quick shopping outweigh cheaper models. Another benefit, in the broader sense is supporting New Zealand business and lessening the impact my purchase has on the environment due to needing less travel to travel to get to me.

②

**Stakeholder Feedback**

I started by talking with my stakeholders. They gave me information on how I can improve my outcome.

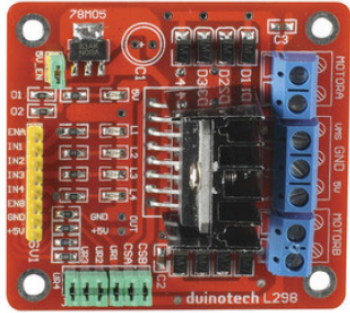
- Improved ease of use
- Increased reliability
- Weather resistance
- Power supply

I will use these points they highlighted to improve my design through testing and prototyping.

④

**Selecting components**

Since I am using three Servo motors, I will need three controllers these will need to be suitable for the context of my use. I will need them to be powerful (withstand high currents) and be cheap. I selected a L298 designed controller because of their superior voltage and current handling abilities, but also because of their ability to control servos. Unlike the L293D which was the second-best choice for this project.



③

I tried with Jaycar electronics, but they no longer stocked these. I then tried a company called Techexpress. They are selling these at the same price as Jaycar and have a similar purchase price as shown below. I ordered these and waited for them to arrive.

I had a look at a couple of websites and found a good method of connecting the stepper motor to a L298N driver board and running the Stepper.h library on Arduino IDE. This is a good option as I can use pre-existing code in my system to cut down on time spent creating and debugging. Especially useful in a classroom context, where time is limited.

②

I started with the cover for my electronics. I wanted to select a cheap, strong, and easily worked with material for my cover. This led me to select three methods for the cover: 3D printing, laser cutting and metal bending. 3D printing is an uncomplicated way for me to create objects for decorative, implemented uses or prototypes. The main advantages of 3D printing are the ease of use, quick manufacturing, and cost of production. However, 3D printing is not strong and I would need a large part, meaning printing in multiple pieces or getting a larger printer. Both of which I want to avoid. This has left me wondering if metal bending is a practical choice.

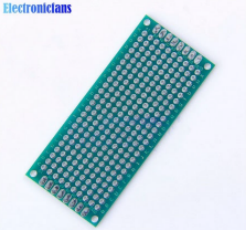
③

Bending metal is a desirable choice for this as the process requires thin metal and a hammer or bender. This metal is cheap, and I can source it easily. The advantage is being able to use simple construction methods and produce a high quality, resistant product. The glaring problem though, is that metal conducts electricity and if there was an issue, the metal could cause a short circuit or arc to the components if there was static electricity build up. Because of this I think a metal cover would not work well for me in this application.

①

I now moved onto constructing the electronics I would need. I considered CNC cutting a PCB, but I do not have the experience necessary nor the time to learn now. Because of this I considered acid etching, but this was also unavailable to me as I need to make multiple versions and the chemicals needed are unsafe for me to use at school.

This brought me onto soldered breadboards. Which allow me to solder my components and then create the connections between them myself.



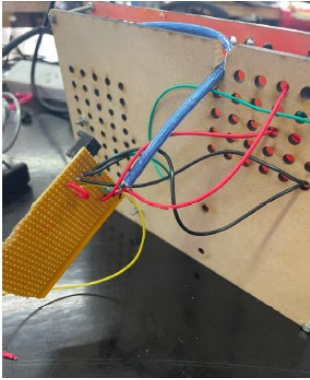
①

③

I started with the USB board, which I used to connect the USB connections through switches and other I/O. This was a good output and as a prototype I am happy with it. I need to change the way that I mounted everything and will do this by moving the components to a larger PCB to accommodate the rest of my circuitry.



①



This new and improved version of the PCB allows for a single connection point between the USB and ethernet systems. The only issue for me being that it is not as easy to work with as a professionally constructed PCB. I had to use the Prototyping board to minimise time and in doing so have lost the ability to make it look nice and be as compact as I would like. This is fine for testing, but for a final piece, I will need to make a safer and more professional outcome for my stakeholder. I also want to make my design as efficient as I can, so that I am not wasting materials that can be used by others. ①

Stakeholder feedback

- Do you need the rasppi for the system to work. Try to get it working then add complexity
- Focus on a reliable system
- Consider multiple bands that you can sense with
- How is the system going to be controlled?

④

Final adapts

④ I want to now get the system running. I evaluated the rasppi extensively and after no avail, my stakeholder suggested that I have made my system far too complicated and that maybe I should consider simplifying the product to meet specifications first. Then I can integrate my custom PCBs and other devices.

I decided to remove the rasppi, control box and the components that went with them to maximise the capability of my system in the shortest amount of time possible. I will keep these parts though as if I have time later down the line, I can re integrate them into the system. This saves me wasting my components and worst case, I will use them in another project. In context, it was a smart decision as I needed to save time and crack on. This pushed me forward weeks in the development process, saving me time and money. ⑥

I now focused on a single arduino system. I kept the motor controllers, signal reader, dish, and power supply. I removed everything else. Then, moved onto testing code and working on singular subsystems. This allows me to figure out what works and what doesn't before going onto a full integration. ③

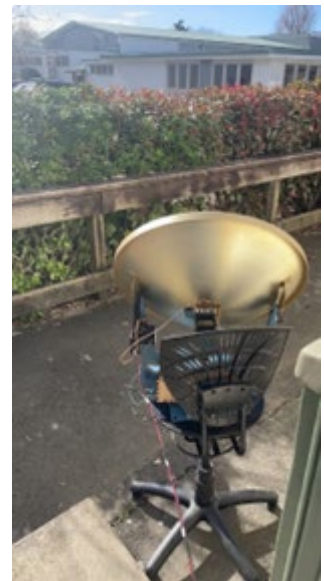


This is a first look inside the onboard electronics. I selected to laser cut a box out of MDF to give light weather and drop protection as I will need to stop the electronics from touching metal on the dish or from being wet/dusty. This does not need to be rain proof as I do not plan to use the telescope in severe weather. I selected hot glue for my electronics as I can use it to hold everything in place for transport etc. bit it will also function as an insulator, adding another layer of protection. This is useful as I have already learnt what voltage mishandling can do to my system and I want to minimise this in the future.

This is the finalised prototype control system, with upgraded insert and computer in place of the raspberry pi. By swapping to a computer, I was able to shed time in taking images with the radio telescope. Therefore, my stakeholder was in the right when giving me advice on how to simplify my system.



Prototyping being tested outside the classroom. ⑤



	Grade Boundary: High Not Achieved
6.	<p>For Achieved, the student needs to develop a prototype considering fitness for purpose in the broadest sense.</p> <p>This involves:</p> <ul style="list-style-type: none"> <li>• considering the context when determining the suitability of materials and/or components, and of practical techniques and processes</li> <li>• selecting suitable materials and/or components; tools and equipment; and applying techniques and processes to make the prototype</li> <li>• using results from testing and stakeholder feedback to inform the making and trialling of the prototype</li> <li>• prototyping to gain specific evidence of fitness for purpose</li> <li>• explaining any decisions to accept and/or modify the prototype based on a judgement against the brief.</li> </ul> <p>This student has developed a prototype for a jazz costume suitable for a National Competition.</p> <p>The student has considered the context at the outset of the project, identifying both social and physical environmental considerations that could impact the selection of materials, components and practical techniques (1).</p> <p>A material study has allowed the student to select the most suitable material to ensure fitness for purpose (2).</p> <p>Testing results through making a toile (not shown) has given the student evidence to develop their prototype. Further testing informed the making of the final costume (3).</p> <p>A final prototype is completed, fitted and worn to dance on stage (4) (not shown). The final evaluation explains decisions to accept and modify the prototype and how it met the specifications (5).</p> <p>To reach Achieved, the student could have obtained stakeholder feedback to inform the selection of materials, components and techniques when making the dance costume. For example, the best materials for dance movement or the best processes required for stretch fabric. Evidence of selecting equipment could have been explored and documented.</p> <p>Further evidence could have evaluated how the prototype met fitness for purpose in the broadest sense. For example, evaluating aspects like the sustainable materials or practices used, or how the costume could be maintained in relation to sweat or abrasion.</p>



The stakeholders are the primary people that influence my design and product. They are people who give me feedback, these people have a mixture of perspectives as they are my friends, choreographer and family.

**Friends-** My friends are extremely important stakeholder as they aren't afraid to speak their minds. This is something that I will benefit from because if they felt as though one of my designs was ugly, not practical or wouldn't suit me, they would tell me, this means that I would be able to have the most successful outcome as possible. My friends are very 'in' with the fashion and they know me very well. They would be able to advise me positively while considering all aspects of use for my product.

**Family-** As I am under 18, my family are my caregivers. Their stakeholder opinion would focus largely on cost of the product. My family are very vocal when I waste my money, this means that I would be ensured of purchasing material that would aid my design the most. My family would have opinions on the appropriateness of my garment and would tell me if it was inappropriate, encouraging me to change my design in order for it to be successful.

**Choreographer-** The choreographer is a main stakeholder in this design as this product is being made specifically for their dance. Their opinion would alter the form of the product as their opinion would be specifically just for looks. The choreographer also knows what judges are looking for as they are currently working in the industry. This is extremely important for my performance.



1

Social considerations

Competitions on stage around New Zealand. All theatres in New Zealand are indoor which means that the environment is controlled. Where the dancers are, backstage, the temperature and environment is an average heat, although when dancing it gets really hot. As dancing is an art that gets judged on its beauty, I need to ensure that when I'm dancing on stage underneath the hot lights, the colour and fabrics won't pick up my sweat and the adjudicator and audience won't be able to see my sweat on my costume. The fabric that I chose for my product will need to be able to slip on and off easily. After dancing on stage and sweating and having the heat of the stage lights on me means that when I get off stage I will be sticky, say I had a quick change, my garment would need to be able to come off my body with ease. Although being able to come on and off easily, since the environment of use for this product is a theatre, inevitable there would be an audience of varying ages and genders meaning that the product would have to function well and the risk of a wardrobe malfunction would be extremely low. This means that when making my garment I would benefit from having clips in order to secure the costume onto my body. Having clips means that when I need to take the costume off I can unclip it, leaving the garment loose and easy to remove. When on stage I can clip it to my desired tightness, ensure safety and practicality on stage. Having clips would also be extremely useful in order to alter the size if I grow at all during the time of using the product.

Competitions are family friendly, my costume would have to meet a lot of criteria. It would have to fit my age and maturity as well as appropriate enough for young people to watch the performance without being inappropriate. I will be representing my dance school and town in this costume as I would use it at nationals.

- Able to alter tightness
- Appropriate to look at for all ages
- Fabric that is a colour and material that doesn't pick up on sweat.



1

Physical considerations

**Appearance-** My product needs to be suitable for on stage wear, this means that it has to be pretty and feminine and have some applique on it. My product also needs to look good on stage under the lights and in photographs that get taken at competition. This is a key attribute that must be considered during the production of my costume. It is also important that my product stands out in a competition as there are so many dancers with the same costume. It is essential that this costume stands out as well as fitting with my dance style as it is a crucial part of a successful garment that is memorable to both the audience and judge panel.

**Materials-** Strong and durable material so it doesn't rip and lasts long. Materials also need to be suitable to move freely in and a colour that suits my dance and doesn't show my sweat. It is also really important that the materials used for my garment look nice on stage as it is a key contributor toward its final appearance and outcome. Materials that compliment my movement would be ideal (when I move it follows). This is important as it helps to add another 'layer' to the performance as it does help to heighten audience engagement and compliments the music that you are dancing to.

Key attributes

**Time-** My product needs to be completed by the end of October 2019. Time affects the quality of the product because if the product construction is rushed the product quality will become limited. I want to ensure that the quality of my product is at the highest standard possible so that it can last me a long time. I don't want to get stressed during the production of my garment due to time restraints as I don't want the quality of my product to be jeopardised. I need to manage my time properly in order to design and produce the best possible garment, able to solve all of my problems.

**Function-** The function on my product is a high priority for me. It must have a closure and be adjustable so that the garment lasts me as long as possible. This is so that if the cost of my product is high, the amount of time it lasts will counteract the cost and make the product worth it due to the quality. My product must also be appropriate to wear on stage in front of a large audience. It is extremely important that my costume is fully secure as most competitions are videographed and families watch in the audience.

If the production of my product is rushed and my budget has caused me to have cheaper materials of lower quality my product will no longer be fully functional.



## Material study

After researching my material study, I have decided to go with polyester for my briefs and top and then to add a chiffon overlay to the top and then use chiffon for the skirt/or flowy parts of the costume. This is because they are the most versatile in washing, stretchy for growth and don't wrinkle, meaning that travelling with this costume would be good as I wouldn't need to iron it before going on stage.

2



Polyester is an extremely durable material that is resistant to most chemicals, shrinking and stretching, wrinkling mildew and abrasion resistant. The fibres of these fabrics are also extremely strong. Polyester is also known to be hydrophobic in nature and quick to dry.

This material is ideal for my product as it is durable, meaning that it will last me a long time. It is also wrinkle resistant which means that it will look really nice on stage. As it is a 'quick dry' material, it won't pick up on my sweat as much/or will dry my sweat really quick. This is an ideal material



Satin is a material known for its good drape, elasticity and luxury feel. It is challenging to sew and frays easily, it also snags easily because of the long floats.

This material will be more suitable as a skirt or overlay for a base costume such as a leotard or briefs and a bra. The only problem with this material is that it isn't very durable.



Chiffon is a lightweight material made of my different fabrics. It tends to be slippery making it hard to hold but also floats nicely when moved in.

This material will be more suitable as a skirt or overlay for a base costume such as a leotard or briefs and a bra. This is very pretty on stage and 'soft'. It would be good for travelling as the wrinkles aren't as obvious as other materials.



Silk velvet has a shimmering, almost fluid surface. It also has a soft and more flexible drape. Velvets other properties include being heavy and durable.

Under the stage lights the material shimmers really nicely giving it a luxurious effect. This material would be good for both a base material and for a skirt.

## Testing and trailing

Last week myself and Ella went into town and purchased some materials for our mock up. After researching my materials and fabrics I decided to go with polyester briefs and bra and a chiffon overlay. These materials were not available at the time, so for my mock up I will be using velvet and polyester satin. I also couldn't find a stretchy diamante strip.

3

Over the weekend, I started the production of my garment. The production of my briefs and bra went smoothly and I promptly moved on to adding my applique. (My mock up needs to be presentable as I will be wearing it on stage at the end of this week) As I started the production at home, I didn't have the tools available to me that would be at school. I had to hand sew all of my applique onto my garment which took a long time but the end result was really pretty.

I didn't have a stretchy material to put on the back of my top so I was very specific in my measurements so that when my top was on it would fit perfectly. This worked really well and looked nice, it was also very secure. I tried my top on once it was finished and it fit perfect, I even danced a little bit in it and it felt really good. I then went onto to take my top off and I couldn't get past my shoulders and had to get my mum to forcefully get it off me. This then made me realise that I needed to find either a stretchy back or attach it with a clasp. As I said before I couldn't find stretchy material so resorted in stitching a hook and eye so which made taking it on and off really nicely. Sewing on different hooks also meant that my product would be adjustable which suited my brief more so than my previous design.

I moved onto making my briefs with a pattern that I used last year. Unfortunately I didn't take into consideration that I had grown and so my costume doesn't fit me. I will now need to find a pattern that is more suited to my size.

I have now completed the production of my garment and will be moving on to the testing and trailing of it on stage this weekend at forum north. With this I will come back and evaluate my design and alter any specification that I need to, to ensure that my final product is exactly what I want.



Diamante around the middle of bra



Attachment of diamante back

## Evaluation against brief

My costume going on stage was extremely functional and didn't let me down when performing my high energy solo which matches my brief perfectly. The diamante straps at the back were sewn straight on. It would have been a lot better if the back of my bra was either a bra clasp or the diamante was attached via a hook. On stage this issue was no a problem I was only the aking off of the garment that was a struggle. I was fortunate that at this competition I didn't have a quick change which meant that I could take my time to take of my garment carefully, although this won't be the case at very competition. This means that my mock up did not function the way I wanted it to.

From stakeholders such as colleagues and the judge, I received many positive comments about the way it looked. It was "very pretty on stage the the sparkles looked great underneath the stage lights" - said the judge.

Although I had many positive comments about the appearance of the costume one thing I would alter when making my final piece is that the skirt will only be a half skirt (at the back) this is because the front skirt looked like a pouch and I didn't like the way it sat on my body. This may have been the fabric that was used but I really liked the way the fabric looked on stage so would rather just change the design on the skirt and keep the same material.

The cost of my materials was a total of \$34 which was cheaper than my desired costs of material.

5

I have decided that the colour was not strong enough for my dance song and a red costume would better suit my dance. My final product matches my brief. Although being sure to match my dance is also appropriate to wear in front of a varying audience as the cleavage area is covered by applique and the bottom has a skirt over top. After researching my material study I have picked fabrics that are strong a durable which means that my product will last long and it will be unlikely for my costume to break. I choose red and black for my costume as these colours are known to be "sexy". I needed my costume to be conservative but still sexy, which is why I went with this colour choice, enabling me to have a secure and conservative costume. When trying on my costume and wearing it on stage I felt very confident as I had zero costume malfunctions and it made me feel good about myself, as I liked the way it sat on my body. During construction on my garment I decided to leave the classic bra structure for optimal function. This bra structure meant that my straps were adjustable, extending wear considering growth. The total cost of my garment came to \$34 which is \$16 below my budget.

4

