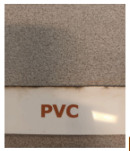
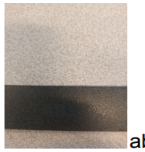
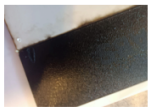
Material Experimentation 1

Materials physical properties testing

Test 3 different materials and some of its properties.

Material & Photo	Structure	Properties	Common uses	Sustainability Y/N
1.  birch plywood	The panels are not made from one solid piece of wood, but rather multiple layers, or plies of veneer. The number of layers depends on the thickness of the panel,	Very stable in all directions due to alternate layering at 90o, with outside layers running in the same direction. Thin flexible versions available (flexiply)	Furniture,shelving, toys and construction.	Yes, it's one that won't send out a poisonous gas
2.  pvc	The electrolysis of salt water produces chlorine, which is combined with ethylene (obtained from oil) to form vinyl chloride monomer (VCM). Molecules of VCM are polymerised to form PVC resin, to which appropriate additives are incorporated to make a customised PVC compound .	Flexible,chemical resistant,tough, unstabled to uvc light	Pipes,tape ,clothes	No, when pvc is burns it produces pure chlorine gases that can lead to death
3.  abs	ABS is a terpolymer made by polymerizing styrene and acrylonitrile in the presence of polybutadiene. The proportions can vary from 15% to 35% acrylonitrile, 5% to 30% butadiene and 40% to 60% styrene.	Impact,strength, tough,high surface, chemical resistant	Lego, helmets	No, abs tends to emit a cyanide gas that is deadly

Material Property Tested	Definition of the property	Material 1 Evidence of testing & results	Material 2 Evidence of testing & results	Material 3 Evidence of testing & results
Thermal conductivity	The ability to conduct heat	 The plywood doesn't burn as much as the others	 Abs does melt but doesn't melt and produces toxic gas	 Pvc left a black burnt area and didn't melt but produced a toxic chemical
toughness	The ability to absorb shock/impacts without breaking	 The birch plywood snapped under 90 degree	 The abs only had a slight bend but still resisted the toughness test	 The pvc did not bend or snap at all during this test
hardness	The ability to resist abrasive wear and indentation through impact	 The birch plywood was the deepest punched	 The abs didn't went far but still left a solid hole	 The pvc resisted slightly better but lefted a outline on the hole
Looks	How cool does it look	 has a dark outline but doesn't outline well	 has a scaly texture can't see any burns but can't see the outline	 shows where its cut but a dark colour and outlines well

Conclusion

Birch plywood snaps easily and seem be worst then the other two but it the only material useable as plywood doesn't release poisonous gas

Material Experimentation 3

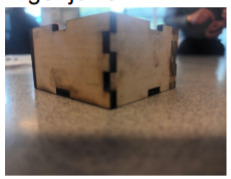
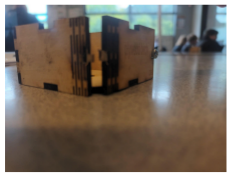
Light Conductivity of material

Material	Photo of test	Conclusion	Stakeholder Comments
Acrylic fluro	 	You can see the outline and its a yellow tint that can suit the crown	1. 2.
Acrylic frosted	 	You could barley see the outline when lighted up	1. 2.
acrylic clear		Doesn't really work well unless shine threw form the bottom	1. 2.
			

Conclusion

I will be using the acrylic fluro for my light display for the nice effect

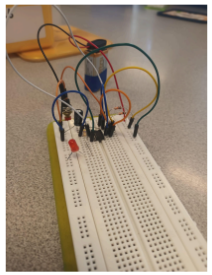
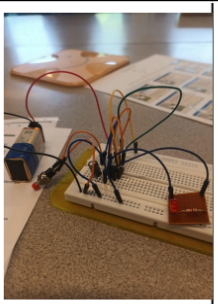
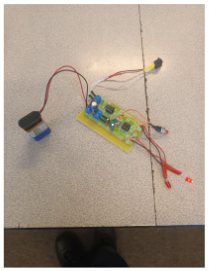
Joint method

Method & Photo	Description	Advantages	Disadvantages
finger joint 	The fingers are glued with each other making the joints more stronger	Hold strong together and one of the toughness joint	Ridges get burnt easily
curb 	Curb was meant to be a smooth surface with small rectangles cutted out	Curb is aesthetics base joint	Lot of holes in the curb making it extremely weak
flat 	Glue together but not supported	Look aesthetic pleasing	Extremely weak and break easily
Bolt and nut 	A bolt locking the pieces together	holds strong good door	Look ugly,isn't glued in

Conclusion

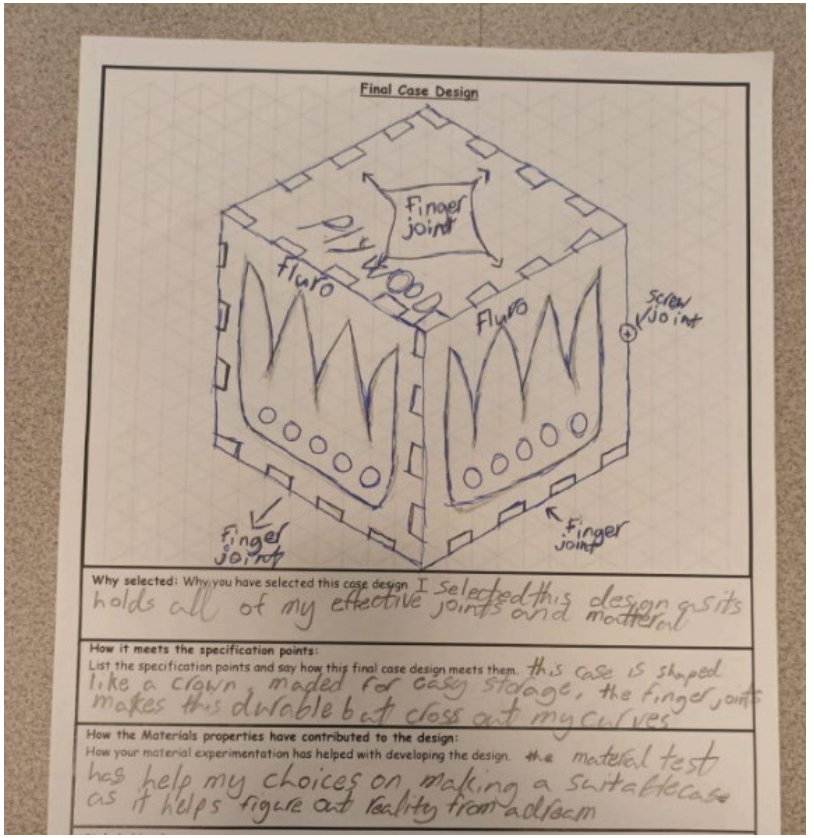
I am going to use finger joint screw joints, to use for the design as the kerfing joints are fragile and broken when I try to use it.

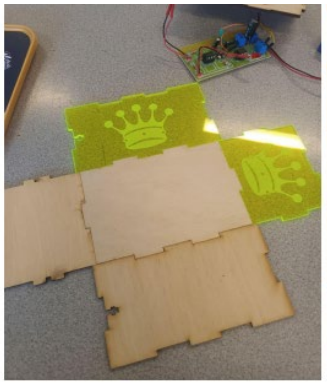
Material Experimentation 5
Circuits board methods

Method & Photo	Description	Advantages	Disadvantages
 Breadboard	Breadboard, a board where you can swap circuits out to replace and it able to be reuse at anytime	easy Simple You can swap circuits out fast	Not permanent Breaks easily then other methods.
 Matrix board	Matrix board, a board is where you solder your circuits in and they can't be moved.	Permanent Stays in place Durable	Can't do difficult circuits Difficult to swap and change circuits
Circuit board 	Circuit board is a board where you soldier the circuits in and you can do harder circuits	Permanent stays in place durable can do diffucit circuits	Difficult to swap out circuits

Conclusion

I'll will be using the third option as it is a combination of the breadboard and the matrix





Brief

Context

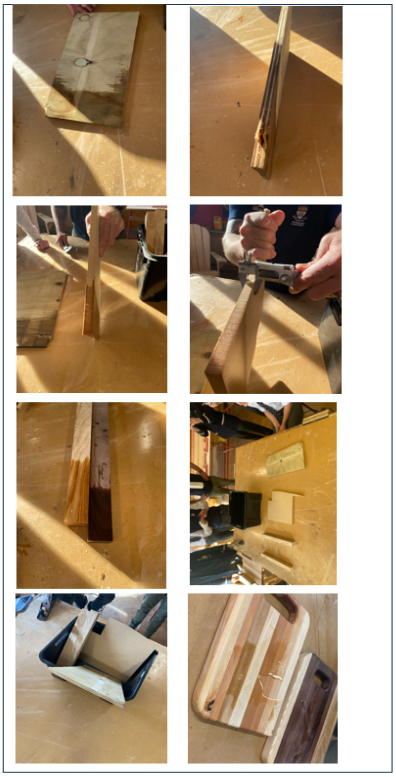
Wooden chopping boards are essential in any kitchen, serving a wide range of purposes from food preparation to presentation. They make ideal gifts for family members and can be treasured for years. This project involves creating a chopping board that can be used at home or given as a gift. The chopping board must meet the following specifications and constraints to ensure it is fit for purpose:

Specifications

- Exactly match the size and shape of your MDF or Fusion 360 model.
- Be no less than 35mm thick.
- Durable and resistant to knife marks
- Made from high-quality, food-safe wood
- Easy to clean and maintain
- Aesthetically pleasing and suitable for display
- Appropriately sized for various kitchen tasks
- Have at least one ergonomic handle

2 - Water absorption

Does it change shape / stretch / distort



Expert stakeholders feedback: Selection

- Less dense wood will soak up more moisture, because of open cells in the structure.
- MDF will swell and de-laminate because it's basically cardboard (wood pulp, glue).

My Feedback
What was the feedback?
To choose soft wood materials. Rimu, and Macrocarpa. This being chosen due to the fact soft wood is easier to work with, and because water will absorb, but only if it's left soaking in a pool of water.

Was the test a success or failure ? Why ?
Success. The test were successful as we'd seen the obvious reasons of why natural woods are more recommended. Some reasons being they mostly aren't poisonous, don't decay with minimal water, uphold structure for long period of time.

What I Learned ?
plywood and MDF is not a suitable a chopping board

3 - Timber Lamination

Gluing the same or different Materials together to make a more stable piece of material to work with.

Expert stakeholders feedback: Clamps
-It's important to dry fit before glueing. This making sure that all pieces of wood align nicely and won't leave gaps between the joined pieces.
-Its important to have multiple clamps pressing between each other, to make sure that the glue spread evenly throughout the board.

My Feedback
Made sure I had at least 8 pieces of wood, with two sides being completely flat. And exceeding past 300mm in length, (this being so you won't have to worry about the template not fitting, leading to yourself shortening the board). After that making sure you use a minimum of 3 vices to clamp shut the board, to ensure to air bubbles can form.

Was the test a success or failure ? Why ?
Success. I glued all the pieces together, without any visible gaps that mattered. And the only downside being I had to add 20mm worth of wood to the, to make the template fit along the top.

What I Learned ?
Make sure you have enough wood, as well as it all being to an acceptable length. Making sure that all individual pieces have flat end facing each other. And not to glue a soft wood next to a hard wood, (they expand and contract at different rates).

4- Stress testing

Stress-graded timber is assessed by its load-bearing capacity and is primarily used for building applications that are non-visible and structurally vital

Expert stakeholders feedback:Density
-Strength is important.
-For chopping board timber to maintain its shape & flatness, stronger timber will do this over a longer period.
-Density is important so the chopping board can withstand knife cuts and everyday use.

My Feedback
What was the feedback?
I wasn't overly worried about density of my wood, but rather appearance. I choose rimu and Macrocarpa as they looked rather nice together and wouldn't chip easily when in use.

Was the test a success or failure ? Why ?
Yes. We were able to choose from a selection of 4 types of wood, 2 soft, 2 hard (focusing mainly on density). By learning of the pressure that each piece could take meant the we could choose a type of wood to create a durable chopping board.

What I Learned ?
White ash - 9 pumps
Purple heart - 9 pumps
Rimu - 6 pumps
Macrocarpa - 7 pumps

5 - Shaping Process

Shaping is used to change the size and shape of a workpiece







What not to do:
When using the jigsaw and cutting the handles from hole to hole, make sure the board is clamped down. This allows for the board to have zero movement when cutting, allowing the person to cut freely without the jigsaw cutting up and down, moving the board with each stroke.

Expert stakeholders feedback: Shaping
After shaping/drilling/cutting has finished, it's important to have the whole board sanded smooth. This leaving the board with minimal scratch marks, and scuffs/dents.

My Feedback
When drilling the two holes for the handle, make sure that the chopping board is clamped down to the board underneath. While also making sure the board underneath, has no previous drilled holes, (drilling through wood with nothing underneath it means that the exit hole will splinter outwards).

Was the test a success or failure ? Why ?
Success. Finished sanding/shaping the board with little to no damages caused, that couldn't be fixed with glue and sawdust.

What I Learned ?
When using the jigsaw, full speed and hold firmly. If not held firmly the vibrations that travel up your arms, can have the tendency to make them go limp. Unableing you from really cutting through anything.

Wood Oiling

Applying oils to timber helps replenish and protect from the inside out, drying, cracking, and weathering



Note: The two boards shown have water placed on top. The white oak board has only 2 coats of water, while the purple heart board has 2 coats of oil plus a coat of wax. The water on the white oak board had separated into individual blobs when moved around, this being because the board didn't have a coat of wax, so said board didn't have any water resistance. While the purple heart board having a coat of water-resistant wax on it meant that the water swayed around in a singular large drop and stayed together when moved.

Expert stakeholders feedback: Oiling
When oiling, don't soak the entire cloth with oil. Just get a teaspoon or so onto the rag, and wipe in a circular motion, up and over the entire board, (repeat process once more, plus once again with wax).

My Feedback
Don't coat the entire thing with so much oil, that the board won't even be able to soak it up. As well as only a small amount of wax to be placed on at a time, used in a circular motion as well, wipe excess wax of after 10 minutes.

Was the test a success or failure ? Why ?
Success. Didn't muck up, used the right amount of oil, completed the suggested coats of oil/wax, ripped excess wax off on time.

What I Learned ?
Excess wood wax also must be wiped off.

Material Selection

Wood 1: Rimu

Rimu wood is a soft native wood. They reach up to heights of 45 meters and live for about 16-17 years. When cut open, rimu is a red to yellowish brown, with distinct marking of either light or dark streaks. I choose this wood because it's easy to work with and is a great looking wood.



Wood 2: Macrocarpa

Macrocarpa is a coniferous tree, being from the central coast of California, United states of America. It that was introduced to New Zealand during the early 1860's. With 1 metre of growth a year, it's typically farmed for clear wood production when it is aged from 35-40 years. I choose to use Macrocarpa as it's a great looking wood, dense, and it's a wood that grown up using to fix buildings when they've broken down back home.



Glue:

PVA glue. The reason I chose to use this type of wood glue is because it's a NZ made company, fast setting, non-toxic, ideal for face edge joinery, and was mainly chosen as its heat/water resistant. We also chose this because we know it works, it was trialled and tested during our lamination test, held together when placed in water as well as placed through the planning machine, which all boards held together.



Oil:

The oils/wax we had chosen to use since they are non-toxic, food friendly, and work well together to help protect the board. They also allow the board to be water resistant.


FINAL OUTCOME




The outcome of my year 11 chopping board consisted of some minor cracks, and some natural occurred knots scattered through the board. (Note) The bottom right picture indicates myself using the board to chop up some mushrooms to fry up for breakfast.