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

Exemplar for Internal Achievement Standard

Technology Level 2

This exemplar supports assessment against:

Achievement Standard 91352

Demonstrate understanding of advanced concepts used in processing

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.	For Excellence, the student needs to demonstrate comprehensive understanding of advanced concepts used in processing. This involves: • comparing and contrasting processing operations and tests, and their suitability for different materials and/or purposes • discussing the implications of testing outcomes on processing decisions. This student has compared and contrasted processing operations for potato-based products including potato pompoms (1), fries (2) and triple-cooked fries (3). Comprehensive understanding is shown through discussing the effect of starch and moisture content, and the effect of different cutting and cooking methods. The need for testing for different purposes is discussed. This includes testing pompoms at the precooking stage and testing a clump of mixture (1). Comparisons are made for the testing done when cooking fries (2) (3). The student notes that a test such as the clump test would not be used for a one-ingredient product such as fries (2). The implications on decision making are discussed for testing outcomes when processing potato chips. This includes a discussion of the implications of the snap test which is used to determine the crispiness of chips (4), and the crunch test which determines crunch (5). For a more secure Excellence, the student could show more comprehensive understanding by comparing and contrasting a wider range of tests used when processing other potato-based products. The implications of testing outcomes on processing outcomes could also be discussed in more detail.

Student 1 Page 1: Low Excellence

NZQA Intended for teacher use only

Comparing processing operations and how these produce a different product that has a different purpose e.g. pompoms, fries, potato chips (same material but a different purpose)

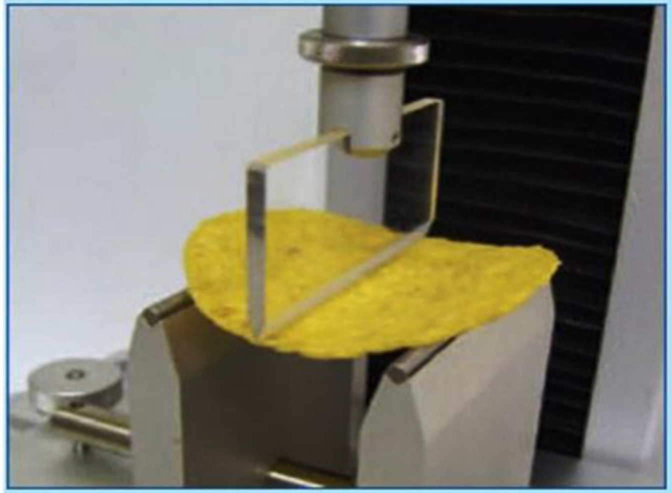
[1] Potato Pompoms have a fluffy interior. They are mostly potato, but also have vegetable oil, a pure starch (like cornflour, which is a pure starch) and flavours. The starch and protein in the potatoes is needed to help keep the mixture together, so a relatively starchy potato would be best to use. The oil needs to be part of the mixture to stop the proteins and starches in the potatoes from rubbing together too much and becoming gluey.
The potatoes are precooked to a point where, if punched with a fork they won't crack or fall apart. This would cause them to become too moist.
The potatoes should be processed just enough to break them down into small pieces. Processing too much can release too much starch, making the pompoms gluey.
The mixture should stay together when a clump is squeezed—if not, more starch needs to be added (ie cornflour).
The pompoms are par fried and then frozen. They need to be fried again before eating.
The desired colour is a dark, golden brown.
They are cut up into small pieces. The large surface area and craggy exterior (created from all the small pieces) makes them crispy on outside.

[2] The processing of **french fries** has some similarities and some differences (to pom poms).
One of the differences is that there is only one ingredient—so the potato itself has to achieve the desired effect. So the testing that is done to make sure pompoms are bound together doesn't need to be done when processing fries.
The potatoes used to make French fries need to have an ideal shape for the type of chip, and to be relatively free of blemishes, bugs etc (these need to be taken out). Some makers of fries use Russet potatoes—they have an oval shape which is good for making long fries. Smaller potatoes get made into fries that are ring or cubed shaped. Pom poms are made with bits of potatoes (they were originally developed to use up the disgarded bits of potato).
Potatoes like Russet are lower in sugar, which helps to get the crunch desired in fries. The lower sugar also keeps the flesh whiter for longer, a desired property when processing fries.
The picture opposite is of a rotational slicer that McDonalds use to make their long skinny chips.
Fries are generally soaked to leach out sugar, to help to ensure they all turn out same colour once they are cooked. The colour will be more obvious on a fry (particularly a straight one) than a crinkly pom pom.
The fries might also be blanched in hot and then cold water. This is to make the potato flavour more pronounced and to make the colour more even. A dextrose (sugar) product might be added to get a more even colour.
A computer can be used to analyse size and colour. Any fries that don't match the desired size and colour are blown off the production line by an air jet. These could then be further processed in to pompoms.
Testing for low moisture content is also important when processing fries, as too much moisture will inhibit the crispiness desired in fries.
Like pom poms, fries are also cooked again in fat before they are eaten.
Most fries are double cooked—firstly at a lower temperature to soften them, then at a higher temperature to crisp them up.

[3] Fries can also be triple cooked — this will give them a glass like crust on the outside and a soft, fluffy centre.

The fries are first simmered until when tested they almost fall apart. This is to ensure they attain a soft texture and so that the cracks that develop provide a place for the oil, which will harden (which makes the fries crunchy). They are then cooled and drained of water using a sous-vide technique (cooking in airtight plastic bags, like in the picture) or by freezing. Drying the fries drives out moisture that would otherwise keep the crust from becoming crisp.
They are then deep fried at a lower temperature (130 C) for 5 minutes and cooled. The aim is that any starch left in the surface cells dissolves and combines to create a rigid outer layer that can withstand the higher temperature of the final frying (18o C for 7 minutes). Just having a single frying at a high temperature can lead to a thinner crust that can get soggy by whatever moisture remains in the fries interior.

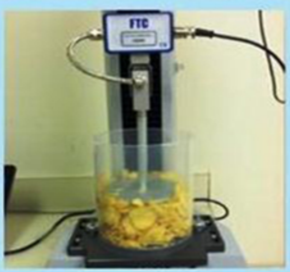
Discussing the implications of testing outcomes on processing decisions



The potato chip sample is supported at two points. The travelling beam moves down and snaps the sample.

[4] The snap test is done to determine the crispness characteristics of potato chips. For thin chips in particular, the crispiness is really important.

A machine is used to apply a force and to measure how the chip breaks. It is used to get an indication of what the frying profile should be, the cooking time, or that the moisture content of the raw product needs to be adjusted or the raw product needs to be soaked for longer to remove the starches. The goal is to get the chips brittle and dry.



It can also be used after packaging to determine the moisture migration (which will make the chips go stale).

This test can be used to determine the ideal sensory preference (ie too crisp, ideal, not crisp enough) during the development stage for a new product.

[5] For thicker chips, crunch (or hardness of texture) is really important.

This can be determined by a crunch test (see the picture on the left). This is done by a machine that simulates the chewing motion. The amount of chewing time is an indicator of the crunch. This is seen to be a far more accurate way of testing than relying on sensory testing. The results can be used to make adjustments to processes like the thickness of the slicing or the frying time. Adjustments might also need to be made to the moisture content of the potato before frying—production lines will use air dryers for this.

	Grade Boundary: High Merit
2.	For Merit, the student needs to demonstrate in-depth understanding of advanced concepts used in processing. This involves: • explaining processing operations and how they achieve required outcomes • explaining why specific tests are used in processing operations. This student focused on pie making, explaining processing operations and how they achieve required outcomes for the five categories listed in Explanatory Note 4. This included explaining the effect of sugar on egg whites (1), the ultimate crust to filling ratio (2), unsafe practices when processing (3), the gelatinisation process (4) and piping (5). The student explained how and why eggs are tested for freshness (6), and the tests that are used to ensure that meringue is to required specifications (7) (8). To reach Excellence, the student could show more evidence of comparing and contrasting processing operations and tests and their suitability for different purposes. For example, they could have compared pastry making processes to achieve different desired outcomes for different types of pies. They would also need to discuss the implications of testing outcomes on processing decisions.

[1] **Effect of sugar on egg whites**

The more runny the egg white, the less the sugar granules are dissolved. Whisking until a foam is formed and then adding sugar gradually was most effective as the meringue was stiff. This is because the egg white had a chance to expand and incorporate air so by the time the sugar went in slowly, it could focus on dissolving the granules rather than incorporating air and dissolving the sugar. So the key to the perfect meringue is to form soft peaks first so it has air in the egg whites and to slowly add the sugar so it has a chance to mix around in the mixture and dissolve a little before more is added. The reason why adding the sugar at the beginning failed was because the egg white hadn't got any air in it yet and it was all added at the same time. Because it got added at the start, it had time to dissolve so it worked better than B when I added the sugar at the end. This failed because all the sugar got added at the same time and it was at the end so it wasn't given a chance to dissolve. Adding sugar gradually from the start was alright but the egg white hadn't gotten any air in it before the sugar was added.

[2] When making pies, it is important to get the right crust to filling ratio. Too little filling will make the pie taste boring. Too much filling will ooze out of the pie when cooking or eating. Preparing too much filling is a waste. The depth and width of the pie shell have to be taken into consideration to get the ratio right.

One way of trying to get this ratio right is to try to add up the volume of the different ingredients that will go into the filling. As things like sugar will dissolve, this gets tricky. So some experimenting might be necessary to work out the exact volume of filling needed for a particular pie crust shell size. This could be used for future pies.

In industry, automated filling systems are used in pie making (or for quiches, cheesecakes etc). These systems deposit exact-weight portions of filling in to the pastry shell. They can be used on fillings of a range of viscosity. They can transport and place the filling gently, to prevent crushing or smearing.

[3] It is important that food safety programmes of a high standard are established.

The main concerns around contamination in pie making include:

- cross contamination of cooked and uncooked ingredients during storage time. Cooking destroys harmful bacteria, so if cooked products come into contact with raw products, they may take up that harmful bacteria.
- When the same utensils etc are used (without cleaning) to process raw, uncooked ifoods and also cooked foods. This can cause food poisoning bacteria (eg salmonella) to develop. (for the same reasons as above)
-Unhygienic practices (open cuts, not washing hands, sneezing etc) can cause food poisoning bacteria to be transmitted to the food
- washing meat (eg chicken) and eggs can cause the spread of bacteria onto benches etc
- Making sure that flour is not in contact with rodents and insects and foreign bodies.
- Not cooking at high enough temperature or for long enough. Safe cooking time guidelnes should be followed for meat, poultry, seafood, eggs.
- Not correctly defrosting frozen pastry. This should be done in the fridge
- Not getting pies chilled when they are in the danger zone—ie straight after cooking.

Some industries use cooling conveyers to reduce the core temperature of the pie before they are frozen.

[4] The lemon meringue pie filling goes through a process called gelatinisation. This is dependent on the sugar and the corn flour. Adding heat to both these elements, along with liquid (ie water and lemon juice) thickens the mixture. It is actually the cornflour (a starch) that will cause gelatinisation when heated to the proper temperature. Flour would also work—but more would be required (as it is not just purely starch, like cornflour) and it would possibly give a floury taste. There needs to be the right amount of liquid to allow the cornflour to absorb the liquid and swell. The mixture becomes more viscous (thicker) and gluey,

Sugar and acid (lemon juice) will affect the thickness of the gelatinised starch mixture and the rate at which is gelatinises when heat is applied. The starch in the sugar ends up competing for the water, the acid breaks down the starch molecules—both contribute to thinning the mixture.

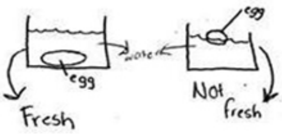
Adding butter and egg yolk will also make the mixture thicker.

An efficient boiling point is needed, without burning the starches.

[5] In the classroom situation, meringue can be effectively piped by hand. Disposable plastic bags are often used—they can be thrown away, and contamination avoided. The bag should be twisted, to make sure there are no air bubbles. Different angles are used to achieve different shapes (eg 45 degrees—spirals, 90 degrees—stars). Pressure should be applied evenly for a particular count, depending on the shape being created.

In industry, machines are used to extrude even amounts of meringue mixture. The beating phase (required in the classroom, or at home) is eliminated. This makes it possible to reuse the granular mixture (which you can't do in the domestic situation).

[6] Before you process an egg, float it in water to test for freshness. If it floats, the air pocket has expanded and it is off.



You can also crack the egg onto a plate. The thicker the albumin (egg white) is, the fresher the egg is. If the amount of thin white is greater than thick white, the egg is possible off. The egg yolk should also be in the centre and it should be firm. The egg in the photo is not very fresh as the yolk is off centre and the thick part of the white is smaller than the thin part. It is almost off, so I wouldn't use it in my processing. This is an important test as making meringue is best with not so fresh eggs. The older whites are thinner and easier to peak, but unfresh eggs create a risk of illnesses such as salmonella.

[7]

Add sugar at the beginning	Very glossy texture but quite runny and the sugar granules hadn't completely dissolved into the mixture	
Add sugar at the end	Very runny and the texture was very very gritty so sugar had barely dissolved into the mixture, making it very unsatisfying. This was also the sweetest egg white.	
Add sugar gradually from the start	Firmer than A & B and the sugar granules had dissolved a lot more into the egg.	
Whisk until foam formed, then add sugar gradually	Very very firm, sugar granules were almost unnoticeable when rubbed between fingers. Meringue was able to be held above the head	

[8] A visual check should be done to make sure there is no egg yolk or oil in the egg white (it won't beat properly otherwise). Plastic bowls are not good to use as fat/oil residue can stick to it. Copper bowls are perfect. Egg whites contain protein and no fat—the protein provides the strength to form the peaks. Egg yolks contain fat, so any bit of yolk will stop the whipping. Before the next lot of sugar is added to the meringue mix, some of the mixture can be rubbed between the thumb and forefinger to make sure the sugar is dissolved. It should feel completely smooth. Beating should continue until the whites are glossy and stand in stiff peaks. The sugar helps to stabilise the foam, so does an acid (ie cream of tarter, vinegar, lemon juice). When the beaters are taken out, test for thick, glossy, stiff peaks. Also, tip the bowl on the side—the mixture should stay in place and not slide.

	Grade Boundary: Low Merit
3.	For Merit, the student needs to demonstrate in-depth understanding of advanced concepts used in processing. This involves: • explaining processing operations and how they achieve required outcomes • explaining why specific tests are used in processing operations. This student has explained how processing operations associated with making pastry will achieve particular outcomes. For example, they explain the effects of temperature, differing quantities of ingredients, the mixing process, blind baking and cooling (1). The student also explains the outcomes of automated pie filling systems used in industry (2). This includes explaining dispensing without damage, accuracy of measurements and the sanitisation benefits (2). An explanation is given for why viscosity testing is used in processing operations. The focus is on lemon meringue pie filling and what can affect its viscosity, and how to carry out viscosity testing in the classroom. The student also explains why viscosity testing is important in an industry setting. The student also explained why sensory attribute testing is used in processing operations. For a more secure Merit, the student could explain processing operations that were more reflective of the examples given in Explanatory Note 4 of the standard. Explanations should be presented for processing operations from each of the five categories, and how they achieve the required outcomes. A focus on more than two tests, explaining why they are used in processing operations, would also strengthen this Merit grade.

- Butter (as well as hands and the bowl) needs to be cool or cold to make short pastry for a sweet pie crust (or any pastry). If the butter is too soft, the pastry will be too. That will make the pastry lose its shape and shrink. A warm mixture will make the pastry greasy, heavy and dull. The pastry should be put in the fridge on a warm day, and hands can be run under the cold tap to keep them cooler. A marble slab is good for rolling the pastry on, as it stays cooler. The pastry should be worked quickly, to stop it getting too warm. **[1]**
- Butter makes things like shortbread and pie crusts crisp and tender. When butter is blended well into flour, you get a very rich pastry. Mixing in small pieces of butter causes less evaporating of moisture than for flaky pastry—makes the crust tighter and firmer. Not adding enough butter makes it easier for the gluten to develop—which makes the crust tough.
- Butter provides moisture. This makes pastry keep longer than drier, lower-fat baked goods.
- The milk fats in the butter allow the crust to brown
- Because butter has a high melting point, it melts nicely in your mouth
- Adding too much flour can make the pastry too crumbly and difficult to work with. It can also make it tough.
- You need to be careful not to over mix pastry, or it will elongate the gluten (protein) cells and make the pastry tough, gluggy and doughy. However it does need to be mixed before the liquid is added. Covering the grains of flour in fat (butter) gives the pastry its fragment discontinuous 'short' texture –as it is harder for the flour to bind with its neighbours. Adding sugar also helps to stop the gluten strands forming so the pastry breaks up in the mouth. This layer of fat makes it difficult for water to hydrate the flour, so structure-giving gluten proteins cannot form. The more coated the flour cells, therefore, the less well they will bind with their neighbours and the weaker (shorter) the pastry will be. However, if the flour is too well coated the pastry will not hold together and will become difficult to work with. This can happen if you use oil or if the solid fat is too warm.
- After making the pastry, chilling it in the fridge for at least 15 minutes (wrap it in plastic wrap or greaseproof paper) will help the gluten to relax. If the pastry is rolled out as soon as it is mixed, it is like trying to roll a sheet of elastic. It will roll, but then it will shrink back. Let the dough warm up just a little before rolling it out—this will make it easier to roll. Once rolled, it should be rested again.—so that it doesn't shrink in the oven.

- Acid (eg lemon juice, vinegar) or a pastry relaxing agent helps to avoid shrinkage.
- Metal baking pans (that don't warp) work well as they conduct heat well. A removable bottom makes it easier to get the pie out.
- Always put pastry into a preheated hot oven. If the oven is too cool, the pastry will melt rather than cook. Placing the pie on a heavy heated baking sheet will help to make the bottom crispy. The hot oven temperature would destroy any microbiological contamination.
- Thin, uncooked fillings can make the pastry soggy.
- Make sure any cracks or holes are patched up with pastry (use water to make it stick). Leaks will make the pastry go soggy
- Blind baking the pastry before adding the filling stops it going soggy as it seals the surface. This is done by covering the pastry with non stick baking paper and then adding some weights (eg rice, dried beans, ceramic balls). These weights stop the pastry rising up. The pastry can then be cooked for another 5 or 10 minutes before adding the filling.
- Cool on a wire rack so the air can circulate—this will also help to stop the crust from going soggy.

Pies Filling Systems **[2]**

In industry, viscous products and particulate sauces can be dispensed without damage/ deformation into the pie shell through a piston filler. These fillers will give clean (ie lower change of contamination) and highly accurate measures of filling. These are easy and fast to sanitise.

Rotary plate fillers can be used to accurately deposit small free flow particulates (like a biscuit crumb crust or frozen vegetables) into containers. Sanitary construction, easy to wash down, easy to adjust the timer and volume.

Topping dispensers spot deposit or evenly spread products like grated cheese, bread crumbs, mince, vegetables etc. They are built from food grade materials and are easy to clean.

Viscosity testing **[3]**

Cornflour is usually used to thicken something like a lemon meringue pie. IT is good because it doesn't seem to affect the flavour or texture. Other ingredients (lemon juice, the fat in the butter, the sugar, the enzymes in the raw eggs) and heat can work against the thickening ability of the starch in the cornflour. The acid in the lemon reduces the ability of the starch to capture moisture, which can lead to 'puddling'. To get the ideal thickness, a viscosity test should be undertaken.

The test can be easily undertaken in a classroom using a stop watch and a funnel. You measure how long it takes the liquid to run through the funnel. This would then be compared to the ideal viscosity. Or sometimes people will just time how long it takes the liquid to drip off a stick.

Viscosity testing is important in industry because it can help to make the processing more efficient and cost effective. For example, it effects the rate and which a pie filling travels through a filling pipe. It also effects how long the filling might take to dry (before the next process can happen). The viscosity of the filling will help to determine how the pipes are set up (for example, the angle) to make the flow as good as it can be.

In industry, the texture of the food also needs to be maintained as it is meant to be, and a viscosity test allows that.

Also controlling the viscosity is important to make sure that the food item will perform specific functions, for example able to be dipped or used to coat something.

Viscosity testing can also be used to detect changes in colour, density, stability, solids content, and molecular weight.

In industry, special viscosity testing machines are used.

	Grade Boundary: High Achieved
4.	For Achieved, the student needs to demonstrate understanding of advanced concepts used in processing. This involves: • describing processing operations and identifying their impact on the resulting outcomes • describing the nature of specific tests used in processing operations • explaining visually how processing operations and tests can be combined in a processing sequence • explaining the differences between processing in the classroom and processing in industry • explaining the differences between health and safety regulations in the classroom and industry. This student describes processing operations (from each category listed in Explanatory Note 4) for making a lemon meringue pie. They describe the impact these operations have on outcomes. For example, they describe the effect of eggs and iced water, rubbing in butter and preheating the baking sheet when making short pastry (1). Different equipment was used to whisk whites. Testing revealed the best results, and was therefore the most suitable equipment for making the meringue for a pie (2). The student explains how they formulated and followed a process flow diagram showing processing operations and tests for making a pie crust (3). The explanation includes the value of establishing a processing sequence. This was also done for other parts of the pie making process. The student explains differences between classroom and industry processing (4) and health and safety regulations (5). To reach Merit, the student should explain how processing operations achieve the desired outcomes. For example, they could explain how rubbing in butter makes the short pastry moist, crisp and crumbly.

[1] Making pastry for my lemon meringue pie

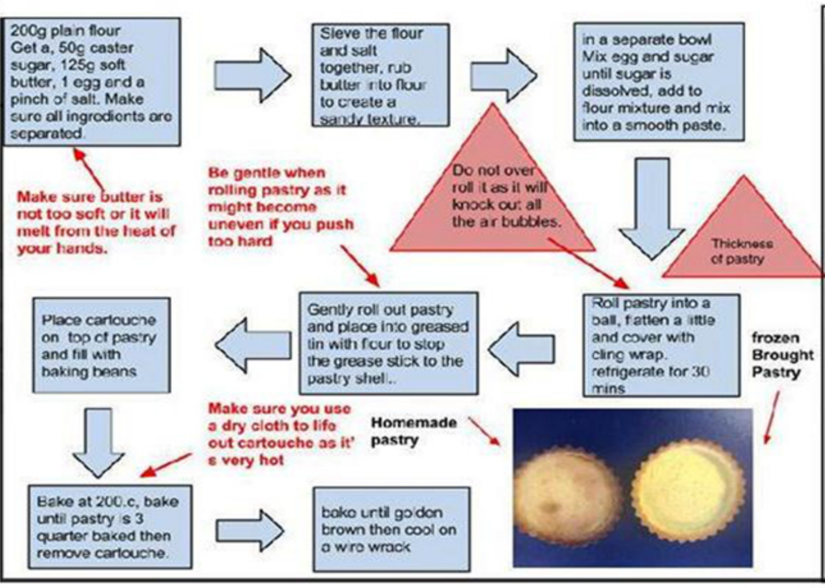
I have chosen to make short pastry:

- its not as fragile as flaky pastry and its easier to make
- it will not easily go soggy when the filling is added
- Rubbing in butter will make it nice and crispy and crumbly and give it some moisture
- I used my hands to rub in the butter—but the food processor might have been better because the blades are colder than my hands
- I will add sugar as this will make it sweet, which suits a dessert pie
- Adding egg makes the pastry richer, which suits my dessert pie
- Adding a small amount of iced water helps to bind the pastry together
- Sieving the flour adds extra air and makes the pastry lighter
- I'll make the pastry as quick as I can—too much handling will make it greasy, less handling will stop it shrinking
- Dusting the pastry with flour will prevent it from sticking
- Preheating the baking sheet will make the pastry crisper, which is what I want

Rubbing the flour into the butter to create a course breadcrumb like texture.

Chopping up the butter into smaller pieces to make it easier to rub in

[2] **Whisk an egg to the point where you can hold the bowl upside down** **Conclusion:** The **hand whisk** was probably most effective altogether. It was $34 cheaper than the **electric whisk** yet it gave a similar result, only it took a couple more minutes longer to whisk. The average time the **electric whisk** took to whisk was 1:30 minutes which is very time effective, the actual result of the egg white was very good as well. The average time the **hand whisk** took was 3:70 which is pretty good for time as well as the fact that it is way cheaper than the electric whisk. The **wooden spoon** was the worst in the way of time and result of the egg white. The egg white was very lumpy and curdled. The one group that managed to get close to a foam took 19 minutes to do it so it was a big waste of time for the result. The **spoon** was a terrible whisk because it has no holes for air to move through the egg whites so it took a very long time to incorporate air into it because air is what actually makes it foam. The fact that the **spoon** is wood as well also means that it will not conduct heat so the egg won't expand as fast. Although the **wooden spoon** was the second cheapest item, it was not worth it, even the **fork** proved to be a better whisk. The **fork** was the third fastest time to whisk which was an average of 5.20 minutes that is not that time effective and the result was also not really worth it as it was quite bubbly which means the air bubbles hadn't quite mixed with the egg white. Overall, the **electric whisks** result was the best along with the time but the **hand whisk**



I prepared a flow diagram so I knew the processing operations I would undertake and the testing I would do along the way. The arrows are there to show the direction the processes and tests need to flow in.

I have shown (in red text, because its important) how I need to test for the softness of the butter.

As well as identifying (again, in red text) it is important to be gentle when rolling the pastry, I should have identified the need to test by measuring the thickness of the pastry (also in a red triangle).

I should have more clearly shown some of the tests I needed to do (ie to make sure the texture is sandy, the sugar is dissolved, and the baking time gave the right colour). These tests could have also been in red triangles. This would have made it more obvious that I needed to do these tests. **[3]**

[4] Processing in the classroom compared to processing in industry

I found out that commercial situations generally seemed to just use scaled up versions of a recipe I would use in the classroom. That is, they will think of the flour as being 100%, and they will have lesser percentages for the butter, eggs, sugar, water. They will also follow a similar process (eg making sure the flour granules are covered in a good fat - to stop the gluten effect, etc)

The tricky bit is how they process to make a large volume. This is because making good pastry requires some important techniques - keeping the pastry cold, not overmixing.

The big mixers that would be needed to process large quantities can give off a lot of heat, can make it easy to overmix the pastry, and it can be tricky to add the right amount of liquid to get it to all bind together.

Unless bakers have got a really good mixer, they will often bake in batches. This makes it easier to control the amount of liquid that is added.

This pie making machine makes things a lot different to what we would be in class. It can be programmed to cut any size and shape, it uses what is called a relaxed application of pastry—this means that there is not the shrinkage problem that we have to overcome in class. It can measure the exact amount of filling - its hard for us in class to get the right amount of filling to match the pie tim size we are using in our kitchen.

It seems that lots of bakers still prefer to do the processing by hand (very similar to how we work in the classroom). They will weigh the mixture to the quantity needed for each pie shell and refrigerate it. It can be in the fridge for up to 3 days and in the freezer for a month. This is good for us at school too - we can make the pastry one period, keep it in the fridge and do the next stage the next period.

In class, we roll out our pastry. In industry, bakers will do this too, or some have pressers and cutting machines. Some will roll the pastry into a log, chill it, cut off circles etc. Some use a template for cutting the pastry to the right size.

To keep the larger quantity of pastry as cold as possible, industry will sometimes chill the flour in the fridge (we don't need to do that for the quantity we make in class). They will also chop up the cold butter and put it back in the fridge or freezer before they mix it into the flour.

Industry will take the scrap and mix it into the next batch. They don't want to have too much scrap as the pastry might end up being overworked.

[5] The difference between health and safety regulations in the classroom and in industry

In class, just like in industry, we follow a HACCP. This stands for hazard analysis and critical control point. It is used to identify, evaluate and control hazards. The HACCP that we developed for making our lemon meringue pie is based on what would be done in industry, as we want our food to be safe and suitable for eating.

The things I identified as being high risk include eggs—they can carry salmonella. I documented that I would throw away cracked eggs, and keep them in the fridge away from other ingredients. In industry, to be extra safe, they might use pasteurised eggs.

In industry, because the pies are being made for selling, there would also need to be guidelines about labelling, packaging, storage that we in the classroom don't have to be concerned about. This is to protect the food from contamination while it is being stored (ie to point of sale) , to let the consumer know how to handle it and also what ingredients are in the pie.

In industry where commercial machines are being used (eg cutters), there would also need to be guidelines about the safe use of these. Our teacher makes sure we know how to safely use the equipment in our classroom.

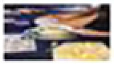
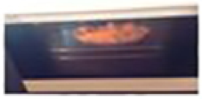
Industry would also need to have guidelines about toilets, hand basins etc. At school, these facilities are managed under other school guidelines. But we do have hand basins in the foods room for washing our hands.

Industry also has to keep a strict control of the health of their workers. Because we are eating the food ourselves and not selling it, school is not always so strict about that.

At school, we also follow the guidelines that are in the 'Safety in Technology Education' book.

	Grade Boundary: Low Achieved
5.	For Achieved, the student needs to demonstrate understanding of advanced concepts used in processing. This involves: • describing processing operations and identifying their impact on the resulting outcomes • describing the nature of specific tests used in processing operations • explaining visually how processing operations and tests can be combined in a processing sequence • explaining the differences between processing in the classroom and processing in industry • explaining the differences between health and safety regulations in the classroom and industry. This student describes some processing operations involved in making short pastry for a lemon meringue pie. The impact on the resulting outcomes is sometimes described (1). The effect of adding sugar at different times when processing egg whites to make meringue is tested. The resulting outcomes are described (2). Part of a processing sequence is presented (5). The student explains how they used it when combining processing operations and tests to make a lemon meringue pie (3). The explanation includes how it might need to be presented differently in industry (4). The student also explains the differences between processing and health and safety regulations in the classroom and industry. For a more secure Achieved, the student could describe the impact of other processing operations on the resulting outcomes. For example, the student could describe the impact of rubbing butter into flour, sieving the flour to incorporate air, refrigerating the pastry, running a fork over the lemon filling before putting the meringue on top, and ensuring the egg whites are separated from the yolk when making the meringue.

Student 5 Page 1: Low Achieved

[1] Sieve the flour and salt together, rub butter into flour   	Flour is sieved so air can be incorporated into the flour. It also removes any possible foreign bodies or compacted flour.
in a separate bowl Mix egg and sugar until sugar is dissolved, add to flour mixture and mix into a smooth paste.  	Sugar is dissolved in egg so the pastry doesn't have a gritty texture.
Roll pastry into a ball, flatten a little and cover with cling wrap. 	Pastry is refrigerated for 30 mins so it is easier to work with.
greased tin with flour to stop the grease from sticking to the pastry shell. 	Had a bit of trouble tapping the flour around the tin but eventually distributed it evenly.
Place cartouche on top of pastry and fill with baking beans 	This stops the pastry raising when it's cooking.
Bake at 200 degrees, bake until pastry is 3 quarter baked then remove cartouche.  	Pastry got a thin layer of liquid on top. The crust was golden and the bottom was undercooked. To help cook the bottom, I removed the cartouche because it was preventing it from cooking as fast.
Remove from heat when thick like custard 	I removed it just in time because in my practice, I always over cooked it and this made it too thick. This time I knew to take it off the heat before it over thickened.
Pass through a fine strainer to remove any lumps  	This also went well as the Lemon filling went straight through instead of sticking gluggy to the bottom of the sieve
Leave to cool. when put into pastry shell, run a fork over the top  	Lemon filling spread nicely, tried my best to get it even
separate the egg by cracking the egg in half and straining the eggs into a bowl by passing the egg between the two egg shells. 	Eggs separated nicely, there was no contamination of the egg yolk
Leave the egg whites to sit and become room temperature while you do the other components of the lemon meringue pie.	Egg whites at room temperature means they will whip quicker, as cold eggs are denser and that means they take longer to whip.

Add sugar at the beginning [2]	Very glossy texture but quite runny and the sugar granules hadn't completely dissolved into the mixture	
Add sugar at the end	Very runny and the texture was very very gritty so sugar had barely dissolved into the mixture, making it very unsatisfying. This was also the sweetest egg white.	
Add sugar gradually from the start	Firmer than A & B and the sugar granules had dissolved a lot more into the egg.	
Whisk until foam formed, then add sugar gradually	Very very firm, sugar granules were almost unnoticeable when rubbed between fingers. Meringue was able to be held above the head	

[3] I made up a processing sequence where I combined the processing operations and tests I needed to carry out to make a lemon meringue pie. I arranged it so that it showed the order in which I had to carry out operations. Alongside those operations, I added in what had to be done to ensure I got the quality I was wanting. This meant that tests had to be carried out. Another time, I think I would make sure I clearly stated the test I was carrying out. For example, I could state that you test the pastry for golden brown by comparing to a colour chart, and I should have added in the viscosity test I did for the filing etc.

The feedback loop column is there to show what needs to happen if, after testing, the desired result for that stage of the process is not achieved.

[4] The processing sequence I developed was good enough for me to follow in a classroom situation. In industry, the sequencing would often need to be a lot more detailed. This is to ensure consistency in the processing of the product, to guide new workers, to adhere to health and safety guidelines that need to be much tighter etc.

Method (cont.)	Feedback loop (cont)	Quality checks (cont)
sugar, juice of 2-3 lemons, lemon zest and 15g butter. Mix together until the mixture is smooth.		[5]
Cook the filling over a medium heat and stir constantly with a whisk until the mixture boils and becomes thick.	If lumps form in the filling, strain them out. If the mixture cannot be fixed, start the filling over again.	Constantly stir it so no lumps are formed. Push through a sieve if slightly lumpy.
Take pastry out of oven and remove baking rice and paper. Return to the oven and bake until golden brown (about 3-4 minutes), then remove from oven.	If the pastry is burnt, it may need to be made again. However, this will take a lot of time, so try to avoid it getting burnt.	Watch the pastry as this can bake quite quickly!
Pour the filling into pastry shell.		Pour the filling in evenly. Make sure filling is smooth, or the pie will be ruined, or you will need to make more filling.
Make the meringue topping by beating 4 egg whites until they are stiff and glossy but not dry.		Watch carefully to avoid over or under whisking.
Whisk ½ cup sugar in gradually, until the mixture is very glossy and thick.	If the meringue collapses, remake it.	Make sure the sugar is whisked in gradually or the meringue will be flat. Also ensure bowl is grease free or this will affect the meringue.
Spoon the meringue mixture over the pastry case and filling.		Spoon meringue on evenly- make sure the topping looks tidy and fluffy.
Place meringue pie in the oven and back at 190C until golden, but not over cooked. (This should take 4-7 minutes). Bake on a tray lower down in the oven to avoid the meringue getting burnt.		Watch carefully to avoid burning as this part cooks very quickly.
Once finished, take out of the oven and allow to cool on a wire cooling rack.		Cool with a wire mesh over top, to prevent insects from destroying the pie.
Once cool, serve.		

	Grade Boundary: High Not Achieved
6.	For Achieved, the student needs to demonstrate understanding of advanced concepts used in processing. This involves: • describing processing operations and identifying their impact on resulting outcomes • describing the nature of specific tests used in processing operations • explaining visually how processing operations and tests can be combined in a processing sequence • explaining the differences between processing in the classroom and processing in industry • explaining the differences between health and safety regulations in the classroom and industry. This student has focussed on potato based products. Processing operations associated with making fries (1), and the nature of some specific tests used in processing potato products (2), are described. A simple flow chart visually explains how processing operations and tests can be combined in a processing sequence for potato chips (5). The differences between processing fries in the classroom and processing in industry are explained (3). The student also explains differences between health and safety regulations in the classroom and industry (4). To reach Achieved, the student could describe a greater range of tests that are more reflective of the examples given in Explanatory Note 7 of the standard. A process flow diagram could have been presented that used accepted symbols and feedback loops to visually show how processing operations and tests can be combined in a sequence.

Student 6 Page 1: High Not Achieved

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[1] Processing operation	Result
Shaping and sizing French fries	This effects the uptake of fat. Thick cut strips absorb less fat than thin cut (because there is proportionately less surface area). Cracks and rough shapes s increase the fat absorption. Ideally all fries should be cut uniformly so they cook uniformly.
A large amount of waste water is produced during the production of French fries. This occurs during washing, peeling, blanching, slicing and trimming The equipment also has to be sanitised	This pollutes ground water. The waste water contains - dirt etc (from washing the potatoes) - peel and starch from peeling - small pieces of potato and starch from slicing/trimming The waste from sanitising (chemicals, fats etc) also contaminates the environment.
Drying French fries	This helps to reduce the fat uptake. Drying causes a skin to form on the surface and reduces fat vapour transport through the surface layer
Freezing fries – either by rapid freezing (cryogenically) or slow freezing (mechanically)	Rapid frozen chips have a lower fat content and better organoleptic (sensory) qualities. Also have higher moisture content. Better quality fries (slow freezing causes structural damage, ice deposits, melts on refrying and more fat gets in).

[2] Tests	Role
A clump of pompom mixture is squeezed	The mixture should stay together. If not, it hasn't got enough starch.
Colour tests	Pompoms should be dark brown after frying. If not, they need to ne fried more. Raw potato for fries and potato chips should be an even light colour. If not, the amoun t of starch in the potato needs to be reduced.
Snap test	This is used as a measure of crispimess of potato chips. The cooking time or amount of starch might need to be adjusted.

[3] Making fries at home/in the classroom	Making fries in industry
Potatoes are washed in the sink, dirt removed with a brush. A hand held peeler is used.	Because of the greater volume of potatoes being processed, high pressure steam loosens the skin and automated brush peelers remove it.
Any low quality potatoes would not be washed or peeled, they would be thrown away before that. Or the good parts of the potato would be used.	After peeling, low quality potatoes and foreign matter are removed.
At home we cut our chips by hand—we try to make them the same size. At school, we have a hand held cutter—it is like a square grid—the potatoes come out the same thickness but sometimes the lengths are different.	Potatoes are cut to size with a cutting machine. The type of fries wanted determines the system used to process ie a rotary mechanical slicer or a hydraulic system that throws them against cutting blades. Industry tires to get the same size fries, so that they evenly cook.
Any defects that are found after cutting are chopped out with a knife. These would not taste good and could cause illness.	An automatic defect-removal machine gets rid of any remaining imperfections.
At home/in the classroom we may not do the blanching stage that they do in industry—as we are not so worried about the colour when it is for home use. We use a clean lint free towel to dry of the potato before frying.	Blanching machines are used to remove sugars so that the French fries don't discolour.. After drying with air dryers, the fries are put on an equilibrium belt to balance the moisture.
We fry the potatoes once and then eat them straight away.	The potato is lightly fried then put in a freezing tunnel. They are refried before eating.

[4] The MPI (Ministry of Primary Industries) website states that manufacturers of food products that are to be sold for human consumption, will most likely operate under the Food Act 1981. To comply with this, manufacturers can either operate under the Food Hygiene Regulations which are administrated by the manufacturers local council or under a Food Safety Programme audited by an external expert. The 2013 food labelling guide would have to be followed. Also the Health and Safety in Employment Act 1992. because we are consuming the fries ourselves, we don't have to adhere to these regulations in the classroom. But we do follow the guidelines as set out in the Technology safety manuel.

The Chip Group is a group of companies (including Potatoes New Zealand) who are involved in the chip industry. They, along with the Heart Foundation, have established a set of standards for deep fried chips to help improve their nutritional value and quality, while still retaining a delicious flavour and texture. The standards promote thicker chips (less fat), keeping fryer topped up with oil, filtering it, covering oil when not in use, disgarding when degrading, using the 'good oil' (below—28% saturated fat, 1% trans fat, 3% linolenic acid), keeping oil at the right temperature (175/180 C for 3-4 minutes), draining off

[5] Gather Potatoes required weight & shape of fresh potatoes that have the desired sugar and starch density	Check for too many blemishes, bugs, too much 'green' - disgard
↓	
Storing the potatoes Fresh potatoes will keep longest when stored in a cool, dry, dark area with good ventilation	Check temperature. Ideally, storage areas should range between 5-10° C.
↓	Control the feeding speed and the quality of potato as they go into the production line.
Rough Washing	Wash away the dust on the potatoes
↓	Control the quantity of cleaned potatoes into peeler
Peeling Peel the skin of the potato	Check for efficiency and amount of peel loss
↓	
Inspection Conveyor	Check the quality of peeled potato. Defects need to be removed
↓	
Slicing	Check that the slices are of uniform thickness
↓	
Washing of the Starch Wash potato chips by warm water in order to prevent dark fried potato chip	Test chips for starch level
↓	
Water Draining Conveyor Draining the water in the potato chips in order to promote the frying quality.	Check moisture content
↓	
Frying By automatic conveyor fryer Will depend on thickness and desired outcome	check oil quality – free from pesticides, fatty acids, sediment, check oil absorption rate
↓	
Oil draining and cooling By conveyor	
↓	
Seasoning Spray seasoning evenly	