SASTA OLIPHANT SCIENCE AWARDS

SOUTH AUSTRALIAN

Prize Winner

# Scientific Inquiry

# Year 7-8


## Zoe Curtis

## St Peter's Girls' School

# Can you fry an egg on a slippery dip?

Zoe Curtis, St Peters Girls, Stoneyfell (1938 Words)

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# Questioning and Predicting

## Hypothesis

If the temperature is above 38 degrees Celsius, then the heat energy stored in a playground slide will be enough to cook an egg that sits on its surface.

A secondary hypothesis is that if the temperature is above 38 degrees Celsius, then it would be possible to cook an egg on the sidewalk.

## Prediction

I am predicting that it is possible to cook an egg on a playground slide within one hour. I predict that an egg will cook on the sidewalk in a shorter timeframe.

# Planning

I chose this method of investigation because there was a heat wave in Adelaide which gave me the idea to test if the myth about cooking eggs on a slippery dip was true. I used the opportunity to also record data for sidewalk materials to test if cooking an egg on the sidewalk was possible. I selected some materials that slides [Ref 5] and pavements are made of to test my theory. My dry run of the experiment was very messy as the eggs slid straight off the slippery dip onto the ground. I adjusted my method to use egg rings so that the eggs did not run off the surfaces and I placed all the material surfaces in the direct sun so they would absorb maximum heat. This would also make sure that my experiment was fair and consistent on all surface materials.

My investigation is a fair test because all the materials that were used in my investigation were placed in the sun at the same time and given the same period to warm up. The eggs were then all added together to their materials at the same time (12:30pm). All eggs had an equal chance of cooking and were only removed if they met the definition of cooked [Ref 8]. All materials experienced the same temperature fluctuations and sun exposure throughout the experiment.

### Independent Variable

The independent variable in this experiment is the materials that I am using to cook the eggs.

### Dependent Variable

The dependant variable in this experiment is the time that it takes for the egg to be defined as cooked.

## Controlled Variables

*Table 1 Controlled variables table*

| Controlled Variable | How it will be controlled | Why it needs to be controlled |
|---|---|---|
| The ambient temperature conditions. | All of the surface materials were placed in the same spot in the sun so that they always experience the same weather conditions. | This needs to be controlled because if one egg has a heat fluctuation and the rest do not then the data will be invalid and inaccurate. |
| Keeping all the eggs on their materials. | I will use egg rings to stop the eggs from running off of their designated materials. | If some of the eggs run off their surfaces and some do not then the ones that do not will have a longer and a better chance to cook which would result in unfair advantages to some of the materials in the experiment. |
| Having all eggs start at the same temperature. | I will have all the eggs in the fridge at a set temperature so that they can start at the same temperature. | This must be controlled because if one egg is considerably warmer than the rest it will take less time to reach its maximum temperature and take less time to cook resulting in invalid data. |

# Conducting

## Setup

1. Gather experiment materials.
2. Install egg barrier on the slide.
3. Layout the material cooking surfaces in direct sun (Solar Oven, Frypan, Pavers and Metal Sheets)
4. Take eggs out of the fridge 1 Hour before the experiment starts.

## Experiment Conduct

Experiment conduct time: 2 hours and 30 minutes

1. Measure and record the temperature of each cooking surface every 30 minutes for the duration of the experiment.
2. After taking the fourth set of temperature measurements. Add an egg to each surface.
3. Measure and record egg temperature in addition to cooking surface temperature at each data point.
4. When recording temperature, any egg that meets the conditions for being cooked is to be removed. The definition of cooked to be used in this experiment is "*...Cook until the whites are completely set and the yolks begin to thicken but are not hard.*" [Ref 8]

# Equipment and Materials

The materials required to repeat this experiment are as follows (see Figure 1):

- 1 x Solar Oven (Wired, 2021, Ref [6])
  - Glad Wrap
  - Aluminium Foil
  - Cardboard box
  - Tape
  - Bulldog clips
  - Insulation foam
  - Cooking Tray
- Safety
  - Sunscreen
  - Hats
  - Sunglasses
  - Gloves
- Experiment
  - 1 x Frypan with glass lid
  - 1 x Sheet Aluminium
  - 1 x Sheet Stainless Steel
  - 1 x Dark Coloured Paver
  - 1 x Light Coloured Paver
  - 6 x Slides (of various materials)
  - 7 x Eggs
  - Spatula
  - Knife (for cracking egg)
  - Paper Towel
  - Compostable Rubbish Bags
  - Notebook
  - Pen
  - Camera
  - Wooden boards (optional to protect surfaces)


*Figure 1 From Top Left, 1. Constructed Solar Oven, 2. Cooking Utensils, 3. Cooking materials laid out in the sun, 4. Solar oven materials*

# Processing and analysing data and information

The experiment data analysed in this report was captured March 11th, 2024. The long weekend was forecast for above 40 degree temperatures and met the conditions for attempting to fry an egg on a slippery dip or sidewalk. Due to issues with glare in test attempts the metal materials were painted with a strip of black spray paint because after further research it was found that this would stop glare and allow the infrared thermometer to get a reading. Before the eggs were placed the metal sheet could be tilted to reduce glare and measurements were taken for the black and unpainted surfaces for comparison. The raw data measurements are available in Appendix A – Raw Measurement Data.

The experiment was started at 11:30am with all materials placed in the sun. All materials were left to absorb heat for one hour and temperature readings were taken at 12:00pm and 12:30pm. During this time a survey of local playground slide temperatures was taken to get readings for a different range of slides. After the 12:30pm reading the eggs were all cracked onto the materials. Due to the heat, for safety reasons, the eggs were only checked every half hour, all participants stayed out of the sun in the cool. In the five graphs showing the materials, eggs and air temperatures compared to each other it can be seen that in all of the graphs materials started around the same temperature. As the day continued every material reached its peak temperature at the 12:30 reading. At the time of the 1:00pm and 1:30pm readings there was cloud blocking the direct sun and a breeze.


*Figure 2 Eggs being cracked onto various slide and sidewalk sample materials during experiment*

The temperature results for the slide materials of plastics and metals were not what were expected. Before the experiment, I expected that metal slides would get hotter than plastics slides based on metal being a better heat conductor. On review of the data the steel sheet of metal [Figure 4] stayed only a few degrees above air temperature, this is due to the thermal conductivity properties of the steel and its ability to transfer heat to the surrounding air. Plastic takes more energy to heat up but stores a lot more energy than metal slides [Ref 26]. The aluminium sheet [Figure 3] measured at higher temperatures in direct sun. In the readings at 1:00pm and 1:30pm where there was increased cloud cover and wind the aluminium measured less than 10 degrees above air temperature. The egg temperature on the metal sheets was only slightly above air temperature after one hour in the sun. To cook an egg, the egg needs to reach a temperature of approximately 70 degrees Celsius [Ref 8]. After one hour, the egg temperatures on the metal sample materials did not reach a level that would be able to cook an egg.

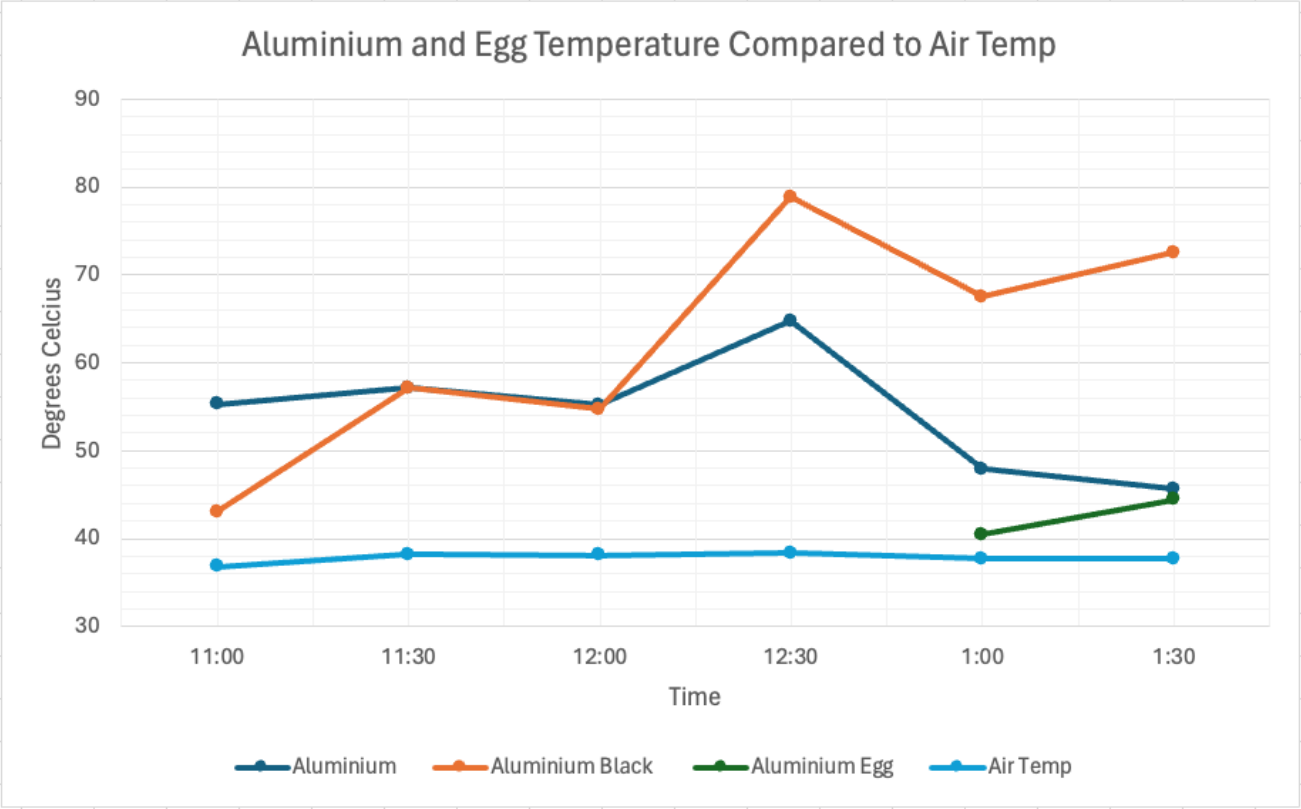


*Figure 3 Measured Aluminium Sheet and Egg Temperatures compared to Air Temperature over Time*

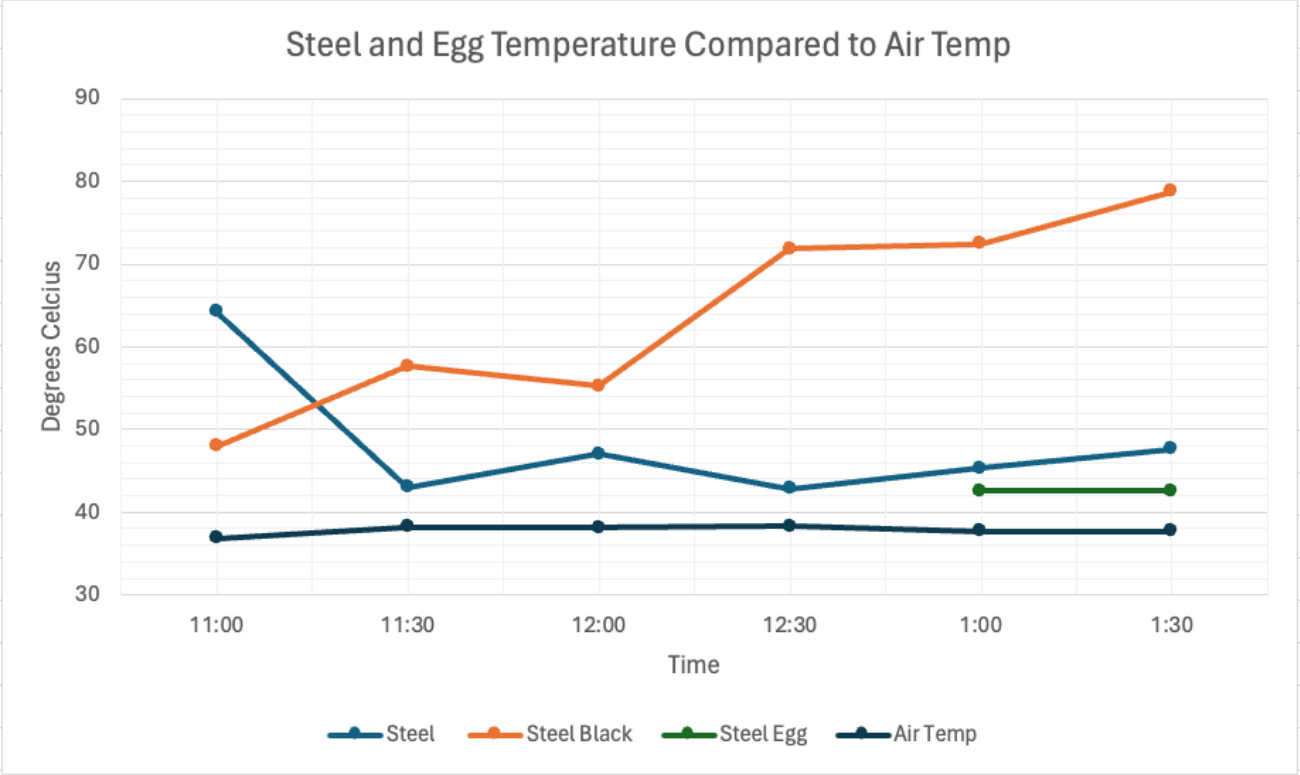


*Figure 4 Measured Steel Sheet and Egg Temperatures compared to Air Temperature over Time*

The temperature readings for the sidewalk materials of road and pavers [Figure 5, Figure 6] showed that the dark paver measured the highest temperatures. The dark paver increased the egg temperature more than the light paver. The road surface measured at temperatures between the light and dark paver. Although an egg was not cracked on the road, based on the dark paver egg not meeting the definition of cooked, it is expected that an egg would not have cooked on the road in the same conditions.

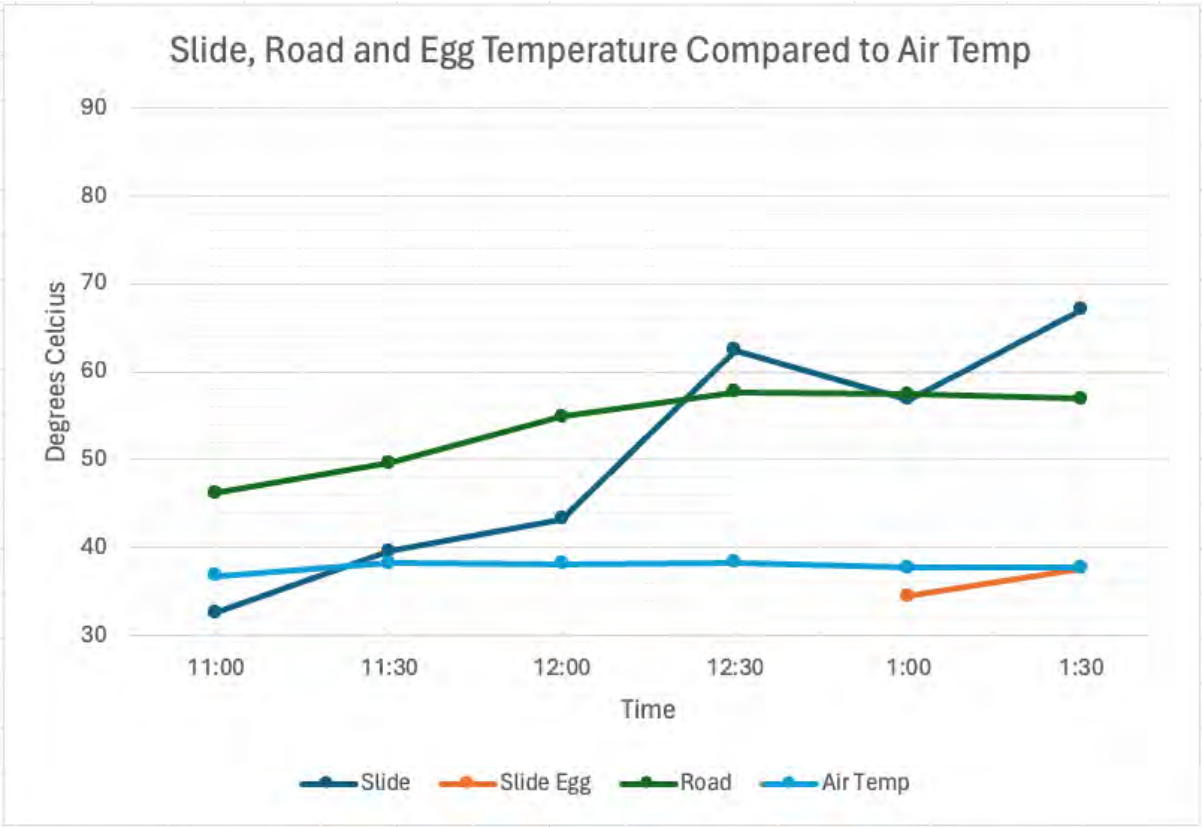


*Figure 5 Measured Slide, Road and Egg Temperatures compared to Air Temperature over Time*

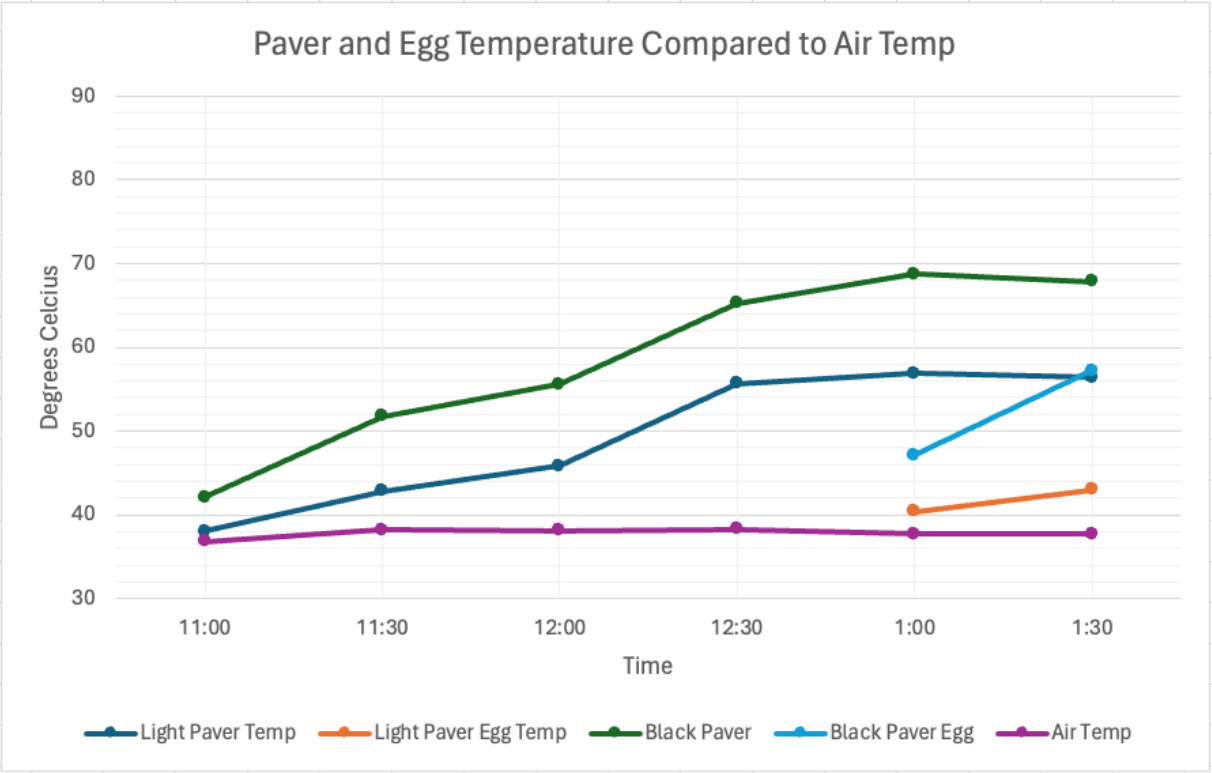


*Figure 6 Measured Paver and Egg Temperatures compared to Air Temperature over Time*

For comparison to the slide and sidewalk materials, two conventional cooking methods were included in the experiment. A constructed solar oven using reflected sun radiation and a household frypan with glass lid. These two methods of cooking an egg in hot weather were the most effective. The temperature readings [Figure 7] clearly show the higher temperatures each of these methods was able to reach. The egg temperatures for the fry pan were in the range suitable for cooking an egg, the solar oven egg temperature was comparable with the dark paver egg temperature. In researching the science of cooking and heat transfer [Ref 13, 15 and 25] it is likely the different results can be credited to the fact that the solar oven and fry pan both had lids and used convection in addition to radiation and conduction heating methods.

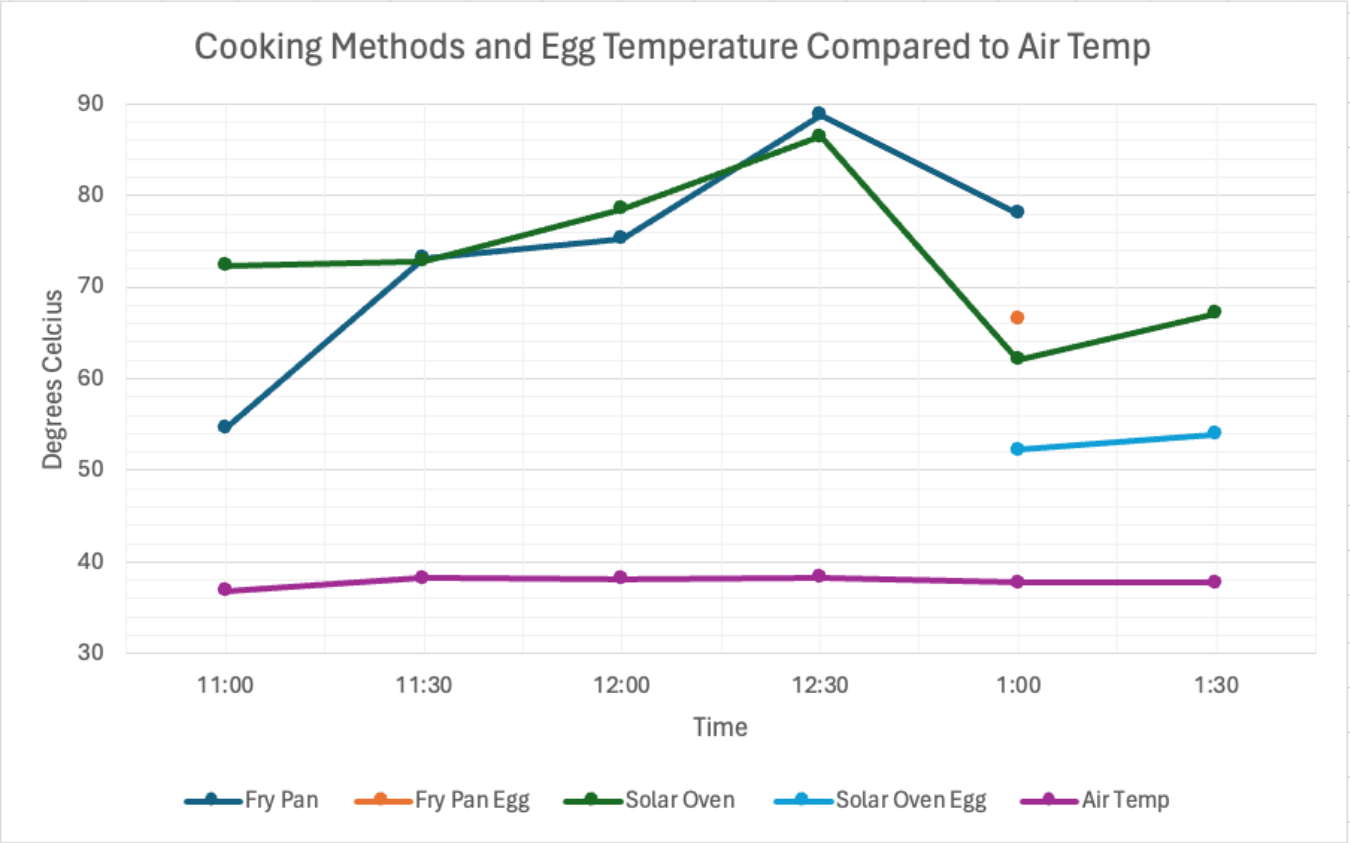


*Figure 7 Measured Fry Pan, Solar Oven and Egg Temperatures compared to Air Temperature over Time*

When the final results of the three highest temperature materials are compared the dark paver egg shows no real visible signs of being cooked. The solar oven egg shows signs of protein denaturation [Ref 14] which changes the structure of the protein in the egg white. This egg with more time was likely to have completed cooking. The egg that was in the frypan met the conditions for being cooked at the first reading after it was placed [Figure 8]. This egg was removed after 32 minutes sitting in the sun.


*Figure 8 Egg cooked outdoors in hot weather - frying pan*

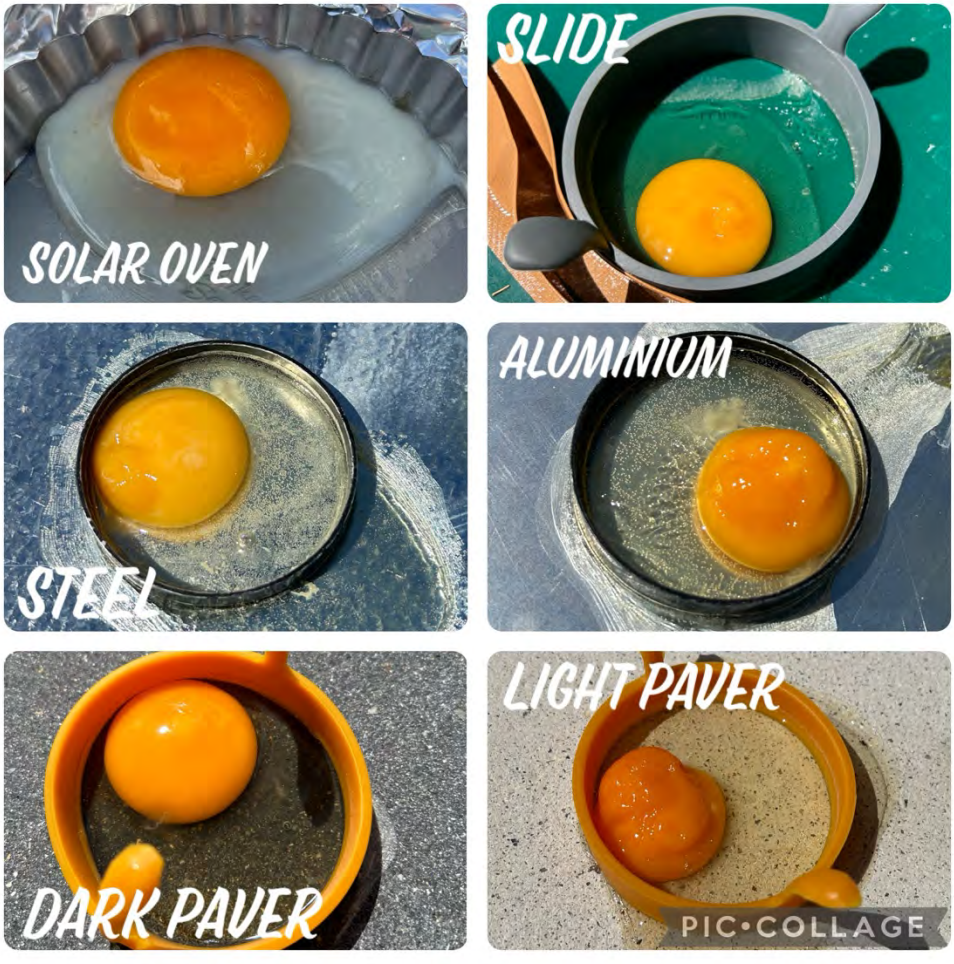


*Figure 9 Remaining eggs at completion of one hour on selected cooking materials*

The conclusion can be made that it is almost impossible to cook an egg on a playground slide or a sidewalk. Unfortunately, this does not support my prediction because I expected that you could accomplish both within less than one hour which is shown to be incorrect.

When analysing the data related to slide temperatures [Figure 10, Figure 11] it was observed that plastic slides measured at higher temperatures than metal slides, with the highest temperature 60 degrees Celsius. Plastic slides in full sun measured at more than 20 degrees Celsius above the air temperature. Based on this finding further research was completed to understand whether using a slide at that temperature could cause burns.

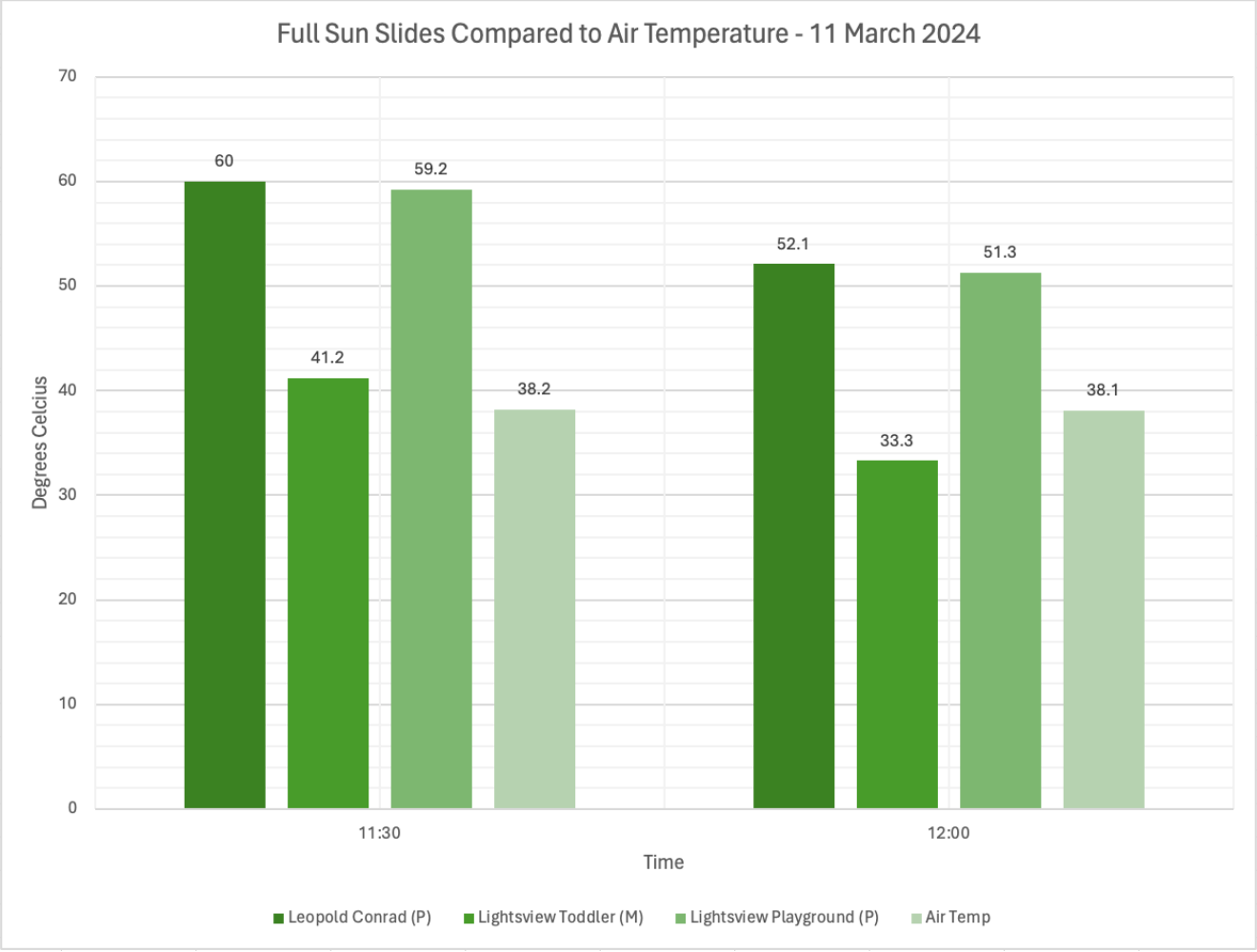


*Figure 10 Slide temperatures measured at local playgrounds with slide in full sun compared with Air Temperature*

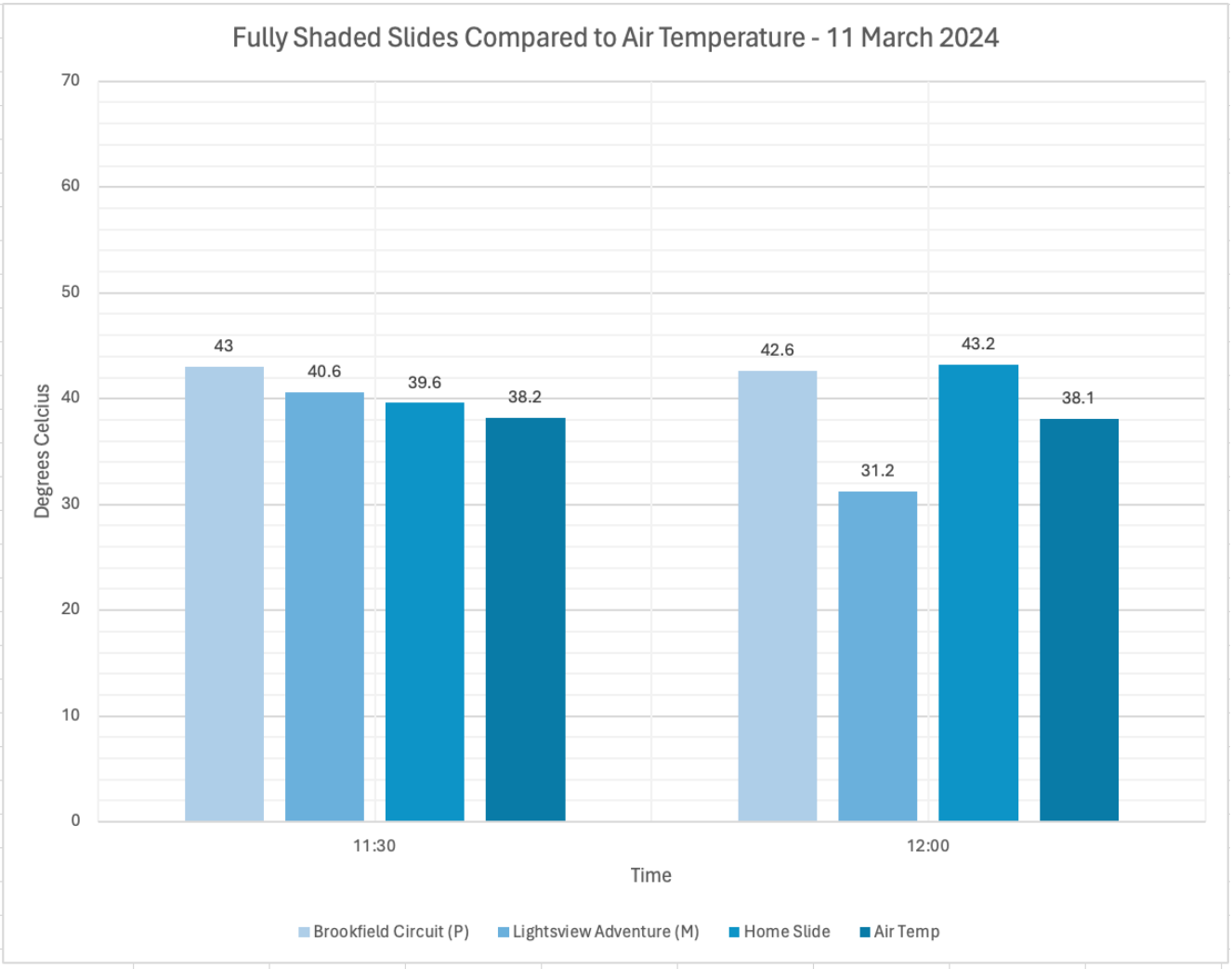


*Figure 11 Slide temperatures measured at local playgrounds with slide in shade compared with Air Temperature*

# Evaluating

To improve the experiment, I could test cooking an egg on a larger variety of materials and even take those materials to a place in the world that reaches hotter temperatures than Adelaide, for example WA's Onslow Airport with the highest recorded temperature in Australia, taken on the 13th of January 2022 at a temperature of 50.7 ºC [Ref 24]. Another improvement that may increase the chance of cooking an egg on a slippery dip may be to construct a cover for the egg to use convection as well as radiation and conduction methods for cooking.

My findings can be useful to others as the data showed a significant difference between the slide temperatures at playgrounds that had shade versus those that did not. Playground designers can use this information to help them make choices about the materials used for a slide or other playground equipment and the shade provided to reduce the risk of burns. I researched playground standards and contact burn standards [Ref 16-22] and then wrote a letter to the local council to share my findings and request to interview one of the playground designers. At our meeting I asked the council many questions about playground design and materials, learning about many ways that the council design playgrounds to be safe. I also shared my findings with the council about pain reaction times and how younger children take longer to register that they are feeling pain. The council also answered one of my important questions which was if a child had ever been burnt because of hot playground surfaces, and they had. A one-year-old child was burnt on a merry-go-round in the council area on a 27 degree day at only 10:30am.

Related questions that could be further investigated are: How often is there injuries to playground users that relate to burns? Is there recorded evidence of someone cooking an egg on a slippery dip, road or sidewalk successfully?

# Conclusion

With the temperatures that are reached in Adelaide it is highly unlikely you would be able to fry an egg on a slippery dip cracking it directly onto the surface. Under the right conditions e.g. heat, surface material, a cooking dome and weather it may be possible that you could successfully Fry an Egg on a Slippery Dip. I would not recommend eating an egg off of a slippery dip though because after some further research [Ref 9, 10, 11] I have found that it would not meet the food safety standards and you never know who or what disgusting things have been on it.

# Appendix A – Raw Measurement Data

The following table captures the experiment data for the experiment run on March 11th, 2024. Eggs were cracked onto materials after the 12:30pm data reading. The Fry Pan egg met the definition of cooked at the 1:00pm reading and was removed. Therefore there is no reading taken at 1:30pm for the Frypan Egg.

| Time | Light Paver | Light Paver Egg | Steel | Steel Black^ | Steel Egg* | Black Paver | Black Paver Egg* | Aluminium | Aluminium Black^ | Aluminium Egg* | Fry Pan | Fry Pan Egg* | Solar Oven | Solar Oven Egg* | Slide | Slide Egg* | Road | Air Temp | App Temp | Wind Speed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11:00 | 38 | | 64.2~ | 48 | | 42.1 | | 55.3 | 43 | | 54.6 | | 72.3 | | 32.6 | | 46.2 | 36.8 | 33.3 | 19 |
| 11:30 | 42.8 | | 43 | 57.6 | | 51.8 | | 57.1 | 57.1 | | 73.2 | | 72.8 | | 39.6 | | 49.6 | 38.2 | 34.2 | 22 |
| 12:00 | 45.8 | | 47 | 55.2 | | 55.6 | | 55.2 | 54.7 | | 75.3 | | 78.5 | | 43.2 | | 54.9 | 38.1 | 33.5 | 24 |
| 12:30 | 55.7 | | 42.8 | 71.8 | | 65.2 | | 64.7 | 78.8 | | 88.8 | | 86.4 | | 62.4 | | 57.7 | 38.3 | 35.6 | 19 |
| 1:00 | 56.9 | 40.4 | 45.3 | 72.4 | 42.6 | 68.7 | 47.1 | 47.9 | 67.5 | 40.4 | 78 | 66.5 | 62.1 | 52.2 | 56.8 | 34.5 | 57.4 | 37.7 | 33.6 | 24 |
| 1:30 | 56.4 | 43 | 47.6 | 78.8 | 42.6 | 67.8 | 57.2 | 45.6 | 72.5 | 44.4 | | | 67.1 | 53.9 | 67 | 37.6 | 56.9 | 37.7 | 33.9 | 24 |

*Figure 12 Raw Data Temperature Measurements in degrees Celsius measured March 11th, 2024*

* Egg temperature measurements were taken from the egg white

^ The Steel Black and Aluminium Black measurements were taken from the painted black strip on the metal. In testing once eggs were on the surface it was difficult to tilt the metal to avoid glare and get a clear reading.

~ This reading identified in analysis looks to be an error in the reading likely due to glare from the steel

| Time | Brookfield Circuit (P) | Leopold Conrad (P) | Lightsview Adventure (M) | Lightsview Toddler (M) | Lightsview Playground (P) | Home Slide | Air Temp |
|---|---|---|---|---|---|---|---|
| 11:30 | 43 | 60 | 40.6 | 41.2 | 59.2 | 39.6 | 38.2 |
| 12:00 | 42.6 | 52.1 | 31.2 | 33.3 | 51.3 | 43.2 | 38.1 |
| | Shade Sail | Full Sun | Shade Sail | Full Sun | Full Sun | Shade | |
| | Plastic | Plastic | Metal | Metal | Plastic | Plastic | |

*Figure 13 Playground Slide Temperatures measured March 11th, 2024*

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    - Pg 26-29 Mixtures, Solutions and Solvents
    - Pg 36-37 Metals
    - Pg 60-63 Defining Materials, Plastics
    - Pg 70 Composites
    - Pg 122-125 What is Energy? Types of Energy
    - Pg 132-135 Heat, Heat Transfer
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# Journal Log Book

## Thursday March 7th, 2024

Today I started Oliphant brainstorming with my mum. I want to try a new category this year. I started brainstorming for Photography, Scientific Inquiry and Games using a mind map.

- brain storming – this year I started my mind map with categories and looked at the photography themes that interest me to get me started on ideas. I added thoughts, ideas and questions. Thinking about how to get timelapse photos of baking and the heatwave gave me the idea for this Inquiry. I completed my risk assessment.
- Things I am wondering about:
    - What are slippery dips made of?
    - How hot does it need to be to fry an egg?
    - What materials absorb the most heat from the sun?

## Saturday March 9th, 2024

Today is a heatwave long weekend. I completed hazard identification for my risk assessment and my parents agreed the hazards and safety measures. Using materials we have at home I made a solar oven and mum and dad helped with scrap materials to lay the items out in the sun by 10:30am. I wrote up my prediction. Below is my mind map of thinking to get me to the idea for this report and the different variables to try.

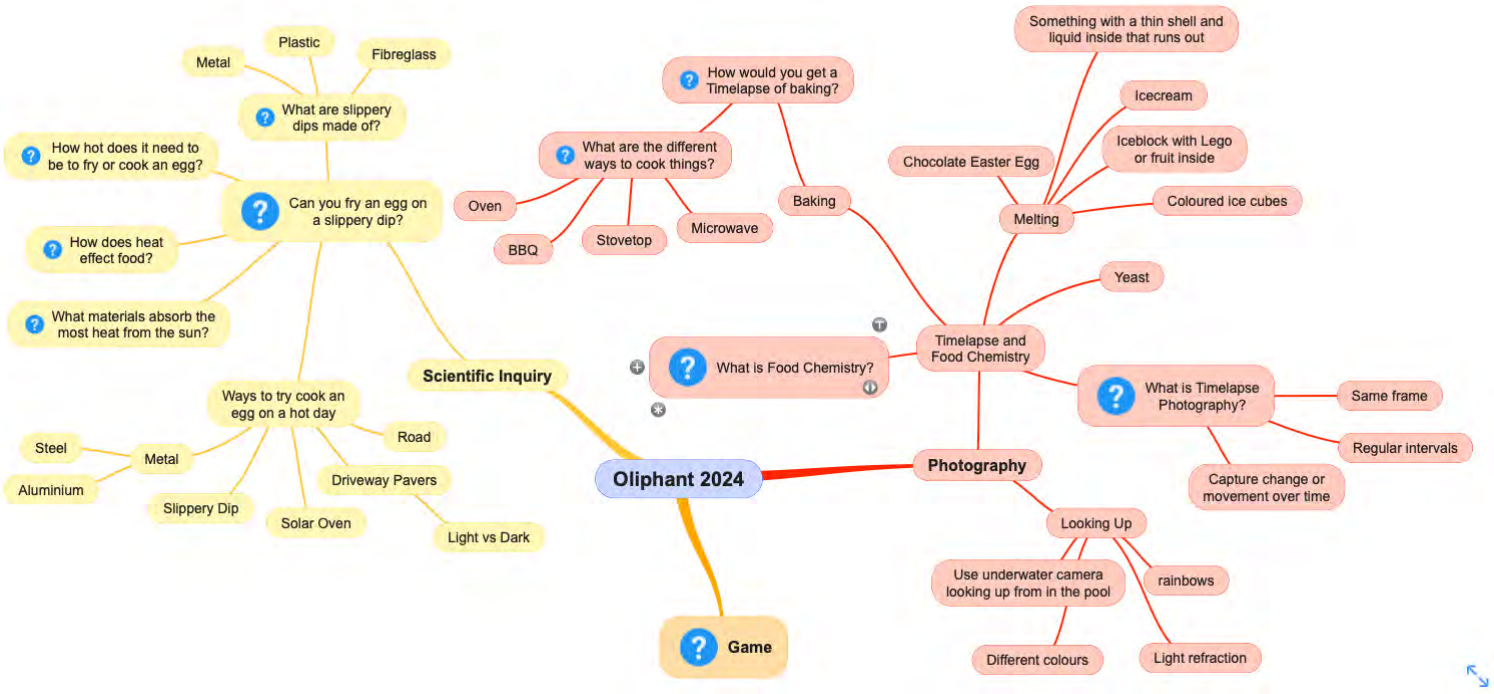


*Figure 1 10th March Brainstorming Mind Map*

While coming up with different slide materials I also decided to add in some other variables I was curious about as I have heard myths around it being “hot enough to cook an egg on the bitumen or car bonnet” on the radio. These materials are also around playgrounds. Mum and Dad said no to the car bonnet. The other hot day cooking idea I have tried before is a pizza box solar oven. I researched a different version of that concept to make the most of the heatwave (we didn’t have a pizza box in the recycling). The frypan is included as a comparison to more usual ways of cooking an egg even though it is just outside in the sun.

Key Decisions

- Should I try to flip the eggs for cooking? No the definition of cooked I decided to use was for the egg white to have turned white and I would accept some runniness in the yolk. Similar to sunny side up.
- Frying typically uses oil, I have decided I won’t put oil on all of the surfaces as I didn’t think this would make a lot of difference but it would make a lot of mess.
- Our home slide is partly shaded for most of the day. I have decided to put all of the materials in all day sun rather than near the slide, to allow them to have as much sun as possible and increase the chance of successfully cooking the egg.
- I will use the government Bureau of Meteorology data from our nearest observation point for temperature as that will be more precise than any equipment I have.
- I took the eggs out of the fridge and left them on the bench to come to room temperature one hour before starting to cook them outside.

Observations today –

- Wind and Clouds in the afternoon seemed to match temperature drops in the materials
    - Wind might have taken some of the heat or cooled the surfaces
    - Need to check the data
- Solar Oven – got the hottest. Cooked the egg and looked the best. Possibly due to having a cover. This solar oven design works better than the pizza box style solar oven I tried to make nachos with last year.
- After seeing how long the egg took to cook in the solar oven I decided not to put egg on the road. Leaving it on the road for over an hour is not very responsible and it would likely get driven over. I still took the temperature measurements and they are similar to the dark paver. For my curiosity on myth busting, I think Road would likely have a similar result to Dark Paver.
- Eggs cooked, but really slowly. Probably not in a way that would be okay for humans to eat and may make you sick. They didn’t look that good.

- Our Slippery dip is only in the sun for a short time and that is when it is hottest. When I cracked the first egg on it, it slid off. I tried to create a little plastic egg barrier but it leaked and after 10 minutes was blown away by the wind.
- The temperature reader had trouble with the shiny reflective surfaces of the steel and aluminium. By tilting the sheet away from the sun I could get a reading, once the egg was on the sheet I could no longer get readings as I was unable to tilt the sheet high enough without losing the egg.

Things didn't go to plan today for the slippery dip. I need to do some more research and to design an egg barrier for the slide. Will try the egg cooking again on Monday.

Things to research more

- Food safety with cooking eggs
- Analyse BOM observation data matched to egg observations and photos
- How heat works in the cooking process
- Playground slide temperature survey to get more data on different types of slides and their temperature.

*Figure 2 Road Readings and Egg Spread Challenges*

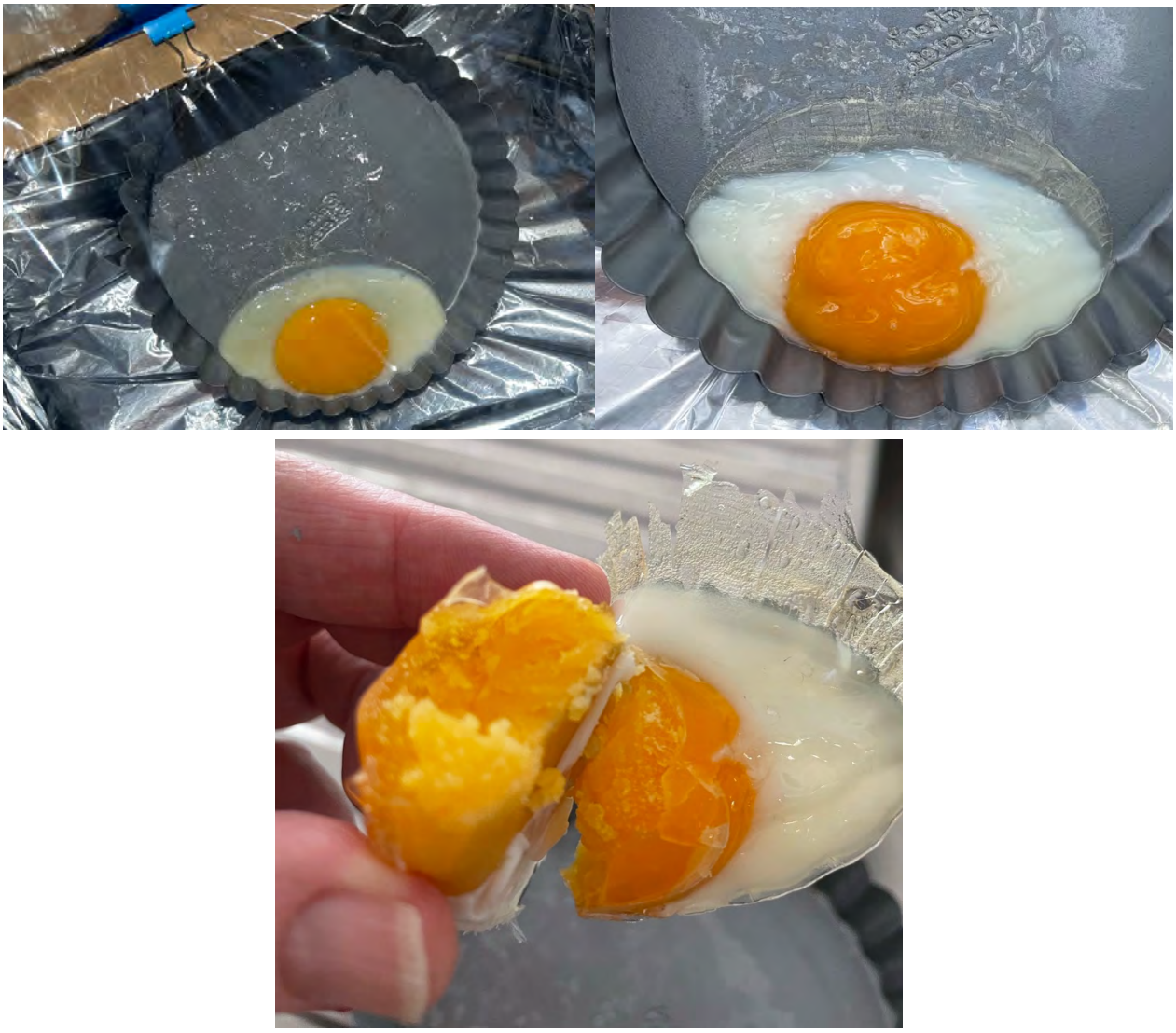

*Figure 3 Leaving the solar oven egg cooking until the end of the experiment led to the egg overcooking. Pic 1 was when it first met the definition of cooked, Pic 2 and 3 are at the end of the experiment*

*Figure 4 Egg Spread resulted in dry crusty eggs*

*Figure 5 Egg on Slide Take #1 = Fail, Take #2 With Egg Barrier 1 also failed*

# Monday March 11th, 2024

Full run of the experiment with minor adjustments from the trial run. I collected new data points for the slides in our area to see how the hot weather affected them compared to my slide at home. This extra data was needed to support testing my main hypothesis. I also managed to find a contraption that would keep the egg on my slide so that it did not fall off again. Overall it was a very successful day.

Key Decisions

- I decided to shorten the experiment because the data from Saturday showed each of the materials reached its maximum heat within an hour. Also from Saturday it was really exhausting spending so much time in and out of the hot weather. When I researched egg food safety this also explained the 2 hour/4 hour rule where food should only be between 5 and 60 degrees for a maximum of 2 hours in order to be considered safe to eat.
- Another modification I made to the experiment materials was to use egg rings to stop the egg from spilling. I noticed in the test run of the experiment the eggs spread very thin and they just dried out and became crispy.
- The new contraption to keep the egg on the slide was cloth tape doubled over to use as a barrier.
- In order to retain heat in the frying pan and make it more like the solar oven I added the lid to the fry pan for the actual experiment run.

- For the final experiment run I decided that when the egg met the definition of cooked I would remove it rather than leave it to continue cooking.

Observations today –

- I chose 5 playgrounds near our house that we could easily drive to with a mixture of plastic and metal slides. In the heat of the day in between egg readings my Dad drove me to each playground and I took a reading for each slide so that I had more slide data to compare to.
- I was surprised that because we used the egg rings the eggs were not as flaky and crusty.
- I was surprised that the plastic slides measured at a much higher temperature than the metal slides. However, only one slide had a heat warning sticker and it was the second metal slide that was in full sun.

Things to research more

- Why do they make slides out of plastic and metal? Could they find materials that do not get as hot on hot days?

*Figure 6 One of the local slides measured as hot at 60 degrees. That's Hot!!*

*Figure 7 Only one of the local slides had a warning sticker, it was one of the metal slides*

# Wednesday 17th April, 2024

Today I added all of the data I have collected in my experiments into Excel so that I can begin making my charts and graphs.

Observations today –

- After the eggs had been added the surfaces began to decline in temperature from there. I think this is because the heat transferred to the egg meaning that the eggs were cooking.
- I stayed outside for a much longer time on the 9th of March than on the 11th of March meaning that there is a lot more data for that day than the 11th

Things to research more -

- Heat transfer between different materials and surfaces.

# Thursday 18th April, 2024

Today I started charting all of my data, my layout for this was that in each graph I am putting the air temperature for that day which I found on BOM, the material I heated up and the egg once it was added on top. I had some problems with making the graphs because I recently learnt about trend lines in my science class at school and thought I would add some, but I was not sure what needed one and what type of trend line I should use. I have decided to ask my science teacher about trend lines and when to add one next science lesson.

# Friday 19th April, 2024

Today I continued making all of my charts and adding in the data. I also started adding notes onto the graphs I have already made about when the materials were in the shade and when the eggs were added on top.

Things to research more –

- I would like to improve my report to better meet the rubric so that I may be able to place higher in the scoring. To do this I will revisit my term 1 topic for science class which was to learn how to write a scientific report and see what I could improve on.

# Monday 22nd April, 2024

Today I did research on the topics that relate to my experiment that I could add to my report. Today I read about materials, heat energy and heat transfer. I found some interesting data in the articles I read.

Observations today –

- Plastic is an insulator and metal is a conductor and in my opinion this means that neither are good for slide materials because both properties lead to hot slides that can burn your bum

Things to research more –

- Why do they make slides from metals and plastics?
- How long does it take to burn your skin?
- How much heat would it take to burn your skin?

# Tuesday 23rd April, 2024

Today I did a lot, I started off by finishing my graphs so that I could add them to my report. After I had done that, I realised that I had not added or graphed the data that I had taken from local slides, so I copied that all in and began to graph it which did not take long because there was not a lot of data. When I was making my graphs and charts, I found it very difficult and frustrating to use Excel because I could never find the right spot to click in and eventually, I asked my mum to help point out the different areas in the chart that I needed to learn. When setting up the graphs I also tested different ways of laying them out before settling on one design. I had some difficulties deciding how to group the slide data I had taken, in the end I have grouped them with the slides in full sun together and the slides in full shade together to compare the differences that the sun makes on these surfaces.

Observations today –

- When reviewing the photos of playground slides only one slide had a warning on it about potential hot temperatures and it was the metal slide. I wonder if the council knows that the plastic slides get hotter than the metal slides in full sun.

# Sunday 28th April, 2024

Now I am getting into my research to better understand the results I see from the experiment. Research reading today - The science of cooking heat and cooking methods.

Dad helped with giving examples of the food I am used to eating for each of the cooking types. I was surprised by the braising being so effective. That is like the slow cooker meals we cook at home.

# Sunday 5th May, 2024

Today I did some journal tidy up where I had just included dot points. I finalised my entry submission with the school. Research and reading today on the science of how heat affects food.

# Sunday 19th May, 2024

Today I researched hot surfaces and what temperatures could result in a burn. My mum helped me access standards from different professional organisations. The standards were very long and some of the science was too complicated for me. My mum helped me understand and read the table of contents and showed me how to find the useful information that was related to my Inquiry. The Australian Standard for playgrounds included some guidance on risk and the materials that were acceptable for playground equipment. It did not include any details on equipment temperatures and skin burns. The temperature threshold standards explained the thresholds for burns for different

material types based on the amount of time the skin was in contact. I looked up our local council policies and they have a shade policy, the shade policy talked about ensuring general shade at playgrounds. I wrote a letter to the council asset planning department to see if I could interview them on the materials and standards they use and how they decide on the risks of burns in playgrounds. I found a workplace website that gave simple contact temperature guidelines and a standard (CENELEC Guide 29) that gave guidance on reaction times of children.

More data: I will go back to each of the playgrounds and time myself going down the slides to get an idea of how long skin would be in contact with the hot surface. I will do this on a cool day where the risk of burns is low.

## Sunday 9th June, 2024

- The council confirmed they are happy to be interviewed. I have arranged a time to meet with the city Asset Planners.
- This weekend goal is to complete the drafts of the Analysis, Evaluating and Conclusion sections. Ready for proof reading next weekend and then submission.
- Needed to do some more reviewing and reading on heat transfer and cooking methods to analyse the data.

## Monday 17th June, 2024

Today I visited the Port Enfield Council and met with playground expert Katherine Trzesinski from the City Assets team and Mayor Claire Boan. Whilst at the meeting we discussed many aspects of designing a playground and the consideration of injury. The questions I had sent them in my letter were discussed at our meeting -

1. Can you advise if the slide materials for metal slides are coated?
2. Does the council survey playground slide temperatures during hot weather to inform the Recreation Plan and Shade Over Playground Policy Assessments?
3. Which standard does the council use to assess the risk of burns from playground slides?
4. How does the council determine acceptable risks in playgrounds?
5. Does the council take into account that younger children's senses are still developing meaning that they take longer to recognise extreme heat and therefore can be easily burned from hot surfaces.

I learned quite a bit from Ms Trzesinski about these topics and enjoyed hearing about what the council deems an acceptable risk. A summary of our conversation is below-

- The new Largs Bay Playground will have a concrete slide (using new materials)
- Risk is in accordance with the Australian standard – not to stop broken bones and minor injuries but is to stop major head injury

- Risk is good in play and part of learning, it needs commonsense and adult supervision to guide children
- All playgrounds in the council area are visited once a week for smaller playgrounds, every day for larger ones and if needed to inspect any issues
- There was one case of a child being burnt on equipment (2014) addressed by council with additional coating materials added
- A slide temperature survey has not specifically been taken but a survey of suitable shade conducted in 2019 found a number of playgrounds needing additional shade
- Ms Trzesinski provided the outcomes report of the Shade Survey and three of the playgrounds in my survey were identified as needing more shade
- It is important in playground design to consider the orientation of the equipment, slides and swings are not west facing to avoid the long late sun. Typically they are placed to run north-south orientation
- Ms Trzesinski had not considered and was not aware of the delay in child reaction times but was interested in my findings from "CENELEC Guide 29 Temperatures of Hot Surfaces" that children under 2 can take as long as 15 seconds to react to temperatures hot enough to burn.
    - After I got home I researched the playground incident from 2014 and the child was a one year old who suffered serious burns

# Sunday 23rd June, 2024

Today I finished writing my report and my mum proofread it for me ready for submission.

# OSA RISK ASSESSMENT FORM

**for all entries in (✓) ☐ Models & Inventions and ☑ Scientific Inquiry**

**This must be included with your report, logbook or entry. One form per entry.**

STUDENT(S) NAME: Zoe Curtis ID:

SCHOOL: St Peter's Girls Collegiate School

Activity: Give a brief outline of what you are planning to do.

I am planning to bake eggs on different surfaces to test if you really can "fry an egg on a slippery dip." And to see if the myths about cooking an egg on a hot day are true.

**Are there possible risks? Consider the following:**

- Chemical risks: Are you using chemicals? If so, check with your teacher that any chemicals to be used are on the approved list for schools. Check the safety requirements for their use, such as eye protection and eyewash facilities, availability of running water, use of gloves, a well-ventilated area or fume cupboard.
- Thermal risks: Are you heating things? Could you be burnt?
- Biological risks: Are you working with micro-organisms such as mould and bacteria?
- Sharps risks: Are you cutting things, and is there a risk of injury from sharp objects?
- Electrical risks: Are you using mains (240 volt) electricity? How will you make sure that this is safe? Could you use a battery instead? **Only batteries can be used for Models & Inventions entries*
- Radiation risks: Does your entry use potentially harmful radiation such as UV or lasers?
- Other hazards.

**Also, if you are using other people as subjects in an investigation you must get them to sign a note consenting to be part of your experiment.**

| Risks | How I will control / manage the risk |
|---|---|
| High temperatures - | I will control this by using gloves, sunglasses, sunscreen and hats to protect myself from the sun and limit the time I spend outside |
| Heavy pavers - | I will control this by wearing enclosed shoes and getting my dad to help with lifting heavy objects |
| Using a laser - | I will control this by using the laser responsibly, not pointing it at any living things and by reading the safety manual |

(Attach another sheet if needed.)

**Risk Assessment indicates that this activity can be safely carried out**

RISK ASSESSMENT COMPLETED BY (student name(s)): Zoe Curtis

SIGNATURE(S): Z Curtis

☑ By ticking this box, I/we state that my/our project adheres to the listed criteria for this Category.

TEACHER'S NAME: Lené van Schalkwyk

SIGNATURE: LvSchalkwyk DATE: 29/4/24