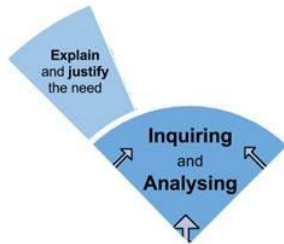# MYP Portfolio Scaffolds

Criterion (Part) A – *Inquiring and Analysing*
The Need

1. *Explains and justifies the need for a solution to a problem.*

> **You may satisfy this criteria and command terms in any way you can.**
> **Command terms here are: explain and justify.**
> - **Explain:** *to give a detailed account including reasons or causes.*
> - **Justify:** *to give valid reasons or evidence to support an answer or conclusion.*

Complete the following.

The problem is the number of people needing to fly between Sydney and Melbourne per year and the environmental impact of those flights.

My target audience is commuters travelling between Sydney and Melbourne who are train enthusiasts.

Australia's population is currently growing at a rate of 2.4%, greatly affecting the amount of transport needed. As the country's population count increases, a greater number of faster transport methods are needed to accommodate the people's needs. However, an increase in flights is extremely detrimental to the environment. According to Epic Flight Academy, the Boeing 737-800 burns up to 3,200 liters of fuel per hour. If Australia were to create only additional flights between Sydney and Melbourne, our fuel consumption, and therefore our impact on the environment, would be significantly higher. If we never implement a high-speed rail system such as a hyperloop or bullet train, especially in major cities, then the financial and environmental situation of Australia would be much worse.

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Commuters travelling to and fro between the cities of Sydney and Melbourne would greatly benefit from the implementation of a high-speed rail. At the current rate, it takes people 11 hours to travel between the two cities by public transport, says Rail Ninja. With the addition of high-speed rail, that time could reduce to less than 3 hours, assuming the distance to travel is 866km and a speed of 300km/h (the maximum speed of most modern Shinkansen). Such a change would allow commuters in Sydney to travel to Melbourne to, for example, attend a meeting and return by 3pm. Aside from commuters, the benefits of high-speed rail would also greatly affect the lives of others. High-speed trains tend to be much quieter than their traditional counterparts, mainly due to the use of magnetic levitation. These sorts of trains are also usually more energy-efficient, decreasing the amount of electricity needed for them to run.

https://www.abs.gov.au/statistics/people/population#:~:text=Australia's%20population%20was%2026%2C638%2C544%20people,was%20624%2C100%20people%20(2.4%25).

https://epicflightacademy.com/boeing-737-800/#:~:text=The%20737%2D800%20burns%20850,four%20hundred%20737%2D800%20aircraft.

https://rail.ninja/route/sydney-to-melbourne#:~:text=Sydney%20to%20Melbourne%20Train%20Information&text=Providing%20a%20fast%20and%20comfortable,mi)%20in%20about%2011%20hours.

https://edition.cnn.com/travel/article/worlds-fastest-trains-cmd/index.html#:~:text=While%20most%20Shinkansen%20currently%20operate,from%20Tokyo%20to%20Shin%2DAomori.

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Criterion (Part) A – *Inquiring and Analysing*
Research Plan

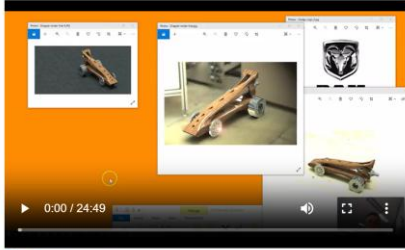
2. *Constructs a research plan, which states and prioritizes the primary and secondary research needed to develop a solution to the problem.*

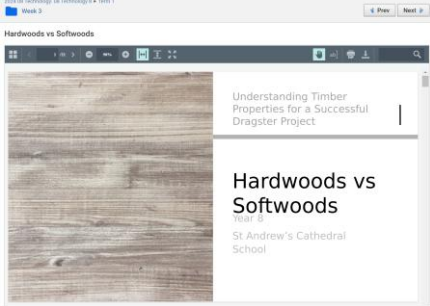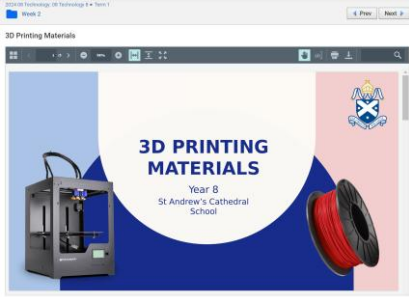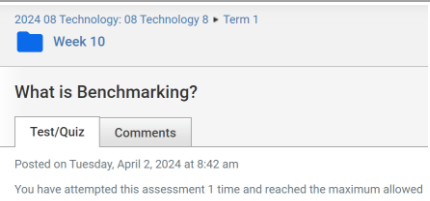> **You may satisfy this criteria and command terms in any way you want.**
> **Command terms here are: <u>state</u>, <u>prioritise</u> and <u>construct</u>.**
> **- State:** *to give a name, value or other brief answer without explanation or calculation.*
> **- Prioritise:** *to give relative importance to or put in an order of preference.*
> **- Construct:** *to display information in a diagrammatic or logical form.*

Complete the scaffold tables below or create your own.

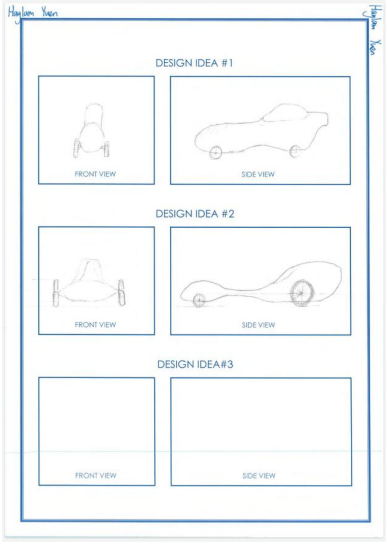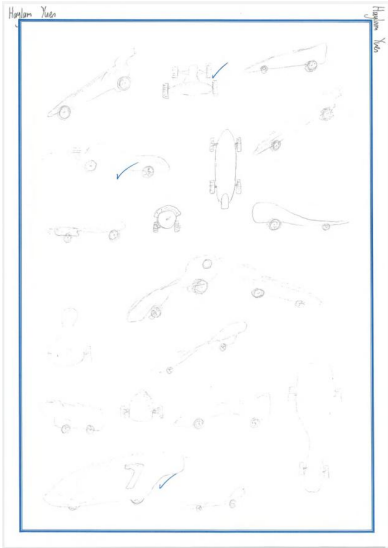| TEACHER DIRECTED Topic	Primary/ Secondary	Evidence of Completion (Photograph/Screenshot)	Priority (High/Medium/Low)	Importance
Dragster Tutorials	Secondary		High	Watching the dragster tutorials for Solidworks is very important because it will allow me to build a foundational understanding of how the software works so that I can then create my own unique dragster design. This is a good place to start because the videos are specifically meant for students making CO2 powered dragsters.

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Hardwoods vs Softwoods	Secondary		Medium	Watching this PowerPoint presentation about hardwoods vs softwoods is reasonably important. When making a dragster, you need to know what wood you are working with and choose the wood type based on your design specifications, however it is not necessary to watch this.
3D Printing Materials	Secondary		Low	This lesson about 3D printing materials and types of plastic filaments is low on my priority list because my final product was not likely to be 3D printed, and valuing the positive and negatives of the different plastics wasn't very important, but could still be useful to some extent.
OnGuard v3 NeXT GeN	Primary		High	Completing the OnGuard v3 NeXT GeN tests is extremely vital to making a dragster. This is because it is important to stay safe and not get injured in the workshop, and by completing the tests provided by OnGuard, I am ensuring that when I use workshop tools I do not hurt myself or anyone else in the vicinity.
"What is Benchmarking?" Test	Primary		High	The "What is Benchmarking?" test is quite highly placed in terms of priority, as it is crucial to set a standard when doing any sort of large project, especially when doing something like making

MYP Portfolio Scaffolds

					wooden dragsters. This test allows me to determine whether or not I had succeeded, and create a solid benchmark.
Paper Aeroplane flying activity.	Primary			Medium	The lesson about aerodynamics through a paper aeroplane flying activity is moderately important. It was not my main design criterion for my dragster to be very aerodynamic, but it would be quite useful to know the features of an aerodynamic object in order to meet that specific specification.
Learning how to use the Dragster Racing Machine.	Secondary			High	One of the most important aspects of creating a dragster is learning how to use the racing machine. One of my design specifications was to do with the speed of my dragster and it is also a lot of fun and helpful for my learning to know how to use such a machine. Therefore it is extremely important and of high priority for me to learn how to use the dragster racer.

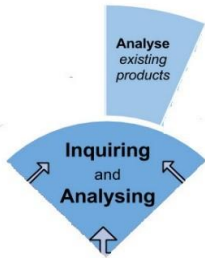| STUDENT DIRECTED Topic	Primary/ Secondary	Evidence of Completion (Photograph/Screenshot)	Priority (High/Medium/Low)	Importance

MYP Portfolio Scaffolds

Orthographic drawings of possible dragster designs.	Primary		Medium	Making some orthographic drawings of possible dragster designs would be reasonably helpful for me. These orthographic drawings can help me brainstorm some ideas of dragster that I could make. It also helps me in improving my technical drawing skills, which is a useful skill when making wooden dragsters as well as other technological projects. Despite that, you can still make a good dragster without this.
Isometric and Orthographic drawings of dragster ideas.	Primary		Medium	Similar to the orthographical drawings, the isometric drawings of dragster ideas is useful for generating a variety of possible designs for a wooden dragster. Although I still ranked it as "Medium" on my priority list because it is not necessary for what I am going to do. These pencil drawings are also only general pictures so they don't actually provide exact dimensions, meaning that if I will use one of the ideas then I will need to make additional drawings.

Analysis of existing dragsters using a "Plus, Minus, Interesting" (PMI) table.	Primary		Medium	Analysing existing products is an important part of the design process. By analysing existing dragsters, I will look at the positive, negative and interesting parts of the product. This will allow me to construct a wooden dragster from the various good ideas that I found on the internet. The resulting dragster will incorporate aspects of these existing products, ensuring that my final design is good. The PMI table is an easy way to organise these pros and cons. However I would still be able to create a viable solution without the need to analyse current dragsters, ranking this piece of research "Medium".

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Criterion (Part) A – *Inquiring and Analysing*
Existing Products

3. *Analyses a group of similar products that inspire a solution to the problem.*

You may satisfy this criteria and command terms in any way you want.
Command term here is <u>analyse.</u>
- Analyse: *to break down to bring out the essential elements or structure. To identify parts and relationships, and to interpret information to reach conclusions*.

	The dragster looks quite aerodynamic, as it seems relatively pointed, and it is carefully painted. It is also made from wood, which is the permitted material. However, the dragster is pink, which reduces from its aesthetic, and the thin wheels at the front might break. It is interesting how the front wheels have holes in them, which might make it lighter, and therefore more aerodynamic.

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This dragster has a conic shape and rubber-coated wheels, which makes it very aerodynamic, however it is not made of wood, which is the permitted material. Additionally, it has a very simple design which is not aesthetically pleasing. The car also has an extension on the back to fit the CO2 canister instead of a hole drilled into the body of it.

The train-styled dragster in this photograph seems like it is the right sort of size. It is also very detailed, so it is aesthetically pleasing. However, it is not particularly pointed, making it not very streamlined and it doesn't have a visible CO2 canister hole. It is interesting how this dragster has four wheels, which might help increase stability.

The dragster looks visually appealing, as it has an intricate design and a lot of detail. It also looks somewhat aerodynamic due to its shape, however the dragster lacks colour, which reduces from its beauty. This dragster design has rear wheels that are much larger than the front wheels, possibly providing better balance.

The dragster in this image looks like an eagle, which is very visually pleasing and aesthetic. However, the beak touches the ground, providing friction and less aerodynamics. The rear wheels being wrapped in more rubber than the front wheels is an interesting design choice that may help improve the dragster's stability when raced.

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	This design looks like an old-fashioned steam train, which is very aesthetically pleasing and it also seems quite sturdy. However, this design is not made of wood, and is too large to meet the required size specifications. Interestingly, it has a unique black and red colour palette.
	This dragster has a good design that looks carefully painted and has a cool colour scheme of green and orange. It also looks fairly aerodynamic with a conic shape. However, the wheels appear to be quite smooth, which could reduce from the dragster's speed. This dragster design has the wheels on the interior of the body, rather than the exterior, perhaps aiding in aerodynamics.

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Criterion (Part) A – *Inquiring and Analysing*
Design Brief

4. *Develops a design brief, which presents the analysis of relevant research.*

You may satisfy this criteria and command terms in any way you can.
Command terms here are: <u>develop</u>, <u>present</u> and <u>analyse.</u>
- Develop: *to improve incrementally, elaborate or expand in detail. evolve to a more advanced or effective state.*
- Present: *to offer for display, observation, examination, or consideration.*
- Analyse: *to break down to bring out the essential elements or structure. To identify parts and relationships, and to interpret information to reach conclusions.*

 Complete the scaffold below by filling in the blanks.

I have completed research on a variety of topics related to developing a solution to the problem.

The **teacher-directed** research topics will be useful because it helps me to understand the sorts of protective equipment that I need to wear when using various tools in the workshop, as well as the sorts of ways that I could utilise tools to create my dragster. Additionally, it can help me understand benchmarking and aerodynamics through a fun activity and teach me about the physics of my dragster. The teacher-directed research could assist me in making choices to do with the dragster's design, such as what material or type of wood it will be made out of, what aerodynamic shapes I implement, as well as how to race the dragster and test my final solution.

The **student-directed** research topics will be useful because it helps me to create ideas for which dragsters I can create. It is useful because it allows me to choose which dragster design I might like to make that are of my own creation, and develop original designs by looking at the positives and negatives of trains and dragsters that currently exist through a PMI analysis. Through this I will be able to find what I like about each design and combine all the best parts of each dragster idea to create a final solution that is much better than all the other ideas explored in the drawings and PMI analysis.

MYP Portfolio Scaffolds

In conclusion, my project will use all of my relevant research to create a solution to the problem that will please my audience, who are commuters travelling between Sydney and Melbourne who are train enthusiasts. I will create a dragster that conforms to the aspects that I want my final solution to have. Through the extensive research and analysing process, I will identify the ways in which I can make a good dragster that will solve the problem of my intended audience. I have 14 weeks to create this solution.

Criterion (Part) B – *Developing Ideas*
Specifications
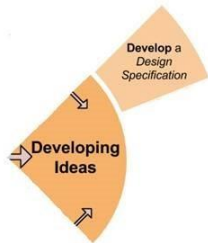
1.   *Develops a design specification which outlines the success criteria for the design of a solution/final product based on the data collected.*

> **You may satisfy this criteria and command terms in any way you want.**
> **Command terms here are: <u>develop</u> and <u>outline</u>.**
> **- Develop:** *to improve incrementally, elaborate or expand in detail.*
> **- Outline:** *to give a brief account or summary.*

 Use the scaffold below and answer the questions.

   A. **Who are you designing for specifically? What do you know about them that will help you design your design solution?**

   I am designing my dragster for commuters travelling between Sydney and Melbourne who are train enthusiasts. I know that these people have a great interest in trains, so I will make my design solution related to trains, which will interest these commuters and increase the quality of the transport service for commuters.

MYP Portfolio Scaffolds

B. Complete the table below. You can design your own table should you choose.

Success Criteria E.g., Size and Colour scheme	Outline specifics of this to your solution as decided in your brief E.g., It will be tall or short, blue, or yellow, etc.
Old-Fashioned Aesthetic.	My dragster will look old-fashioned, with a late-1800s-looking design. It will be mostly black, with some red and gold on it. To test this success criterion, I will create a Microsoft Form. Then I will post the link on Schoology and get my peers to fill it out.
Smooth Look.	My dragster will be not very angular, and instead have smooth features that do not look futuristic. I will see if this is true by making a Microsoft Form for my classmates to complete.
Eight Wheels.	In the end, my dragster will have 8 proper wheels, with four on each side of it. To test if the dragster has met this success criterion, I will count the wheels after the train is complete.
Speed of 4m/s.	My wooden dragster will have a speed of 4m/s or higher. I will test this by measuring the amount of time it takes for my dragster to complete the racetrack and the length of the track.
Hogwarts Express Design.	My dragster will look somewhat like the Hogwarts Express from "Harry Potter". I will determine if this criterion is met by interviewing a friend.
Remain Intact.	The dragster that I am creating will remain whole after the race with all the parts intact. I will test this by examining the dragster after the race and asking Titus and Mr. Pierotti if the dragster is intact.
Vinyl Stickers.	My dragster will have vinyl stickers that will add additional detail to my train dragster. To see if I have done this, I will create a survey, asking people to determine if I have put stickers on my dragster.
Hollowed Out.	The dragster that I will create will be hollowed out to increase its speed when raced. I will test this by interviewing Mahé and asking whether he thinks that my dragster is hollow or not.
50x80x200mm.	My planned dragster will have a minimum size of 40x70x200mm. This will make it structurally sound and conform to the dragster size guidelines. To test this, I will measure the dragster with a ruler.

Weight below 150g.	Once the dragster is complete, I plan it to have a weight at or below 150g. This is to make it more aerodynamic, and I will test this criterion by weighing it on some scales.

Criterion (Part) B – *Developing Ideas*
Design Ideas

2. Presents a range of feasible and possible design ideas, using an appropriate medium(s) and annotation (labeling), which can be correctly interpreted or understood by others (target audience).

You may satisfy this criteria and command terms in any way you can.
Command terms here are: <u>present</u> and <u>annotate</u>.
- Present: *to offer for display, observation, examination, or consideration.*
- Annotate: *to add brief notes to a diagram or graph.*

Complete the table below. You may create your own should you choose.

Draw <u>at least three</u> variations of your proposed idea below which are labelled (annotated) and are explained/justified. What does that consist of?

Annotated Design Idea	Explanation and Justification
1.	1. This dragster design is simple yet looks very good. It would be relatively easy to construct out of wood, due to

MYP Portfolio Scaffolds
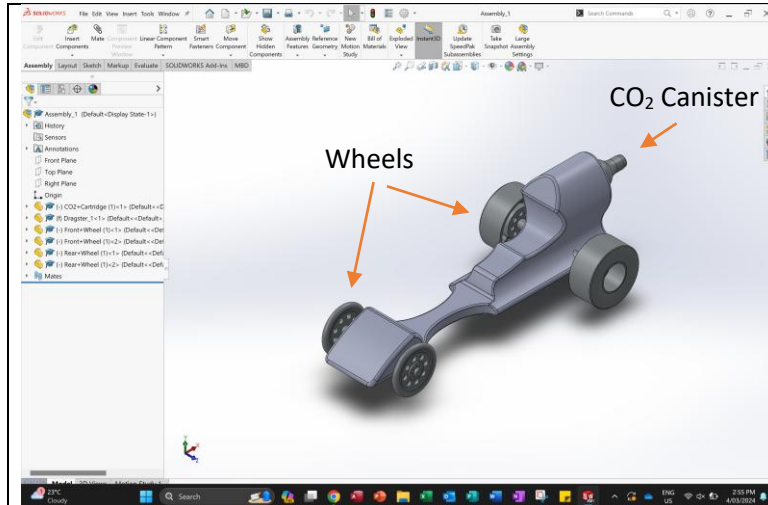
<table>
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CO₂ Canister

Wheels

</td>
<td>

most of the detail coming from the profile view, which can be easily cut with a bandsaw. Although it does not have a train theme, it would be quite aerodynamic and have an adjustable design. This dragster would feature wheels, a CO2 canister and a smooth design, which would help it be aerodynamic.
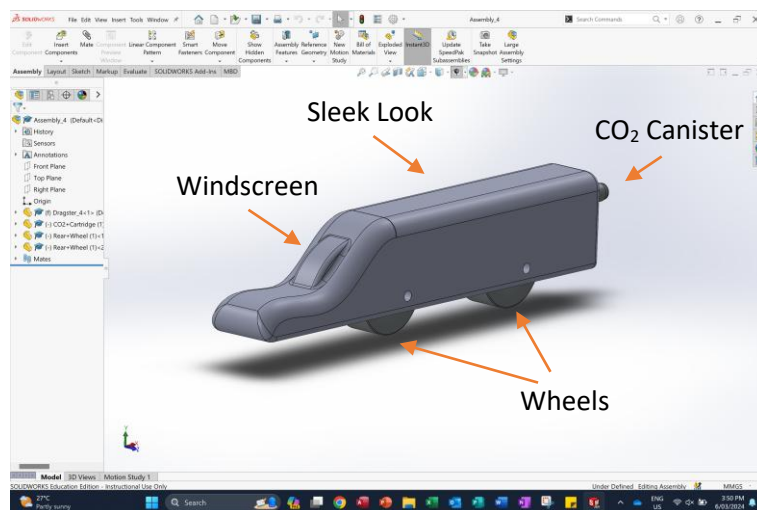
</td>
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2.

Sleek Look

CO₂ Canister

Windscreen

Wheels

</td>
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2.

The dragster design in this image resembles a Japanese Shinkansen train. Similar to the previous dragster, this train is quite simple and aerodynamic. The design specifications also state that the final design should be smooth, which it is, however this dragster does not closely resemble the Hogwarts Express from Harry Potter. This is a shell dragster, which would improve its aerodynamics, but possibly decrease its stability because the wheels are closer together. It will feature a sleek look, a windscreen, and a CO2 canister as well.

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3.

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3.

This dragster is shaped like an old-fashioned steam locomotive from the 1800s, so it conforms to one of my designs specifications. It also

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</table>
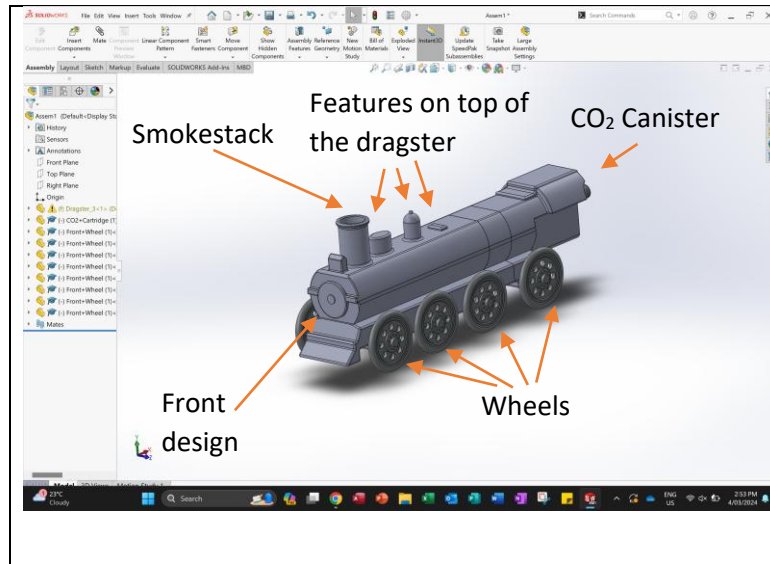
has eight wheels and is very detailed, making it quite aesthetically pleasing. This train will have features like a smokestack, CO2 canister, features on the train's top, a front design and wheels. Unfortunately, this train would be harder to carve due to its intricate design, but its high detail would also be a good thing as it conforms to one of my design specifications.

Criterion (Part) B – *Developing Ideas*
Chosen Design Idea

3. *Presents the chosen (final) design and outlines the reasons for its selection.*
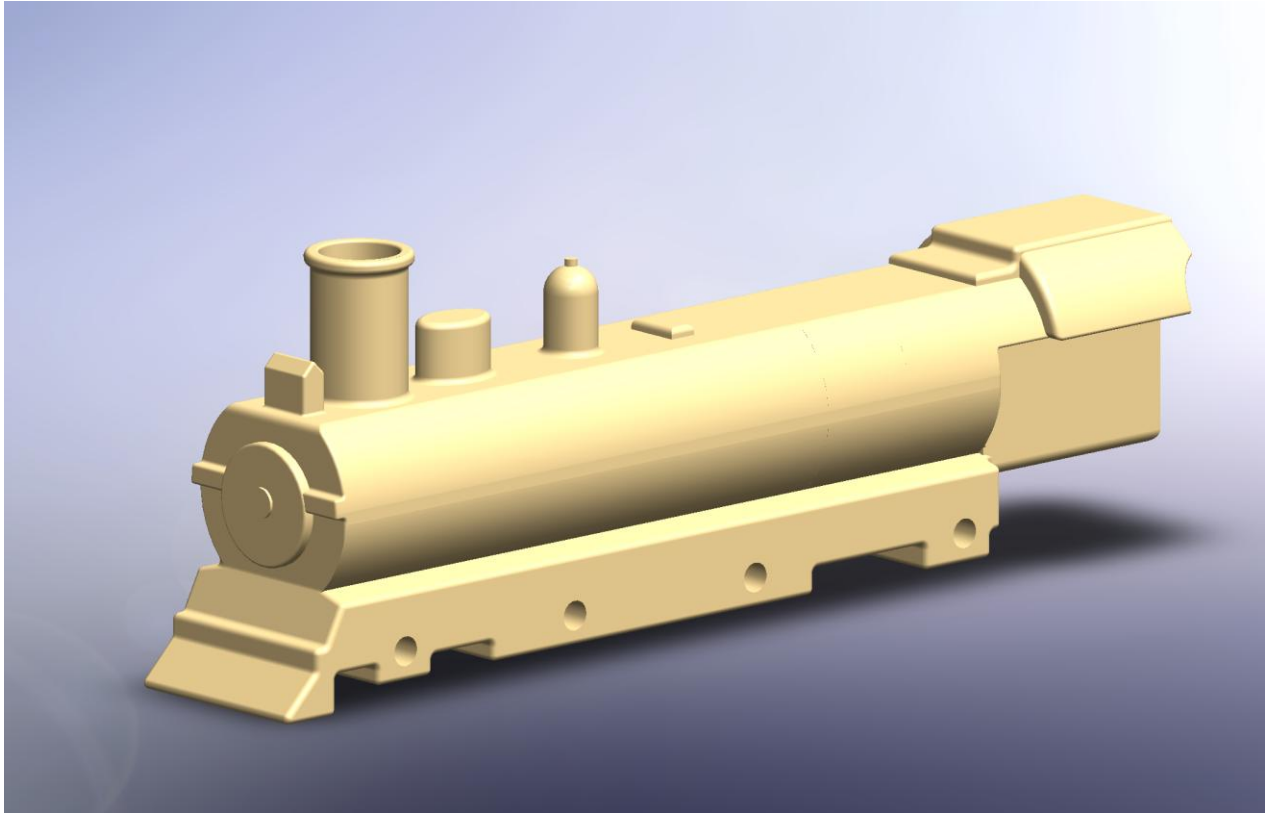

You may satisfy this criteria and command terms in any way you can.
Command terms here are: <u>present</u> and <u>outline</u>.
- Present: *to offer for display, observation, examination, or consideration.*
- Outline: *to give a brief account or summary.*

MYP Portfolio Scaffolds

A. Present the rendered (coloured) drawing you have chosen as your final design.


B. Outline why you have chosen this as your final design? (refer to your design specifications)

I have chosen this as my final design as it conforms to most of the design specifications stated at the beginning. It has a recognisable old-fashioned steam locomotive design. It is smooth and contains detailed features such as a smokestack, pilot and cab that were present in many 1800s steam trains. It also has four axel holes designed to hold eight wheels, and the general design of this dragster has a clean yet detailed look.

Although this is the hardest design to create out of wood, I chose this design because it is possible to carve, but would be challenging, and I thought that the finished look seemed the most aesthetically pleasing of all the dragster designs.

Criterion (Part) B – *Developing Ideas*
Planning Drawings/Diagrams
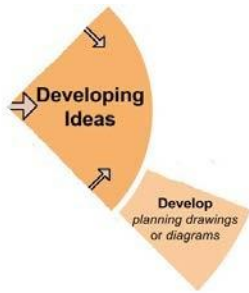
4. *Develops accurate planning drawings/diagrams and outlines requirements for the creation of the chosen solution/final product.*

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You may satisfy this criteria and command terms in any way you can.
Command terms here are: <u>develop</u>, <u>evolve,</u> and <u>outline</u>.
- **Develop:** *to improve incrementally, elaborate or expand in detail.*
- **Evolve:** *to a more advanced or effective state.*
- **Outline:** *to give a brief account or summary.*

Complete the following.

Place your <u>final product design</u> here.

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72mm

40mm

200mm
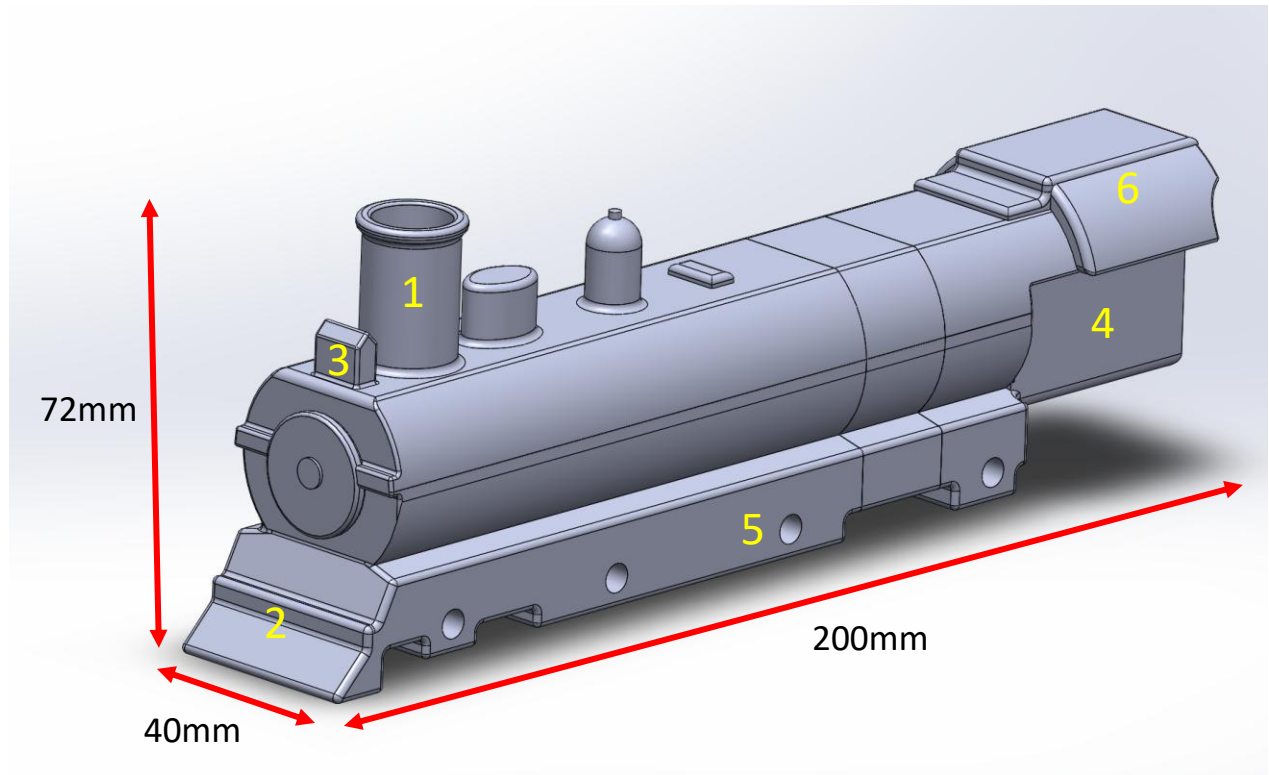
Materials:

- 240x45x90mm Wooden Block
- Front Wheels x 8
- Wheel Axels x 4
- Wood Finish

Features:

1. Smokestack
2. Pilot / Cowcatcher
3. Headlight
4. Cab
5. Axel Holes
6. Cab Roof

Criterion (Part) C – *Creating the Solution*
Logical Plan

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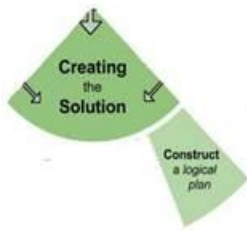
1. *Constructs a logical plan (how your product will be made), which outlines the efficient use of time and resources sufficient for peers to be able to follow to develop and create the solution/final product.*

You may satisfy this criteria and command terms in any way you can.
Command terms here are: <u>construct</u> and <u>outline</u>.
- Construct: *to display information in a diagrammatic or logical form.*
- Outline: *to give a brief account or summary.*

Solidworks:

| Step No.	Describe the step	Resources Needed	Time (min)
1	Use the function "Extrude Boss/Base" to create a rectangular prism of the dimensions 240x90x45mm.	Solidworks Mouse	10 minutes
2	"Cut Extrude" the profile and front view of the dragster.	Solidworks Mouse	15 minutes
3	Extrude details on the nose of the Steam Locomotive.	Solidworks Mouse	15 minutes
4	"Boss Extrude" the smokestack and features on the top of the dragster.	Solidworks Mouse	25 minutes
5	Cut into the back of the locomotive and extrude a roof.	Solidworks Mouse	45 minutes
6	Use the function "Cut Extrude" to hollow out the smokestack.	Solidworks Mouse	5 minutes
7	Create four axel holes by cutting 5mm diameter circles into the locomotive.	Solidworks Mouse	20 minutes
8	Use the "Fillet" command to smoothen out the entire design to various fillet amounts.	Solidworks Mouse	20 minutes
9	With the "Shell" function, hollow out the train to a 4mm thickness.	Solidworks Mouse	5 minutes

MYP Portfolio Scaffolds

Workshop:

Step No.	Describe the step	Resources Needed	Time (min)
1	Stick the template to the wood block.	Wooden Dragster Paper Glue Stick	2 minutes
2	Drill the canister hole with the pedestal drill.	Wooden Dragster Bench Drill	2 minutes
3	Drill the axel holes with a hand drill and pedestal drill	Wooden Dragster Pedestal Drill Hand Drill	10 minutes
4	Use a tenon saw to cut relief cuts.	Wooden Dragster Tenon Saw	40 minutes
5	With a coping saw to saw out the rough profile of the train dragster.	Wooden Dragster Coping Saw	60 minutes
6	Using a metal file and a rasp, cut away the rest of the profile and smoothen out the dragster.	Wooden Dragster Rasp Metal File	35 minutes
7	Use a tenon saw to make relief cuts for the front view	Wooden Dragster Tenon Saw	30 minutes
8	With a coping saw and a file, cut out the front view of the dragster and smoothen.	Wooden Dragster Coping Saw Metal File	35 minutes
9	Round the smokestack and features on the top of the train with a file and 200-grit sandpaper.	Wooden Dragster 200-grit Sandpaper Metal File	30 minutes
10	Hollow out the smokestack with a pedestal drill.	Wooden Dragster Pedestal Drill	8 minutes
11	Put on PPE: Safety goggles, apron and a respirator. Then get a can of spray-paint and shake it for 10 seconds.	Spray Paint	10 minutes
12	Spray 15cm away from the dragster in a sweeping motion. Start spraying off your dragster, then move across and stop spraying off your dragster.	Spray Paint Wooden Dragster	10 minutes
13	Do very light coats. Repeat 5 times.	Spray Paint Wooden Dragster	10 minutes
14	Create vinyl sticker designs in Adobe Illustrator and stick them onto the side of the dragster.	Vinyl Stickers Adobe Illustrator Wooden Dragster	

MYP Portfolio Scaffolds

Criterion (Part) C – *Creating the Solution*
Technical Skills
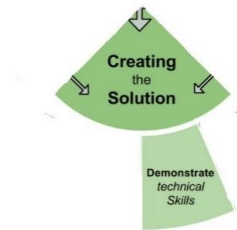
2. Demonstrates excellent technical skills when making the solution/final product.

> **You may satisfy this criteria and command terms in any way you can.**
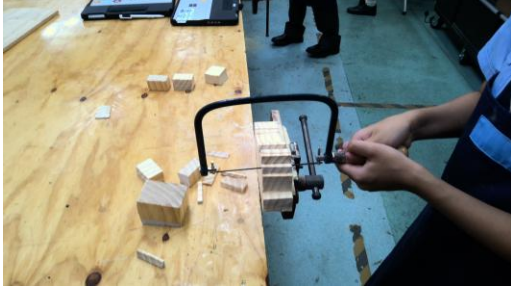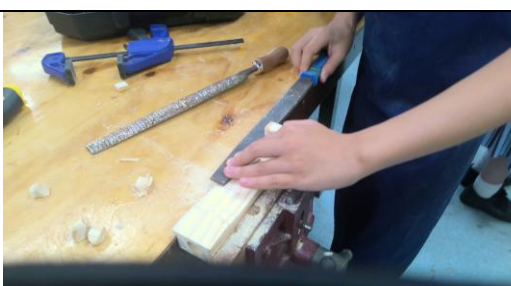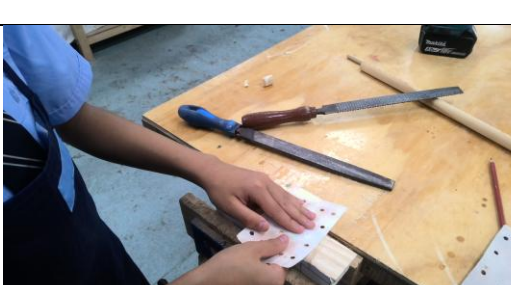> **Command term here is <u>demonstrate</u>.**
> **- Demonstrate:** *to make clear by reasoning or evidence, illustrating with examples or practical application.*

Complete the table below. You may create your own should you choose.

A. **Include <u>photographs</u> in a logical order, of your manufacturing process as evidence of your excellent technical skill.**
B. **Make sure you <u>explain/justify</u> what you are showing and the resources you used. It is also very importantly to indicate <u>safety considerations</u> with using that technology, e.g.: eye protection, hearing protection, ventilation, apron, etc.**

Manufacturing Process (Photo)	Justification	Resources Used including WHS
	The dragster has relief cuts made at 1-inch intervals to aid in cutting the profile view of the dragster using a tenon saw. I used a tenon saw rather than a coping saw because I am cutting rough, straight lines.	Safety Goggles Apron Tenon Saw Wooden Dragster Leather Shoes
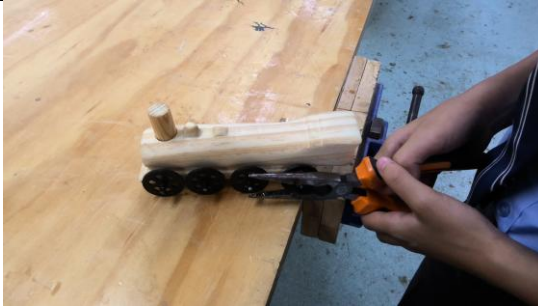
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	With a coping saw, the profile of the locomotive is cut out in sections, ensuring that the correct PPE is worn. Because I am cutting a curved shape, I used a coping saw.	Safety Goggles Apron Coping Saw Wooden Dragster Leather Shoes
	Here, a rasp is used to remove large sections of material from the top sections of the dragster. This is because I wanted to remove large amounts of material and roughly round the dragster.	Safety Goggles Apron Rasp Wooden Dragster Leather Shoes
	I used metal files of various coarseness further refine the shape of the locomotive, and smoothen it without removing too much material.	Safety Goggles Apron Metal File Wooden Dragster Leather Shoes
	Here, I used 120 grit sandpaper to smoothen the dragster. I used 120-grit because I needed to remove large scratches and smoothen the train, but not change the general shape.	Safety Goggles Apron 120-grit Sandpaper Wooden Dragster Leather Shoes
	In this image, a bench/pedestal drill is used to drill a hole in the dragster which is secured with a clamp. I used a pedestal drill because it is more precise and easier to use than a hand drill.	Safety Goggles Apron Pedestal Drill Wooden Dragster Leather Shoes

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	I employed a disc sander to flatten out the end of a section of a wooden dowel which would serve as a smokestack. The disc sander ensured that the end surface was flat, and it provided a quick way to sand it.	Safety Goggles Apron Earmuffs Disc Sander Wooden Dragster Leather Shoes
	A small chisel is used in this photograph. I used a chisel to create sharp 90-degree cuts quickly, as sandpaper would make it rounded rather than angular.	Safety Goggles Apron Chisel Wooden Dragster Leather Shoes
	In this photo, I used 50-grit sandpaper. I used it because 50-grit sandpaper very quickly removes material but does not severely roughen the sides.	Safety Goggles Apron 50-grit Sandpaper Wooden Dragster Leather Shoes
	I used a flap-wheel piece attached to a hand drill because I wanted a quick and effective way to sand my dragster. I used safety goggles and an apron for safety.	Safety Goggles Apron Flap-Wheel Drill Piece Drill Wooden Dragster Leather Shoes

	Here I am using pliers to cut the plastic axels to size, because it allowed for precise and safe cutting of the axels and rubber stoppers.	Pliers Plastic Axels Plastic Wheels Wooden Dragster Leather Shoes

Criterion (Part) C – *Creating the Solution*
Solution
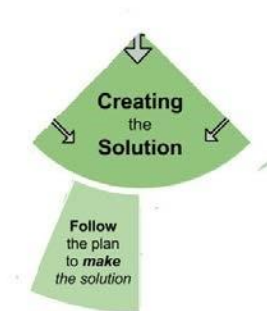
3. *Follows the plan to create the solution/final product, which functions as intended and is presented appropriately.*

> **You may satisfy this criteria and command terms in any way you can.**
> **Command terms here are: <u>create</u> and <u>present</u>.**
> **- Create:** *to evolve from one's own thought or imagination as a work or an invention.*
> **- Present:** *to offer for display, observation, examination, or consideration.*

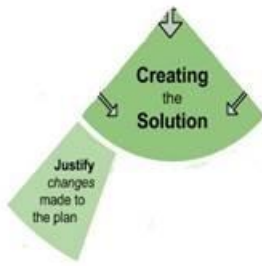# MYP Portfolio Scaffolds

Complete the following.

➢ **Insert below, a photo of your final (and finished) design solution.**

➢ **Ensure that your teacher is also given the completed physical product/item.**

Criterion (Part) C - *Creating the Solution*
Changes Made

MYP Portfolio Scaffolds

4. *Explain changes made to the chosen design and plan when making the solution/final product.*

You may satisfy this criteria and command terms in any way you can.
Command term here is: <u>explain</u>.
- Explain: *to give a detailed account including reasons or causes.*

Complete the two tables below. You may create your own should you choose.

Change made to your chosen <u>final design</u>	Why did you make this/these change/s?
Simplification of features on the top of the dragster.	I simplified most of the segments on the top of the train due to the features constantly breaking. I accidentally cut into one of the features, so it had to be removed. This influenced the final design because it meant that my train didn't have a widened top to the smokestack, or any complex features on the top of the dragster because they had been sanded down. Therefore it was different from my technical drawings.
Not hollowing out the locomotive's smokestack.	I did not end up hollowing the dragster, as it would have been hard to execute well without the dragster losing its structural integrity. This made my final design look and feel different because it ended up weighing more and it didn't have a hole in the side from which I would have hollowed the dragster, differing it from my technical drawing.
A wooden dowel was used for the smokestack.	A wooden dowel was used for the smokestack as it provided an easy solution to the original smokestack constantly breaking, and it was perfectly cylindrical, making it close to the original Solidworks design. But it also looked different from the Solidworks design, as it was taller and slimmer than the original design on the computer, and it also didn't have a wide end and was not smoothened into the rest of the design. This is because I was not able to cut it in that manner with enough precision, so I just sanded it down.

Change made to your logical plan	Why did you make this/these change/s?
Not spray-painting the dragster.	I wanted to spray-paint my dragster black, but this did not go to plan. There were none of the colours I wanted left, so I did not paint my dragster, as other colours would not fit the design of locomotive. I intended my train to be black and red, so the change to my logical plan made it so that my dragster looked different, as it lacked the intended colour scheme.
Waxing my wooden locomotive.	I decided to wax the train instead of painting it because it would take less time, look smoother and would provide stark contrast against the trains 3D printed counterpart. Originally I wanted to spray paint the train, but due to lack of resources, I ended up waxing it. This significantly changed the result of the final product because it meant that my dragster would be smoother and have a woody brown colour rather than the grey in the Solidworks design and the black and red of the intended design.

Criterion (Part) D – *Evaluating*
Testing Methods
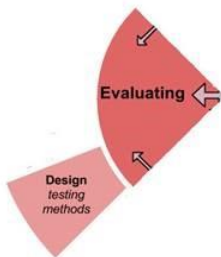
1. *Describes detailed and relevant testing methods, which generate accurate data, to measure the success of the solution/final product.*

> **You may satisfy this criteria and command terms in any way you can.**
> **Command term here is: <u>describe</u>.**
> **- Describe:** *to give a detailed account or picture of a situation, event, pattern, or process.*

MYP Portfolio Scaffolds

Complete the following.

Carry out testing methods which will produce data (yes/no or numerical answers).
Aim to develop meaningful feedback questions on each of your design specifications.

Surveys using Survey Monkey or Microsoft Forms is one way to generate testing evaluation.

Insert your methods of testing here.

Design Specification	Test
Weight of Dragster.	I will test this criterion by placing my dragster on an electronic scale and recording the weight of the dragster in grams. I expect the dragster to weigh less than 150g. If the dragster is more than 150g, I will refine the design to weigh less by sanding and removing material from it. I decided to do this test because it was the quickest and easiest way to test my design specification with minimal equipment.
Speed of Dragster.	I am going to test this design specification by racing the finished dragster and recording the dragster's time. I will calculate the speed of my train by dividing the length of the track (7.1 meters) by the time it took for my dragster to complete the course. I am aiming for my dragster to have a speed of 4m/s or higher. If it is slower than expected, then I will smoothen out my dragster and hollow out the train to make it faster. I did this method of testing, as it was the only viable way to test my dragster's speed with sufficient accuracy that was available at the school.
Old-Fashioned Aesthetic.	
Smooth Look.	
Eight Wheels.	
Hogwarts Express Design.	

MYP Portfolio Scaffolds

Vinyl Stickers.	 The way that I tested if my dragster had vinyl sticker, had an old-fashioned design, was smooth, had eight wheels and looked somewhat like the Hogwarts Express, was by creating a Microsoft Forms survey. I decided to do this because I was able to collect many responses quickly, and Microsoft automatically graphs the information, making it easy to read ad interpret.
Remain Intact.	To see if my dragster remained intact after the race, I will interview Titus and Mr. Pierotti and ask them if it looks like my dragster remained intact. I expect it to not break, but if it was not intact then I will glue the parts back together and drill a metal rod into the middle to ensure that it does not break. I did this test because I see Titus and Mr. Pierotti quite often, and it would be fast to do an interview due having only one short question.
Hollowed Out.	To test if my dragster is hollow, I am going to ask Mahé if he thinks my dragster is hollow. If my train dragster is not hollowed out, then I will use a drill, chisel and sandpaper to hollow out my locomotive. Mahé is in my technology class, so it would be an efficient way to see if my final product met the design criterion by asking Mahé if the dragster is hollowed out.
50x80x200mm.	I will use a ruler to measure the height, width and depth of the dragster at its widest point in millimetres. I expect the dragster to have a size no greater than 50x80x200mm. If this criterion is not met, I will work on sanding and cutting down my design until the desired dimensions are met. Rulers are a reasonably accurate way to measure the dimensions of objects and they are a common object, which is why I used it.

MYP Portfolio Scaffolds

Criterion (Part) D – *Evaluating*
The Success

2. *Explains the success of the solution/final product against the design specification.*

> **You may satisfy this criteria and command terms in any way you can.**
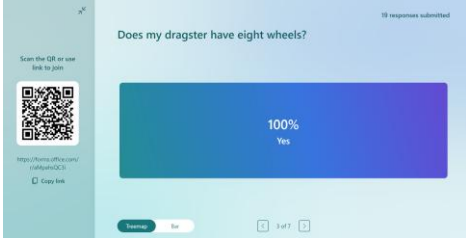> **Command term here is: <u>explain</u>.**
> **- Explain:** *to give a detailed account including reasons or causes.*

Answer the questions below or create your own.
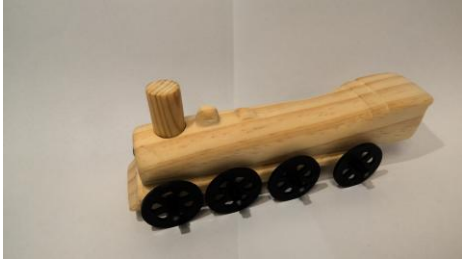
   A. **Present your data from your survey questions below. Microsoft forms does this for you so just take a screenshot!**
   B. **Complete the table below. (You will need to list design specifications back in 'SPECIFICATIONS')**

Design Specification (Criteria)	Test result (average/score)	Success
Weight of Dragster.	142 grams, including axels, eyeholes, and wheels.	My dragster was successful in meeting this success criterion, because its overall weight was less than the maximum design specification weight, which was 150g. My dragster weighed 142g.
Speed of Dragster.	Reaction Time: 0.249s Race Time: 0.836s Total Time: 1.085s Reaction Time: 0.237 Race Time: 0.832 Total Time: 1.069	The train dragster that I built took on average 0.834 seconds to complete a 7.1m track. 7.1 divided by 0.834 is about 8.513m/s. Therefore, my dragster significantly outdid the minimum speed for my design specification, which was 4m/s. My reaction times were 249ms and 237ms,

		which is faster than the average human reaction time.
Old-Fashioned Aesthetic.		Most people in my survey said that my train looked very old-fashioned, as shown by the graph. This means that my dragster conformed to this design specification, because the criterion stated that the train would have an old-fashioned aesthetic.
Smooth Look.		The majority of the people I surveyed stated that my dragster was quite smooth, which was what I had aimed for. Therefore I think that my dragster met this design specification, however I could improve my design to be smoother by sanding it.
Eight Wheels.		My train dragster met the "Eight Wheels" design specification very well, as 100% of people said that my dragster had 8 wheels, which is what I aimed for.
Hogwarts Express Design.		Two thirds of respondents said that my dragster looked a lot like the Hogwarts Express from Harry Potter. An additional 26% said that my dragster was a little like the Hogwarts Express. Therefore, my dragster mostly met the design specification, but people said that I could paint it to make it look even more like it. This is because the average respondent said that my dragster met that design criterion.
Vinyl Stickers.		All the respondents stated that my train lacked vinyl stickers. So my dragster did not follow the design criterion, and in the future I could spend some time creating and printing stickers to stick onto my locomotive, which was a common

		comment that people said in the "Improvements" text box.
Remain Intact.	**Mr. Pierotti**: "The dragster is intact". **Titus**: "Yes, it's still intact". 	I succeeded in this specification, because both of my interviewees said that my dragster was intact, which was my design criterion.
Hollowed Out.	**Mahé**: "No I don't think it's hollow". 	My dragster did not meet this design specification, because Mahé said that my dragster wasn't hollowed out. In the future, I could take time to hollow it out with a drill.
50x80x200mm.	44mm – Depth 71mm – Height 197mm – Length	My dragster ended up conforming to the success criterion, as its end dimensions (44x71x197mm) were less than the maximum intended size (50x80x200mm). Therefore, my dragster met this specific design specification.

Criterion (Part) D – *Evaluating*
Improvements

MYP Portfolio Scaffolds

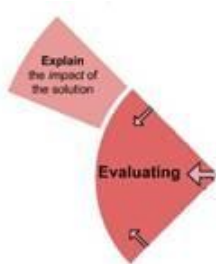3. *Describe how the solution/final product could be improved.*

Complete the table below or create your own. Make sure you use the results from your testing methods to justify your answers.

Improvements that could/can be made to the finished product	Description on how these changes could be made
Drilling the hole in which the smokestack fits into first.	One improvement that I could make to my finished dragster would be to drill the hole that the smokestack fits into first, using a bench drill. This would remove the difficulty of sanding the other features on the top of the dragster without ruining the smoothness of the smokestack. This change could be made by drilling a hole about 4cm deep and 19mm wide to the top of the dragster after the canister hole was drilled.
Further sanding the dragster with 240 and 400 grit sandpaper.	Another thing I could do better in the future is sand my dragster more to eliminate most scratches on the dragster. Many people in my survey said that I could improve my train by making it smoother. I could implement this feedback by using 240 and 400 grit sandpaper to smoothen out my locomotive and improve my dragster to be more aerodynamic and less rough.
Using a ruler to measure the intervals between axel holes.	The respondents in my survey commented that the spacing between the axel holes of my dragster were inconsistent. I could address this problem in the future by measuring the intervals between the holes and marking where to drill each hole with a pencil before I use a bench drill to create the holes. This would make the wheels more evenly spread out and improve my dragster design.
Painting my dragster red and black.	32% of respondents replied that my dragster would be much better if I had decided to paint it red and black rather than wax it. In the future, I could improve my design by following this advice and using spray paint to coat the dragster in a matte black. Then I would hand paint details such as a locomotive name and red stripes with a

	paintbrush to make my dragster better. To do this, I would need to manage my time more effectively and ensure that the correct colours are available to paint my train dragster, which were the original reasons why I didn't paint the dragster.
Making the front have a more conic shape.	One of the people that I interviewed said that one way that I could improve my dragster design is to add a cone to the front of my dragster to make it more aerodynamic. I could implement this feedback on my locomotive by using a rasp, file and some sandpaper to remove material from the front of the train. This would make it so that the front is more conic and therefore aerodynamic. However by doing this I am also reducing from other design specifications such as an old fashioned look and being similar to the Hogwarts Express. Nevertheless, I think that overall making the front of the dragster more conic would be an improvement to my design.

Criterion (Part) D – *Evaluating*
Impact

4. *Describe the impact of the solution/final product on the client/target audience.*

MYP Portfolio Scaffolds

Answer the questions below in detail – provide justification in your answering:

A. **How do you think your solution/final product solved the problem for your client/target audience?**

My design solution mostly solved the problem for my target audience. My clients were commuters travelling between Sydney and Melbourne who are train enthusiasts. My final product conformed to the initial need for a solution and met the majority of the design specifications and success criteria. It had an old-fashioned design, had a speed over 4m/s, weighed under 150g, and conformed to a lot of the other requirements. However, it also did not have vinyl stickers or was hollowed out due to not having enough time.
Therefore, while my dragster was not perfect and had ways in which it could improve, it mostly solved the problem that I needed a solution for, and it mostly met the criteria of my target audience.

B. **What impact (either positive or negative) will/did your solution/final product have on them?**

My dragster (the solution) will have a large impact on my target audience. Commuters travelling between Sydney and Melbourne who are train enthusiasts will have a much more pleasurable time travelling to and fro between the two cities and will be able to travel much quicker with my final product. These commuters will benefit hugely from my dragster because they would be able to travel in a hyperloop vehicle which suits their interests very much, as well as travelling fast so that they have time to do what they wish. The positive impact on my clients will result in a much-needed improvement of inter-state transport in Australia.