

2018 VCE Product Design and Technology examination report

General comments

In the 2018 VCE Product Design and Technology examination, students who had a strong grasp of the terminology combined with the ability to interpret the context of the questions produced high-scoring responses. However, many students did not demonstrate thorough knowledge of concepts or understand the context of the questions.

Some students rewrote questions in full, which was not required.

When a product is provided for analysis, students must use the information provided in the examination and make the information specific to their responses. This was also true for the design scenario in Section B.

Many students were able to create a good-quality design brief with specifications, drawn from the given scenario. However, some struggled to construct meaningful specifications and to understand how to complete the design brief template.

Students need to be reminded that all their responses in Section B should relate to the given scenario and therefore their design option drawing.

Students are reminded to refer to the *VCE Product Design and Technology Study Design 2018–2022* as the reference for all terminology.

Areas of strength

- knowledge of the three given steps of the product design process: visualisations, the scheduled production work plan and product evaluation
- ability to choose suitable new technologies such as computer-aided design (CAD) and 3D rapid prototyping (3D printing) that would be employed during design and development and to explain their usefulness
- describing a creative thinking technique
- writing informatively about a joining process in their design option, the equipment used, why it was appropriate and were able to identify a potential problem that could occur in the finished product they had designed
- giving warnings or instructions for the designed product

Areas for improvement

- qualitative and quantitative research methods and how they would be used
- critical thinking techniques
- anthropometric data and its application
- lean manufacturing
- scales of manufacturing
- product design factors and their associated parameters, both in relation to product analysis and in constructing a design brief

- writing the context and requirements for a design brief drawn from the given scenario; use of insufficient wording for design brief requirements, not realising this information was to inform their drawings
- recycled materials
- drawing types – the purpose of visualisations and the quality of drawing required for design options.

Specific information

Note: Student responses reproduced in this report have not been corrected for grammar or spelling.

This report provides sample answers or a brief indication of what answers may have included.

The statistics in this report may be subject to rounding resulting in a total more or less than 100 per cent.

Section A

Question 1

Marks	0	1	2	3	Average
%	2	4	16	78	2.7

	Brief outline of step
Visualisations	<ul style="list-style-type: none"> • initial sketches of the whole/parts of the product based upon research and needs of the end user(s) • concept (or quick) sketches and drawings • 3D mock-ups or models of ideas
Scheduled production plan	<ul style="list-style-type: none"> • a document/plan that includes: timeline, steps needed for production, materials and equipment list, risk management and quality measures • a plan that the designer will create before production of the product • sequenced plan and timeline, listing tools, equipment and machines with risk assessment
Product evaluation	<ul style="list-style-type: none"> • evaluation of product quality using evaluation criteria and end-user feedback with recommended improvements • checking of finished product against predetermined evaluation criteria • looking at positives and negatives (or pros and cons) of the finished product

Students generally answered this question well, although some students were not clear on visualisations and their purpose, confusing them with the design options or research. Almost all students could give a brief outline of a scheduled production plan, with most students stating that it involved plans to make the product and a timeline.

Question 2

Marks	0	1	2	Average
%	6	7	87	1.8

Students needed to select two expectations related to the M+D crutches such as:

- easy to use
- flexible
- will distribute weight evenly
- lightweight
- less pain
- cater for up to 136 kg
- long-lasting
- increasing mobility
- gentle due to shock absorber
- comfortable/ergonomic
- strong
- will stay secure with arm straps
- adjustable
- quality product
- will suit different terrain

Question 3a.

Marks	0	1	2	Average
%	42	25	33	0.9

	Type of market research
Qualitative	<ul style="list-style-type: none"> • end-user feedback (interviews/surveys/observations/reviews) that seeks or forms descriptions • questionnaires containing open questions • focus groups to gather descriptive feedback or emotional responses to the product • end-user trials asking for descriptive feedback
Quantitative	<ul style="list-style-type: none"> • survey on how much people are prepared to pay • end-user trials asking users to score aspects out of a number • survey questions with limited choices as answers • questionnaires with yes/no or numerical choices

It was evident from responses that many students did not clearly understand the use of qualitative and quantitative data in the context of market research. Many students mixed up quantitative data with anthropometric data as a method of determining end-user sizes, heights and/or weights, or they stated that it was about material tests and trials rather than information gained from end-user trials or focus groups. Others suggested quantitative research would 'seek to find how many people used the crutches'. This information is unlikely to be sought from market research, which would be targeted much more on the product and its various aspects.

Some students wrote suitable questions for each type of market research but this was not asked for in the question. If a question was not accompanied by a brief explanation of the type, the response could not be awarded marks.

The following are examples of high-scoring responses.

Example 1

Qualitative: asking potential customers for descriptive feedback on their ideas. Also personal experiences from potential customers in relation to a similar product will be explored.

Example 2

Quantitative: ask a group of potential end-users to rate the aesthetics of the crutches out of 10.

Question 3b.

Marks	0	1	2	Average
%	30	37	33	1.1

Although many students did not understand qualitative and quantitative research methods, most understood how market research information can be used: to detect any issues or problems and to use the information to adapt/improve the design of the crutches.

The following is an example of a high-scoring response.

To help designers develop a more suitable, comfortable pair of crutches that function better and are more innovative than current / existing crutches on the market.

Question 4

Marks	0	1	2	Average
%	34	26	40	1.1

Product design factor	Description
legal responsibilities	<ul style="list-style-type: none"> must be produced safely and be safe for the end user(s)
user-centred design	<ul style="list-style-type: none"> should suit end users to improve their quality of life
purpose, function and context	<ul style="list-style-type: none"> needs to be high quality to be safe secondary functions need to support the primary function to be safe
technologies	<ul style="list-style-type: none"> how it is constructed, important for its longevity and reliability or strength
innovation and creativity	<ul style="list-style-type: none"> a new and different type of crutch that is more secure yet adjustable

The most common response was user-centred design, which was also the most applicable. Many students did not seem confident to describe a factor other than materials important for the primary function of the M+D crutches as asked.

The following is an example of a high-scoring response.

Purpose, function and context – this provides an outline of the main primary reason as to what the purpose of M+D is and what it will be used for as well as why.

Question 5

Marks	0	1	2	3	Average
%	24	10	28	38	1.8

Many students wrote about an aspect of the crutches rather than a new technology that may have been used in their development as listed in the study design (page 23). Possible responses included CAD and rapid 3D prototyping. Laser was acceptable if the student explained its use during the design and development stage. Those who chose technologies used in manufacturing only did not score any marks.

High-scoring responses included how the technology would be used and how it would apply to designing the M+D crutches.

The following is an example of a high-scoring response.

Rapid prototyping could have been used to test the fit of the forearm holder or the hinged arm support. Various prototypes of the shock absorbing pads/feet could have also been altered.

Question 6a.

Marks	0	1	Average
%	59	41	0.4

Anthropometric data is about populations and most countries publish their own specific data. It is not exactly the same as sizes of an end user and it is not market research. Many students thought that anthropometric data was from primary research by the designer, not realising that it is data collected from a large number of people.

Possible responses could have been:

- It is measurements or sizes, weight and/or shape of the human body.
- It is body dimensions.

Question 6b.

Marks	0	1	2	Average
%	51	16	33	0.8

Although many students were unclear on the exact meaning of anthropometric data, they knew that it was data applied when designing products to suit humans. However, many incorrectly considered it as market research or a way of finding out about end users, when it is about using established data, which often needs to be purchased.

The following is an example of a high-scoring response.

Because the data collected would help with creating a product that is suitable for a wide range of body types. If they didn't collect that data, the final product may only suit a small group of people. This would impact the business.

Question 6c.

Marks	0	1	2	Average
%	48	20	32	0.9

High-scoring responses for this question mentioned specific adjustable aspects of the crutches that would be designed with reference to anthropometric data.

The following is an example of a high-scoring response.

They would have collected data, then found a way to make the crutches for multiple body types. For example, the crutches have an adjustment feature that allows users from the height of 150 to 200 cm to use them.

Question 7

Marks	0	1	2	Average
%	28	31	40	1.1

Many students added information about the availability of the product to end users rather than describing the most suitable scale as the question asked.

The following is an example of a high-scoring response.

High volume manufacturing involving Robotics, CNCs & automated assembly would suit the demand of the M+D crutches as it allows for quick and large-scale production.

Question 8a.

Marks	0	1	2	3	4	5	6	7	8	Average
%	9	1	2	4	23	22	19	12	7	4.8

While students could easily identify a product feature, many students found it difficult to identify a parameter as listed on page 11 of the study design. A number of students did not refer to the information given regarding the Onya backpack.

The following is an example of a high-scoring response.

Product feature 1	Product feature 2	Product feature 3	Product feature 4
<i>Simple zip closure</i>	<i>Ultimate light weight</i>	<i>Comfortable easily adjustable should straps</i>	<i>Useful front pocket</i>
Parameter 1	Parameter 2	Parameter 3	Parameter 4
<i>Ergonomics</i>	<i>Safety of a product to reduce strain and well-being</i>	<i>Innovation and creative</i>	<i>Secondary function</i>

Question 8b.

Marks	0	1	2	Average
%	33	21	46	1.2

Possible answers included:

- using the SCAMMPERR (substitute, combine, adapt, magnify, modify, put to another use, eliminate, rearrange, reverse) technique, trigger words or other thinking techniques to generate more ideas
- using a mood board to present creative ideas/styles/colour themes
- mind-mapping to organise/sort ideas
- exploring the design elements and principles to enhance designs or create more ideas
- idea sketches or visualisations to explore ideas for parts of or the whole bag design
- using nature or historical styles as inspiration
- combining unusual elements/areas in new and different ways.

The following is an example of a high-scoring response.

Mood board – when designers place ideas and images of products on a board to help stimulate creative thinking.

Question 8c.

Marks	0	1	2	Average
%	56	26	18	0.7

Acceptable answers included:

- using feedback from end user(s) about designs
- applying evaluation criteria
- testing materials or processes
- questioning related to ability/availability/timeframes/chosen methods/different scenarios or uses of the product
- making decisions on materials, design and aesthetics
- researching to check facts
- measuring aspects
- selecting relevant data
- testing mock-ups or prototypes
- creating working drawings
- annotations on drawings
- using a PMI chart

Few students could name a critical thinking technique. Most students gave one-word answers rather than giving a phrase to indicate a technique, which would have been a better approach.

Question 8d.

Marks	0	1	2	Average
%	28	24	49	1.2

Any of the product design factors were acceptable answers but needed to be written correctly in full as below:

- purpose, function and context
- innovation and creativity
- materials
- visual, tactile and aesthetic
- economics
- user-centred design
- technologies
- sustainability
- legal responsibility

Many students added a description or application, but this was not required.

Question 8e.

Marks	0	1	2	3	Average
%	30	23	27	19	1.4

Many students wrote about the needs of the end user or how to promote the product, rather than how needs could be identified.

The following is an example of a high-scoring response.

Create an online survey for that online buyers could complete to highlight their needs and wants so you can adjust and make important changes to your product's design and features if need be.

Question 9a.

Marks	0	1	Average
%	39	61	0.6

Question 9b.

Marks	0	1	2	Average
%	54	21	25	0.7

Students could identify an issue with planned obsolescence but struggled to describe the impact the issue had on product development. Some students did not equate planned obsolescence with volume production and instead mistakenly applied it to one-off products. Their responses to Question 9b. reflected this misunderstanding.

The following are examples of high-scoring responses.

Example 1

9a: That the life of a product is shortened

9b: To balance this manufacturers, have to design products that are innovative and better than the last as well as always keep up to date with what their competitors are producing.

Example 2

9a: *Products and up in landfill.*

9b: *This means that more and more products need to be creative and distributed, contributing further to landfill.*

Question 10a.

Marks	0	1	Average
%	49	51	0.5

Many students confused the 'no waste' ethos of lean manufacturing with no waste created (by scraps or offcuts) or with using recycled materials. However, lean manufacturing is more about production flow being managed efficiently, resulting in more units per hour and therefore fewer costs.

Although lean manufacturing can have environmental benefits, it does not necessarily follow the cradle to cradle framework as many students stated. Other students confused it with a scale of manufacturing, a small product or a small amount.

The following is an example of a high-scoring response.

Cutting out excess waste when developing or producing something to get the most out of the materials, employees and technology.

Question 10b.

Marks	0	1	Average
%	72	28	0.3

Examples of lean manufacturing could be the elimination of anything that is an unnecessary cost and does not give value to the consumer, such as:

- purchasing parts and materials needed only for current orders (avoids over-production, reduces unsold stock, saves on storage)
- reducing waste in matters/resources related to production flow such as precision cutting of materials (computerised cutting layouts)
- reducing 'wait' times and managing labour efficiently
- training of staff to use machinery correctly to increase accuracy (fewer mistakes)
- using electronic tags or mobile phones on the factory floor for fast tracking and communication.

It was also acceptable to name companies known to have implemented lean manufacturing such as Lego toys and Zara clothing or methods such as Just-in-time manufacturing (also known as the Toyota Production System).

Students struggled to provide examples of lean manufacturing. Those who wrote 'use of recycled materials' did not score a mark.

The following is an example of a high-scoring response.

Ensuring that trucks are as full as they can be when transporting stock instead of sending two trucks with smaller loads.

Question 10c.

Marks	0	1	2	Average
%	48	27	24	0.8

Most students struggled to explain how lean manufacturing could help a designer be more aware of environmental impacts.

The following is an example of a high-scoring response.

Lean manufacturing may help a designer become more aware because the idea is based on reducing waste and resources, which may make them question the impact previous manufacturing they have been involved in may have negatively impacted the environment.

Section B**Question 1**

Marks	0	1	2	3	4	5	6	7	8	9	10	Average
%	3	6	8	6	7	9	12	9	12	12	17	6.2

Outline of context: International Secondary Schools' Tennis Tournament 2019 in Melbourne or a description of the event. The function and purpose of the product could also have been included but was not essential.

End user(s)	Product
event staff or vendor name, e.g. ice-cream seller and/or visitor	mobile refreshment cart
event staff	event staff jacket
attending public or new generation tourists	souvenir game

Product design factors and associated parameters

Marks were awarded for each correctly named factor and each reasonable/suitable parameter drawn from the scenario. Some aspects from the scenario could have related to several factors, i.e. there could be overlap. Other relevant requirements were acceptable.

It was important that students extracted the necessary information from the design scenario to create the specifications of the design brief. Many students did not seem to understand the meaning of 'context' and wrote the name of the product (already identified in the box) and end user (to be written on the next line) in the space provided for the context, and did not mention the event, where it was occurring or when. Many were confused about who the end user of their product was, even though it was included in the scenario.

Students who could easily outline the context, the end user, four product design factors and parameters drawn from the scenario as clear requirements scored well. Other students did not know the product design factors sufficiently to write them correctly in the left column and did not understand that 'associated parameters' meant requirements from the scenario. A lot of students wrote one-word responses in the parameters column, making it hard to gauge what the requirement for the intended product was, i.e. colours instead of 'must include bright colours' or whatever may be required.

Question 2a.

Marks	0	1	Average
%	35	65	0.7

In general, this question was answered well. Students who answered with a requirement from the scenario that was not written in their own design brief did not score a mark. Some students were confused about the end user. Most interpreted the question as asking about the product's appeal to visitors to Melbourne and therefore the most common response was: must include an iconic Victorian landmark (or feature a significant aspect of Victoria).

Other acceptable answers included:

- must be suitable for Melbourne's unpredictable weather
- inclusion of at least one recycled material
- use of colours to appeal to the end-user's eye (board game)
- needs to be original, creative and innovative.

Question 2b.

Marks	0	1	Average
%	32	68	0.7

Possible responses included:

- This is important because it signifies that the product is unique to Melbourne and makes it appealing.
- Young people are becoming more concerned with sustainability and the use of recycled materials would increase the appeal of the product.

Students needed to say why it is important rather than just state that it was important.

The following is an example of a high-scoring response.

This specification is important to the end user, so that they can represent Melbourne / Victoria in a positive way that appeals to visitors.

Question 3a.

Marks	0	1	Average
%	30	70	0.7

Typical responses included:

- Does the cart/jacket/game include material that is recycled?
- Is the material suitable for Melbourne's unpredictable weather?
- Does the cart/jacket/game include two materials successfully?
- Does the product successfully incorporate a Victorian/Melbourne landmark?
- Does the cart lock up easily at the end of the day?
- Are the pockets/compartments in the jacket able to keep belongings secure?
- Does the board game successfully reflect the tennis theme?

This question was answered well but some students did not write a question that was specific to the product and the context and instead wrote very general questions that could be applied to any product. As for Question 2a., students who included a detail from the scenario but had not included it as a parameter in their design brief did not score a mark.

Question 3b.

Marks	0	1	Average
%	35	65	0.7

Examples included:

- recycled materials and their suitability
- iconic Victorian landmarks and their features
- locks, wheels and mechanisms suitable for carts
- ideas for pockets or compartments in the jacket
- themes, colours, etc., for the tennis event.

Students easily identified an area of research relevant to their criterion question.

Question 4a.

Marks	0	1	Average
%	25	75	0.8

Acceptable answers included:

- rPET from recycled PET bottles
- recycled plastic
- recycled pine, floorboards, piers, etc. (needed to include name of the timber)
- used rubber tyres or tennis balls (for game tokens and parts)
- metal from old bike wheels
- recycled fabrics such as denim, silk, polyester or cotton
- reused fabrics from other garments or products.

Question 4b.

Marks	0	1	2	Average
%	22	24	54	1.3

Many students did not understand characteristics and properties of materials. Some students explained how the material was made rather than characteristics and properties, while others talked about the product itself, i.e. will make the product sturdy.

Some students chose to name the recycled plastic material rPET from Question 8 in Section A, which was suitable as the required information on this product was provided in the question.

The following are examples of high-scoring responses.

Example 1

4a - recycled plastic for the jacket

4b - lightweight won't add too much density to the jacket and recycled plastic is also waterproof and quite durable therefore suitable to Melbourne's unpredictable weather.

Example 2

4a - recycled radiata pine off old bench seats

4b - radiata pine is reasonably hard and won't be easy to indent, scratch or snap/ break with simple and correct use.

Question 5

Marks	0	1	2	Average
%	35	35	30	1

Most students could discuss safety considerations but many found it difficult to relate safety to the function of the product.

The following are examples of high-scoring responses.

Example 1

The product will need to have specific functions that allow the end user to be safe. This means the jacket will need to function simply without an excessive amount of features that could have an impact on how the end user moves.

Example 2

Safety needs to be considered by ensuring that the cart won't roll away or roll onto the staff / tourists. Safety affects the product's function as it is another need to be looked into, something that needs precautions to be taken.

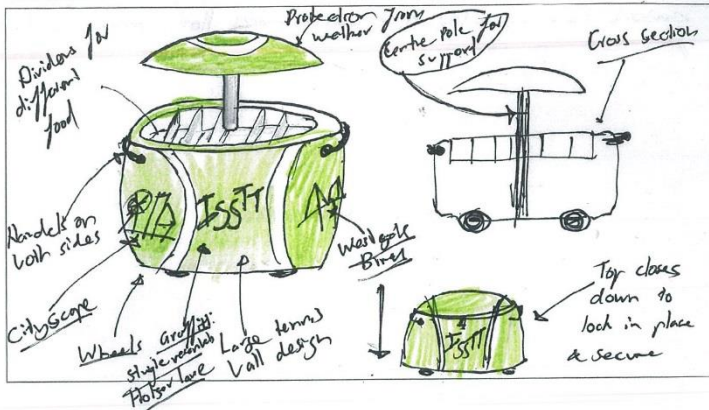
Question 6a.

Marks	0	1	2	3	4	5	6	Average
%	3	2	10	17	28	17	24	4.1

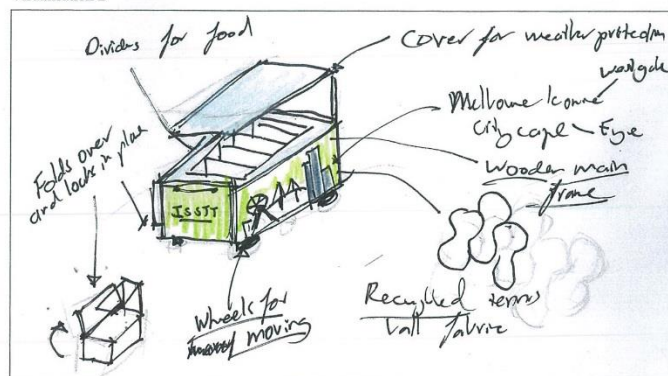
Overall, visualisations were drawn well but many needed to include more of the requirements such as a Victorian landmark or features. Students found it difficult to include all requirements from the scenario in the visualisations. Many students put more colour, detail, time and effort into the visualisation drawings instead of the design option.

The following are examples of high-scoring responses.

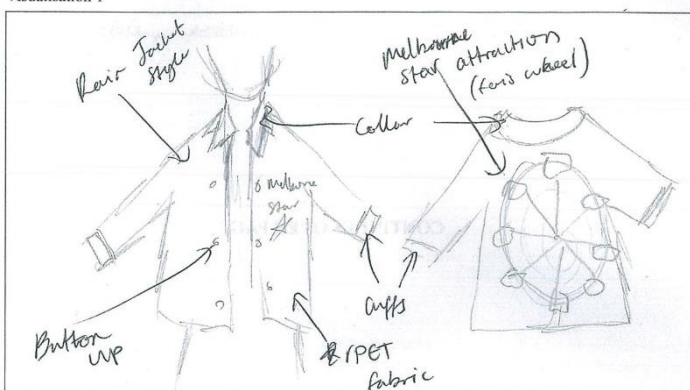
Visualisation 1



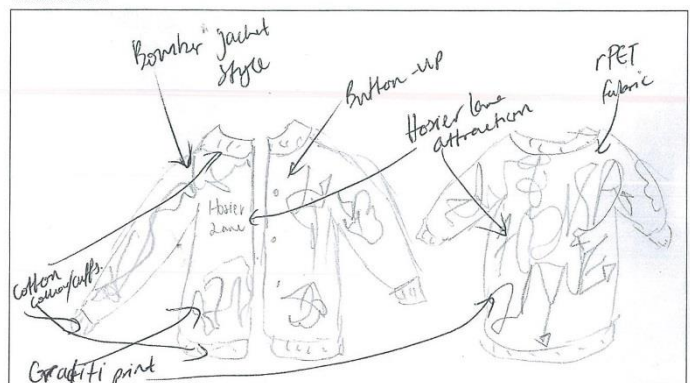
Visualisation 2



Visualisation 1



Visualisation 2



Question 6b.

Marks	0	1	2	Average
%	14	23	63	1.5

Students could easily justify which visualisation met the design brief, by mentioning how it incorporated a Victorian landmark, suited the weather or was innovative.

Question 7

Marks	0	1	2	3	4	5	6	7	8	9	10	Average
%	6	1	2	4	7	12	15	18	17	10	7	6.2

Annotated views of the design option needed to demonstrate command of the visual, tactile and aesthetic parameters and design options needed to contain sufficient detail.

The design option drawings needed to demonstrate command of the visual, tactile and aesthetic parameters and to contain sufficient detail. Students needed to carry through their best creative ideas or detail from the visualisations. The annotations of requirements from the design brief needed to be discernible/visible in the design option.

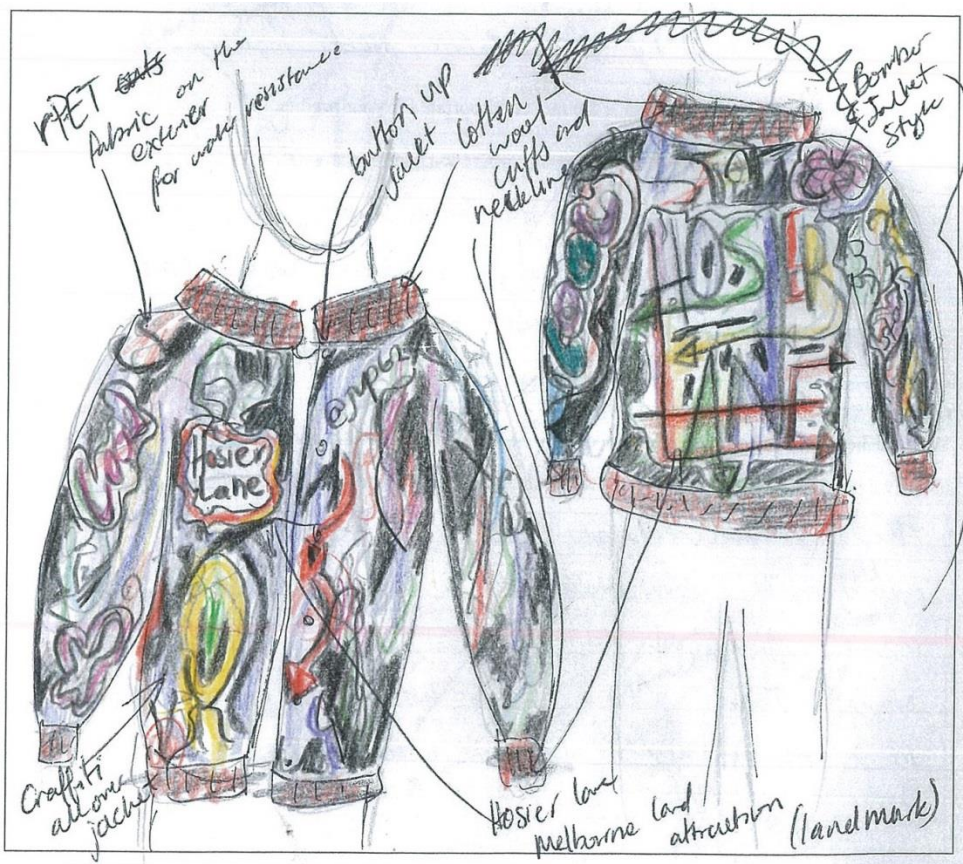
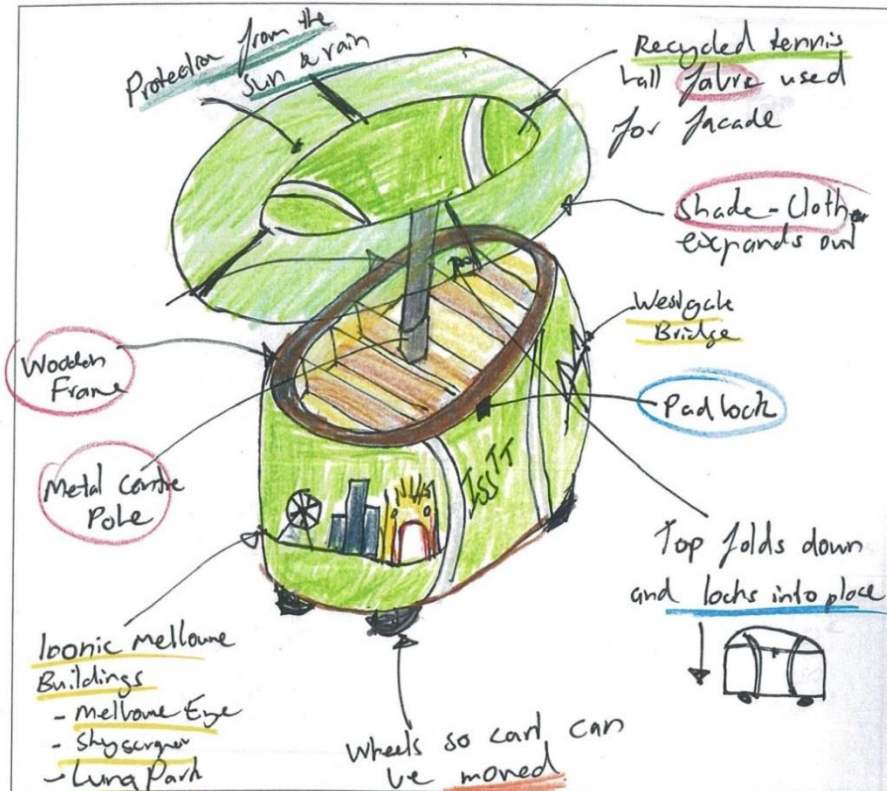
A number of students either did not add important annotations or crowded the page with annotations that almost obscured their design option. Other design options were too small, with some students using only a small amount of the space provided. Some design options were small because students included more than one view, when only one view was required.

Thick textas were unsuitable media for the paper and the space.

To score well students needed to create a design option that:

- filled the space provided
- solved the functional requirements of the brief and reflected a Victorian landmark
- was rendered to look realistic (3D for resistant materials) and to represent materials or textures
- was creative and/or innovative for that product and that showed some flair as demonstrated in the visualisations from Question 6a.
- was annotated to indicate four requirements from the design scenario
- had enough detail for a third person to construct a working drawing, i.e. to be able to figure out where joins or fasteners were placed, all its parts and/or how it would be constructed.

The following are examples of high-scoring responses.



Question 8a.

Marks	0	1	2	Average
%	20	29	51	1.3

Question 8b.

Marks	0	1	2	Average
%	25	28	47	1.2

Most students could identify a suitable joining process; state what it would join; describe it, including equipment; and explain why it was the most appropriate.

The following is an example of a high-scoring response.

Biscuit joint

8a I will use this joining process to join the cart top board together. In order to complete this process, I would need a biscuit cutter, biscuits, safety glasses, clamps and glue.

8b This joining process is relatively simple to perform and can be done in a timely manner. Therefore, I would be able to join the table top together efficiently leaving time for other areas of production.

Question 9

Marks	0	1	2	Average
%	23	41	36	1.2

Overall, students could easily identify a potential problem but many did not add/explain where it occurred in the process. Students need to keep the whole question in mind when responding.

The following are examples of high-scoring responses.

Example 1

The metal movement joint may not allow for the top timber piece to sit flat on top of the base piece. This may be because there is a slight measurement problem with where the bracket is located. This problem may have occurred in the research area as the certain moving bracket may not have been researched enough to do with information on how much it is capable to move and if it will allow items to lay flush on the product.

Example 2

The way the felt flowers were attached weren't done in a way that was strong and reliant enough. This problem would have occurred in the design and development stage as not enough thought and detail was added to the design option in terms of how they were going to be attached.

Question 10

Marks	0	1	2	Average
%	13	19	68	1.6

Students could easily list two instructions but some used both of the label templates. In this case, students were scored on their content in the first template.

The following are examples of high-scoring responses.

Example 1

When washing garment use cold wash.

Iron on silk setting to not damage the recycled plastic material.

Example 2

When lifting or moving the cart, ensure that correct lifting techniques are used.

To avoid discolouration, do not leave cast in direct sunlight for prolonged durations.