

# 2016 VCE Product Design and Technology examination report

## General comments

Overall, in the 2016 VCE Product Design and Technology examination, student responses could have been better supported with detailed information, showing specific knowledge and skills based upon the content of the study design.

### Areas of strength

- In Section A, Question 8a., students displayed a good knowledge of product attributes and how and why a designer would value them.
- In Section A, Question 13, most students expressed ideas and opinions that showed an understanding of the general terms and the relationships between the factors in this question.
- The majority of students could identify and make comment on emerging technologies.
- Students displayed strong knowledge of the components of a design brief and how to develop evaluation criteria from the considerations and constraints.
- Students showed awareness of Australian and international standards and how they impacted on or influenced each other.

### Areas of weakness

- Students' lack of knowledge of correct terminology impacted on their understanding of the questions and limited their responses when expressing ideas and concepts.
- Responses to the design brief suggested that there is a need for development of more creative design techniques in students.
- Very few students could correctly answer questions related to qualitative and quantitative evaluation.
- In relation to knowledge of materials characteristics, properties and how to test for them, many answers related to general knowledge and were not based on real processes used by designers.
- Design options related to textiles were often annotated with aspects that are not requested in the assessment criteria.

### Advice for students and teachers

- Learning the appropriate terminology from the study design is crucial to understanding the examination questions and terminology, and key words should be analysed for what is being asked. Appropriate terms should be used to answer questions. Use of these terms and concepts reflects and indicates understanding.
- The product design process is fundamental to every aspect of the study and it forms the basis for questions in the examination.
- Product design factors influence all manufactured products. They constitute a major area of design knowledge and are assessed in the examination.
- Students must work on their presentation drawing skills to learn to annotate in an effective way.
- In general, presentation drawing skills need practice and revision prior to the examination.

## Specific information

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

This report provides sample answers or an indication of what answers may have included. Unless otherwise stated, these are not intended to be exemplary or complete responses.

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
%	21	10	20	48	2

Students were asked to identify three components present in a folio that documents the product design process. Marks were given for any three steps that were in order. Marks were not given if students listed the four major stages of the product design process.

Answers could have included any three of the following in sequence:

- a client or end-user profile
- a design brief
- evaluation criteria (design option criteria or product evaluation criteria)
- research
- visualisations (concept sketches)
- design options with a decision matrix and justification of the preferred option
- working drawings or pattern drafting
- production plan (timeline, work plan, risk assessment, quality measures, materials list/costs)
- record of progress and modifications
- evaluation of product or process.

### Question 2

Marks	0	1	Average
%	24	76	0.8

Students were asked to identify one main difference between a traditional office chair and the Focal Upright Locus Leaning Seat. The majority of students responded with appropriate answers, such as the following.

Traditional chair:

- has back support
- has a flat/horizontal seat.

Focal chair:

- does not have armrests
- has ease of movability
- does not have multiple legs or wheels.

**Question 3**

Marks	0	1	2	Average
%	49	20	30	0.8

Students were asked to identify one qualitative and one quantitative method of evaluating the Focal Upright Locus Leaning Seat.

Examples of qualitative methods related to subjective information gathered from individuals or small groups such as through focus groups or interviews. This information is usually based on experiences and includes answers such as 'Ask users to try out the product and record their opinions – Get feedback about the experience.'

Examples of quantitative methods related to data gathered that can be measured numerically such as in tables and graphs. Examples of quantitative methods include sales and returns or costs.

Qualitative methods could have included:

- ask users to try it out and get their opinions
- get feedback from users about how it feels after a day of use
- show people an image and see if they can see any problems or would like something extra
- ask a user to adjust for size and get a response on how they found it

Quantitative methods could have included:

- Ask user to score out of 10 any of the following:
  - adaptability
  - aesthetics (or anything visual)
  - quality (strength, reliability etc.)
  - whether it removed fatigue
- any of the above with a numerical scoring method
- how long (hours) can a person remain seated maintaining concentration
- look at sales data for a particular area

**Question 4**

Marks	0	1	2	3	Average
%	45	18	19	18	1.1

Students were asked to outline three advantages of using a qualitative rather than a quantitative method to research the viability of the Focal Upright Locus Leaning Seat.

This question required comparisons, so a typical answer might have included: Consumers will provide a range of emotional responses to the product, not to technical data related to the product.

**Question 5**

Marks	0	1	2	3	4	Average
%	12	15	30	22	21	2.3

Students were asked to determine the quality of the Focal Upright Locus Leaning Seat product by considering performance and durability.

To gain full marks the answer needed to demonstrate an understanding of each term in order to describe why the seat is a quality product. Answers could have included information such as:

- quality can depend on the durability, such as repeated use and adjustment, for example, raising and lowering of the seat

- the materials and construction should make it long-lasting, hard-wearing and durable
- it is a quality product when materials are strong and wear-resistant and mechanisms can be used repeatedly without failure – an indicator of quality performance.

**Question 6**

Marks	0	1	2	3	Average
%	23	23	25	28	1.6

This question asked for an explanation of why the Focal Upright Locus Leaning Seat is an example of socially responsible design.

Answers that scored highly showed an understanding that socially responsible design takes into account the welfare, health and wellbeing of people either at home or in the workplace.

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

*The design of the Focal Upright Locus Leaning Seat considers the well-being of the end-user, providing health benefits due to its ergonomic design which aims to assist in reducing back pain and keeps the user active, balanced and physically engaged.*

**Question 7**

Marks	0	1	2	Average
%	47	24	29	0.8

A definition of anthropometric data was required here. Anthropometric data relates to the human body – size and scale.

Answers could have included:

- measurements of the human body (or parts)
- sizes of body parts, limbs
- direction or extent of reach, flexibility, articulation of joints.

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

*Anthropometric data refers to the information gained of specific measurements of the human body which assists designers in creating products that are correct size for the target user or given demographic.*

**Question 8a.**

Marks	0	1	2	Average
%	20	36	44	1.3

Students were asked to list two product attributes excluding performance and durability that the designer would value for the seat. The majority of students could list at least one attribute.

The answer needed to include any two attributes that relate to:

- function (e.g. size, ergonomics, adjustability, or compatible with a standing desk)
- aesthetics (any parameters of the visual, tactile and aesthetics factor)
- physical wellbeing (e.g. not sitting, standing, moving, core strength, keeps spine straight or promotes movement )
- human-centred design (similar to wellbeing examples, as well as targeted at specific user)
- cost.

**Question 8b.**

Marks	0	1	2	Average
%	33	28	38	1.1

Students needed to explain how any one of the attributes given in Question 8a. applied to the Focal Upright Locus Leaning Seat.

A possible response could have been: One attribute is adjustability of the seat and this is useful because a range of people of different sizes would have access to the seat during the working day.

**Question 9**

Marks	0	1	2	Average
%	19	32	48	1.3

Students needed to identify two ways that emerging technologies, such as CAD, could have an impact on how the Focal Upright Locus Leaning Seat was designed. They could have used any emerging technology, and they were not specifically asked to name the technology, but most used CAD.

Most students had a good understanding of emerging technologies, but the majority were unable to identify the impact of these on the design of the seat.

Answers could have included one of the following:

- CAD can provide a visual simulation of how the seat will function.
- CAD can make the design of the seat faster through 3D imagery for evaluation.
- CAD is fast when changing design aspects, as CAD drawing is adjusted quickly and easily.
- Some CAD can give information on the best materials for the seat.
- A CAD file can be sent to a 3D printer and a prototype could be tested immediately.
- CAM will make the production accurate and fast.
- Laser can cut all the joints accurately and this could influence the design of joints or construction methods of the seat.
- Laser can engrave in great detail, so this could be included in the design.
- 3D printing is good for prototyping, so weak points can be seen.
- With robotics, complicated and unsafe processes that are difficult for humans on an assembly line can be included in the design.

**Question 10**

Marks	0	1	2	3	Average
%	69	6	7	18	0.8

It appeared that students were unfamiliar with the scales of manufacturing as a whole and could not specifically explain the effectiveness of using different scales of manufacturing. Students were not awarded marks for answers that included one-off manufacturing. Mass production was only accepted if the reason it was used was justified.

Acceptable answers included:

- the need to produce a very large quantity of the product would be limited because this is a niche product that is not necessarily required by everyone
- this is a new product so it is not yet ready for mass production, as new ideas can take a long time to be accepted.

**Question 11a.**

Marks	0	1	Average
%	58	42	0.4

Students were asked to identify one creative design thinking technique.

Examples of acceptable responses included:

- mind mapping
- PMI (plus, minus, interesting)
- brainstorming
- De Bono's six thinking hats
- picture or word association
- SCAMPERR (substitute, combine, adapt, modify, purpose, eliminate, reverse, rearrange)
- problem reversal.

**Question 11b.**

Marks	0	1	Average
%	82	18	0.2

Examples of acceptable responses included:

- questioning (asking questions)
- using logic to select ideas, processes, etc.
- criteria-based selection
- weighting the evaluation criteria
- scoring the design options with evaluation criteria
- using a decision matrix
- eliminating weaker ideas or those beyond ones' capabilities or resources
- weighing up priorities.

Many students found it difficult to identify one critical design thinking technique.

**Question 11c.**

Marks	0	1	2	3	Average
%	43	27	18	12	1

Students were required to explain how both creative and critical design thinking techniques combine to help the designer to develop and refine their ideas. Creative thinking is about coming up with ideas, whether they are realistic or outlandish (doable and achievable or not). Critical thinking is about filtering and combining information and ideas to develop an effective design. Both approaches refine the designer's ideas for a good quality solution.

**Question 12a.**

Marks	0	1	2	Average
%	37	34	29	<b>0.9</b>

This question asked students to identify two quality measures that could be used in the production process. Few students could clearly identify two quality measures. The question didn't specifically require students to relate this answer to the Focal Upright Locus Leaning Seat.

Answers could have included any two of the following:

- selecting material (looking for flaws, warping, knots or holes, vermin infestation, etc.)
- testing material to assess quality or qualities (e.g. colour fastness, flex, strength)
- ensuring measurements are accurate
- training skilled workers
- accuracy/precision of joining methods
- edges are straight (square or level)
- straight seams with no puckering
- no scrambled or jumbled stitches
- no gaps in joins (could name a specific join)
- final product check and testing of the product.

**Question 12b.**

Marks	0	1	2	Average
%	45	20	35	<b>0.9</b>

Students were asked to give an explanation of how one of the quality measures identified in Question 12a. improves the quality of the production process.

An answer for the quality measure of testing materials could have included:

- the manufacturer would make sure that when the material has arrived at the factory, it is checked to see whether there are any faults in the material
- establishing the quality of material in the beginning affects processing and the eventual quality of the finished product.

**Question 13**

Marks	0	1	2	3	4	5	6	Average
%	17	15	18	19	17	9	5	<b>2.5</b>

Students were asked to discuss how the following product design factors have an impact on each other as a designer develops a product: innovation and creativity, and technologies (tools, processes and manufacturing methods).

Most students made an attempt to discuss how innovation and creativity impacts with technologies in product development but they had to ensure that they discussed the impact both ways. They expressed ideas that focused on the interplay between both of the product design factors and how they impacted on design possibilities and available technologies. To discuss this relationship and gain full marks students needed to give an example of a product. Many students could have used stronger examples and provided more information in their discussion.

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

*A designer may approach their initial ideas without having any concern or interest as to whether or not their idea can be constructed. However, as they refine their idea, their knowledge and*

*understanding of tools, processes and manufacturing methods will inform how they refine and manipulate their ideas. A designer must have knowledge of what manufacturing methods are available and the processes available to construct their product.*

*This is obvious when you think of a simple bent plywood chair. The technologies involved in bending plywood allow the designer to think of ideas utilising flat and curved surfaces knowing that the ability to manipulate plywood exists. The designer can refine their idea with the knowledge that their idea of a chair can be made possible. The lack of knowledge of technologies might lead to the designer having ideas which are unable to be manufactured (cannot be made).*

## Section B

### Question 1

Marks	0	1	2	Average
%	5	7	89	1.9

Most students were able to list considerations or constraints extracted from the design brief.

### Question 2

Marks	0	1	Average
%	18	82	0.8

Most students were capable of expressing the design considerations and constraints as evaluation criteria in a question format.

### Question 3a.

Marks	0	1	2	Average
%	35	30	35	1

Students were required to select one property from elasticity, absorbency and hardness, and describe a test for the selected property to be carried out on the students' design to assess the selected property.

Some students did not describe a test and just explained what the property was. Many explanations were not scientific by definition, but were general knowledge of the property and included many misconceptions – for example, elasticity is how far a fabric can stretch, and hardness is how much weight a material can take. These responses indicated a lack of knowledge of material properties and how to test for them.

### Question 3b.

Marks	0	1	2	Average
%	30	31	39	1.1

Students were asked to explain the significance of the test in Question 3a. for their design. Each design required an individual response, with most materials able to be tested for any of the three listed properties.



Answers could have included:

- absorbency (timber, fabric) – the rate and amount that a material will take in moisture
- elasticity (fabric, timber, metal) – the ability of a material to return to its original shape/size after undergoing a tensile load
- hardness (metals, fabric, plastic, timber) – the ability to withstand indentation or scratching.

#### Question 4i.

Marks	0	1	2	3	4	Average
%	10	30	31	20	9	1.9

Innovation and creativity relate to interplay between originality of ideas (ideas not seen before) and uniqueness of materials combinations, processing techniques and the overall look/design of the object. Responses could have included offbeat and unusual but functional ideas in this category. Many responses were straight-line box construction concepts. Most designs for the outfit product appeared preconceived, with any further criteria just added on, rather than an overall concept related to the design inspiration.

#### Question 4ii.

Marks	0	1	2	3	4	Average
%	15	14	29	17	25	2.2

Full marks were awarded if the student had drawn, in the two boxes, recognisable processes, including one from the degree of difficulty list, and explained both of the processes. Most students were able to answer quite well. Explanations related to the process used in producing the design varied in quality.

#### Question 4iii.

Marks	0	1	2	3	Average
%	3	30	40	27	1.9

Full marks were awarded if the product met the requirements of the end-user in terms of the product's function and suitability. Students had to ensure that the designs fulfilled the criteria set out in the design brief.

#### Question 4iv.

Marks	0	1	2	3	Average
%	7	36	36	20	1.7

Full marks were awarded for a range of visual, tactile and aesthetics in the design option. Students needed to express their design option using any combination of the design principles such as balance, emphasis and repetition, and design elements such as line, colour and texture. Some students could annotate the design brief requirements. Some tended to either over-annotate (particularly designs related to textiles) or under-annotate (designs related to wood/timber and metal).

**Question 4v.**

Marks	0	1	2	Average
%	6	35	58	1.5

Most students could annotate their design proposal in relation to the design brief requirements.

**Question 4vi.**

Marks	0	1	2	Average
%	6	60	34	1.3

Drawing needed to be of a high standard, using conventional drawing systems. Design details should have been clearly visible and the design needed to be presented as a possible option for a client. Many drawings lacked the clarity and detail required.

Students should prepare carefully for questions that may require drawing in responses. Students can miss out on marks because of a lack of drawing preparation.

**Question 5a.**

Marks	0	1	2	Average
%	40	19	41	1

Students needed to give any two visual, tactile and aesthetic design principles or elements from the product design factors, for example, design principles such as balance, emphasis, repetition, movement/rhythm, pattern, proportion, symmetry, space and surface qualities; and design elements such as point, line, shape, form, colour, texture, tone, transparency, translucency or opacity.

**Question 5b.**

Marks	0	1	2	Average
%	49	18	33	0.9

Students who could identify one of the visual, tactile and aesthetic principles were able to explain how they were used as inspiration in the design.

**Question 6**

Marks	0	1	2	3	Average
%	31	17	23	29	1.5

Students needed to identify the stage of the product design process where a designer would make a prototype or toile and explain why this stage was appropriate.

Possible stages for identification included:

- design and development
- planning and production

Students then needed to explain why this particular stage was appropriate.

**Question 7**

Marks	0	1	2	3	Average
%	47	9	17	28	1.3

Students needed to identify and explain the importance of one component they could include in a production plan. They needed to identify and explain the component.

Identification of one of these components could have included:

- a detailed work plan (sequence plan, operational sequence, etc.) showing processes, materials, tools, equipment and machines, and estimated time
- an overall timeline/Gantt chart showing how the product will be completed within the allocated timeframe; time to complete specific production processes
- materials list with costing, fittings and fastenings as required
- risk assessment
- measures to ensure quality.

Examples of component and explanation include the following:

- Detailed work plan – I will have the correct tools ready when I need to use them because they will make the job more efficient.
- Timeline – Working within a timeline will ensure that the product is finished on time and not have costly delays.
- Materials list and costs – To make sure you stick to the budget because you do not want to charge your client more than you stated. To make sure materials are ready when needed.
- Quality measures – To do a good quality job on all processes.
- Risk assessment – To be safe at all times.

**Question 8**

Marks	0	1	2	Average
%	25	42	33	1.1

Students needed to identify two actions that would ensure that their product meets safety requirements for the end user.

Answers required any two of the following:

- The fabric I use will be fire-resistant.
- The fabric I use will not be harmful to the skin.
- The product will not contain harsh chemicals.
- All components will be properly secured and contain no sharp edges.
- I will make sure joints are strong.
- I will get rid of sharp edges.
- I will eliminate tripping hazards.
- There will be no pins left in the garment
- I will add a warning label.
- I will undertake a safety check (tried and tested).
- The product will be constructed or built to regulations or acceptable guidelines (Australian standards).
- There will be a risk assessment (that includes the finished product).

**Question 9**

Marks	0	1	2	Average
%	18	49	33	1.2

Students needed to explain the purpose of Australian and international standards.

Examples of acceptable answers include:

- safety, consistency (reliability) and quality of products for consumers
- standards ensure that a material, product, method or service is fit for purpose and consistently performs the way it was intended
- make sure certain products meet regulated safety standards and that the product is safe to use
- it is a published document that sets out specifications and procedures that should be followed by a manufacturer so that consumers get a reliable product.

**Question 10**

Marks	0	1	2	Average
%	75	12	13	0.4

Students needed to explain how social sustainability could be achieved during production.

Social sustainability during production is about the ways production might affect the well-being of the workers. Many students did not differentiate between economic, social and environmental sustainability in their responses and wrote about environmental, not social, sustainability.

Examples of acceptable answers included:

- the people involved in the production of my design/product should be protected from any health and safety issues
- the pay for the production workers should be fair and the working conditions should be safe
- the workers who make my design should be safe so that they do not get injured and they get paid fairly for the work they have done
- my product would be manufactured under ethical working conditions with a safe and secure environment for the workers.

**Question 11**

Marks	0	1	2	Average
%	41	32	27	0.9

Students needed to list two ways in which they could ensure the effectiveness and efficiency of their design planning and production activities. Most students mentioned either efficiency or effectiveness of production planning but only a few mentioned both. Effectiveness relates to what you do and efficiency is how you do it.

Examples of acceptable answers included (any two of) the following:

- Make a production plan.
- Work to a schedule.
- Set evaluation criteria.
- Make graphic organisers of things to research ideas for design.
- Think ahead when planning to cover everything.
- Make notes at the end of each session to plan the next session.
- Make timelines so that time isn't wasted.

- Have a good sequencing plan to minimise time wastage.
- Do trials so that mistakes aren't made on good material.
- Do trials so that skills improve, are more accurate, etc.
- Train workers for effectiveness.
- Have up-to-date machines or production methods.

**Question 12**

Marks	0	1	2	Average
%	25	40	35	1.1

Students needed to identify two different ways they could present information about the product's features to their client.

Examples of acceptable answers include (any two of) the following:

- Show a photo of the finished product, including annotations, to the client.
- Make a multimedia presentation highlighting the features of the product.
- Present an annotated photograph or diagram.
- Present an oral presentation about the product.
- Show a PowerPoint presentation with voice over.
- Create a website that includes a YouTube clip.
- Design option drawings.

**Question 13**

Marks	0	1	2	3	Average
%	17	12	25	46	2

Students needed to provide one instruction for the end user and explain its importance.

Generally, students answered this question quite well, though some answers were too brief and lacked appreciation of what it takes to care for a product in a realistic sense. These answers did not consider the environment in which the product would be placed, worn or stored.

Examples of acceptable answers include:

- if the performer's outfit is washed at a higher temperature, the fabric may shrink, making it difficult for the product to be used again
- the chair and table have been varnished to protect the timber and therefore only need to be cleaned of stains; if you use chemicals you may damage the protective coating and this will lead to deterioration of the product
- if the adornment is cleaned with detergents, it may have a chemical reaction with the glue and the materials; the soft cloth is the only thing required because the materials are durable, but delicate.