2017 VCE Product Design and Technology examination report

General comments

Overall, in the 2017 VCE Product Design and Technology examination, students who produced high-scoring responses understood the terminology used in the study design, had an understanding of the context of the questions and gave answers in like terms.

Many questions were unanswered by students, indicating a lack of knowledge in specific areas. Students made a good attempt to utilise visual and tactile design elements in the drawing of the design option in Section B, Question 3.

Unless a simple answer was requested, one- and two-word answers did not attract high marks. There was evidence that questions were not read carefully, and students often missed the context of what was being asked.

Areas of strength

- For Questions 1, 2 and 3 in Section A, student responses showed good knowledge of the investigating and defining stage of the product design process. Students wrote confidently about the role of the designer, client and end user. They indicated good understanding of what an end user profile is and could confidently name at least two new and emerging technologies and/or processes.
- Students responded knowledgeably to questions about legal responsibilities related to design and designers.
- Most students wrote informatively about innovation and its importance in the product development process. Most students could identify at least one component of a production plan, using correct terminology, and explain its role in the production step.
- Most students nominated a creative thinking technique to generate ideas from a design brief, and they could also identify a hazard that was present during production and suggest what control measures should be used.
- A large number of students suggested correct methods to maintain quality and prolong the life of products.

Areas of weakness

- A high percentage of students could not differentiate between design principles and design elements. These design principles and elements are the parameters of the product design factors in the visual, tactile and aesthetic area.
- Students' knowledge of the manufacturing industry sector requires improvement.
- A large majority of students could not name a sustainability system or a manufacturing system for the Greenbo planter.
- A high number of students could not identify a method of evaluation of the product and could not suggest how criteria could be established to evaluate the tents in Question 12.
- For Question 3 in Section B, students' responses did not display strong innovation and creativity in the design option. Very few demonstrated the competent and deliberate use of

visual, tactile and aesthetic product design factors. Clarity of ideas and design and drawing detail were often at a low level.

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.

Section A

Question 1

Marks	0	1	2	3	Average
%	2	6	27	65	2.6

	Main role in the product design process
Designer	• the designer should develop a solution to a design problem using the product design process and meet the needs and wants of the client or end user to create a suitable product/solution • to understand the context and what is required, formulate a design brief that outlines constraints and considerations, including the product design factors, to research, explore designs and create a solution • designs a product for an end user or client
Client	• the client should communicate to the designer their needs and wants throughout the product design process • to give as much information as needed to the designer and agree on the budget
End user	• the end user should use or intend to use the finished product created by the designer • to give feedback on prototypes during the processes

There were many possible responses to this question. Most students answered competently, indicating good knowledge of the role of the designer, client and end user.

Question 2

Marks	0	1	2	Average
%	8	20	72	1.7

Most responses demonstrated an ability to build an accurate profile of a typical end user from the information given on the examination.

High-scoring answers included details from the stimulus material, such as ‘the end user lives a modern, urban lifestyle in apartments or flats with a balcony, stairs or fence, enjoys gardening’.

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

Someone who wants to bring plants into their home, workplace or business but lacks the garden space to do so, but has railings or fences tat may be used instead, and is likely environmentally conscious

Question 3

Marks	0	1	2	Average
%	34	17	48	**1.2**

Most students could name at least one new and emerging technology and/or process.

Examples of acceptable answers included:

- CAD
- injection moulding
- CNC
- rapid 3D prototyping.

Question 4

Marks	0	1	2	3	Average
%	79	3	5	13	**0.5**

Students who correctly identified a design principle invariably explained how it made the product appealing.

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

Design principle: *SYMMETRY*

Explanation: *The symmetrical design makes the product look balanced and sturdy, this appeals to the end user as they will feel the product is safe and will not fall off the railing.*

Question 5a.

Marks	0	1	2	3	Average
%	5	4	23	69	**2.6**

Most students were able to extract three innovative features (attributes) from the product description.

The answer needed to come from the information provided. Examples of acceptable answers included:

- removable, cleanable trays to catch dripping water
- adjustable rail stabiliser
- does not require screws
- UV-protected polypropylene
- mechanism for theft protection.

Question 5b.

Marks	0	1	2	Average
%	15	43	42	**1.3**

Although most students could answer Question 5a., not all were able to explain the importance of innovation in the product development process for Question 5b.

For full marks, students should have included one aspect from each of the two lists below. Broader answers were also accepted.

Examples of innovation (related to product design factor):

- to improve use and functionality
- can be new technology (or processes) to manufacture products, such as injection moulding, robotics, use of laser, advances in CAD/CAM/CNC
- design of features that could improve functionality (e.g. removable trays)
- introduction of new materials.

Examples of why innovation is important (something concerning productivity or marketplace):

- sets it apart from other products
- can gain market appeal as a point of difference to other existing products
- to make sales and stay in business
- to give consumers what they need
- to keep up with market trends and new living situations.

Question 6

Marks	0	1	2	3	Average
%	17	8	22	54	**2.1**

While a significant number of students did not attempt this question, students who did answer it scored well. They related the features to the product design factors and ascribed a value that an end user could place on these features.

Feature of Greenbo planter	Value placed by end user
polypropylene (materials)	it is long-lasting
two trays (function)	it reduces any mess or staining from dripping water
patented stabiliser (safety)	it is easily fixed to a structure
lockable or patented anchoring mechanism for theft protection (intellectual property)	• it can't be easily stolen from the fence or banister • makes it unique from other planters

Question 7

Marks	0	1	Average
%	83	17	**0.2**

Student responses required a broad knowledge of manufacturing. The range of acceptable responses was quite large.

Examples of acceptable answers included:

- chemicals and/or plastics sector
- engineering
- garden or nursery pots/products/home decor
- petroleum
- polymers.

Question 8

Marks	0	1	2	3	Average
%	65	6	13	17	0.8

The few students who could name a sustainability system were able to describe it.

Examples of acceptable answers included:

- design for the environment (DFE) – minimises or limits energy use, emissions such as gas and toxic chemicals, noise, transport, toxic chemicals or materials, waste, etc.
- cradle to cradle concept (C2C) – chooses technical components that can be used over and over
- design for disassembly (DfD) – limits the number of materials in the construction of the product, uses snap-lock fittings, easy repair
- extended producer responsibility (EPR) – uses DfD methods and includes information on how the consumer can return the product for recycling or repurposing.

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

DfD - The designer could ensure that no permanent joints were included in the design of the product, along with labelling and explaining methods of disassembly. This would maximize the ease and efficiency in which the product could be disassembled and recycled at the end of its useable lifetime.

Question 9a.

Marks	0	1	Average
%	76	24	0.3

Low volume or batch quantity/number/amount

Agile manufacturing was also accepted.

Question 9b.

Marks	0	1	2	Average
%	76	6	18	0.4

High-scoring responses included aspects such as:

- because the planter would not have mass appeal (low manufacturing run, so as not to create oversupply)
- agile manufacturing is used to change operation quickly – needed when there is demand for certain colours.

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

This is a better fit for a manufacturer who has a small or uncertain market. Low-Volume allows room for change if the market increases, the manufacturing can be changed accordingly

Question 10a.

Marks	0	1	2	Average
%	22	44	34	1.2

Students were required to identify two legal requirements such as:

- intellectual property (IP)
- safety of the product

- OH&S (manufacturing)
- Australian and international standards
- mandatory standards.

Question 10b.

Marks	0	1	2	Average
%	30	32	37	1.1

Students were able to explain how one of the legal responsibilities identified in part a. would influence a designer.

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

Selected legal responsibility: *Intellectual Property*

Explanation: *The designer needs to protect their intellectual property to avoid idea theft or someone else using their original idea to make money. A designer needs to consult an IP professional (to advise on registering their design, or applying for a patent). The designer also needs to check and make sure that their design does not infringe on someone else's intellectual property (such as existing patents or registered designs) to avoid legal action.*

Question 11

Marks	0	1	2	3	4	5	6	Average
%	36	5	14	8	15	5	16	2.4

Many responses used weak terminology, but students expressed the role of the components of the production plan quite well.

Component	Role
Detailed work plan	sets out the steps of construction in an expected sequence
Production steps	predicts the order of steps in production
Planned sequence of steps	to list processes, materials and equipment needed
Sequential plan	to estimate time for each step needed
Timeline/GANTT chart	to indicate when each step should be finished and due date of completion/to plan the sequence within a timeframe to ensure client and/or end user receive product on time
Risk assessment	• establishes safe practice – identifies potential hazards, risks and controls • controls are put in place to reduce or eliminate risks
Materials list and costings	• enables the budget from the client to be managed prior to commencement • ensures materials are readily available and organised
Quality measures	• gives checks and measures for the quality expected • states tolerances or minimal allowances for mistakes or errors • can include methods to achieve accuracy • helps to achieve a quality standard

Question 12a.

Marks	0	1	Average
%	75	25	**0.3**

Examples of acceptable answers included:

- expert appraisal method
- end-user trials
- comparative testing methods
- tests or lab test (the rain testing).

Many students did not attempt this question.

Question 12b.

Marks	0	1	2	Average
%	40	21	39	**1**

Qualitative methods assess/evaluate/analyse the quality of the characteristics or attributes of the product/tents, as seen in the user trials description. Whereas quantitative evaluation uses numerical measures to rank/score features and attributes of the product/tent, as seen in the table.

Some students produced excellent responses to Question 12b. They were clear about the distinction between the two evaluation terms and could describe them in detail.

Question 12c.

Marks	0	1	Average
%	76	24	**0.3**

Examples of acceptable answers include:

- asking experienced users (campers) via a survey to state what they want in a tent for different conditions
- survey of users (or customers).

Many students confused the intention of the question. The criteria were for a Choice™ survey to determine the client's needs and were not about tent design.

Question 12d.

Marks	0	1	Average
%	18	82	**0.8**

Does the tent comfortably fit four people?

Overall, students scored well on this question. Most students were familiar with the process of establishing criteria for the function of products.

Question 12e.

Marks	0	1	2	Average
%	35	26	38	**1.1**

Testers allocated 60% to usability because they viewed that as the most important aspect when evaluating the tents (reflecting user needs), whereas ease of assembly and the rain test (each allocated 20%) were seen to be of much lesser importance.

Students expressed familiarity with weightings.

Question 12f.

Marks	0	1	2	Average
%	14	36	50	**1.4**

Examples of acceptable answers included:

- buyers can read the comparisons of a range of different tents and chose which tent would be the best to suit their needs
- gives buyers a better idea of how the tents performed using the three criteria and a lot more detailed information about the tents that consumers may not have considered initially but that could be important.

Higher-scoring responses included how buyers could use the information to judge the customer needs or quality. Lower-scoring responses included only the information Choice™ gave.

Question 13

Marks	0	1	2	3	4	5	6	7	8	Average
%	27	14	10	8	9	6	7	7	13	**3.2**

This was an extended-answer question but many students did not deliver a comprehensive response. A large proportion wrote extensively and knowledgeably about the product design process but often failed to mention the stage or the method of communication in varying degrees.

To receive full marks, there needed to be one communication method for each stage of the product design process.

Possible responses are grouped in the appropriate stage of the product design process below.

- Investigating and defining
  - An interview
  - Design brief – written
  - Evaluation criteria
  - Annotations
  - Moodboard
- Design and development
  - Visualisations
  - Design options (or presentation drawings)
  - Working drawings
  - Moodboard
- Planning and production
  - Prototype
  - Changes to the prototype/toile for client feedback
  - A timeline
  - Record of progress
- Evaluation
  - Getting written or verbal responses
  - A written evaluation report such as on the effectiveness and efficiency of the design, planning and production activities

Section B

Question 1

Marks	0	1	2	3	4	Average
%	26	10	25	14	25	2

Product design factor	Description
Human-centred design	Suitable for people with a wide range of needs, including children, the aged and people with disabilities
Visual, tactile and aesthetic	The design must represent/incorporate the shapes, textures and colours that reflect the floral and garden theme
Purpose, function and context	An outdoor, family friendly flower and garden show in Ballarat over four days
Innovation and creativity	Needs to be original, innovative and creative
Materials	Two or more materials are required
Legal responsibilities	Must be original
Economics	Must all be ready for March 2018

Overall, a high-scoring response to this question indicated that students knew the relevance of product design factors and how they are applied. Correct terminology was needed – that is, the product design factor should have been named as per page 14 of the study design.

High-scoring responses identified two product design factors and gave a relevant and accurate description.

Question 2

Marks	0	1	2	3	4	Average
%	9	6	15	27	43	2.9

High-scoring responses demonstrated good knowledge through the development of a four-part evaluation criterion from the design brief.

- The evaluation criterion written as a question
  - The answer needed to be written as a question and be from the brief; for example, does the design incorporate the shapes, textures and colours that reflect the floral and garden theme?
- Its justification and relevance to the design brief
  - It needed to link back to the brief; for example, the design must incorporate the shapes, textures and colours that reflect the floral and garden theme to ensure that it suits the Ballarat International Flower and Garden Show in March 2018.
- How it could be achieved
  - Methods needed to be suggested on ways this could be achieved; for example, by researching different flowers and plants and how they look to use as inspiration; by exploring ideas using flowers and plants as inspiration; by exploring ideas, such as a combination of very unusual aspects in a new way.

  - Specific suggestions were acceptable.
- How the completed product could be tested or checked against the criterion
  - A method of testing or checking a finished product against the criterion needed to be given, for example, by checking the product visually with the directors to get their feedback on whether flowers or plants were incorporated/reflected/integrated into the product's design.

Question 3

The design options were assessed on the following criteria.

i. innovation and creativity in the design option

Marks	0	1	2	3	4	Average
%	6	32	34	21	8	2

There were a lot of designs that were too literal or that used the required inspiration purely as decoration on a standard piece of clothing or furniture. This criterion assesses the ability to extract design elements and principles to be reworked into an imaginative design or idea. Many students referred to what they had learnt in the classroom and changed it slightly using a required theme. High-scoring responses showed innovative thinking with the use of materials, processes or design, and usually innovative thinking with all three elements.

ii. use and explanation of processes, with at least two from the degree of difficulty list

Marks	0	1	2	3	4	Average
%	19	13	25	16	28	2.2

Students were required to explain two processes from the list in the examination insert. Many responses did not refer to a process but explained why the student chose the process for their design. Students were not required to include a diagram, but some explanations were aided by diagrams.

iii. function/suitability of the design option for intended use

Marks	0	1	2	3	Average
%	6	26	43	25	1.9

This was a high-scoring criterion. Quality of drawing was an important aspect in the assessment because it had to be seen to function properly and hence be suitable.

iv. use of visual, tactile and aesthetic product design factors in the design option

Marks	0	1	2	3	Average
%	10	39	38	13	1.6

Many students did not meet this criterion. Those who used design elements and design principles in a targeted way scored high marks.

v. annotations, on the design option, that indicate how the requirements of the design brief have been met

Marks	0	1	2	3	Average
%	7	26	31	36	2

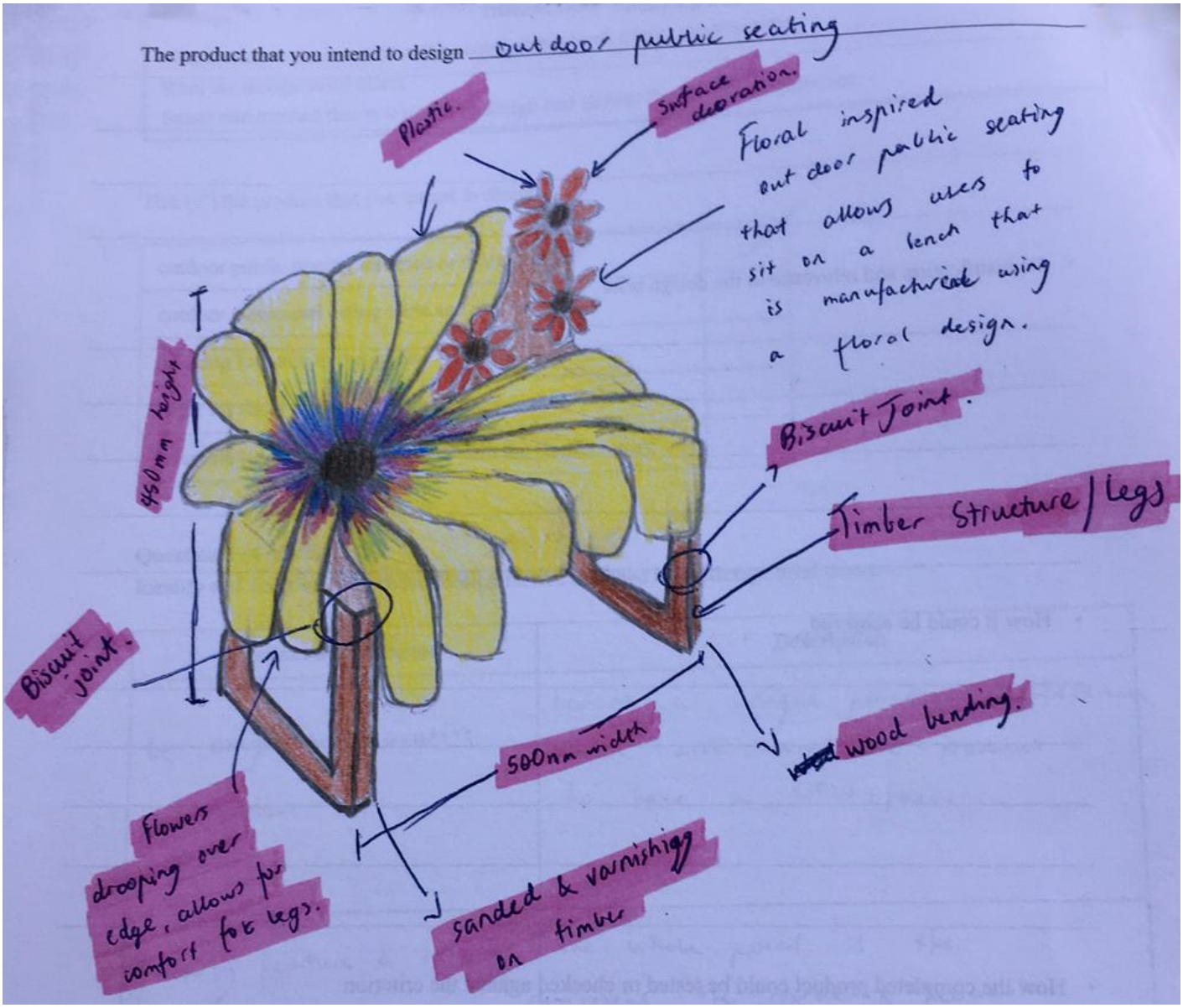
This was a high-scoring criterion and students quite readily transferred elements from the design brief to their design page.

vi. clarity and detail of drawing in the design option

Marks	0	1	2	3	Average
%	9	45	37	9	1.5

The quality of drawing in the design option was not high, with very few students attaining the highest mark. Detail in the drawing was not always evident and was generally quite poor.

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



Question 4

Marks	0	1	Average
%	47	53	**0.6**

Answers could have included Venn diagram, SCAMPER, lateral thinking or PMI.

A slight majority of those who responded to this question offered a correct response.

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

> *Visual thinking tools such as brainstorming, concept or mind maps can be used to identify the problem (client or end-user needs), explore ideas or plan research with related ideas stemming or linked around the central idea, design brief problem or intended product.*

Question 5

Marks	0	1	2	3	Average
%	42	18	19	20	**1.2**

Many students relied on general terms for scientific concepts. Knowledge of a material's characteristics and properties were lacking. Definitions were often wrong or misused.

Examples of methods of testing include the following.

Textiles examples:

- wash test/colour fastness test/shrinkage test
- drape test
- iron test
- flammability test

Wood/metal examples:

- strength test/tensile test/compression
- impact test
- bend test
- elasticity and return ability (material memory)

Question 6a.

Marks	0	1	Average
%	35	65	**0.7**

Most students gave a correct response to this question, although some confused 'hazard' and 'injury'.

Students needed to include the hazard in the response, not just the injury. Examples of acceptable answers include:

- entanglement
- cluttered walkway
- cords across walkway
- water on floor
- lifting heavy objects/materials
- bad ergonomic setup.

Question 6b.

Marks	0	1	2	Average
%	29	49	22	1

Most students gave a reasonable assessment as to the likelihood of an injury to occur, in either the low, medium or high range. High-scoring responses identified the level of risk and provided the likelihood or probability of an incident/injury happening.

Question 6c.

Marks	0	1	2	Average
%	18	32	50	1.3

Many students recommended appropriate control measures. Students were clear in their recommendations to mitigate risk.

Question 7

Marks	0	1	Average
%	32	68	0.7

Examples of acceptable answers included:

- instructions on how to wash the product to ensure it does not shrink or lose colour fastness (e.g. cold wash, do not tumble dry)
- keep out of direct sunlight, wipe with a damp cloth, do not expose to water
- add a new protective coating every six months.

Most students could identify the type of care needed for their product and they could recommend actions to ensure its longevity.