



# Design and Technology

**A LEVEL**

## **Product Design: Testing and Evaluating**

Topic Exploration Pack

September 2015

We will inform centres about any changes to the specification. We will also publish changes on our website. The latest version of our specification will always be the one on our website ([www.ocr.org.uk](http://www.ocr.org.uk)) and this may differ from printed versions.

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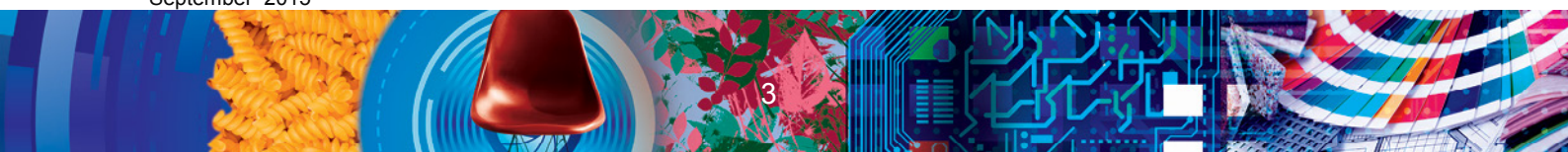
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## Introduction

When students have completed the making of their products, they will need to test how well their product meets the requirements identified in their design specifications.

Careful planning and the setting/monitoring of suitable **deadlines** will be essential to allow sufficient time at the end of their projects to complete this section. Along with Sections 6 (Marketing) and 7 (Review and Reflection) it accounts for 33 marks – over a quarter of the whole marks available.

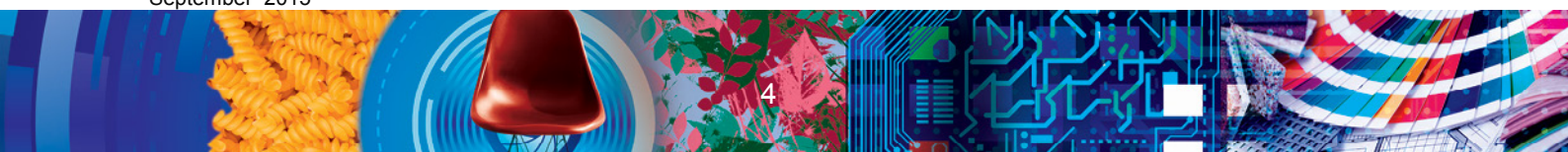
Students should use and develop skills gained in AS units F521 Advanced Innovation Challenge and F522 Product Study when tackling this section.

### Mark Scheme

<p>5 TESTING and INDEPENDENT EVALUATION of the FINAL PRODUCT</p>	<p>Show evidence of the testing of the final product against the specification. Identify and state strengths and weaknesses in the product. Respond to independent evaluation</p>	<p>9</p>
<p>Shows evidence of thorough testing of the final product against the specification. Identifies and clearly states the strengths and weaknesses in the product. Responds positively to in depth independent evaluation of the product.</p>		<p>7-9</p>
<p>Shows reasonable evidence of testing of the final product against the specification. Identifies some strengths and weaknesses in the product Shows a reasonable response to some independent evaluation of the product.</p>		<p>5-6</p>
<p>Shows limited or no evidence of testing of the final product against the specification. Identifies few strengths and weaknesses in the product. Shows a superficial response to limited independent evaluation of the product.</p>		<p>0-4</p>

There are **three requirements** for candidates' responses if they are to satisfy the assessment objective (T I S):

1. **Testing to the Specification**
2. **Independent Evaluation**
3. **Strengths and Weaknesses**





As a guide **3 pages** should be submitted and a mark **out of 3** should be awarded for how well each section is addressed.

### Guidance

Remind students that they are testing their **actual products**. They are **NOT** commenting on the project or the process of designing and making, as that will be marked in section 7.


## Testing to the Specification

### Example page

This topic exploration pack is accompanied by Teacher's support slides, which can be found on <http://www.ocr.org.uk/qualifications/as-a-level-gce-design-and-technology-product-design-h053-h453/>

### Testing Against the Specification

#### Testing



**Herb Planting Test**  
This was meant for us to find out if herbs of a sizeable nature could be planted into the troughs, using extra soil to fill up the space and give more room for the roots to grow. It was easy enough to undertake but it was rather messy due to the extra soil being taken out of its bag onto the table.

**Strengths**

- +Enough room inside and outside for large herb plants due to good spacing between troughs and wide pots within the troughs.
- +Easy to put the herbs into the pots due to easy removal of troughs.

**Weaknesses**

- +Extra soil needed therefore more spending.

*Click to play video!*

**Inserting Full Trough Test**  
This was meant for us to find out if the trough, when full, could be inserted into the frame with no extra effort than without the herbs in. Admittedly, much more care had to be taken when inserting the trough as it had gained more weight and a lot of mess could have been made.


**Strengths**

- +Very stable when in the frame due to weight.
- +Easy to put the troughs into frame.

**Weaknesses**

- +Soil can make a dirty mess.

*Watering herbs is easy and does not take long.*



**Rotating Frame Test**  
This was meant for us to find out if the frame could be rotated easily with all the troughs full and the tall herbs in, possibly interfering with the other troughs. During the rotation, the swing of the troughs was not entirely smooth and tall herbs interfered slightly in the process.

**Strengths**

- +Rotates very easily when troughs are full due to lightweight frame.
- +No soil or herbs fell out in the process due to good depth of troughs.

**Weaknesses**

- +Need to rotate slowly otherwise, herbs may tip.

*Click to play video!*

**Labelling Herbs Test**  
This was meant for us to find out if the Herbs could be labelled easily removing and inserting the card piece. As easy as it was, the card pieces could have been larger and the quantity could be much more.

**Strengths**

- + Easy to insert and remove piece of card due to label holder.

**Weaknesses**

- + Spare card needed if herbs are changed frequently.

#### Evaluation against my Specification

Spec. Area	Detailed Reason Why
<b>Function</b> 9/10	The herb garden consists of 9 separate pots within the troughs, all different surface areas for different sizes/ amounts of herb. There is <b>no drainage system</b> so the user <b>must be careful to not overflow</b> each pot when watering the herbs. The side panels act as legs for the product and can be vertical, saving a lot of space, or horizontal for watering.
<b>Materials</b> 10/10	Being used indoors, all the materials will last over 5 years, with daily use, due to waterproofing. The side panels are strong enough to hold 3 full troughs. The herb garden is waterproof due to the oiled oak, aluminium and HIPS. All materials are high quality and finished well.
<b>Manufacturing</b> 7/10	Manufacture, due to the machines used and amount of work to go into the product, will cost more than £25. The process will take longer than an hour due to production of the troughs. There are more than 20 components currently but changes to the washer could be made to decrease the number.
<b>Ergonomics</b> 9/10	Herb garden will not be in an awkward place but not the best as it is rather tall on a window sill and perhaps too big for a counter. It is no wider, not taller than 1m. It weighs less than 8kg and can be easily manoeuvred. The handles and aluminium rods are thin enough to be held by those users 10+ years old.
<b>Safety</b> 9/10	There are no dangerous sharp edges, but some corners could be smoother. There is no child safety warning as it requires none and it is out of reach from children and meets standards for quality assurance.
<b>Moral Issues</b> 9/10	All material could be reused and recycled due to being wood, metal and plastic. The product could be manufactured in china to save costs. Some materials are fair trade but the hard woods are worse for the environment.
<b>Cost</b> 9/10	Product will probably cost more than £25 to manufacture. High quality materials may cost more than £35 but the product should not cost any more than £60.
<b>Aesthetics</b> 10/10	Aluminium will have natural finish and the wood is oiled beautifully. Pots and outer panels could come in different colour schemes but looks nice with the green/grey contrast. The troughs are organised well and look attractive.
<b>OVERALL</b> 72/80	Everything is incredibly satisfactory throughout the specification, however, there are manufacturing problems for the 'real world' to be considered.

Students should devise a series of **physical tests** to determine how well their product performs. The finished product needs to be tested in its **intended location**, preferably by its intended user or a suitable consumer to be legitimate.



It should ideally be subjected to all the expected conditions that it would face during the phases of its life - its suitability in all situations and conditions in which it may be placed, used, consumed, stored, packaged, or transported. **Evidence** of this testing must be provided in the form of photographs and/or video clips. A concise account of the testing and the results should be written up with key strengths and weaknesses highlighted/discussed.

A **formal evaluation** against the specification should also be written up. Detailed analysis/justification is required rather than a tick list of spec points. Colour can be used to highlight potential strengths and weaknesses identified.

**Common student misconceptions:**

*No evidence of any actual tests, testing their product in the school workshop, superfluous /inappropriate tests, a lack of detail in the written evaluation.*

## Suggested Activities

### Peer assessment

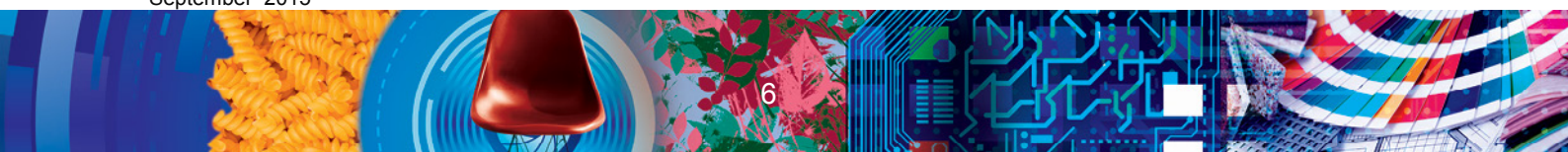
Mark examples of Section 5 from previous years or from examples provided by OCR – focus on a mark out of 3 for each component – Testing/Evaluation, Independent Feedback and Strengths/weaknesses

### Product Analysis

After watching the iTunes videos on testing (see resources) working individually or in pairs students select an existing product from their chosen material focus. They first identify then describe and justify a range of suitable physical tests that could be carried out on the chosen product. A whole group plenary can be used at the end to assess the suitability of each test.

### Preparation/homework assignment

Using a similar form to the one shown below, have students plan their own testing by describing and justifying a range of suitable physical tests appropriate to their product.



Product Design – Homework Assignment **HAND IN MONDAY**

**Testing – Preparation**

Describe **three** appropriate tests that could be carried out on your product to determine its effectiveness

For each test describe:

- a) A **name** for the test
- b) What the test would **involve** ( a sketch would be useful)
- c) **Why** that particular test would be useful for your product
- d) How **well** ( you believe) your product would perform

<b>Test 1</b>	<b>Test 2</b>	<b>Test 3</b>
Name:	Name:	Name:
Show me:	Show me:	Show me:
Why do it?	Why do it?	Why do it?
How will it do?	How will it do?	How will it do?





# Student Worksheet 1

## Evaluating against a specification

Use a range of pre-prepared handouts that include a photo of a suitable product and a simple five-point specification. Working in pair's student's practice writing an evaluation against each point then swapping and evaluating each other's work. (This could be combined with the Product Analysis task above) Make sure the products chosen are available to handle in the classroom/workshop such as hole punches, staplers, binders, G cramp etc...



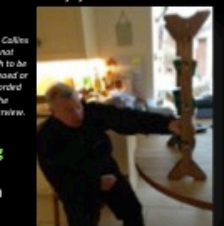
## De Bono's thinking hats

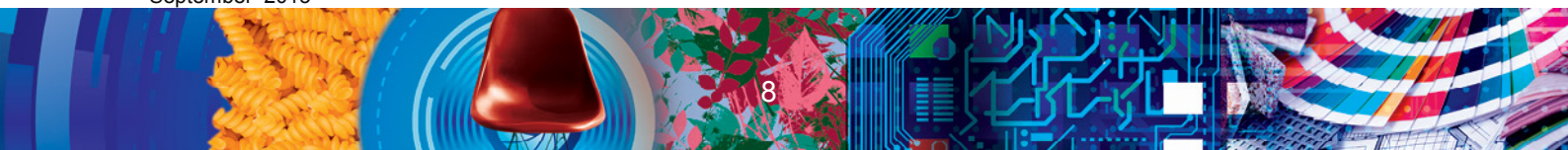
As a variation on the thinking hats exercise (<http://www.debonoforschools.com>) use each 'hat' to represent an area of the specification such as Function, Ergonomics, Manufacturing, Materials etc. Pupils can work in groups to evaluate a range of products.

# Independent Evaluation

## Example page

### Client and User Feedback

<p><b>Feedback 1 – Mrs. Harriet Wood (My Client)</b> Mrs. Wood is the cook in her household and loves to experiment with herbs to enhance the flavour of her food.</p> <p><b>Summary of Interview.</b></p> <p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>• Rotating and carrying the frame is very easy, even with troughs full of herbs.</li> <li>• Easy to assemble, with the correct tools.</li> <li>• Handles score 5/5 for strength and comfort.</li> <li>• Rotation is safe and great aspect.</li> <li>• Oiled oak is beautiful.</li> </ul> <p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>• Frame is <b>too tall, could be much shorter.</b></li> </ul> <div style="text-align: right; font-size: small;">  <p>Video of interview – Click to Play!</p> </div>	<p><b>Questions</b></p> <ol style="list-style-type: none"> <li>1. How easy is it to rotate the product?</li> <li>2. Can the herb garden be carried with ease?</li> <li>3. On a scale of 1-5, how strong is the herb garden?</li> <li>4. Is the product easy to assemble?</li> <li>5. On a scale of 1-5, how comfortable are the handles?</li> <li>6. What do you not like about the herb garden?</li> <li>7. Are the troughs easy to handle?</li> <li>8. What do you like about the product?</li> <li>9. What's the best aspect of the herb garden?</li> <li>10. How might I make the product better?</li> </ol>
<p><b>Feedback 2 – Ms. Jacqui Swan (Plant and Garden Enthusiast)</b> Ms. Swan created and designed her own garden and continues to keep up her hard work. She is very enthusiastic about cooking with her AGA, and herbs.</p> <p><b>Summary of Interview.</b></p> <p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>• Rotating and carrying the frame is very easy.</li> <li>• Easy to assemble, with right tools.</li> <li>• Handles score 5/5 for comfort.</li> <li>• Contemporary aesthetics with useful function is best aspect amongst the great grip, removable troughs, balance, and 3 tiers.</li> </ul> <p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>• Slight wobble in the frame on surface.</li> </ul> <div style="text-align: right; font-size: small;">  <p>I spoke to her over the phone about the product.</p> </div>	<p><b>My Response</b></p> <p><b>Mrs. Harriet Wood.</b></p> <p>I agree, the <b>frame is definitely too tall</b> for Mrs Wood's kitchen and a shorter, 2 tier frame would be a huge improvement. I am pleased that the oak stands out enough to be the best aspect about the product, aesthetically. The rotation function is definitely a great aspect and draws customers toward the herb garden.</p> <p><b>Ms. Jacqui Swan.</b></p> <p>I agree that there is a <b>considerable wobble</b> that comes from the frame at the bottom of the 'feet', where the <b>bottoms must not be exactly level</b> and so something must be done to fix that. I had <b>never taken into account</b> that the product has a <b>beautiful aesthetic look about it yet it is a very functional product</b> that works at the same time. It is rather versatile. I agree with the rest of the strengths.</p> <p><b>Mr. Derek Collins.</b></p> <p>I have <b>not noticed before</b> that <b>soil/dirt could potentially get stuck in the creases</b> of the end inside faces of the troughs, but it <b>should go with a good wash</b>. I agree that the <b>3 tier frame is tall</b> for some kitchens and places and so other 2 and maybe 1 tier versions should be made to fix this problem. I agreed with Mr Collins about the rest of the strengths that he had mentioned.</p>
<p><b>Feedback 3 – Mr. Derek Collins (Potential Customer)</b> Mr. Collins is a very enthusiastic retired workman who enjoys crafts and DIY. He loves herbs and cooks frequently with his wife.</p> <p><b>Summary of Interview.</b></p> <p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>• Rotating and carrying the frame is easy.</li> <li>• Incredibly easy to assemble.</li> <li>• Handles score 5/5 for comfort.</li> <li>• Troughs easy to handle.</li> <li>• Eye-catching, lightweight and space saving</li> </ul> <p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>• Dirt may get into creases on ends of trough when in use.</li> <li>• 3 tier frame <b>too tall</b> for some kitchens.</li> </ul> <div style="text-align: right; font-size: small;">  <p>Mr. Collins did not wish to be videotaped or recorded in the interview.</p> </div>	





Students should arrange an evaluation of their product by **at least two people** suitably qualified to give opinion and comment - one of these should be their client. Allowing these people to have direct contact with the product is essential for an effective evaluation. **Evidence** of this testing must again be provided in the form of photographs and/or video clips and could also include headed/signed letters and audio clips.

A **summary** of the key findings is preferable to a complete written transcript. This can also allow the student to highlight key strengths and weaknesses. A questionnaire could be used at this stage, not as the sole source of feedback but rather to support and expand upon the range of face-to-face feedback obtained. The emphasis is on the **quality** of feedback obtained rather than the quantity.

**Responding** to the independent feedback is crucial for a high mark. It is important that students remain positive and openly consider the suggestions made by others. This may include proposing suitable modifications.

**Common student misconceptions:** *Faked feedback, no evidence of contact with a real person, evaluation by email, having only friends evaluate their product, inappropriate questionnaires, written transcripts of entire interviews, no response to the feedback, an assumption that their product is perfect*

## Suggested Activities

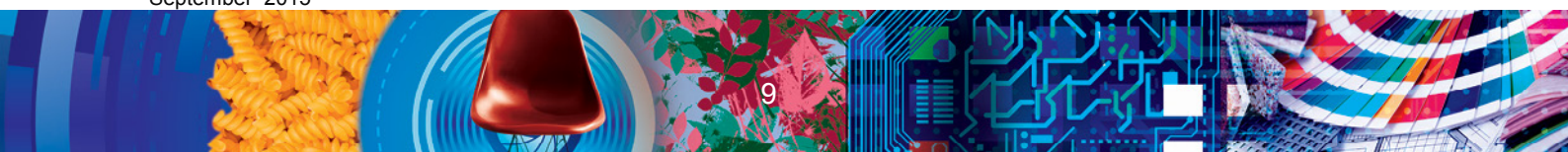
### Practice interviews

Students will need to be confident when conducting their interviews. Working in groups of three (interviewer, interviewee and cameraman/ photographer) get them to practice on each other. This does not have to be design related; it could be focused on hobbies. There are many styles of interview available on YouTube to help introduce and prepare them.

### Preparation

Get your students to write 10 appropriate questions that could be used during their interviews. These can be checked in advance by working in small groups.

<http://predictableprofits.com/the-10-most-powerful-questions-to-ask-when-developing-a-new-product-or-service/> is a good site to help them.



A handout similar to this one can be used to as a homework assignment during the making to help them prepare for this page:

<p><b>PREPARATION FOR INDEPENDENT FEEDBACK</b></p> <p>Some things may be difficult to test, for example how long a product might last, how well it might keep when stored, so the <b>opinions of experts</b> and those with experience in the appropriate field will be important.</p> <p>Arrange evaluation of your product by those qualified to give opinion and comment because of their knowledge, qualifications and expertise in the specific design field.</p> <p><b>Who will you interview?</b></p> <p><b>Interview 1</b> Who?..... Why?..... .....</p> <p><b>Interview 2</b> Who?..... Why?..... .....</p> <p><b>Interview 3</b> Who?..... Why?..... .....</p> <p>The <b>relevance</b> of people is the key, not just your best mate. Use your CLIENT and an expert in the field as well as a potential customer/user.</p> <p><b>PHOTO &amp; VIDEO</b> these interviews as they happen</p> <p>Explain your product to them and show them how it works and what it does. Then ask them all a <b>series of questions</b> – for example: <i>How does it feel to use? How does it look? What felt awkward? How might it be improved?</i> Use a range of open ended questions and look at your spec to see what it SHOULD do!</p>	<p><b>PLANNING</b></p> <p>Make a list of <b>10 suitable questions</b> that you could ask your "experts" – use a variety of CLOSED questions (yes/no answers, on a scale of 1 to 5 etc.) and OPEN questions (e.g. What is the best aspect of my product? How might I make it better?)</p> <p>1..... 2..... 3..... 4..... 5..... 6..... 7..... 8..... 9..... 10.....</p> <p><b>Page Checklist</b></p> <ul style="list-style-type: none"><li>✓ A list of the <b>questions</b> used in the interviews</li><li>✓ <b>Video evidence</b> of interviews</li><li>✓ Summary of <b>good &amp; bad</b> points</li><li>✓ A <b>positive</b> response to each interview</li></ul>
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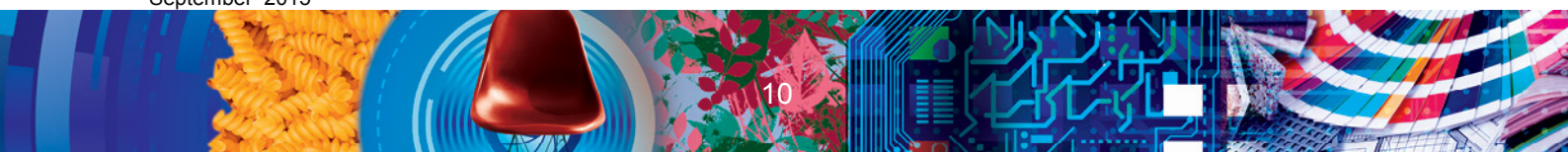
## Student Worksheet 2

### Responding positively to feedback

This skill is best developed throughout the course. AS unit F522 requires a substantial amount of interactive dialogue and peer review throughout and Unit F521 makes use of group feedback before development.

An excellent resource to help students prepare can be found at Smashing Magazine -

<http://www.smashingmagazine.com/2009/10/01/how-to-respond-effectively-to-design-criticism/>



# Strengths and Weaknesses

Example page:

## Strengths, Weaknesses & Improvements

### My Products STRENGTHS

- It can **rotate** from vertical to horizontal or vice versa because it has rubber corners that provide grip to avoid the frame sliding and handles to hold when bringing the frame down, with control.
- The troughs can be easily removed and inserted because of the gaps that have been cut out to hold them.
- The troughs stay upright when the frame is rotated due to the weight of the trough and its contents and the force of gravity.
- The beautifully oiled oak side panels, vac formed HIPS troughs and wet and dried aluminum tubing are all high quality and aesthetically pleasing. They are also waterproof due to the natural and physical finishes.
- The handles and aluminum tubing allow the herb garden to be carried around easily.


### My Products WEAKNESSES

- It is surprisingly **very tall** for a standard kitchen windowsill or counter due to it holding 3 troughs.
- Some of the corners are **slightly sharp** and have the potential to harm users due to not enough sanding of the wood.
- There is a **slight wobble** from the side panel due to them **not being level** at the bottom when on a surface.
- The handles may **not be the most comfortable shape** as they are just one solid shape with nothing to properly grip comfortably.
- The troughs are **not incredibly rigid** due to there **not being thick enough** plastic on the sides.
- Extra soil** is needed when planting the herbs into the troughs due to **not having enough** with what comes with the bought herbs.

### Improvements that could be made.


**The 3 tier side panels are too tall for a kitchen.**

I have **shortened** the side panels so now only 2 troughs can be inserted but there are still more than enough pots for 6 different herb types. The height of it has been shortened to 500mm. This will improve the rotation time and it will be much easier for the user to use. It will not take up half as much space as the previous height. This will **save time** in manufacture and the amount of expensive material used in the process.




**Handles are not the most comfortable shape.**

I have designed the new handle so it can be wood lathed to create grooves in the tube so the user has somewhere to comfortably place their fingers when holding the handle. This will make the manufacturing process **longer due to extra work** to be done on the wood lathe. However, no more material will be needed.



2 views showing the grooves and how the handle will be fitted.



**There is a slight wobble in the frame due to 'feet' not being level on side panels.**

I have placed much thicker foam on the very bottom of the feet so that when in contact with any surface, the foam will squash accordingly and the herb garden will be level and not wobbly on a flat surface. This will **require more material time for manufacture** and therefore the **costs will be increased** so this improvement can be made.

Based upon their testing, evaluation and user feedback students should now be in a position to summarise their products **strengths** and **weaknesses**. If these have been highlighted throughout then this should be easier to achieve. **Quantifying** a range of important strengths/weaknesses is more important than listing every single one. Consideration of **weaknesses** should be in order of **seriousness**, as this can help students to focus on any improvements required.

Suggested improvements are best presented in the form of **high quality annotated sketches** but could also include CAD models. A selection of **specific** improvements presented and discussed in detail are preferable to a long list of superficial improvements. It should be clear which specific weakness they are addressing. Discussing the **implications** of each weakness should also be encouraged. Note that any improvements needed to make the product more suitable for batch production should be in section 7.

September 2015

**Common student misconceptions:** *Lists with no explanations, a reluctance to identify weaknesses, superficial improvements, quantity over quality, improvements that do not address the important weaknesses*

## Suggested Activities

### Match up

Using prepared cards get students to match the strength to the description and justification. For example matching “*Lightweight*” to “*due to the use of aluminium tubing*” to “*this makes it very easy for the user to move it around in the office*” helps them to see the structure of a good comment. This could be made more difficult by getting students to work in teams to write them first then break them up and swap over and complete each other strengths/weaknesses.

### Next Step

Using edited examples of work from previous years (just the testing and interview pages) get the students to identify the strengths and weaknesses of a variety of products. Then check them against the actual ones.

### Sketching improvements practice

This skill should be developed throughout the entire A level course but students can practice by tackling quick re-design tasks as starters or homework assignments. You can vary the level of difficulty by how much is given to them. Ranging from them choosing a product to a prepared sheet with a product and three weaknesses to address listed for them.

### Preparation/homework assignment

A sheet similar to the one below can be used to get students thinking about potential improvements during their testing:



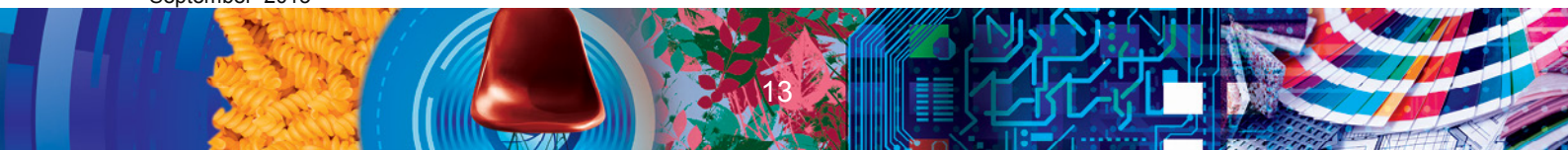


<p>Look back at your <b>EVALUATION</b> think carefully about your product and identify the <b>FOUR MOST SERIOUS WEAKNESSES</b>. Focus on things that can be <b>IMPROVED</b> by altering the <b>DESIGN</b>. <b>**DON'T</b> focus on mistakes made during the making! (such as poorly chiseled joints, wonky fixings, poor quality finish etc)</p>	
<p><b>Problem</b> .....</p> <p><b>Why is this a problem?</b> .....</p> <p><b>Solution</b> .....</p> <p><b>Show me (use annotated sketches)</b></p>	<p><b>Problem</b> .....</p> <p><b>Why is this a problem?</b> .....</p> <p><b>Solution</b> .....</p> <p><b>Show me (use annotated sketches)</b></p>
<p><b>Problem</b> .....</p> <p><b>Why is this a problem?</b> .....</p> <p><b>Solution</b> .....</p> <p><b>Show me (use annotated sketches)</b></p>	<p><b>Problem</b> .....</p> <p><b>Why is this a problem?</b> .....</p> <p><b>Solution</b> .....</p> <p><b>Show me (use annotated sketches)</b></p>

### Student Worksheet 3

#### Implications

Provide students with example products/improvements and ask them to discuss the implications of each change. This can be left open or guided with questions such as “Explain how this will make the production time longer” or “How will this make the product more expensive?”



## Preparation/Resources

Familiarisation with the following work can help teachers and students prepare for this section:

### Books

P80-82 & P140-144 '*OCR Design & Technology for A level*' by J Grundy, D Hallam, M Hopkinson, S McCarthy

P115-119 '*Advanced Design and Technology 3rd edition*' by E Norman, J Cubitt

**BSI Education Website**<http://www.bsieducation.org/Education/default.php>  
[www.bsieducation.org/Education/default.php](http://www.bsieducation.org/Education/default.php)

### iTunes U – Consumer Product Testing

Video:<https://itunes.apple.com/gb/podcast/consumer-product-testing/id380225312?i=84481174&mt=2>

Transcript: <https://itunes.apple.com/gb/podcast/transcript-consumer-product/id380225312?i=86355113&mt=2>

### iTunes U – Testing Standards

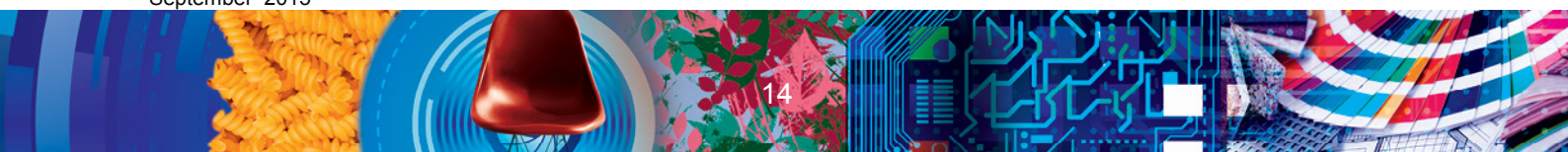
Video:<https://itunes.apple.com/gb/podcast/testing-standards/id380225318?i=84481188&mt=2>

Transcript:<https://itunes.apple.com/gb/podcast/transcript-testing-standards/id380225318?i=86365767&mt=2>

### Interview Questions

<http://predictableprofits.com/the-10-most-powerful-questions-to-ask-when-developing-a-new-product-or-service/>

Previous students' work / examples from the Centre or from those provided as part of OCR support for this Specification can be analysed/marked and used for guidance.





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