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Registered office: 1 Hills Road
Cambridge
CB1 2EU

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Teacher guide

This topic exploration pack focuses on the subject of evaluation through testing and analysis of candidates’ design work. Whilst the process of evaluation is familiar to the majority of Technology students and an objective in both legacy controlled assessments, it is often done as a summative exercise at the end of a design project. This pack aims to introduce and investigate the concept of evaluation as an ongoing formative process throughout a design project; demonstrating opportunities for using testing and analysing to support and enhance work at various stages of a project.

Evaluation is often seen as a bolt on piece of written work stuck on at the end of a project to gain a few extra marks. Frequently, the controlled assessment work in units one and three reflects this and very few candidates achieve high marks in this section. Often the results of the evaluation are not analysed in any way and no conclusions are drawn from the exercise. Testing is an area of the evaluation that is frequently overlooked by many candidates and completely absent from many folders. Whilst many students suggest improvements to their finished products these are rarely as a result of any analysis or testing.

This pack will explore the relationship between analysis, testing and evaluation and how they can be used at different stages of the design process to enhance the work of students.

Starting at the initial design stages, we will look at analysis of the problem and how this can inform and affect the design thinking and aid the writing of a clear, concise brief. Following on from the initial brief, we will investigate ways that students can use testing and evaluation of research to write a detailed specification for their product.

We will examine the use of testing in the researching and analysis of existing products; in the creation of design ideas and the refining of designs and development of the product through the making process.

Finally we will look into different testing methods and techniques that can be used during the final evaluation of the finished product and how the results can be presented and used to suggest improvements to the design, manufacturing methods, material choices and finishing of products.
Each area of study will include and address common areas where students often fail to achieve high marks or lose out on valuable marks, through mistakes or misinterpretation of the objective criteria and give examples of how these can be addressed and evidenced in candidates work.

**Analysing a Problem**

Let us first look at the meaning of the word “analysis”:

'**to study or examine something in detail, in order to discover more about it.**'

In design and technology we know that all products are designed to fulfil a particular need which begins with an initial problem.

In today’s world we have very few ‘new’ problems and as a result of this many products are different designers’ responses to a problem which may already have been ‘solved’ many times before. It is easy for designers to let existing products influence their thinking and use these as the basis for their ‘re-designs’. This leads to wide ranges of very similar products which may have elements which are slightly improved or variations on the same theme. However, by analysing both the original problem and testing how well existing products solve this, we can evaluate their performance and decide on what needs to be improved. This in turn will lead to a clearer and more specific brief which will ensure that the design will address the weaknesses and lead to a worthwhile solution. Refer to the Analysing Problem Teacher Slides to demonstrate these examples. e.g.

**A typical student brief**

I am going to design and make a package for an MP3 player.

Ideally, the student would then, research existing MP3 players and do some analysis:
Following the guidance in the creativity section, the analysis would usually lead to a list of ‘trends’ and common features found on the existing products:

**Common Features**
- They all have Logos.
- They all have multiple colours.
- They are all blister packs.
- They all show the actual MP3 Player in a clear window.
- They all use the colour blue and red (masculine colours) extensively.
- They all have a euro slot so they can be hung up.
- They all use at least 2 different materials (mainly card and plastic).
- They are all around 3 times bigger than the MP3 player.

They would then write a specification:

**My MP3 player must:**
1. Be made from thin card.
2. Have appealing surface graphics.
3. Allow all, or part of the MP3 player to be seen.
4. Have information on the specifications of the MP3.
5. Include the company logo.
6. Protect the MP3 player from damage.
7. Be able to be hung up from a euro slot.
8. Appeal to the target audience.
9. Be safe to use by children.
10. Be easy to open.
11. Be re-cycle able and eco-friendly.
12. Have relevant safety symbols on it.
13. Be easy to manufacture in quantity.
14. Be reasonably cheap to manufacture.

Whilst this follows the traditional ‘design process’, and the conventions set out in Unit 1, it does not allow any re-examination of the brief and subsequent alteration in light of the findings from research.
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Model 2

A typical student brief

I am going to design and make a package for an MP3 player.

The student researches existing MP3 players. By using ‘real life’ examples the students are able to ‘test’ the packages.

How well do they display the MP3 player?

How easy are they to open/re-seal?

How sustainable is the packaging?

How easy is it to see the product?

Following the research, the analysis focuses on the flaws, problems or weak aspects in the design of the existing products.

The existing package is difficult to open. It could only be opened by cutting with scissors and was still difficult to do. Once open the package cannot be re-sealed. The card and plastic were difficult to separate for recycling.
As a result of testing, analysing and evaluating existing ‘real life’ products students are able to refine their brief to a more clear and precise statement of what they intend to produce.

Activity 1

Hand out the Problem cards and the Brief Activity Sheet to students. Students can work individually or in pairs/groups depending on your class. On each of the cards there is a design problem.

Task 1

Students are to read the design problem and decide on a suitable design brief for that problem. E.g. Design Problem:

Brief
They are then to write the brief onto the first line of the Brief Activity Sheet.

Task 2

Using appropriate sources, students are to find three different existing design solutions to the problem. Depending on the class, you may give them free reign to search the internet or guide them down certain avenues. In some cases, you may wish to provide examples of existing solutions in the form of images and information. Where the items are relatively small and easy to get hold of, it is better of you can provide ‘real life examples’ of existing solutions. This allows students to actually ‘test’ how well they work.

Task 3

Students are to study, analyse and evaluate the examples of existing products and for each one, list the actual, potential or possible problems that the existing solution may have.

They would then use these to re-write the brief:

I am going to re-design and make an easy to open and environmentally friendly package for a MP3 player.
Task 4

Based on their findings they now write a revised brief including the key points they have found from their analysis and evaluation of existing solutions.

A completed example of Brief Activity Sheet is shown below:

Problem: “I need to stop my phone getting scratched and damaged.”

<table>
<thead>
<tr>
<th>Initial Brief</th>
<th>Design and make a protective cover for a phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>What existing solutions exist?</td>
<td>Details and images of an existing phone cover</td>
</tr>
<tr>
<td>Problems with existing solutions</td>
<td>• Difficult to fit. • Tears easily. • Covers up the headphone socket.</td>
</tr>
<tr>
<td>Revised Brief</td>
<td>Design a strong cover that is easy to fit and allows the headphones etc to be plugged in.</td>
</tr>
</tbody>
</table>

Task 5a – Extension Task

Students may find that they can find more than one problem with the existing solutions given. Ask to students to discuss in groups which problem is the most important one to overcome and feedback to the rest of the class explaining their answer and reasoning.

Task 5b – Extension Task

Give students in groups a similar type of product but with different problems. Ask them to decide which of the products is more ‘evolved’ i.e. which designer has taken it furthest. Following this ask them to discuss and decide how it could then be taken further again.
Analysis, Testing and Evaluation of Design Ideas

Frequently in controlled assessment work we see candidates produce a range of design ideas which may then be evaluated in some way. Often each idea is judged against some form of criteria (such as the specification) and a ‘winner’ is chosen. Refer to *Analysis, Testing and Evaluation of Design Ideas Teacher’s Slides* to demonstrate the below examples.

**Selecting Ideas**

![Diagram showing evaluation criteria for design ideas](image1)

**Selecting Final Idea**

![Bar chart showing evaluation of final ideas](image2)

In other cases, candidates write a paragraph explaining which idea they like best and why.
The first method can be very effective in narrowing down a range of designs, but this depends heavily on the quality of the specification it is being judged against. If the specification is not detailed the ‘wrong’ design can be chosen.

The second method can lead to students picking designs to develop for completely the wrong reasons.

e.g. ‘I think idea number four is best but it would be too hard to make so I will choose idea two instead’.

In many cases, we see the candidates’ initial idea drawn first (this is the one they wish to make!) followed by a collection of ‘lesser’ designs drawn on to make up the numbers. Regardless of what designs they may come up with, they have already decided to make their first idea.

Are these effective ways of analysing and evaluating design ideas?

**A Different Approach**

A more useful and effective method of designing and developing ideas is to begin with the candidates first idea, sketched out with notes and relevant details added.
Instead of then drawing a range of other totally different ideas which will not be considered, the candidate analyses the design by testing it against criteria in the specification, brief and/or 10 basic principles of good design. This can be done individually by the student themselves or as a group exercise, where students test and evaluate the work of others.

Following the evaluation of the initial idea, the candidate can then develop the initial idea using the analysis as guidelines. This may lead to a single development or a series of new and alternative designs. The same process can then be repeated again until the design(s) are refined to a point where they satisfy the criteria as fully as possible.

**Activity 2**

**Task 1**

Split the class into groups of two or three. Give each group of students a design brief. You can use one of the briefs from Activity 1 or use one of your own.
Task 2
Ask students to spend three minutes just thinking of a solution to the brief. After three minutes give them one sheet of paper on which they are to draw a design idea. Depending on the ability of the group you may give them between five and ten minutes to draw their idea and add relevant notes etc. They can draw alternative views of the idea if necessary, but only one idea.

Task 3
Ask students to swap ideas within their group and discuss their ideas.

- How are the ideas different?
- What things are similar or the same?
- Are there any elements or features of one design that could be incorporated into one of the others?
- Do the students all agree which design idea is best?

Give each student another sheet of paper and allow them another five minutes to draw a refined design based on their discussions.

NB: They must alter at least one part of the design.

Task 4
Each student moves to another group with their design. They explain the brief and show their solution. The group then give their opinions and feedback on the design and how it can be improved.

Based on the feedback the student is then given another sheet of paper and five minutes to refine their design again.

NB: They must alter at least one part of the design.
Task 5

Each student returns to their group. They should each now have three designs. They are now to evaluate each design and decide:

- Which is the best idea?
- What developments/design ideas would you incorporate?
- Can you develop the idea further based on the comments from others?

Analysis, Testing and Evaluation of Finished Product

One of the most common areas for candidates to lose marks in their controlled assessment work is in the evaluation of their work. This is rarely an area where candidates achieve marks in the high ability range. For many candidates, it is done in a cursory fashion, often appears rushed and done as an afterthought, to gain a few extra marks. For many candidates the ‘excitement’ of designing and making the product is over and they are not particularly interested in the analysis, testing and evaluation stages.

Refer to Analysis, Testing and Evaluation of Finished Product Teacher’s Slides to demonstrate the following examples.

The majority of candidates evaluate their work against their initial specification as shown below:

<table>
<thead>
<tr>
<th>Evaluation of the MP3 Player Packaging</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Be made from thin card – The packaging is made of card, apart from the plastic cover</td>
</tr>
<tr>
<td>- Include the company logo – It does have the logo, which is the title</td>
</tr>
<tr>
<td>- Appeal to the target audience – I personal think it does because I fit in with the target audience and I like it</td>
</tr>
<tr>
<td>- Protect the MP3 player from damage – I can’t really tell this because my packaging is on just a prototype but I know it will protect from water and tamper.</td>
</tr>
<tr>
<td>- Have appealing surface graphics</td>
</tr>
<tr>
<td>- Have information on the specifications of the MP3 – Yes it does to the left of the product and on the back</td>
</tr>
<tr>
<td>- Be able to be hung up from an euroslot – No it does not have a euroslot</td>
</tr>
<tr>
<td>- Be safe to use by children – There is only the risk of a paper cut</td>
</tr>
<tr>
<td>- Be easy to open – Is extremely easy to open</td>
</tr>
<tr>
<td>- Be recyclable and eco friendly – Certain parts will be recyclable, all apart from the plastic</td>
</tr>
<tr>
<td>- Have relevant safety symbols on it – It does not have them</td>
</tr>
<tr>
<td>- Be easy to manufacture in quantity – Yes, the packaging only consists of card and plastic which is cheap to buy</td>
</tr>
<tr>
<td>- Be reasonably cheap to manufacture – Yes, the packaging only consists of card and plastic which is cheap to buy</td>
</tr>
</tbody>
</table>
Many candidates will also include a paragraph or two giving some analysis of the evaluation and suggest further improvements:

**Improvements**

I could improve my MP3 design by painting the product. This will make it much more appealing and could also vary the colours the product is available in. This will also make it more customisable for users e.g. A girl which would like a pink one.

I could improve my packaging design by adding a euroslot on the top of the packaging so it can be hung up in stores. This will help store the product and make it stand out on a shelf to customers.

I could improve the packaging idea by adding relevant health and safety symbols to show the safety hazards of the product, such as warning about choking on small parts such as batteries.

Only a very small percentage of candidates however, carry out any form of testing on their final product.

In the corporate world of design, the testing and evaluation stage of a product’s life cycle is seen as one of the most important and valuable processes, from which the designer and manufacturer often learn the most about their product. It is used to determine whether a product meets relevant safety regulations, legislation or British Safety standards and highlight any safety issues. This in turn gives them the necessary information to refine and improve their product or totally re-design it based on the results.

Many companies invest thousands of pounds into the testing of products using their own in house testing procedures or outside agencies who are paid to test products over a set period of time. Each stage of the manufacturing process including the production and material costs can be assessed, which may lead to alternative and cheaper manufacturing methods being investigated if the client has set financial restrictions or limits. Repetitive testing of products may be used to identify failure of individual components leading to a redesign of just a small part rather than the entire product.
Test your understanding. This is a different approach to testing. It is important to test a product in a range of ways, as we have seen in the previous tasks. It is worth repeating what we have learned so far:

- Using the product for the purpose it was created:
  - Which products are easiest / hardest to use?
  - Which products are most / least comfortable to use?
  - Which products actually work the best / don't work?
  - Which products seem to be well/poorly made?
  - What additional features does the product have/need?

- Repetitive testing:
  - Opening/closing of cardboard flaps on packaging.

- Destructive testing:
  - Dropping the items and seeing if they break.
  - Seeing how hard it is to tear/snap items.

- Subjective testing
  - What parts of the product could easily be lost?
  - Which parts of the product will wear out quickly/last a long time?
  - How easy/hard the product is to recycle?
  - Is the product aesthetically pleasing?

If the prices of the products are known this could also be used:

- Is the product good/bad value for money?
- Are the best products necessarily more expensive?
- Are you paying for features you don’t need?
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You may wish to use a prompt sheet such as the Testing Activity Sheet to guide the students. The questions may differ depending on the product, but they should focus around the principles of good design:

- Aesthetics
- Usefulness
- Ease of Use
- Easy to understand
- Unobtrusive
- Long lasting
- Environmentally Friendly
- Thorough
- As little design as possible.

An example of a similar test is shown below:

**Task 2**

We are able to test and gain hard facts about certain product features but how do we test whether something is aesthetically pleasing or appealing? The answer is to conduct surveys.

**Facts vs Opinion**

People are all different and will have different views and opinions on certain aspects of a finished product.

What may be aesthetically pleasing to one person will be viewed as unsightly or ugly by another. One person may find a product easy to understand whereas others may find it too difficult.

Using surveys as part of controlled assessment work is common. Many candidates use surveys in the evaluation of their final product. However, these are often of little use because of the following reasons:

- Questions do not relate directly to the products performance
- Questions are too open ended or too closed
- The choices given to multiple choice questions are too limited
- Questions are based on what has not happened
- Too few people are surveyed
- The wrong people are surveyed.
Task 3

Alternative Questioning Activity. You may wish to use the provided Question Cards as a prompt.

1. Pick a card, and look at the question. Think of it can be improved.
   e.g. ‘Do you like the finished package?’

2. What are the possible answers somebody could give to this question?
   e.g. ‘Yes or No’
   This is a common problem. Many people will ask their friends this question and the answer is inevitably a ‘Yes’. Therefore, the answer is biased and inaccurate.

3. Can you think of an alternative and better question.
   e.g. ‘What features do you like about the package?’
   Will this give a more detailed answer?

4. How else can you improve the answers and information you receive from people.
   e.g. You can then ask them how this could be improved further using multiple choice Colour, shape, ease of use etc.
   Or a ranking system (1-5 good to bad etc).

Evaluation Questioning Activity 2 - Matching Surveys to Audience

Surveys and questionnaires are most effective when given to the right user group.
Split the class into two groups.

Give half the class a card from the Survey Cards, and the other half a card from the Audience Cards.

Ask the class to find their partner by pairing their survey topic to the correct audience.
   e.g.

Survey on a skateboard accessory – A boy aged 14
Survey on a wedding dress brochure – Single female aged 26
Problem Cards

Problem: I need to lift up my bike to change the wheel

Problem: I need to clear snow from my pathway quickly and easily

Problem: I need to wake up on time

Problem: I need to fasten ten sheets of paper together temporarily

Problem: I need to stop losing my keys

Problem: I need some help standing up and walking

Problem: I need to reach a high window

Problem: I need to stop my phone getting scratched

Problem: I need to clean the toilet
# Brief Activity Sheet

## Initial Brief

<table>
<thead>
<tr>
<th>What existing solutions exist?</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Problems with existing solutions</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Revised Brief
**Testing Activity Sheet**

**Drinks bottles tests**

Rank each bottle and add comments to support your score  
(1 = Excellent, 2 = good, 3 = reasonable, 4 = poor, 5 = awful)

<table>
<thead>
<tr>
<th></th>
<th>Bottle 1</th>
<th>Bottle 2</th>
<th>Bottle 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are the looks appealing</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Ease of opening and closing</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Ease of carrying</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Easy to drink from</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Easy to refill</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Holds plenty of liquid</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Stands up well</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Lack of spillage when dropped</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Durability when dropped</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Wear &amp; tear – will it last?</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Do parts look flimsy/weak?</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Are there any loose parts (easy to lose)?</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Is it ergonomically shaped for hands/mouth?</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Any features not needed</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Is it good value for money?</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Is it easy to recycle</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Is it made from sustainable materials</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Other comments</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Overall score and opinion</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>
Question Cards

Question:  
☐ Do you like the finished package?

Question:  
☐ Would you buy this product?

Question:  
☐ Is the product easy to use?

Question:  
☐ What could be improved?

Question:  
☐ Does this product meet the specification?

Question:  
☐ Would you recommend this product to others?

Question:  
☐ Is the colour scheme appealing?

Question:  
☐ Is the product fit for purpose?
Survey cards

Survey:
on a skateboard paint scheme

Survey:
on a wedding dress brochure

Survey:
on a collapsible walking stick

Survey:
on grey hair dye

Survey:
on a sports bra

Survey:
on an innovative briefcase

Survey:
on a driving test learner aid

Survey:
on a new type of sweet

Survey:
on a child safety gate

Survey:
on a promotional calendar for a boy band
Audience cards

Audience:
A 14 year old boy

Audience:
A single female aged 26

Audience:
A male aged 80

Audience:
A female aged over 50

Audience:
An active female aged 30

Audience:
A professional male aged 40

Audience:
A boy or girl aged 17

Audience:
A boy or girl aged 9

Audience:
A male or female parent

Audience:
A girl aged 12
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Links

The Powerpoint Teacher Slides for each of the qualifications can be found on their respective web pages linked below:


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Telephone 01223 553998
Facsimile 01223 552627
Email general.qualifications@ocr.org.uk