Design and Technology

A LEVEL

Product Design: The Advanced Innovation Challenge

Topic Exploration Pack

July 2015

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Contents

Introduction

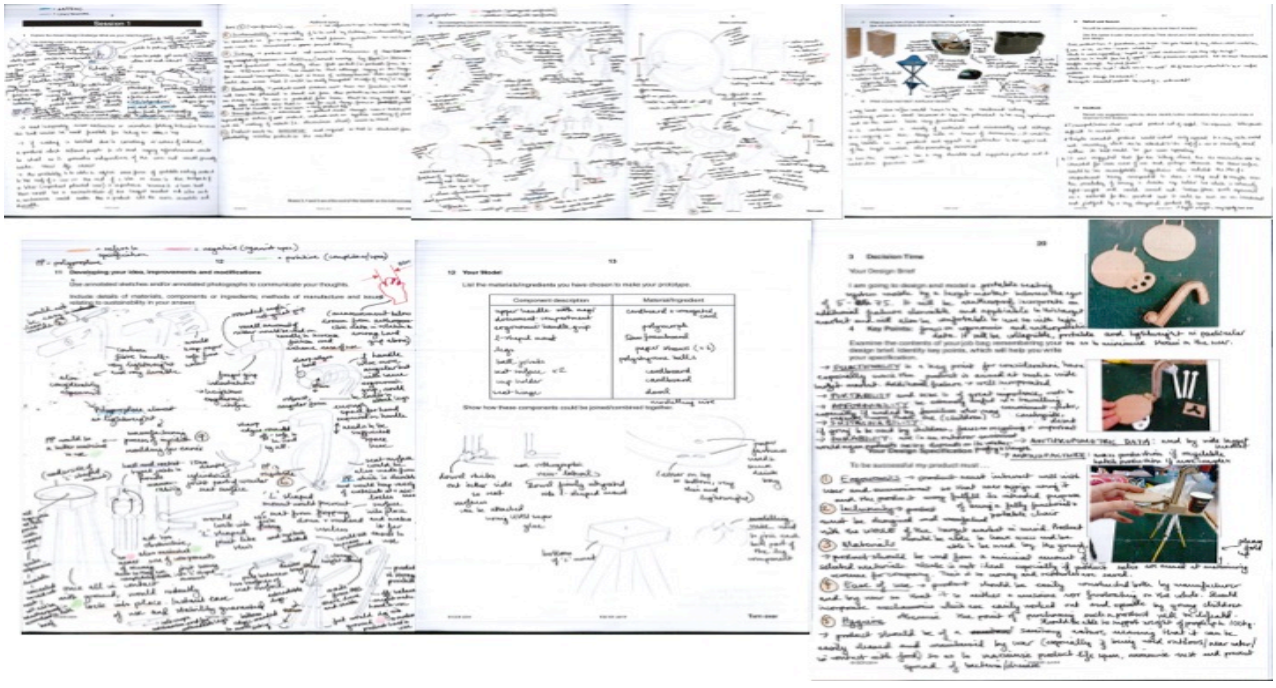
The Advanced Innovation Challenge is a six hour timed creative design task based on a pre-released theme. It takes place under examination conditions. The challenge consists of a design, and modelling exercise recorded in a workbook. A one hour written reflection paper is completed at a later date. The challenge assesses candidates' ability to be innovative, demonstrate flair and thinking skills, work with materials and apply knowledge gained throughout their AS course.

A theme is released in the September prior to the examination, enabling candidates to research and gather resources to form a personal handling collection/job bag.

Throughout the challenge, candidates record and communicate their thinking on a pre-printed answer booklet. Candidates respond to the prompts in pre-numbered boxes and are guided by a member of staff who has a script to help with the organisation and timing of the sessions. Midway through Session 1, candidates have the opportunity to present their ideas to a small group of other candidates. Candidates are encouraged to take advice from others through this controlled and structured peer evaluation.

In Session 2, candidates model their most creative and exciting idea using a range of easy-to-handle materials. Credit is given for the design concept and the way in which the candidate makes resourceful use of materials and construction techniques with basic modelling materials.

(Note: for exemplars of this stage, refer to the training materials for GCE DT which are on CPD Hub: www.cpdhub.ocr.org.uk)



Some candidates approach the challenge with pre-conceived or narrow ideas, perhaps due to fixed mindsets or because they chose to base their work on practiced work to previous design challenges. Strategies to encourage independence, creative thinking and risk taking need to built into the preparation for this unit to develop students' approaches. Easier said than done, but working on this will not only help them with coursework units at A Level, but also in the future at University and beyond.

The themes for the examination deliberately give little opportunity to prepare specification points or ideas in advance of the examination to prevent over-preparation. Candidates will need to address fully with fresh innovative thinking to respond to the challenge. Specification points should be relevant to the challenge they have chosen to follow and specific to their brief.

It is the centre's responsibility to provide a suitable range of modelling materials for candidates. It is not advisable for candidates to bring their own materials for modelling as this can also hamper their design thinking.

A significant part of the preparation for the exam should include; the development of student's thinking skills under pressure; techniques to allow the candidates to present ideas quickly; and practise workbook completion under timed conditions. Examiners are aware of the pressure on candidates in this examination and marks are awarded with this in mind. It is advisable to practise the challenge by completing a past paper on a different theme for a mock examination or across lessons. After this experience, parts of the assessment criteria can then be targeted and examination technique can be developed, through activities and practice responses.

In the reflection paper, candidates have the opportunity to reflect on the challenge by answering questions that require them to consider their product. These will be derived from a design, manufacturing or marketing perspective, including: sustainability and the environment; product life; social, moral and cultural issues; environmental issues; inclusive design; the human interface; aesthetics; scale of production; production technologies; fashion; marketing; commercial issues.

These areas should be taught through the 'AS' course. Students should learn to apply knowledge to products when evaluating and analysing and they should be familiar with technical terms related to these topics.

Areas such as specification, evaluation of ideas and final products and the reflection paper continue to discriminate well between candidates. They are testing higher order thinking skills and these areas should be taught throughout the AS course.

For both Challenge and Reflection papers, using self and peer assessment can be powerful learning tools for students.

Suggested Teaching Activities for Challenge

- **Mini Challenges**

Mini Challenges that last a lesson, or running a challenge across a number of lessons can provide good practice for candidates. Three resources have been developed to help you with this:

Learner Resource 1: 2 hour Mini Challenge - Student Workbook
Resource 1: 2 hour Mini Challenge - Teacher Guidance
Resource 2: One Lesson Mini Challenge - Chocolate Packaging
Resource 3: One Lesson Mini Challenge - Blank Template

- **Initial Thoughts**

Candidates need to be encouraged to produce a combination of text and drawings to explore the challenges and identified possible design areas/problems.

Resource 4: Teaching Ideas for Box 1

- **Developing creative thinking when designing and developing**

Use the well known SCAMPER technique, some good activities can be found at the site below.

The SCAMPER technique can to help generate twists to an idea:

Substitute – materials, components, and so on

Combine – mix or combine parts of other ideas

Adapt – alter the design; change its function or way it functions; use part of another idea/element

Modify – reduce or increase the size of the whole design or part or it, or change the shape

Parts –think about each part that will make your design, break it down

Eliminate – remove and reduce parts, simplify to basics

Reverse – turn inside out or upside down

The following link offers activities to undertake using the scamper technique:
http://www.powerhousemuseum.com/pdf/education/scamper_design_activity.pdf

It is also important for students to build other methods for thinking of innovative approaches to their challenge. Two resources have been developed to help you with this, offering a range of creative exercises and quick tasks to develop creative and innovative thinking:

Resource 5: Design Thinking Tasks
Resource 6: Practicing with Inspiration

- **Modelling**
  Most centres have a better understanding of the type of models required although many candidates concentrate exclusively on the aesthetics of their design ignoring any functional detail (e.g. folding mechanisms). The main point here is for candidates to use appropriate modelling materials to enable them to fully reflect their design. Candidates need to be able to develop their quicker modelling skills using a variety of materials.

  Creative use of common inexpensive materials is probably the easiest way for candidates to score well in this section. Kits should not be used for final models as it restricts the candidate's ability to model their design accurately and skillfully; as does the use of existing products to form part of, or most of their model. The use of collected materials should also be avoided (loo rolls, cereal boxes, plastic bottles). The use of skills section cannot be highly marked if candidates have just stuck together collected items to form a model.

  See the PowerPoint presentation associated with this pack – Challenge Modelling.

- **Reflection Paper**
  More candidates are producing more focused responses and addressing the bullet points; accessing the full mark range available. It is important to practise past papers and to encourage candidates to plan their answers ensuring all bullet points are addressed in relation to the topic of the question.

  Resource 7: Teaching Ideas – Paper 2
  Learner Resource 2: Follow up work on the Challenge
  Learner Resource 3: Revision notes for Paper 2
  Learner Resource 4: Topic Revision for Paper 2

Some candidates do find it a little harder to access the 'Support' marks in their reflection paper. There is a separate resource on the subject web page called How to get an 'S' that should demonstrate more clearly what is expected to be awarded these marks.

Learner Resource 1: 2 hour Mini Challenge - Student workbook

DESIGN AND TECHNOLOGY MINI CHALLENGE

Candidate Name

Instructions to Candidates

completed the answer booklet showing your creative thinking and how your idea works;

produced a model/prototype to show the important features of your design;

have at least two photographs fixed in your workbook showing your modelling activities;

Your answer booklet will be collected at the end of the session 1 and 2

Session	Marks	Total
1	50	
2	50	

SESSION 1

1. **Explore your chosen Design Challenge**. What are your initial thoughts?

   Use sketches and notes and mind maps to communicate your thinking. Think about key points to consider

2. Your Design Specification

To be successful my product must…

3. Start designing

Use annotated sketches and/or models to show your ideas. You may wish to use annotated photographs to communicate modelling.

Ideas continued.

4. Reflect and Record

You will be asked to present your ideas (no more than 3 minutes). Use this space to plan what you will say. Think about your brief, specification and key factors of your design.

5: Feedback

Record any suggestions made by others. Identify further modifications that you could make in response to this feedback.

6. Developing your idea, improvements and modifications.

Use annotated sketches and/or annotated photographs to communicate your thoughts.

SESSION 2

7. Review

Record any new thoughts about your design. Use annotated sketches and/or notes.

MODELLING
Test, develop and refine your design

8. Progress Report 1

Problems you have come up against so far. What are the possible solutions? Did your solutions work? Why?

Progress Report 1 continued…

CONTINUE MODELLING

Final modelling session

9. Evaluation of Developed Design Proposal.

Describe the effectiveness of your developed design proposal and how it meets the needs of the original Design Challenge. Evaluate your final proposal against your specification, you can use annotated sketches and/or photographs.

Evaluation continued.....

Photograph 1

Photograph 2

Learner Resource 2: Follow up work on the Challenge

The following topics are all tested in paper2, sketch the product you designed and annotate it, do this from memory and do not change it. Answer the following questions using your text books to help you.

Each answer should take 20 mins and be detailed (approx half a page to include sketches.)

1. Identify three ways you could make your design more sustainable, this could be by changing the materials, the amount of components or thinking about a secondary wider use. Sketch these improvements and annotate.
2. Think about the "life cycle analysis" LCA of your original product and identify how changes in materials and manufacturing methods etc can improve the life cycle.
3. Every product has a "product life cycle" this is all about it's launch, demand and decline in popularity and should not be confused with LCA (look this up). Consider the initial demand for your product, who would buy it - how could you adapt the design to create more demand and ensure a longer life cycle. Explain in detail
4. How would you market your product to ensure commercial success. What methods would you choose and why, think about cost of your marketing choices against product demand and commercial viability.
5. Think about inclusive design, how could you make improvements to your design for the following people. Sketch and explain one or two improvements for each. The blind Wheel chair bound The elderly Children
6. Fashion and aesthetics is important in the success of any new product - suggest two improvements you could make to your original product with this in mind. Sketch if necessary.
7. Suggest suitable materials and manufacture for your product to be mass produced or batch produced. Explain your choice of processes and level of production.
8. Identify three different examples of anthropometric data needed to design your product, explain using sketches why they are important

Learner Resource 3: Revision Notes for Paper 2

Sustainability and the Environment	**Environmental Issues**	**Aesthetics**	**Fashion**
Product Life	**Inclusive Design**	**Scale of Production**	**Marketing**
Social, Moral and Cultural Issues	**The Human Interface**	**Production Technologies**	**Commercial Issues**

Learner Resource 4 - Topics Revision for Paper 2

Environmental issues

Sustainability and the Environment

Inclusive Design

Fashion

Marketing

Social, Moral and Cultural Issues

The Human Interface

Scale of Production

Commercial Issues

Product Life

Fashion

Aesthetics

Resource 1: 2 hour Mini Challenge - Teacher Guidance

SESSION 1	ORGANISATIONAL INSTRUCTIONS	MUST SAY	SAY IN YOUR OWN WORDS
8 mins	Box 1. Initial Thoughts Open your answer booklet and find box 1.	The first thing we would like you to do is to put some of your first thoughts down on paper. Remember, we want you to be as creative as possible, so sketch and add notes of any ideas you have, even if they seem a bit risky or outrageous at this stage. We really want you to feel able to 'let your mind go out to play'. In this box put down your initial thoughts. You have 8 minutes, so work quickly. Try and remain focused.	You could show these thoughts in a mind map, through sketches or notes. Don't be afraid to put things down, remember this is the innovation challenge.
8 min 20 mins	Box 2 Box 3 Product Ideas. Give a 3 min warning	Produce a detailed and justified specification. In a moment you can start Designing. You can sketch, make notes, in the last three mins you will need to justify your chosen idea.	You should refer back to Box 2 throughout the challenge. On an exam paper this is completed in a fold out.

2 mins	Planning PRESENTATIONS. Teacher Introduction to the presentations. Same working group arrangements as before.	You will have the opportunity to tell others what you are designing (students only). You can present drawings and/or models if it helps to communicate your idea. Students in your working group can ask you questions. Students in your working group can suggest improvements / developments to your idea.	Explain about the presentations. The value of sharing ideas. Suggesting modifications. Discussing further possibilities.
3 mins	Box 4. Reflect and Record.	Use the space provided in Box 4 to plan your presentation. The presentation should last approx 3 minutes, including feedback.	
12 mins 4 Mins	5. Feedback Presentations – remind after 3 mins	Box 5 Record any suggestions made by students within your working group.	How might you modify your idea in response to feedback?
10 mins END OF LESSON	Box 6. Developing your idea. COLLECT BOOKLETS EXPLAIN STAGE 2 MODELLING	You have 10 minutes to develop your idea. Use annotated sketches communicate your thoughts. Make clear reference to your specification.	

SESSION 2	ORGANISATIONAL INSTRUCTIONS	MUST SAY	SAY IN YOUR OWN WORDS
8 mins	Box 7. Review	Look back over the work you did in Session 1. Do not add anything to boxes 1-6. Look carefully at your chosen task ideas and specification. Are you still on track? Fill out box 7 with any new thoughts about your design. Use annotated sketches and/or notes.	
20 mins	MODELLING	You have 20 minutes to start modelling your design proposal. A photograph (photo 1 to be stuck in on the last page) will be taken by a member of staff at the end of 20 minutes to record your progress. Do not annotate this photograph. If you require additional photographs please ask. Additional annotated photographs may be placed in section your progress reports or your evaluation	

5 mins	Box 8. Progress Report 1	Fill in progress report 1. Be honest about the problems you have experienced. What decisions have you made? What were the solutions to your problems?	
20mins	CONTINUE MODELLING	A photograph (photo 2) will be taken by a member of staff at the end of 20 minutes to record your final product. If you require additional photographs please ask. Additional annotated photographs may be placed into your evaluation.	
10 mins	Box 9. Evaluation. Regroup the students at their tables.	Describe the effectiveness of your developed design proposal and how it meets the needs of the original design situation. Look at your original specification in box 2. Evaluate your final proposal against your original specification. You may use annotated sketches and/or annotated photographs.	Explain there is no more time for modelling, but they can still communicate via their booklets. Use sketches and notes to show how your design could be improved
Collect in booklets. Check that final photographs have been taken and glued in. Tidy the workshop!!			

Resource 2: One Lesson Mini Challenge - Chocolate Packaging

The Challenge!

It is your job to design a promotional item that will attract people's attention and make them think of Guylian as Valentines day approaches. The promotional item will be given away to people at transport hubs such as bus stations, airports, and railway stations. Guylian have specified that they do not want either a cuboid or triangular prism type package as the promotion method.

Your design MUST

- Be three dimensional (3D)
- Hold a maximum of 2 chocolates
- You may only use glue during the modelling sessions.

BOX 1: Initial Thoughts:

BOX 2: Write a detailed and justified design specification

Box 3: Design Ideas and Development

Photograph 1 (final)	Photograph 2 (final including chocolate/s)

Box 4: Evaluation

What are the most successful things about your design?

What are the least successful things about your design?

What could you do to your idea to make it work better? Perhaps sketch these out to help communicate them.

Does your design meet the design requirements? If not, how could you develop it further so it does?

Learner Resource 3: One Lesson Mini Challenge - Blank Template

The Challenge!	Box 1: Initial Thoughts

BOX 2: Write a detailed and justified design specification

Box 3: Design Ideas and Development

Photograph 1 (final)	Photograph 2 (final including detail)

Box 4 Evaluation

What are the most successful things about your design?

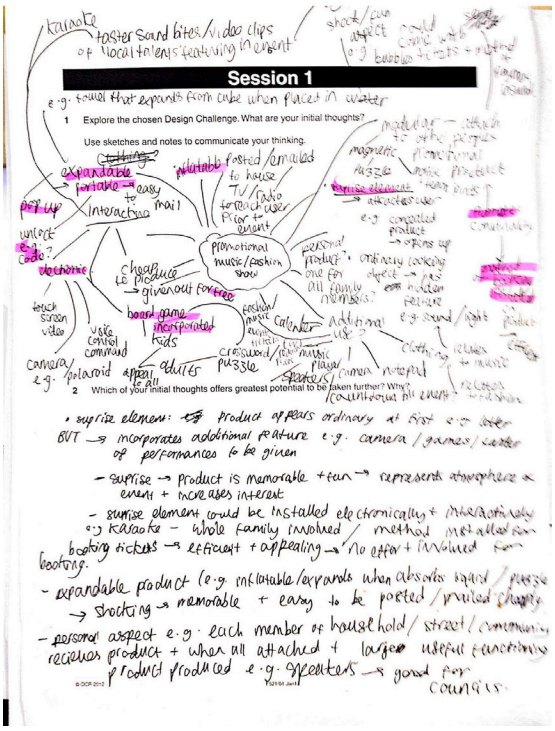
What are the least successful things about your design?

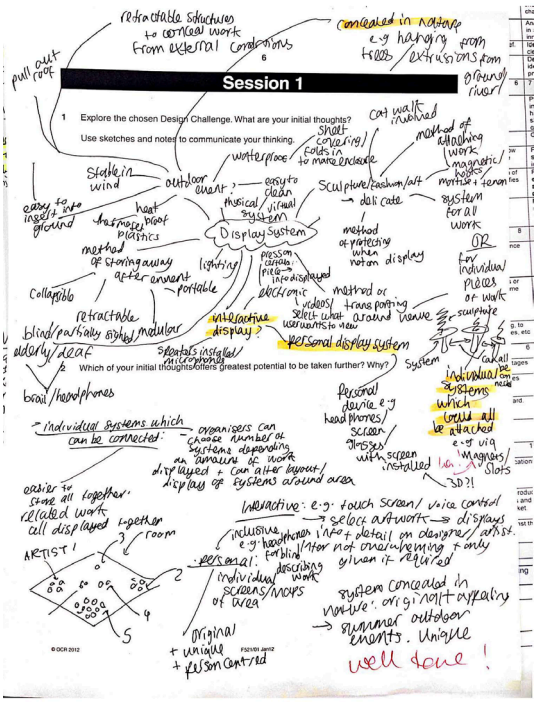
What could you do to your idea to make it work better? Perhaps sketch these out to help communicate them. Does your design meet the design requirements? If not, how could you develop it further so it does?

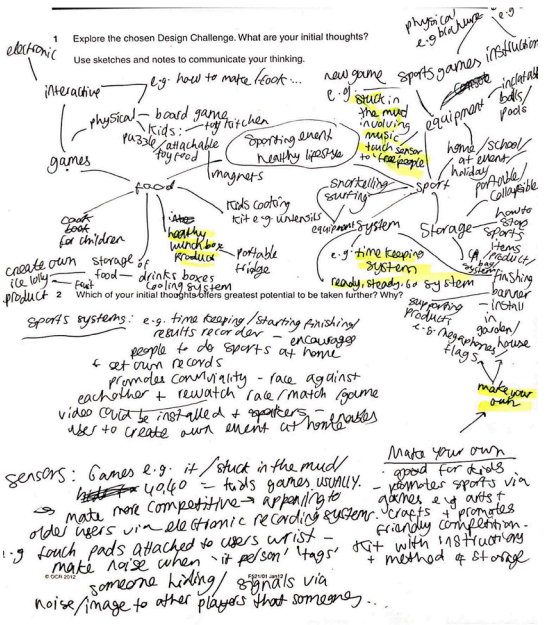
Resource 4: Teaching Ideas for Box 1

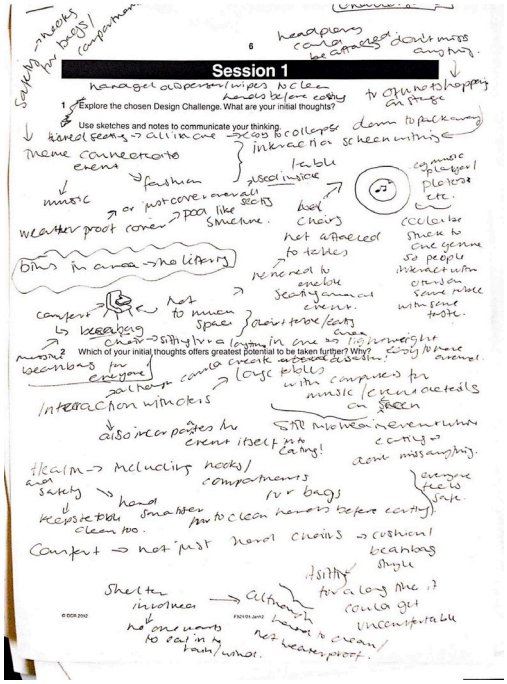
Developing students approach to more creative response in box 1.

Practise responses to box 1 and 2. Use the timings in the Challenge to complete box 1 and 2 and possibly 3. Push candidates out of their comfort zone by then getting them to do this again and again, having to pick past questions they wouldn't have approached as a first choice. Encourage wide response and creativity. Pair and share activities can help further widen response. Use an enlarged version and encourage creativity with collaborative working.









Resource 5: Design Thinking Task

Discuss attitudes that hamper 'good design'

"I have an idea I know it will work, so why do I need to do more."

"I'm not sure that idea would work, so I will stick with something I know I can do."

"I am not sure how I could make that idea so I won't draw it."

"I can't think of any more ideas and I want to do this one."

Teach Designing Methods

User centred design: this focuses on the needs of the end user of the product.

Use-centred design: focuses on how the product functions and why it will be used.

KISS principle (Keep it Simple, Stupid): aims to keep the idea simple avoiding unnecessary complications.

There is more than one way to do it. This can help you think of alternative ideas that are different.

Modelling ideas through collaboration

At any stage of designing and making to develop and move ideas or products forward.

Get into groups of three or four with your design and/or practical work.

You have three minutes to describe the current situation of your work.

The rest of the group then have three to five minutes to comment, suggest, evaluate, constructively criticise.

Read 'The business of innovation: Steven Johnson' who comments on innovation through working with others:

http://www.bbc.co.uk/news/business-11706476

"[Good ideas] come from crowds, they come from networks. You know we have this clichéd idea of the lone genius having the eureka moment.

But in fact when you go back and you look at the history of innovation it turns out that so often there is this quiet collaborative process that goes on, either in people building on other peoples' ideas, but also in borrowing ideas, or tools or approaches to problems. "

Creativity and redesign activities

These can teach quick sketching and idea generation, The DATA 4x4 activity can be adapted.

Resource 6: Practising with Inspiration

There are many places that students can go to find inspiration for their ideas. Learning how to use inspiration can be the biggest challenge as it is a personal interpretation. Forcing students to think outside the box and to challenge their thinking can be hard in the short term, but offers great support to their future thinking, particularly if they discuss the processes with their peers.
In this activity students are to be given picture cards with clear instructions. The cards should be handed out randomly without personal selection. It is also important for the students to be aware that they will need to think and draw quickly.

Once students have randomly selected a card, they should be given 15 minutes to fill half a page of A3 with shapes, patterns and sectional drawings that they find interesting within the images

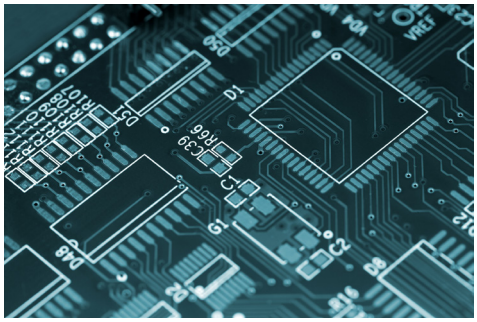
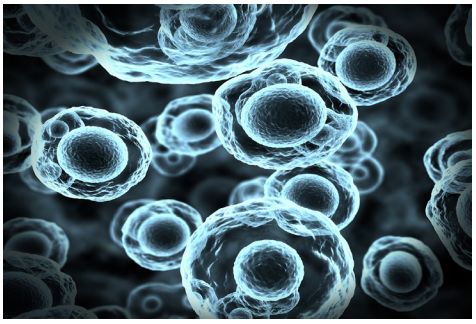
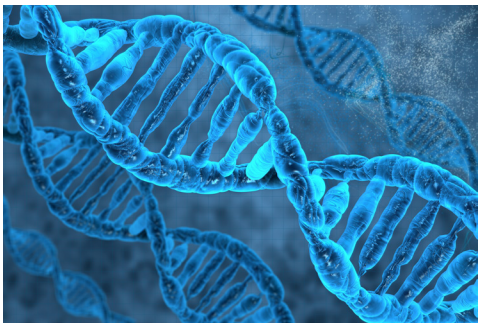
Functional Inspiration

Once students have randomly selected a card, they should be given 15 minutes to draw features of the object that they feel have a specific function, they may feel it necessary to annotate this to explain the motion and purpose of that function.
One page of A3 should now be full!

Existing Products

Finally students are given a random image of an existing product and they can now put into practice the skills they have already learnt with SCAMPER, and other designing methods in order to re-design the existing product completely. Perhaps consideration of a new function, a multiple use, a different shape, a different source of energy etc…
They should be given 20 minutes for this activity and should aim to fill another sheet of A3.
There should be no restrictions to their thinking and ideas can be as off the wall as students feel necessary in order to explore the possibilities that they are trying to express. Some students will find this far more difficult than others and it may be prudent to ask them to take a wonder around the room to see how others are managing or to give them some initial ideas to kick them off.

Visual Inspiration

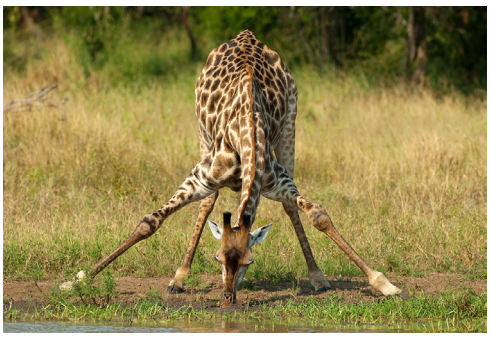






Functional Inspiration

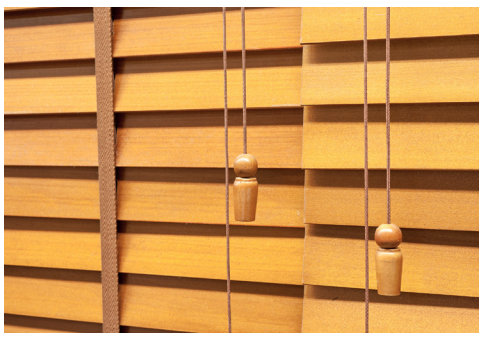


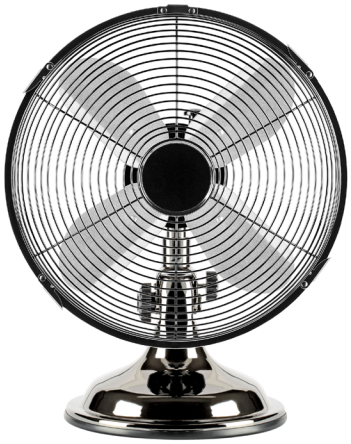








Existing Products



Peer Feedback

One of the most important things for an activity like this is for students to chat and reflect at the end. Discussions could consider the following questions:

- How unique are the ideas we've come up with?
- Could any of these ideas be developed into feasible products?
- How did my other peers come up with the ideas that they did? What process did their mind go through?
- Are any of these ideas influenced by knowledge of other existing products?

Are there any genius thinkers in the room? Why?

Follow on activities

The outcomes from this activity can be used to do individual or group modelling practise exercises. Similar tasks can be run at a later stage to freshen student's minds in preparation for the summer exams.

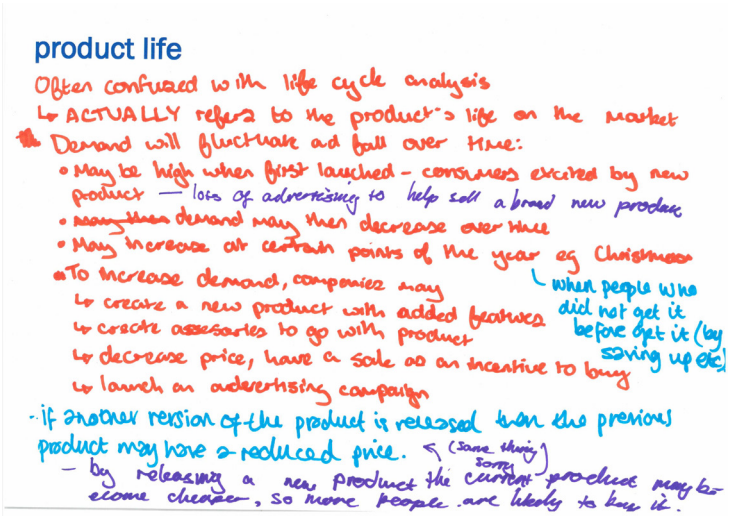
Students should be reminded of these activities when working on coursework projects, to help them with their creative thinking and innovation criteria.

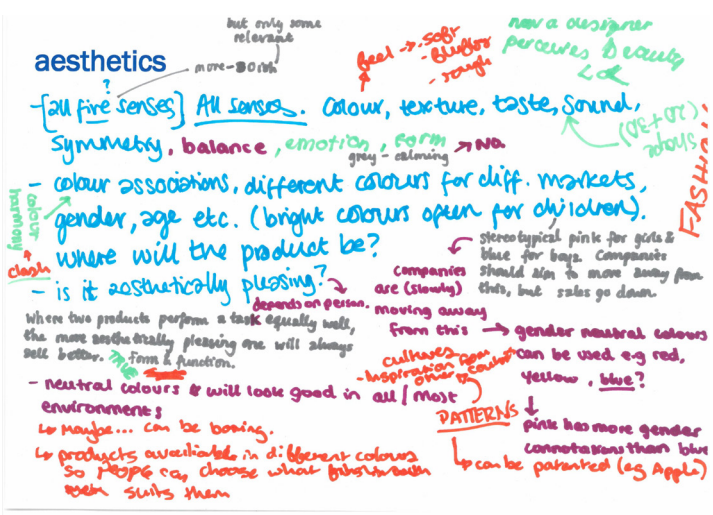
Resource 7: Teaching Ideas – Paper 2

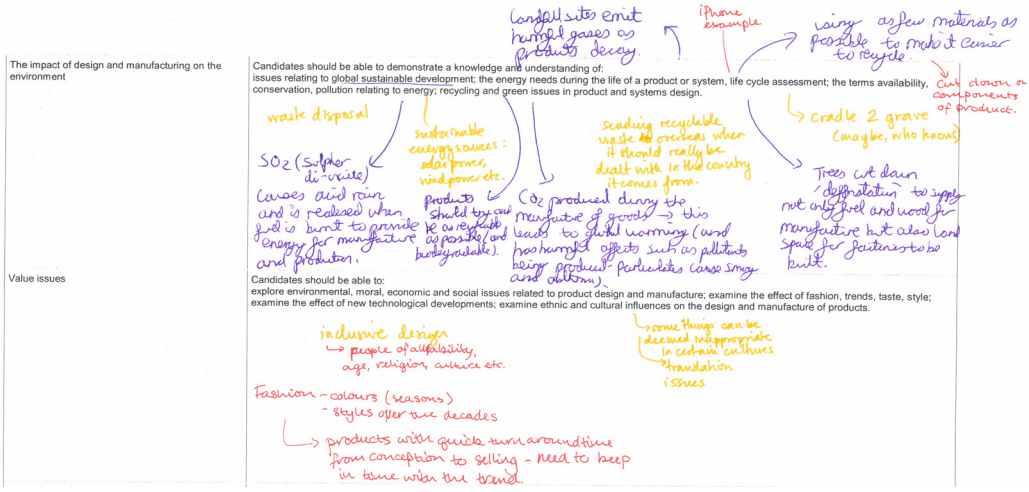
Discussing theory topics and applying to past challenge responses.

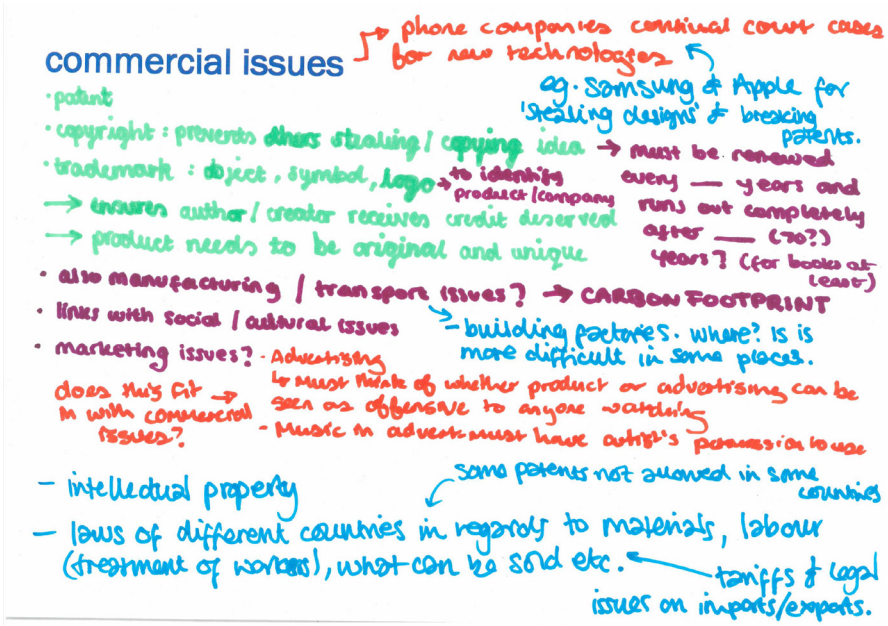
Use ‘Graffiti Talk’ - Each student or group is given a piece of paper with a title and different coloured markers, so that teacher can track each individual contribution. For a short time period (3-5 minutes), every group writes “graffiti” (words, phrase, statement, pictures) on their particular topic. After about three to five minutes, the teacher stops the students and asks each student/ group to pass their graffiti sheets to the next person. The next person with the sheet reads what has already been written or drawn on the sheet and adds additional new information. Continue the process until each group’s original sheet has been returned to them.

This can be used to revise theory at end of a topic and before exams both at AS and A2.







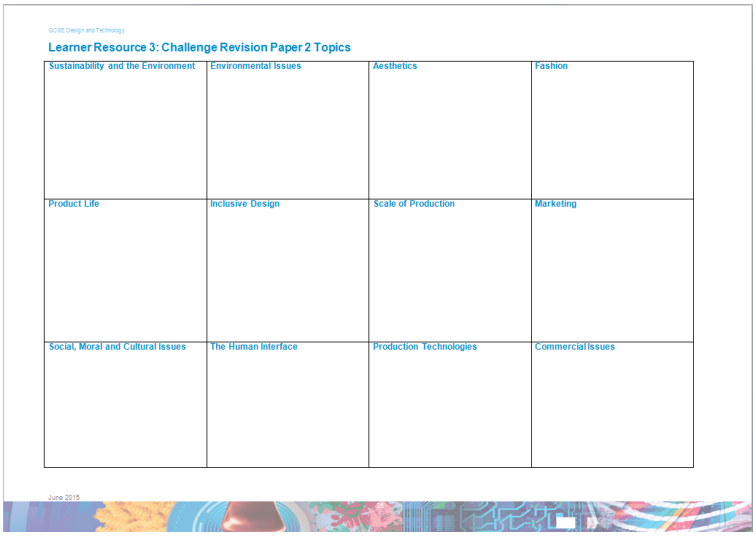


Revision Exercise

The following are the topics you can be tested on in Paper 2 of the Challenge

On the provided A3 sheet (Learners Resource – Revision Notes for Paper 2. Work alone and spend 30 -40mins writing words, comments and possibly even examples relating to each topic. Some will be more familiar to you but think carefully about each and write as much as you can.

Now number the boxes. With 1 being the topic you feel most comfortable with and feel you know the most about. On a new page, pick the two topics you feel least familiar with and using the A level Text book and Internet. Look up these topics and make notes. Spend 15-20 min on each.


GCSE Design and Technology

Learner Resource 3: Challenge Revision Paper 2 Topics

Sustainability and the Environment	Environmental Issues	Aesthetics	Fashion
Product Life	Inclusive Design	Scale of Production	Marketing
Social, Moral and Cultural Issues	The Human Interface	Production Technologies	Commercial Issues

June 2015

Follow up work can be done on practice challenges

The following topics are all tested in paper2, sketch the product you designed and annotate it, do this from memory and do not change it. Answer the following questions using your text books to help you.

Each answer should take 20 mins and be detailed (approx half a page to include sketches.)

1. Identify three ways you could make your design more sustainable, this could be by changing the materials, the amount of components or thinking about a secondary wider use. Sketch these improvements and annotate.

2. Think about the "life cycle analysis" LCA of your original product and identify how changes in materials and manufacturing methods etc can improve the life cycle.

3. Every product has a "product life cycle" this is all about it's launch, demand and decline in popularity and should not be confused with LCA (look this up). Consider the initial demand for your product, who would buy it - how could you adapt the design to create more demand and ensure a longer life cycle. Explain in detail.

4. How would you market your product to ensure commercial success. What methods would you choose and why, think about cost of your marketing choices against product demand and commercial viability.

5. Think about inclusive design, how could you make improvements to your design for the following people. Sketch and explain one or two improvements for each.
The blind Wheel chair bound The elderly Children

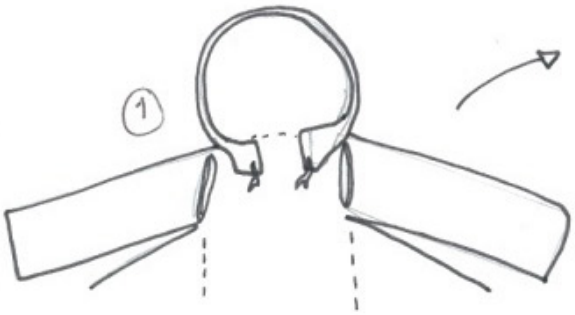
6. Fashion and aesthetics is important in the success of any new product - suggest two improvements you could make to your original product with this in mind. Sketch if necessary.

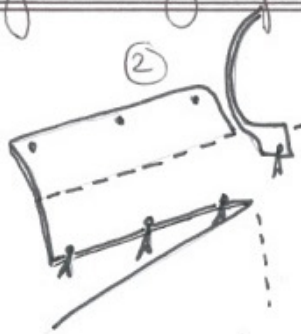
7. Suggest suitable materials and manufacture for your product to be mass produced or batch produced. Explain your choice of processes and level of production.

8. Identify three different examples of anthropometric data needed to design your product, explain using sketches why they are important.

9. Sketch three ergonomic improvements to your original product, include details of materials etc.

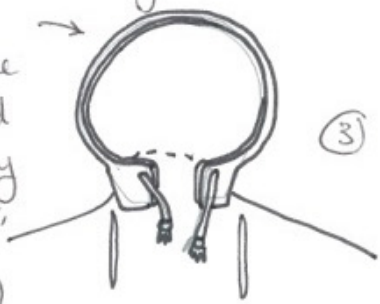
How could you improve your design from an ergonomic point of view?



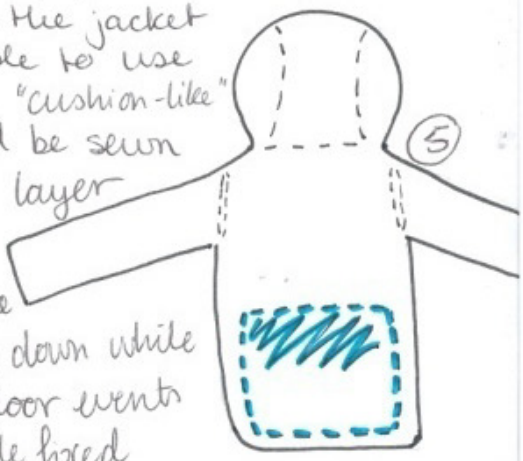


One way in which my personal shelter could be made more ergonomic is by changing the sleeves of the jacket, to make it easier to put on. This could be done by changing the orginal sleeve design, as seen in picture (1), into a flap design such as the one in picture (2). This allows the size of the sleeve to be altered depending on the size of the user, so the jacket is more ergonomic.

A drawstring design could be added to the hood, so that the hood can be fitted comfortably around the user's face, in a way that doesn't obstruct their view (3)

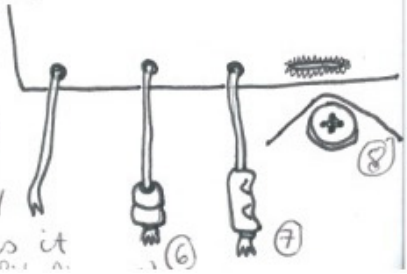


Also, to make the jacket more comfortable to use and sit-on, a "cushion-like" foam pad could be sewn onto the inside layer of the coat. This means that if the user wished to sit down while watching an outdoor events (as there is often little fixed seating), then they could do comfortably, while still remaining dry.



To make the shelter more comfortable to carry while in bag form, an extra foam layer could be added onto one half of the sleeves - this can help provide padding and it will also mould the straps into the shape of the user's shoulders making it more comfortable.

To make the ties more ergonomic, extra features could be added to the ties, such as beads, seen in picture (6). Or a ergonomic rubber grip could be added, as seen in picture (7), as this means it

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