

Photon Factor – minimalist lamp design

Focus: resistant materials

About the project

Photon Factor is a project designed for Year 9 students with a limited prior experience of working with sheet plastic. It uses the design style of minimalism as a starting point for design, providing students with a strong approach and a rich source of ideas. The study of design styles also helps students to understand the built environment and to appreciate how designers have responded to needs and cultures. This project assumes a deal of drawing skill, particularly in concept sketching.

The suggested teaching programme is designed to allow for flexibility. Some of the tasks may need to be modified or even omitted depending on time constraints or how the project is sequenced into a schools programme of study. The supplied OHPs will aid in teaching these skills and the video: [Graphics for Design and Technology](#), by Designability Group will also be helpful

Safety is crucial in this project especially in the wiring. It is recommended that all connections, if not already supplied, be checked by a certified electrician before use. No metal has been used in the project for electrical safety reasons. Whilst the exploration of other materials can be encouraged, anything flammable or conductive is to be avoided. Great care is also required when showing students how to use a stanley knife and steel rule safely.

Sequence of the unit

Photon Factor is an ideal project for the beginning of a Stage 4/5 (Year 9) Design and Technology elective.

The project is less directed than previous projects in a 'foundation course' and the outcomes are plentiful. The exploration of materials, and the endless possibility of outcomes make this an appropriate continuum of a D&T experience.

This project is aimed at taking between 20-25 hours.

I.C.T. has the opportunity to support this project through the use of the more generic software such as MS Word, Excel and the Internet for information. CAD packages such as Rhino3D, AutoCAD, and 3D-Studio Max could be utilised in producing development drawing, models, and engineering type drawings.

Outcomes

At the end of the project

Students will develop knowledge and understanding in:

- properties of polycarbonate and polypropylene
- the production of polycarbonate and polypropylene
- uses of polycarbonate and polypropylene
- ecological issues relating to polycarbonate and polypropylene
- how polycarbonate and polypropylene can be used to make products
- the minimalist design style and its cultural importance
- processes used in making the Photon Factor product
- safe working environments, habits and procedures

Students will develop skills in:

- designing their lamp according to a given brief
- making their lamp and selecting the best methods for their design ideas
- evaluating their design according to set criteria
- communicating their ideas as design concepts and development drawings
- marketing by considering a target group for their product
- managing time and resources throughout the design process

Students will develop:

- an appreciation of the implication for the use of and production of polycarbonate and polypropylene
- a sensitivity to the effects of oil refinement
- a sense of responsibility for the use of this technology
- an appreciation of the contribution made by themselves and that of others in the process of design.

Prior learning

Useful experience could include:

- selecting materials & processes, tools & equipment
- measuring and marking out accurately
- using sheet plastic
- identifying the usefulness of a design style to act as a catalyst for creativity
- managing a design project

Language used in the project

Throughout the project the comprehension and spelling of language will be addressed. Using strategies such as 'word of the day' and investigating its meaning/s and identifying its origin. Language of a technical nature should be discriminated.

FLUORESCENT. HALOGEN, INCANDESCENT,

AMBIENT, EVOKE, EQUILIBRIUM, EXTOL, PROFUSION.

Resources

Books:

Minimalism, J Meyer, Phaidon

Conran, S. & Bond., Lighting, Conran Octopus Contemporary, London, 1999. ISBN 1-84091-066-6

300 Lights, Leuchten, Lampes, Taschen, Cologne, 1993.
ISBN 3-8228-9450-8

These books are available from Designability.

Video:

Photon Factor- Minimalist Lamp, Designability Group Pty Ltd.

Music:

Minimalism, London Chamber Orchestra, Christopher Warren Green.
Virgin Classics, Germany, 1990.

Websites:

www.design-with-lighting.com/lightingdesign

www.copperlily.com/artlighting

Links with other subjects

Science: Electricity, power supplies theory/practice.
Electrical safety.

English: Vocabulary – descriptive terms.

Creative Arts/Music: Music styles – minimalism.

Visual Art: Minimalism painting, sculpture.

Homework & Extension activities

Homework

See Homework Schedule within the programme.

Extension activities could include:

- An exploration of the minimalist philosophy across other creative areas such as art, music, film, architecture, and cuisine.
 - Approach a professional designer to evaluate/analyse your lamp. Send a questionnaire.
 - An investigation into full manufacture of the lamp, making the necessary design developments to accommodate production limitations and processes. Identify suppliers, manufacturers and cost to produce a limited run of 500.
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C	Sheet	Text	Teaching material	Teaching Content	Student Activity	Homework
1	2 3 7		<ul style="list-style-type: none"> Video: <u>Photon Factor</u> Sample lamps 	<ul style="list-style-type: none"> Show video and discuss Change the lighting in the classroom and discuss the emotional effects (you may need some extra lamps). 	<ul style="list-style-type: none"> View video and take notes. Read through Lighting information sheet 	<ul style="list-style-type: none"> Answer questions 1,2,3, on the homework question sheet. (p.7)
2	5 7		<ul style="list-style-type: none"> CD of minimalist music Samples of polycarb and polyprop. 	<ul style="list-style-type: none"> Explain the main tenets of the design style 'minimalism' Discuss the ideas raised by minimalism 	<ul style="list-style-type: none"> Read sheet on minimalism 	<ul style="list-style-type: none"> Answer questions 4 - 9 on the homework question sheet. (p.7)
3	9 10 11 12		<ul style="list-style-type: none"> Fineliner Grey marker Demo. area OHT of examples of concept sketching and instructions. Card for modelling 	<ul style="list-style-type: none"> Introduce the materials polycarbonate and polypropylene. Discuss what properties would be worth knowing for purposes of working with them. Introduce the design brief. Show an example of the final product. Discuss ways to be creative. Demonstration of concept sketching using a fineliner and a construct, firm and shade technique. Students refer also to OHP (concept sketch information) 	<ul style="list-style-type: none"> Handle samples of polycarb and polyprop. Read design brief together Commence concept sketching of a range of ideas (use design sheets provided). Some card modelling may be helpful. 	<ul style="list-style-type: none"> Continue concept sketches
4	12 13 14 15		<ul style="list-style-type: none"> Card for modelling Sample models Globe holder assembly 	<ul style="list-style-type: none"> Discuss developing ideas by modelling with card Show examples Demonstrate how to wire for globe holder assembly Revise each student's design individually to iron out problems. 	<ul style="list-style-type: none"> Complete more concept sketches and choose the best idea. Design development with card modelling 	<ul style="list-style-type: none"> Study for a class test on materials, lighting and minimalism. Complete materials data sheet
5	16 17 18 19		<ul style="list-style-type: none"> Demo. area All tools and materials needed to make a lamp as a demo. 	<ul style="list-style-type: none"> Students to sit class test Go through answers Demonstration of working with polycarb and polyprop. Use all tools and equipment the students will need when making their lamp: marking out, cutting, filing, drilling, joining and finishing (discuss tools, techniques safety issues) Refer to teacher's copy of sheet 	<ul style="list-style-type: none"> Class test View demonstration of working with polypropylene and take notes on sheet. (the demonstration may need to be broken up so that students can take effective notes). Modify chosen design if needed, given the information they now have on working with polypropylene 	<ul style="list-style-type: none"> Cutting plan. Draw all the shapes you need to cut out (scale 1:2) show dimensions

C	Sheet	Text	Teaching material	Teaching Content	Student Activity	Homework
6	20 21		<ul style="list-style-type: none"> • Sample of Product Analysis • All marking out tools ready for use • class set of materials 	<ul style="list-style-type: none"> • Explain Product analysis using example as an overhead. • Briefly revise marking out • Hand out materials 	<ul style="list-style-type: none"> • Mark out materials 	<ul style="list-style-type: none"> • Complete a product analysis (p.20)
7	22		<ul style="list-style-type: none"> • All making tools and equipment ready for use. 	<ul style="list-style-type: none"> • Check all designs and offer advice on possible modifications. Be sure that students explain their ideas in a graphic form. • Supervise making 	<ul style="list-style-type: none"> • Continue making 	<ul style="list-style-type: none"> • Minimalism product reference.
8	23		<ul style="list-style-type: none"> • All making tools and equipment ready for use. 	<ul style="list-style-type: none"> • Supervise making. • Allow students to change their design ideas. making is part of design which is all about decision making. They will document their decisions in their evaluation. 	<ul style="list-style-type: none"> • Continue making 	<ul style="list-style-type: none"> • Lighting product reference.
9	24		<ul style="list-style-type: none"> • All making tools and equipment ready for use. • Make overhead transparency of flow diagram example 	<ul style="list-style-type: none"> • Supervise making. • Revise any making techniques required. • Discuss safety issues. • Explain how to do a flow diagram using the overhead transparency as an example. 	<ul style="list-style-type: none"> • Continue making 	<ul style="list-style-type: none"> • Complete a flow diagram of how you have made your lamp.
10	25		<ul style="list-style-type: none"> • All making tools and equipment ready for use. 	<ul style="list-style-type: none"> • Discuss the importance of evaluation. • Supervise making. • Revise any making techniques required. • Turn off room lights for evaluation 	<ul style="list-style-type: none"> • Complete making process • Commence evaluation questions. • Bind or staple all work together with contents sheet (provided) ready for submission 	<ul style="list-style-type: none"> • Complete evaluation questions.

Contents.

This simply is a list of the worksheets, homework sheet and information sheets. Each sheet should be identified as such in the content listing and as a subtitle on the actual page. The content should identify the sheet with a page number. The contents page is the most helpful way for students to collate all their sheets at the end of a project. It helps them become familiar to the idea of presenting a folio.

Design Brief & Project Overview.

The merits of a well defined brief cannot be under estimated. The 'brief' statement itself maybe very simple but its supporting information is vital to tie the project together.

Introduction statement related to design catalyst, materials, and design focus

Brief (Statement)

Parameters (restriction or guidelines)

Submission (what the students need to complete for assessment)

The Project Overview is directly related to the Design Brief. It will visually explain the project using graphics such as perspective view, mini orthographic views, or exploded views. A parts list will be included.

Video notes.

The video notes help students focus on important parts of the video by providing space for notes to be taken. Sometimes there are discussion questions to help the teachers and the students reinforce what they have seen. This also prevents that silence at the end of a video allowing a flow to the next activity.

Design Catalyst.

Most Designability projects use a design catalyst as a way of inspiring the teachers and students. A design catalyst such as Functionalism or Biomorphism provide a reason for designing a chosen form or overall aesthetic. This information is crucial. It is always difficult to start designing without some kind of stimulation. A design catalyst ensures that students aren't left staring at a blank sheet when the time to draw some concepts comes.

Product Reference.

The collection of images is the process where students will become familiar with a design style or a material. It will also develop research skills. It is often best to insist that students label all images with the name of the object and the name of the designer and when it was designed, and even the primary material it is made of. Books in the library should be the main source of imagery but with careful selection there many good websites with excellent images which naturally makes this aspect of the project very easy – it can be accomplished as in school work or as homework. Some care must be taken with websites so that students aren't lured to sites which merely advertise products as these sites will not have the extra required information.

Materials.

Designability projects use resistant materials, metal, plastics, wood, electronics and will eventually use textiles, food, and new and interesting materials yet to be considered.

This information is vital early on in the project as this can be considered whilst designing. Design possibilities can be considered with a good understanding of physical and mechanical properties.

Concepts.

A worked example of concept sketches is provided for each project. It encourages good practice by providing a role model. This page should be used as an OHT whilst students are in the concept stage of their project. Encourage students to follow instructions on the use of the fineliner.

Design Sheets

These are formatted sheets with a title block for drawing. Encourage students to fill in the title block as this will help their overall presentation.

Working with.

One of the features of Designability projects is the 'Working with' sheet. This information is related to the materials and processes aspect of the project. Each project will be introducing new skills and techniques and this sheet enables students to listen to a practical demonstration and write down the notes that are provided. The Working with sheet is most often a table identifying the stages of making as rows and identifying equipment, how to use and safety as columns. Students can fill this sheet in during demonstrations or as revision after demonstrations.

Main Process.

An information sheet is provided on the main making process.

Flow Diagram. The flow diagram is a standard template that enables students to predict or record their making activities. The sequence for this is provided by the 'Working with' sheet.

Designer Focus.

There are opportunities in Designability projects to have a designer focus so students not only learn about a design style or philosophy but is familiar with one designer and his/her work. The Design Focus could be used as part of any extension work.

Drawing Focus.

Drawing as a way of communicating ideas is considered to be a vital part of any Designability project. Each project will focus on one or two important drawing skills which, will then be built upon in future projects.

Homework Questions.

These relate to the content of design catalyst, materials, and making processes. These questions can also form the basis of Class Tests.

Class Tests.

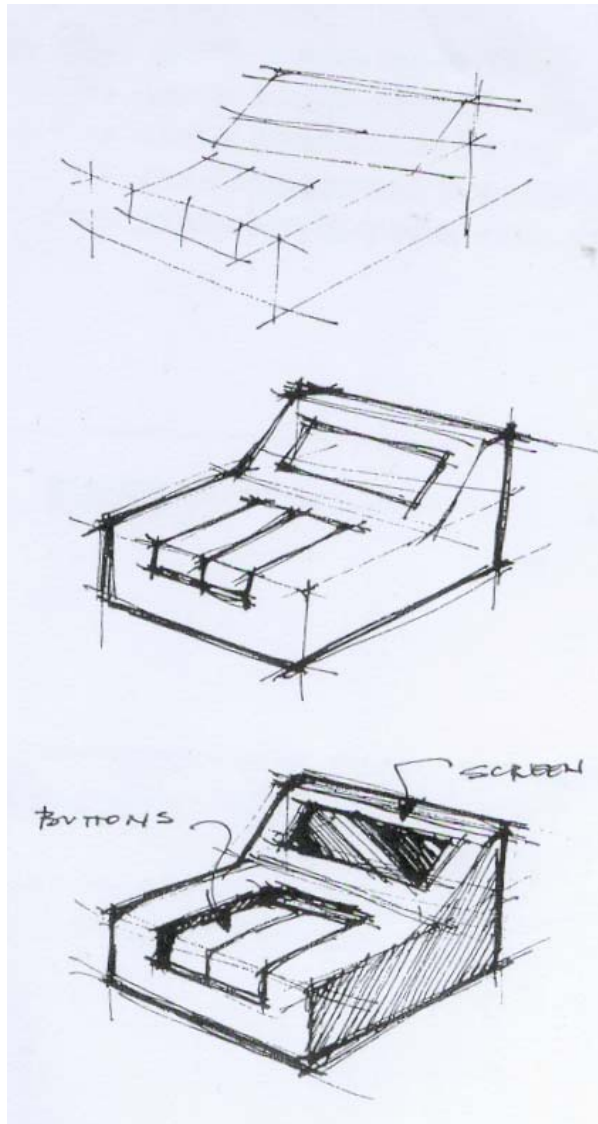
Two class tests per project is normal and these are formulated from homework questions and notes made during the project. These questions can form the basis of examinations.

Evaluation.

It is important for students to reflect not only on how they have gone about the project, but also to evaluate their design according to the design parameters. A series of questions is provided to do this.

Concept sketches are done in the *ideas stage* of the design process.

- Concept sketches are always freehand and drawn quickly.
- Use a fineliner (not pencil).
- Never scribble or cross out what you think are bad ideas.
- Show various views (perspective, orthogonal, sectional and detail views)
- Use colour
- Use your fineliner in the following way



1. Construct your overall shape,

- Light lines are drawn quickly
- Start with a box and then modify it
- Lines are long
- Some lines will be incorrect

2. Firm in the correct lines

- Go over them more slowly
- Lines are long
- Make an outline extra dark

3. Shade in a chosen vertical face

- Use light, fast diagonal lines

4. Annotate by adding notes on various aspects of your design

- Words help people understand your ideas

From the information in the demonstration fill in the following table.

	Equipment	Use	Safety
Marking out PP	<ul style="list-style-type: none"> • Steel rule • Engineer's square • Pencil 	<ul style="list-style-type: none"> • Check for squareness of work piece. • Mark out waste 	
Cutting PP	<ul style="list-style-type: none"> • Scissors • Steel rule and knife • Roller trimmer • Cutting mat 	<ul style="list-style-type: none"> • 	<ul style="list-style-type: none"> • Be aware of what the knife is doing and the position of your hands.
Making holes PP	<ul style="list-style-type: none"> • Knife and cutting mat. • Hole punch and hammer. • For thicker PP use a hole saw in a drill. 	<ul style="list-style-type: none"> • Only a slit is required to make a hole suited to riveting. • The hole punch makes larger sized holes suitable for the cord. 	<ul style="list-style-type: none"> • Be aware of what the knife is doing and the position of your hands.
Shaping PP	<ul style="list-style-type: none"> • Knife and cutting mat. 	<ul style="list-style-type: none"> • PP can be bent by hand, but if it is scored and then bent a very clean fold can be achieved. 	<ul style="list-style-type: none"> • Be aware of what the knife is doing and the position of your hands.
Finishing PC	<ul style="list-style-type: none"> • Wet or Dry • Brasso and rag 	<ul style="list-style-type: none"> • Wet or dry first, then use small amounts of brasso. 	<ul style="list-style-type: none"> • Avoid fumes of brasso
Joining	<ul style="list-style-type: none"> • Rivets • Rivet pliers • Small washers 	<ul style="list-style-type: none"> • Hold all pieces firmly together before squeezing rivet pliers. Washers may be needed to hold rivets on where PP is on the outside. 	<ul style="list-style-type: none"> • Safety glasses required

Name: _____ Class: _____

Answer the following questions:

1. What does *specific gravity* mean? (1 mark)

2. What happens at a material's maximum working temperature? (1 mark)

3. Explain how you would finish the edges of cut thick polypropylene. (1 mark)

4. Explain how you would achieve a perfect fold in thin polypropylene. (1 mark)

5. What piece of equipment is used to allow permanent bending in thick polypropylene? (1 mark)

6. List three properties of Polypropylene. (3marks)

7. Why is down-lighting not used for task-lighting? (2 marks)

8. Name a minimalist designer. (1 mark)

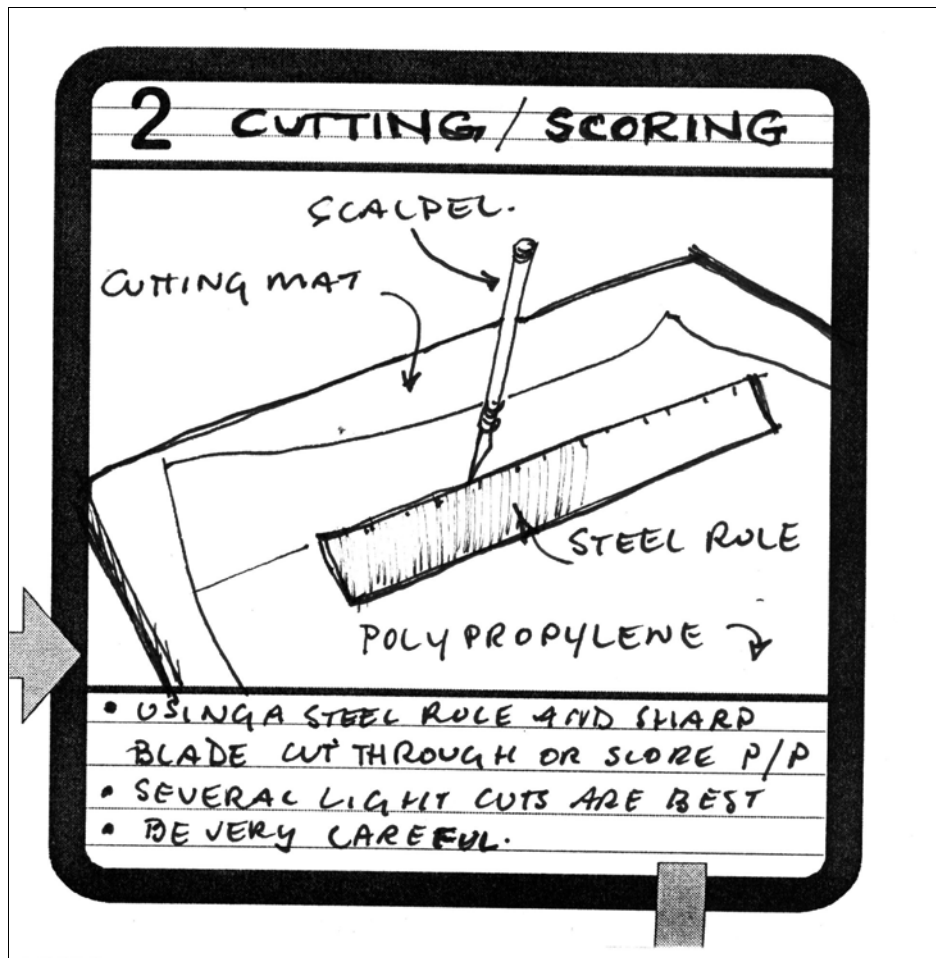
9. What does the minimalist designer try to avoid? (2 marks)

10. Why is there no metal in the lamp you are designing in this project? (2 marks)

11. What is the filament made of in an incandescent globe? (1 mark)

Answers

1. What does specific gravity mean? (1 mark) **density as compared to water. A specific gravity of less than one means that the material would float.**
2. What happens at a material's maximum working temperature? (1 mark) **It becomes too soft to use.**
3. Explain how you would finish the edges of cut thick polypropylene. (1 mark) **File it and then use 'wet or dry' and then even polish it with brasso**
4. Explain how you would achieve a perfect fold in thin polypropylene. (1 mark) **Score it using a blade and straight edge then fold away from the score line.**
5. What piece of equipment is used to allow permanent bending in thick polypropylene? (1 mark) **Strip heater or Magnabend**
6. List three properties of Polypropylene. (3marks) **Water proof, non flammable, recyclable, easy to cut**
7. Why is down-lighting not used for task-lighting? **The shadows are too dark and the lighting source is not movable.**
8. Name a minimalist designer. (1 mark) **Masayuki Kurokawa (et al.)**
9. What does the minimalist designer try to avoid? **Colour, excitement, intricate design, over adornment.**
10. Why is there no metal in the lamp you are designing in this project? (2 marks) **It is conductive and therefore potentially dangerous**
11. What is the filament made of in an incandescent globe? (1 mark) **Tungsten**



1. Number section and complete a title, eg. "2. CUTTING".
2. Draw the process and label tools and equipment
3. In point form, describe the process – include any safety issues.

Choose a lamp already on the market, perhaps something at home. Make a series of sketches of it on the design sheet. Comment on the lamp under the following headings:

1. Name of the lamp and name of the designer

Mambo by EgoLuce. Designer: G Basilico

2. Overall dimensions

In normal position: 550 X 120 X 400

3. Type of light source

Halogen

4. Materials it is made from

Mostly steel. The head is urea formaldehyde

5. Processes used in manufacture

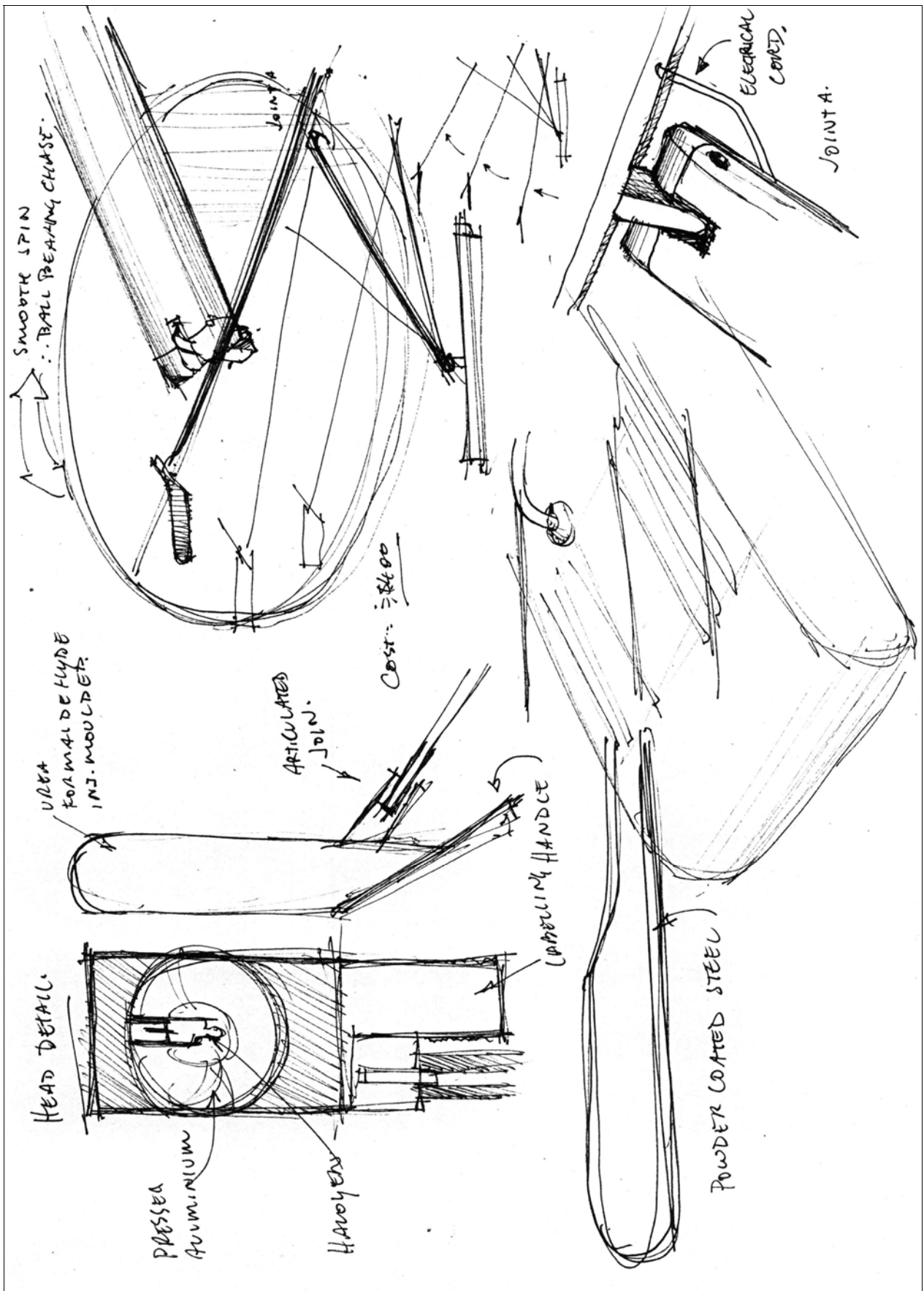
Bending steel on jug, powder coating. Pressing metal. Injection moulding plastic.

6. Kind of light it produces

Strong and bright. Halogen produces dark shadows, but it is still useful as a task light because it is articulated in three places so that it can change position easily.

7. Market – who would buy it?

It is quite expensive (up to \$600), but it is well made and stylish. The buyer would look for quality and would like the lamp to make a statement about themselves. It is minimalist and striking.



Lesson Number	Sheet Number	Task
1	7	<ul style="list-style-type: none">• Answer questions 1,2,3 on the homework question sheet.
2	7	<ul style="list-style-type: none">• Answer questions 4-9 on the homework question sheet.
3	12	<ul style="list-style-type: none">• Continue concept sketches
4	13	<ul style="list-style-type: none">• Study for a class test on materials, lighting and minimalism.• Complete materials data sheet.
5	19	<ul style="list-style-type: none">• Cutting plan. Draw all the shapes you need to cut out (scale 1:2) show dimensions.
6	20	<ul style="list-style-type: none">• Complete a product analysis
7	22	<ul style="list-style-type: none">• Minimalism product reference. Find 5 pictures of minimalist objects. Paste photocopies onto the sheet provided. Explain what they are and who designed each of them.
8	23	<ul style="list-style-type: none">• Lighting product reference. Find 5 pictures of lamps made using sheet materials. Paste photocopies onto the sheet provided. Explain what they are and who designed each of them.
9	24	<ul style="list-style-type: none">• Complete a flow diagram of how you have made your lamp.
10	24	<ul style="list-style-type: none">• Complete the evaluation questions.