

Criterion A: investigate

Design
Situation

I like to read for a while every afternoon, but I find it difficult to see because the lighting in the living room is quite dim. I would like to have an attractive table lamp next to my couch that I can easily switch on and off. I am an eco-fan and so I would like this lamp to be environment- friendly.

Design
Brief

Inspired by the principles of green design and clean technology, I will design and make a table lamp to provide adequate light for reading. This lighting unit must be created within a period of 5 weeks using equipment available in the Design & Technology Department, and its environmental impact must be taken into account all throughout the design cycle. It must also be aesthetically pleasing, so that its presence will enhance the appearance of the room where it will be put.

green design

What is green design?

Green Design - a design, usually architectural, conforming to environmentally sound principles of building, material and energy use. A green building, for example, might make use of solar panels, skylights, and recycled building materials.

Mass production has made consumer goods affordable and has improved health, comfort, and convenience for a significant percentage of the world's population. There are, however, massive by-products produced as well and each year billions of tons of liquid, solid, toxic and non-toxic wastes are generated in industrial processes. Environmental regulations and industry practice have, in past decades, focused on safe and cost-effective methods of disposing of hazardous and non-hazardous waste generated in industrial processes.

There is an emerging field, however, which seeks to rethink waste and to redesign industrial processes in ways that more closely mimic natural processes. In natural ecosystems, one organism's waste becomes food for another organism. Industrial ecologists look at product design and the manufacturing process to discover how to prevent waste from occurring and to develop methods of utilizing waste products as raw materials for other industries. Industrial ecologists analyze the flow of materials and energy in the industrial process to identify ways to reduce the environmental and economic costs of production, use, and disposal of products.

Research in this field looks at how to reduce waste of materials and energy and reduce emissions by analyzing all points of the product lifecycle from extraction of minerals and other resources to the manufacturing process through use and final disposition of the product as waste. This includes substituting less toxic materials in manufacturing, finding ways to reuse those materials in another process, reducing the amount of materials used, and designing products so they can be recycled after use. This type of systematic reduction of the environmental burden of manufacturing and use of products is called "green design."

The 3 'R's



Rewse:

Instead of throwing things away, try to find ways to use them again! For example:

- Bring cloth sacks to the store with you instead of taking home new paper or plastic bags. You can use these sacks again and again. You'll be saving some trees!
- Plastic containers and reusable lunch bags are great ways to take your lunch to school without creating waste.
- Coffee cans, shoe boxes, margarine containers, and other types of containers people throw away can be used to store things or can become fun arts and crafts projects. Use your imagination!
- Don't throw out clothes, toys, furniture, and other things that you don't want anymore. Somebody else can probably use them. You can bring them to a center that collects donations, give them to friends, or even have a yard sale.
- Use all writing paper on both sides.
- Use paper grocery bags to make book covers rather than buying new ones.
- Use silverware and dishes instead of disposable plastic utensils and plates.
- Store food in reusable plastic containers.

Reduce:

Reducing the amount of waste you produce is the best way to help the environment. There are lots of ways to do this. For example:

- Buy products that don't have a lot of packaging. Some products are wrapped in many layers of plastic and paperboard even though they don't need to be. You can also look for things that are packed in materials that don't require a lot of energy or resources to produce. Some products will put that information right on their labels.
- Instead of buying something you're not going to use very often, see if you can borrow it from someone you know.
- Cars use up energy and cause pollution. Some ways to reduce the environmental damage caused by cars include carpooling with friends, walking, taking the bus, or riding your bike instead of driving.
- Start a compost bin. Some people set aside a place in their yard where they can dispose of certain food and plant materials. Over time, the materials will break down through a natural process called decomposition. The compost is good for the soil in your yard and means that less garbage will go to the landfill.
- You can reduce waste by using a computer! Many newspapers and magazines are online now. Instead of buying the paper versions, you can find them on the Internet. Also remember that you should print out only what you need. Everything you print that you don't really need is a waste of paper.
- Save energy by turning off lights that you are not using.
- Save water by turning off the faucet while you brush your teeth.
- Lots of families receive a large amount of advertisements and other junk mail that they do not want. You can stop the mailings and reduce waste by writing to the companies and requesting that they take your name off of their distribution list.

Recycle:

Many of the things we use every day, like paper bags, soda cans, and milk cartons, are made out of materials that can be recycled. Recycled items are put through a process that makes it possible to create new products out of the materials from the old ones.

In addition to recycling the things you buy, you can help the environment by buying products that contain recycled materials. Many brands of paper towels, garbage bags, greeting cards, and toilet paper, to name a few examples, will tell you on their labels if they are made from recycled materials.

In some towns you can leave your recyclables in bins outside your home, and a truck will come and collect them regularly. Other towns have recycling centers where you can drop off the materials you've collected. Things like paper and plastic grocery bags, and plastic and aluminum cans and bottles can often be brought to the grocery store for recycling. Whatever your system is, it's important to remember to rinse out and sort your recyclables!

Commonly recycled materials

Paper

Did you know that for every ton of paper we recycle, 17 trees are saved? You can recycle several types of paper, including newspaper, cardboard, and high-quality papers like printer and notebook paper. (You may need to separate these different types of paper.)

So how does the paper you recycle turn into new paper products? Like this:

1. Paper is sorted by type and sent to a paper mill.
2. Hydrapulper cooks the paper until it is a thick soup of fibers. Detergents and chemicals remove inks. The paper is now pulp, which looks like cottage cheese.
3. Impurities are removed by a moving screen, spinners, and a series of washers.
4. Pulp is bleached with chlorine or other chemicals to make it white, and washed again.
5. Machine rolls out pulp and dries new paper.
6. Paper is cut to size, wrapped, and shipped.

Glass

Most types of glass, including your food and beverage containers, can be recycled. It's especially good to recycle glass because it does not naturally break down over time. Glass goes through a different recycling process than paper:

1. Impactor crushes glass into chunks of cullet, which is chunks of broken or waste glass, $\frac{3}{4}$ inch in diameter.
2. Cullet is dropped into weighing bin along with ingredients to make new glass.
3. Cullet is put into furnace, which melts it into a thick syrup at 2,800°F.
4. Syrup flows out of furnace into an automatic feeder, where it is cut into bottle-size portions.
5. Bottle-size portions flow down a chute into molds, where they are shaped and cooled.
6. A small hole is made in the center by a machine, and air is blown into the bottle to hollow it out. A neck is shaped for a cap or lid.
7. Annealing oven, or lehr, slowly heats, then cools, the glassware, making it strong.

Plastic

Plastic is another material that takes a long time to break down—yet only about 5% of plastic is currently being recycled. Like aluminum cans, refundable plastic soda bottles can be brought back to the grocery store in many areas.

Other types of plastic can be recycled, too; some more easily than others. The most commonly recyclable types of plastic are polyethylene terephthalate, also called "Plastic #1," and high-density polyethylene, called "Plastic #2." Plastic #1 is the type of plastic that soda bottles are made out of. Plastic #2 is the type of plastic used to make milk jugs. You can tell what kind of plastic a container is made out of by looking for a number inside the recycle symbol (usually located on the bottom of the container).

Aluminum

Many states add a five or ten cent deposit to juice or soda cans when you buy them, which you can get back if you return the cans to the store for recycling. Here's how aluminum is recycled:

1. Cans are smashed and cut into dime-size shreds.
2. Shreds are placed in a gas-powered aluminum furnace, making liquid metal.
3. Liquid flows into molds that form ingots, or bars of metal.
4. Rollers squeeze the ingots into sheets for new cans.
5. Sheets are rolled into coils and sent to a plant, where they are shaped into cans again.

The potential significance of the product is to provide a suitable lighting unit which gives enough light for someone who wants to read in a dim room. This lighting unit will help the environment in several ways. First of all, it will conserve energy, since it has a small bulb that will use much less electricity than a larger lighting unit or a spotlight. Instead of having to turn on the main light in a room, a person can switch on this light and he/she will have adequate light for reading. This will help the person who uses it to reduce the electrical bill of his/her home, which would save money! I will test my product, by 1. checking that materials used are recycled or recyclable. 2. Carry out long term tests comparing the use of batteries with mains electricity. This however may not be practical in the time allocated for the project. Also, since the unit will be designed based on the principles of clean technology and green design, it will use less resources and will cause much less environmental damage than an alternative product of similar use. Reusing materials helps decrease the amount of waste and pollution, because materials will be put to good use instead of being thrown away. Also, since a lot of the materials it will be made from will be recycled materials, the product will help reduce the strain placed on the world's natural resources, therefore helping to conserve them for the use of future generations. This will aid in achieving sustainable development in the world. And although the impact of this product alone will be very small, our class's products will collectively have a more significant impact on the environment. Finally, the lighting unit will create a pleasant ambiance in the room it is put in. Since its purpose is to provide only a small amount of light, it will create a romantic atmosphere in a room, similar to that created by candlelight. Therefore, it will help the people in the room to relax and unwind. Also, its attractive appearance will enhance the overall look of any room.

Product testing

CASE STUDIES

Case Study # 1



Strengths:

- extremely original idea.
- reuses a lot of glass bottles, therefore it is very environment friendly.
- easy to clean and maintain because it is made out of glass.
- aesthetically pleasing to look at.

Weaknesses:

- Cannot be battery-operated, as it uses many light bulbs. It is more likely to be powered by the mains supply. Since our products must be battery operated, I cannot do something similar to this unit.
- It is difficult to collect so many identical milk bottles in order to make it. therefore, if I consider making something similar, it will probably take more than 5 weeks to save this many bottles.

- It is quite large and takes up a considerable amount of space, therefore it is more suitable for making a chandelier rather than a table lamp.
- Potentially dangerous, as glass easily breaks and can cause injuries.

Conclusion:

Although it is really unusual, attractive, maintainable and eco-friendly, this lighting unit is not really a good example of existing products. First of all, it is too big for a table lamp, and because it has many light bulbs, it requires a lot more energy than what a battery can supply. It will have to be powered by the mains supply, which is irrelevant to this project. It will also take me a long time to collect all the bottles needed to make such a lamp, which may exceed the time limit I have. Therefore, this idea does not coincide with the design brief and so it is not suitable for my project.

Case Study # 2



Strengths:

- It is very simple, modern and easy to make.
- It would suit any room and color scheme.
- It is made of cardboard, which is easy to handle and plentifully available.
- It can be battery-operated
- It is safe (does not shatter, no rough surfaces, no exposed wires)
- Its size is suitable for a table lamp.

Weaknesses:

- because it is made out of cardboard, it is very fragile.
- It is not waterproof; therefore it cannot be wiped if it gets dirty.
- The battery is not easily-replaceable.

Conclusion:

I think that this lamp is much more practical for my particular design situation, because it is very versatile and can be adopted into any room, it is easy to make, small enough to be battery operated, and reuses materials that are easily found around the house. Its size is also suitable for a table lamp. Its main disadvantages are its fragility and the fact that there is no opening for replacing the battery, but I can modify the design to make it inclusive of these features.

More case studies were provided by the student.

Initial design specifications

ESSENTIAL CRITERIA - the product must:

- Take into account the fundamentals and strategies of green design and clean technology.
- Provide sufficient light for reading.
- Be battery operated.
- Have a switch.
- Be made using machinery and equipment available in the DT department.
- Be possible for me to make on my own.
- Be possible to make within 2 weeks.
- Be aesthetically pleasing and attractive to look at.

Other wor... our husb... ve didn't... an (pictu... 5ft lin, a... s been fa... lacent an... t to com... if I slimm... ie cut ou... urries, w... unched 'rean... chips. Doreen... aerobics class... steered clear c...

At this particular time, when we were our heaviest, we started to compare ourselves

As 42, Robert Brown, a friend of the family who'd been divorced for five years, came over to help her fix her car. We were time... Doreen... roman... he'd be i... he was l... gradually... all in... and gent... Doreen i... after a ye... 1981, the... 'Robert i... weight, s... unconditi... worrying... Pauline a... a year af... working... operato... engineer... me out... amazed... attracti... 38-1 c... 'He nev... being i... person... found i... becaus... Bill. It v... him me... more v... Doreen... Robert... Pauline... together... 'We co... of us ha... 'We had... fact we... From th... Pauline... were wi... would b... more gl... heart of... both sis... Eventual... joined a k... club. Pauli... was a size 18. Doreen was more than 16st and a size 22. 'Although we'd had our toyboys

DESIRABLE CRITERIA - I would like the product to:

- Be made in no more than 4 hours of work.
- Have an unconventional and original design.
- Reflect my personal likes and preferences, such as Japanese/oriental styles.
- Be waterproof.

Bibliography:

- The Eco-Design Handbook. By Alastair Fuad-Luke. P. 86 - 100
London: Thames & Hudson, 2002.

This book was extremely useful because it was a source of inspiration and provided me with examples and case studies that I could not find elsewhere. It put me in the mindset of eco-friendly design.

- www.enviroliteracy.org/subcategory.php/23.html
This website was useful in providing me with background information about green design, its principles and limitations. I think it is a very good website for this purpose, because it gave me the information I was looking for. It is one of the few that provided such information. Most of the other websites are about companies and products.

- www.factmonster.com/ipka/A0775891.html
This website provided background information about the three 'R's, as well as commonly recycled materials. What I liked about it was that the information was written in a simple, understandable manner.