# Design a Recycling Unit - Teaching pack

## Design brief

The ‘client’ for this product you are going to design is the household who have decided that they are going to deal with their rubbish in the way which is most environmentally friendly. The problem they have is how to actually collect and separate the materials in their home.

The aim is to design something which could be mass produced and sold at a price which most households could afford easily.

Imagine the scene in a busy household. Someone comes in from work with some shopping, picks up the post by the door, goes into the kitchen, puts on the kettle, opens the post, some of which is ‘junk mail’, some important things. They make a cup of tea and drink it while looking at the post and then prepare supper. After having supper, they end up with an empty steel can, plastic wrappers off the veg and cheese, a cardboard box with thin plastic coating on it, an empty plastic milk bottle, a couple of plastic bags, the paper receipt from their shopping, a wet tea bag, some vegetable peelings, a ripped up envelope from the important post and some glossy leaflets from the junk mail.

The householder needs some easy way of sorting all these things out of their way quickly until it is convenient for them to deal with them more permanently.

The unit you design will need to be appropriate to most people’s situation, but it could not satisfy the needs of every household.

The unit itself must not add to the problem. It must have a long life and not depend upon having specially manufactured ‘disposable’ containers in it.

Disposable containers which are themselves part of the waste produced in the house would be ok.

An optional element would be to include some graphics which tell people how to use the unit and which, in an attractive way, encourage them to use it.

## The situation

The amount of waste which is carried away from our doorsteps in black plastic bags has become a significant problem.

What people put in these black plastic bags varies enormously. Some people put in everything that could be described as ‘waste’, including things like grass cuttings from the lawn. On average each household produces one tonne of waste a year.

Most of it goes to landfill sites where it is dumped in a hole in the ground. In some places it is becoming difficult to find enough suitable space for landfill sites and it costs a great deal. The sites also have to be well designed and well looked after or they may cause problems. The organic waste in landfill sites usually rots anaerobically (without oxygen) and produces methane. Methane is one of the gases which contributes to the greenhouse effect. If it is collected and burned as a fuel it can be put to good use by replacing a fossil fuel that would have been used instead. If it is burned it gives off carbon dioxide which does contribute to the Greenhouse Effect but only has one twentieth of the impact of methane. Other gases which are produced in landfill sites can give off smells at certain times.

A lot of energy is used in dealing with waste - sending large trucks around the streets to collect it and running the

landfill sites.

Disposing of waste costs Council Tax payers a considerable amount of money and the cost is increasing rapidly.

Recycling is not a magic answer to these problems. It is a very good idea with some materials but it does use energy, sometimes a lot of energy in relation to the amount of benefit from what is produced, and sometimes it is difficult to find uses for all the materials produced.

It is best to reduce the amount of waste which we produce in the first place, whatever we do with it in the end, but, however hard we try, we are not going to reduce this waste to nothing. We are going to produce all sorts of waste materials in our homes. Some of this can be re-used or composted in the home and some of it can be recycled.

## You will need to decide the following -

where the unit could be located

what it's overall size will be

how big each segment will be

how many segments there need to be

what material(s) it will be made of

what shape the segments will be

## Types of waste & what the options are for each

(absolute rubbish means things which cannot be composted, re-used or recycled and are therefore going to end up in a landfill site, via a black plastic bag)

**Food waste**

(including tea bags, coffee grounds, banana skins and the dinner you didn't eat)

All of this could go into a compost heap. After a few days it will start to rot and therefore to smell. If it is rotting in a compost heap in the garden, smell will not be a problem but if it is rotting in your kitchen then it certainly will. However dry it may look this waste is actually 'wet' and will produce liquid quite quickly. It therefore needs to be in a waterproof container.

Some pets will eat some - rabbits or guinea pigs can be waste food processors and lawn mowers and fertilisers at the same time. They like uncooked vegetable waste.

**Garden waste**

All of this could go into a compost heap (since presumably this will never get inside the house it is irrelevant as far as this design is concerned)

**Paper**

Some is suitable for recycling (glossy leaflets, envelopes, newspaper)

Any paper can be composted (shopping receipts, paper bags, kitchen paper etc.) It needs to be screwed up to create air pockets. Compost heaps work better with plenty paper or cardboard well mixed up with the food waste.

**Cardboard**

This can almost all be composted

It needs to be crumpled up or ripped into pieces. Food waste can be put into a cardboard box, like a pizza or cereal box, and then the whole lot can be put into the compost bin.

Cardboard coated with metal foil or plastic or both has probably got to go into the absolute rubbish.

**Steel cans**

In theory these can be recycled, but there may not be anywhere locally where they are collected so they may have to go in the absolute rubbish

**Aluminium cans**

Aluminium is a particularly suitable material for recycling because it takes twenty times as much energy to produce aluminium from it's raw material (bauxite) than it does from scrap aluminium. However, we should still use as little aluminium as possible as there can be pollution caused in the recycling process.

**Plastic containers**

Some are suitable for recycling, particularly bottles that contained washing liquids, shampoo, milk and some other drinks

Some (plastic wrapping such as on lettuce, cucumber, around boxes of tea bags) are not, at the moment, suitable for recycling, so they have to go in the absolute rubbish, if they cannot be re-used for something

Things like ice cream tubs can be re-used for all sorts of storage.

Plastic bags can be re-used a few times but will probably end up in the absolute rubbish.

**Batteries**

Small batteries contain polluting chemicals. They should not go into landfill sites but there is nowhere better to dispose of them, at present. The ideal thing to do with them would be to send them back to their manufacturers.

# Questions it might be useful to consider

How often are you going to be emptying your unit and therefore how big does each bit need to be?

What volume of each different material does an average home produce per day / per week?

How long do you want food waste sitting in your kitchen while it waits for its journey to the compost heap? Most people do not like food waste more than a day or two old sitting around in their kitchen. Not only does it start to rot and therefore to smell after a bit, it also makes it harder to ctean out the container later. If the container is only big enough to hold a days worth of waste then it has to be emptied regularly.

How many different classifications are there? How many parts does the unit need to have?

Will you need a part for each different thing or could you put things in one place to be separated later? For example if the bins for glass, metal and plastic are all near each other in recycling centres perhaps it would be easier to separate them there.

Should it all be in one unit? Does it all get end up in one place or should different things be collected in different places in the home?

Should it be something which will stand on the floor or hang on the wall?

How high or low can it stand/hang in order to be easily used?

How compact does it need to be to be practical for most homes?

What is going to happen to the waste next?

How is it going to be transported to its destination?

How often are you going to be prepared to move it?

Does it make sense to put each item of waste straight into some container which can then be used to take it to its destination?

Is this just going to be a very temporary storage in the house so that it then goes into larger containers somewhere else in the home before it goes off to the recycling centre or the compost heap?

If it will need to be put from the unit into some other container to go on its next journey, how will you ensure that this can be done easily? Presumably you will not want to handle each piece separately so they will need to be tipped into something else.

Does the unit need to be easily washable?

Does it need to dismantle easily?

Does it need to be modular so that you can add or remove elements of it depending on need? Supposing your local council suddenly started collecting for recycling something which before you had to put in the ‘absolute rubbish’. Could a new element be added to your recycling unit?

Do you need to make the actual containers or might it be an option to design something which will hold/support containers which are themselves a waste product, such as plastic bags or cardboard boxes?

How can you reduce the volume of your waste? If you put cans or plastic bottles in just as they are they take up far more space than they would if they are ‘crushed’. What can you do about this?

# Questionnaire

Your design has got to be useful to most households so you need to get a good idea of what will be suitable in a range of households. To do this you will need to write a questionnaire, so that you can collect the information in a systematic way and analyse it.

The sort of things you would want to find out from a survey would include -

- how much room is available for a unit
- what sort of location would be most suitable
- how much of each sort of waste the household produces
- whether people would be prepared to use a unit like this
- which things they would use the unit for
- how important appearance would be to them
- whether they would like it to be inconspicuous or to be a striking "object of beauty"?

You will need to decide how many households you will go to in order to get a useful sample and how you will ensure that you get a variety of types and sizes of household. However, you have also got to be realistic about the time you can spend on this, so you will need to calculate how long each one will take you.

You will need to word your questions carefully so that -

they are quick and easy for people to complete

they are clear so that the answers do actually tell you what you want to know.

It may help if you give people multi-choice questions so that they can just tick a box rather than write a sentence.

When you have written a draft of your questionnaire you should try it out on someone. You could try it out on someone else in your class but you should certainly also try it out on someone who does not know any thing about the project.

You are almost certain to find that you have worded it in such a way that it does not say exactly what you meant it to.

## Notes for the Teacher

This project could be done as group work.

It really would need to be a unit where each container can be easily removed to decant the waste into another suitable container to carry it to its next destination or that the container on the unit itself is the one used to carry it on.

It probably really needs to be a system that is modular and that people can buy modules of so that they make their own choices about how many different categories they collect.

You could have different segments for -

1 things for composting - all food waste, paper & card

2 paper for recycling

3 aluminium - cans, foil etc

4 steel - cans, screws, nails

6 plastic for recycling

7 plastic containers for re-use

8 plastic bags for re-use

9 glass - jars, bottles

10 absolute rubbish

Of all of these only 1 & 10 are likely to be wet. In fact the absolute rubbish tends not to be wet, once all the

organic material is out of it.

Some might quite appropriately be put in together. For example in some recycling centres the bins for glass, plastic and aluminium are near each other and it is virtually as easy to distribute them from the same container as it is the different colours of glass. One could, on the other hand, argue that people might want to separate the different colours of glass in their kitchen. If there is nowhere local to dispose of steel cans etc. then there is no point in storing that separately - it has to go in absolute rubbish in the end anyway.

## Additional Projects

### Poster / leaflet promoting good practice

Small poster or leaflet which could be put up in the home to encourage the household to follow the principles of - Reduce, Re-use, Recycle

### The foot, the most ecological can crusher

Can you design a ‘crusher’ that is more efficient than a foot (with substantial shoes on).

The foot method -

Steel cans - remove both ends completely with tin opener, wash can, place on its side on a hard floor and stand on it.

Aluminium cans - place on its side on the floor, stand on the middle to flatten it, this pulls the ends in and you can then crush each end down.

A similar method can be used with plastic bottles.