



## The Problem

The initial idea came when I saw my parents constantly going to the garden centre to buy plant pots of various sizes as the previous plant pots had broken or become too small. Moreover, through discussion with my Nan I realised this problem was an issue for many gardeners and plant enthusiasts as they would constantly change from pot to pot littering old ones around the garden or shed. This is also an issue for the wider environment as creating and recycling many plastic plant pots uses copious amounts of energy and fossil fuel resources. In addition to not having a short biodegradable life span, some polymer materials begin to break down giving off dangerous toxins into the environment. A contradiction to the objective of growing plants and preserving the environment! A lot of polymers contain toxins, such as phthalates, BPA and flame retardants. As these polymers break down, they can absorb other toxins more easily which can diffuse into the ecosystem increasing contamination even further.

## The Design Brief

Our aim is to develop an expandable, durable and reusable plant pot which can allow the buyer to use one plant pot for the different stages of it's growth and development.

## The Target Audience

After discussion with the design team we realised a durable, reusable and expandable plant pot would appeal to an adult target audience who were design enthusiasts because of its practical and environmental attributes as well as to young children and their families. The potential aesthetics of the expandable plant pot are limitless, the plant pot could be colourful, designed to celebration themes such as Christmas or the material used could be transparent therefore the children would see and learn about the developmental growth of plants. A transparent plant pot has a the scope to be a great learning aid in Reception classes, Primary and even High school, enabling students to watch the plant grow, developing their knowledge of plants as they grow from seedlings.

- However, it may be more practical for the adult buying the plant pot as it will save :
- Space: it can be flattened out and placed in a drawer to be stored.
  - Money: various sized plant pots would not have to be bought as they can be quite expensive for strong and durable ones.
  - Material: you would only have one expandable pot for the plant thus saving typical plastic used for different sized pots.
  - Environment: some polymers can be hard to recycle, moreover the waste produced from polymers affects the environment. Once a polymer has been manufactured it can not be sustainably disposed of.

Therefore this is a great invention for a family project as well as a gift for a design concise student or adult living in a small apartment where they don't have a garden for plants therefore they can enjoy watching their plant grow.

## Research

Through discussion we identified several areas for initial research, these included the following.

### Research at the allotments

We went down to an allotment to ask them about plant pots. We asked four different people of which three said they would buy the product. They commented on the fact that it would stop plants getting pot bound and the roots wrapping together. However, they also commented that water may be an issue as it may trickle down the outsides of the pot, through the slots used to construct the pot. In addition, we also asked the allotment holders about the pot being a novelty item or a gardeners, to which most of them said that they would buy as a present not for their allotment. In conclusion, this lead to us making adjustments to insure the plant pot complimented everyone's feedback. Additionally, this led to us changing the design concept and altering its shape so that water didn't escape through the sides. This meant that our plant pot became more of a practical item.



First model of an expandable plant pot. This was shown to the allotment holders.

### Research existing plant pots

Here are the sizes and proportions of existing plant pots. We discovered that plant pots are usually made from ceramic or polymers such as high density polyethylene (HDPE), polypropylene or polystyrene. This was the starting point for our research into materials to make our plant pot from.

Size	Diameter	Depth
1Lt	13cm	10cm
2Lt	15-17cm	13-15cm
3Lt	17.5-19cm	14.5-19cm
4Lt	19.5-21cm	16.5-20cm
5Lt	22cm	18cm
10Lt	28cm	23cm
15Lt	32cm	26cm

Dimensions of common plant pots.

### Research of possible materials

We looked at a variety of polymers, concluding that polypropylene was the most suitable for the design and manufacturing processes we had available to us.

Polypropylene is often used for food containers. The melting point of polypropylene is very high compared to many other polymers, at 320°F (160°C), which means that the hot water used when washing it will not cause it to warp. Therefore the plant pot could withstand different temperatures and it wouldn't deform the shape of the pot allowing it to be sterilised before being used.

Additionally, Polypropylene is very easy to add dyes to, therefore relatively easy for the expandable plant pot to be dyed appropriately to make themed plant pots, for example to represent Father Christmas. Polypropylene is also:

Tough(will not break easily, good durability).

Has good chemical resistance(will not swell or soften, change shape)

Translucent (You can watch your plants roots grow).

The polypropylene will be relatively easy to manufacture with the use of a laser cutter to cut 2D net designs that could be assembled by the customer into the 3D product.



The colour wheel, showing possible colours the polypropylene could be dyed.

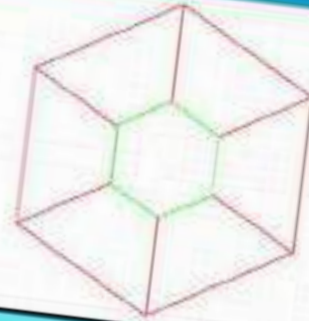




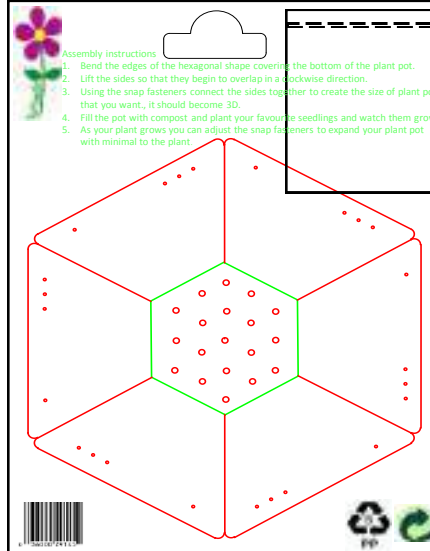
## Design Development

After several modelling attempts and thinking about the possibility of incorporating a base into the plant pot we went back to the research gathered at the allotment. One comment in particular stuck in our minds “ the plant pot does not need to be round, another shape might be better”. This sparked the idea of a multi-sided shape as the base, with the sides attached to its edges which could then be bent upwards and joined to make the pot shape. A bit like the shape of a daisy!

Net drawn in 2D Designer. Need to add holes for drainage of water so the plant does not drown.



## The final prototype



## Point of Sale Packaging

A small high density polyethylene or HDPE plastic bag to hold the plastic snap fasteners is the only additional packaging materials. The expandable plant pot will be sold flat pack, so that it can be simply pressed out of the sheet of polypropylene that it was laser cut from. This will reduce unnecessary waste of additional materials as well as keeping product assembly costs low. The customer can enjoy building their own expandable plant pot. This would fit into the design Ventura museum ethos as visitors would be interested in designing and building their own unique plant pot.

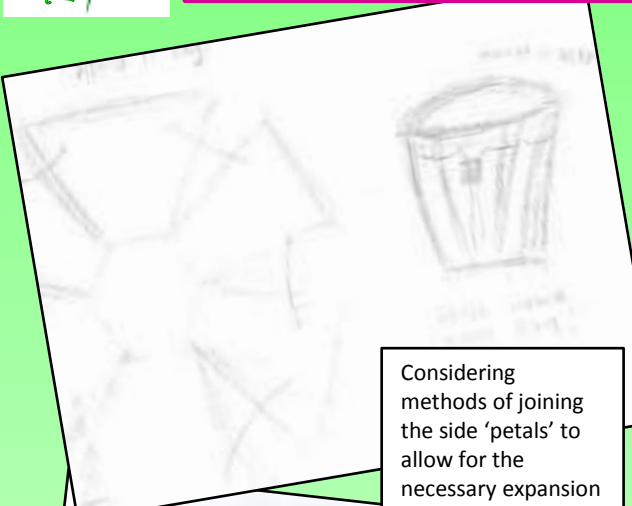
## Manufacturing costs

The following costings are based on approximations.

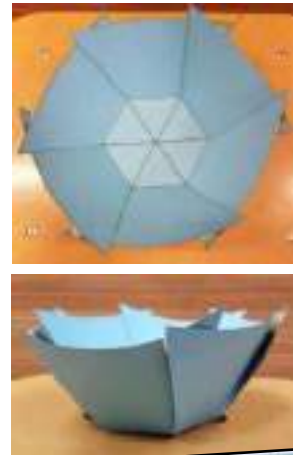
If 'The FlowerPot' was to be commercially produced in batch production the costings of the materials could be further reduced due to the purchase in bulk of the materials.

- A3 0.8 mm thick Polypropylene sheet £1.08
- 25 size 16 resin polymer snap fasteners £1.50
- A HDPE plastic bag zip lock resalable bag £0.03

Total cost of materials is £2.61. Cost of labour and manufacturing using a laser cutter needs to be added, even so the complete product should be produced for about £3.00.

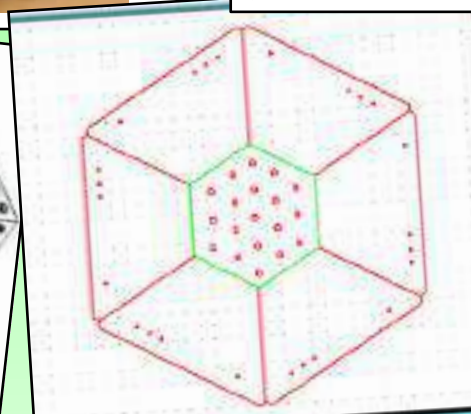


Considering methods of joining the side 'petals' to allow for the necessary expansion of the plant pot.

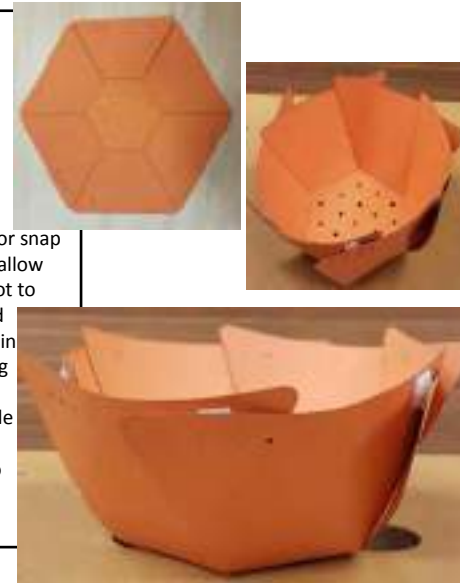


Card prototype model  
This was cut using the laser cutter to identify improvements and to test the proposed method of assembly that will also allow for the sides to move outwards, therefore this creates expansion the flower pot. The CAD work for the prototype is shown above.

Final CAD work for the 'FlowerPot' expandable pot.



Card models of the final expanding flower pot. This includes drainage holes for water, and positioning for snap fasteners to allow the flower pot to be decreased or increased in size. Also rounding of the individual side petals for safety and to improve the aesthetic.



Visualisation sketch showing 'The FlowerPot' in use.

## Future Improvements

For further developments we could have a detachable bottom for seedlings that need to be planted in soil outside therefore, the user could pop out the bottom and plant it neatly by collapsing the walls. Another possibility would be to form the plant pot from a biodegradable material that could be planted into the soil with the plant inside, therefore being less hassle and not disturbing the plants root system. A biodegradable material would be a good focus for further research as the production of polypropylene creates many polluting chemicals as well as using up fossil fuel reserves. In addition to being more environmentally compatible a biodegradable pot could also be impregnated with fertilisers to stimulate the plants growth.



## About you

### Name of your school

Weatherhead High School

### Submitting teacher name

Mrs Rhiannon Pearson

### Year group

- Year 9

### Team members

- ~~Sanjita Akter, Libby Evans, Emma Baldwin, Quirk, Shiann Smith~~

## About your idea

### Product name

The FlowerPot

### Your idea

Our aim is to develop an expandable, durable and reusable plant pot which can allow the buyer to use one plant pot for the different stages of it's growth and development.

### Target Audience

Families and design conscious adults.

### Sustainable design

Although the product is made from polypropylene it is reusable as well as expanding with the plants growth instead of needing to re pot into additional bigger plant pots. Polypropylene can withstand relatively high temperatures therefore it can be cleaned and sterilised for reuse.

### Manufacturing

It will be made from sheet polypropylene which can be laser cut. It will also need polymer resin press studs to assemble the product.

## Costing and budget

### What is the cost price of one product?

3.00

### How many products do you plan to make and sell?

100

### What will the retail price of one product be?

£8.00

### What is the total profit that you will make from sales?

£500.00

### Which charity would you donate the proceeds to? Why?

Water Aid.

Their aim is to provide clean water, decent toilets and good hygiene to populations that are struggling to

access these amenities. Water is an essential resource to enable people to live a healthy life, to help them avoid life threatening diseases.

**Upload your files**

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