



Coffs Harbour Public School Cybernetic Whales

FIRST Lego League

Project Presentation



Generating Oxygen in Space

Naturally...



From Plants to Oxygen..

How our problem changed.

Firstly our team discussed what we wanted our topic to be. After looking at all our options we decided to chose to do further research on 'growing plants in space'.

After doing some initial research we found out about plants behaviours in space these are, plant roots usually grow downwards on earth but in space they grow in any direction they want. Further research got us on to the topic of plants needing oxygen. Oxygen and how it is produced in space was of interest to us as it is a crucial element in the survival of any living things.

Oxygen then became an area of interest for us and we ended up segwaying into how to generate more oxygen in a space craft.

We also found out that one leaf on a plant can produce around 5 millilitres of oxygen per hour on average. Some other interesting facts we found out are that in august 2015 the first space grown vegetable was eaten.

After doing this research for a while we started to get really interested in how plants and trees produce oxygen and how astronauts use it we eventually chose to do that instead.



Thought Process

How we narrowed down our solution

After going with generating oxygen for our project we decided to go into some deeper research on how it is produced and what makes the most for survival. The first thing we researched was how much oxygen a human breathes in on average which is about 7 or 8 litres per minute for an adult which is about 11,000 litres of air per day.

After finding that out we had to figure out how much oxygen a tree/plant produces. We first cut it down to how much a leaf produces which is about 5 millilitres per hour. Once we found that out we went on to the internet and tried to figure out how many leaves a tree had since it must have more than a simple plant.

Before we found the amount of leaves we saw that we had missed a step and had to find what tree has the most leaves, in this we found that an Oak Tree is one of the largest and has a huge amount of leaves. An Oak Tree has about 227,721 leaves so we did some math and found that an Oak Tree produces around 273,265 litres of air per day.

Once we did all this research we realised that we had to fit it on a space ship.



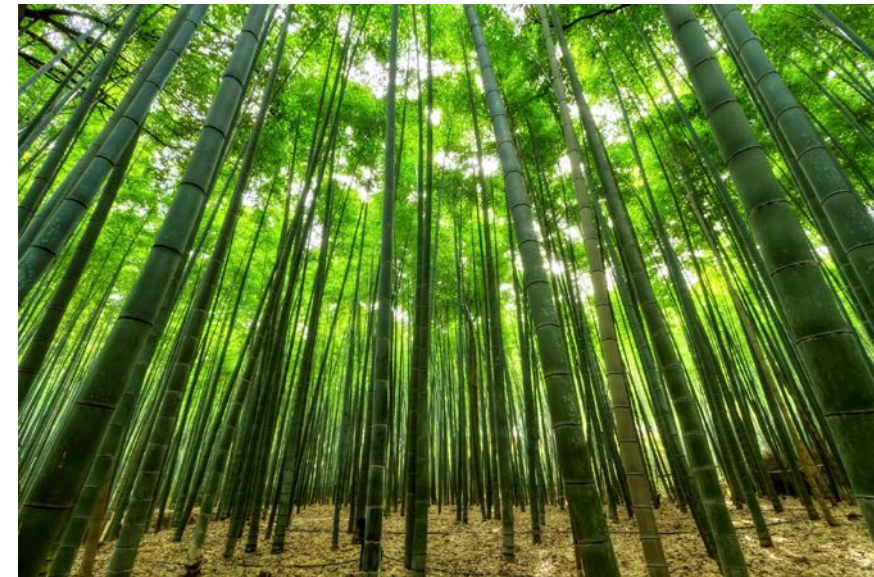
Can we do it?

Big tree, tiny space...

After this we had to figure out 'the how' and what was already out there to solve this problem. We wanted to find out if trees and plants can grow normally as in space as they do on Earth. In our research we found an interesting article from National Geographic called Plants Grown Fine Without Gravity. It stated that gravity is important for root growth but space plants didn't need it to grow which was great to know.

When researching what NASA had already looked into regarding this topic we found that they had thought long and hard about producing oxygen and the most efficient way of doing it. They currently produce oxygen three different ways; using oxygen generators, pressurised oxygen tanks or solid fuel oxygen generators. These are all innovative ways of producing oxygen but we thought by producing oxygen in space like we do on Earth, astronauts would feel less isolated and more connected to their home.

Further research into the Oak Tree found that it was deciduous and when its leaves fall it takes back 50% of the oxygen it produces. This wasn't going to be the best option.



Final Thoughts

Could we actually do it?

We decided on trying to send up Bamboo. After much research we found that Bamboo is one of the fastest growing plants, with it reaching its full growth in just a few months. It can also produce 35% more oxygen than an equivalent stand of plant. It can also tolerate extreme conditions which was great news for us.

To make this idea work we would send up new shoots of bamboo with the makings of a planter box made out of High Density Polyethylene which is a hard plastic used to control bamboo. Astronauts would be able to put together the planter box in space with pre-packaged soil and all part and seedlings.

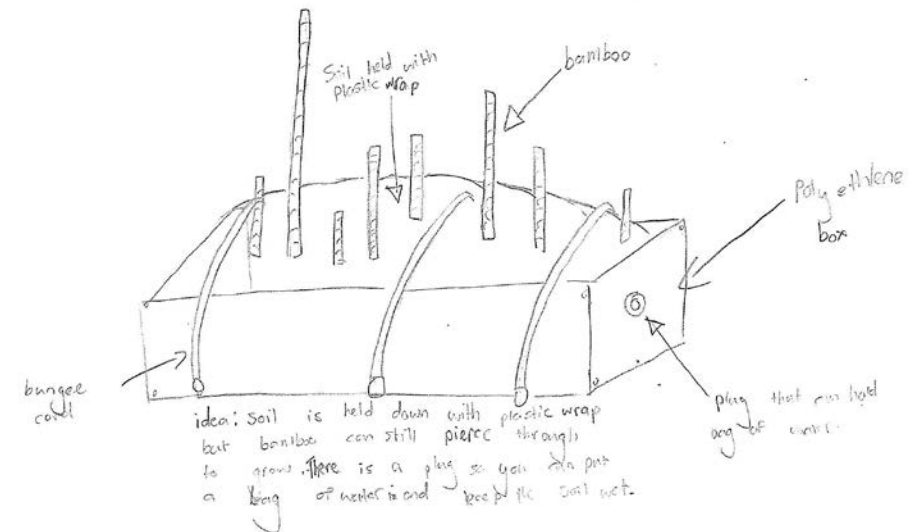
We used information and an image we saw from a NASA article as inspiration to adjust a design that is already in place for our own plan for the bamboo planter box. (see images to the right). We feel we have solved the problem of generating oxygen naturally.

We have thoroughly enjoyed researching this problem and solution and have shared our ideas with the class mates, teacher and wide school community through the whole school blog.



Above: Growth chamber on ISS growing lettuce and our inspiration.

Below: Our plan for the bamboo planter box.





Thank You

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