SASTA OLIPHANT SCIENCE AWARDS

SOUTH AUSTRALIAN SCIENCE TEACHERS ASSOCIATION

Prize Winner

Models & Inventions

Year 7-8

Eugene Lee

Pedare Christian College

ENVIROJAX

Oliphant report
Zara Hutchinson

The world is facing major environmental issues. I decided to come up with a solution for at least two issues.

The first, gully erosion is a major issue in farming regions and results in the loss of arable land used to grow food. It harms underground utilities (power, water, telecommunications) and washes sediment into waterways. Gully erosion occurs when the speed of water running over the surface of land increases to a point that is able to remove particles of soil/rock causing erosion. The second issue, plastic pollution is problematic around the world as we struggle to find suitable solutions to manage non-recyclable plastic waste.

I came up with the idea of the EnviroJax/BioJax. These 'Jax' are placed in eroded gullies and create obstacles and small gaps to deflect and trap water. This reduces the speed of the water and rate of erosion. The biojax on the other hand are designed to breakdown overtime and start regrowing natural vegetation to help stabilise the Envirojax and trapped soil and rebuild the gully.

Originally, I thought the shape would be something like multiple diamonds joined at the centre, but after some research I discovered tetrapods (invented in France in the late 1940s and further developed by the Japanese in the late 1900's to deal with coastal erosion). The Envirojax is similar (multiple shapes to deflect and trap water). Sketches, prototypes made from plasticene, and rough models produced on the app 'Blender' were made and sent to Patrick Kelly for 3D printing on a small scale. A negative mould was created over the positive model to begin manufacturing.

After receiving the moulds, I filled them with plaster (Envirojax) and recycled cardboard, paper and seeds (Biojax). Finding the right plaster mix was difficult as it needed to be piped out of a plastic bag into the top of the mould. Too runny and it would seep out of the mould, too thick and it wouldn't come out of the bag. The BioJax were created by ripping up old carboard and newspaper, which were then soaked in water, and mixed together with some grass seeds. This was compressed into the moulds and left to dry in the sun.




The next challenge was deciding how to display my invention. To best demonstrate how my invention works, I would ideally need to be there. I came up with the idea of pumping water through model gullies to demonstrate erosion with and without Envirojax, however this proved difficult to complete within the rules of the competition. I decided to submit a video instead. I bought a tub and sand and made a model gully. I showed how water gathered in the centre of the gully and rapidly moved to the lowest point, creating a swirling motion and force to erode away sand without the Envirojax. With the Envirojax placed in the gully, the water's velocity was considerably slowed, proving its effectiveness.

Since conducting the experiment, the Biojax seeds sprouted. This was the intent of the final product, but I was not expecting them to grow during the experiment. They will now be part of the Envirojax display.

Word count: 498

OSA RISK ASSESSMENT FORM

for all entries in (✓) ☑ Models & Inventions and ☐ Scientific Inquiry

This must be included with your report, log book or entry. One form per entry.

NAME: Zara Hutchinson ID:

SCHOOL: Walford Anglican School for Girls.

Activity: Give a brief outline of what you are planning to do.

I plan to 3D print examples of my proposed EnviroJax as well as 3D print moulds to produce BioJax and plaster EnviroJaxs. With the plaster EnviroJaxs and the BioJax I plan to explore their effectiveness in controlling water runoff and reducing Gully Erosion. I also plan to film examples of Gully Erosion before the EnviroJax have been used and after.

Are there possible risks? Consider the following:

- Chemical risks: Are you using chemicals? If so, check with your teacher that any chemicals to be used are on the approved list for schools. Check the safety requirements for their use, such as eye protection and eyewash facilities, availability of running water, use of gloves, a well-ventilated area or fume cupboard.
- Thermal risks: Are you heating things? Could you be burnt?
- Biological risks: Are you working with micro-organisms such as mould and bacteria?
- Sharps risks: Are you cutting things, and is there a risk of injury from sharp objects?
- Electrical risks: Are you using mains (240 volt) electricity? How will you make sure that this is safe? Could you use a battery instead?
- Radiation risks: Does your entry use potentially harmful radiation such as UV or lasers?
- Other hazards.

Also, if you are using other people as subjects in an investigation you must get them to sign a note consenting to be part of your experiment.

Risks	How I will control/manage the risk
please see next page	

(Attach another sheet if needed.)

Risk Assessment indicates that this activity can be safely carried out

RISK ASSESSMENT COMPLETED BY (student name(s)): Zara Hutchinson

SIGNATURE(S): Hutchinson

☑ By ticking this box, I/we state that my/our project adheres to the listed criteria for this Category.

TEACHER'S NAME: Maria Caruso

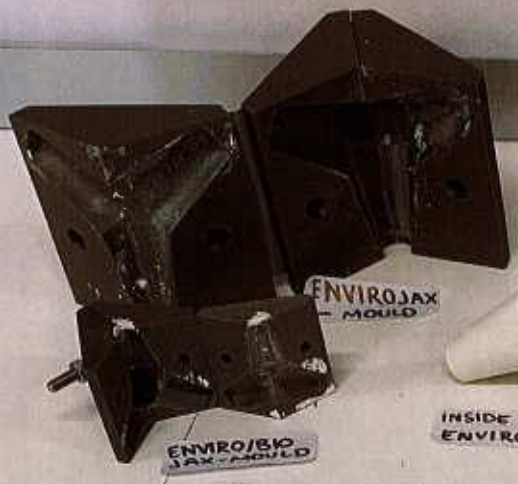
SIGNATURE: MCaruso DATE: 9/8/21

Risks	How I will control/manage the risk
Using scissors – injury, cuts, gashes	By having adult supervision, as well as cutting over a bench/away from my body, closed shoes to protect from potential drop.
3D printing – burn	3D printing is done in a controlled environment by a professional who has had substantial experience in this area before.
Stick blender – electricity, cuts	This will be done with parental supervision. Also using a higher wattage makes the blender more powerful so I would use a lower wattage, so risk is reduced. Also, tough gloves will be worn, and fingers kept away from blade. The blender was inly manipulated via the handle.
Using the Plaster of Paris – stains, skin irritation	I will always wear gloves, safety glasses and a dust mask while working with the plaster
Electrical – electrical shock	Blender will be used in a watery substance. The chords we're checked for splits and faults, Lessing the chance of injury.

Please find above a QR code link to my video.
Please watch by scanning the code on your phone.
Thank you and please enjoy!

Please set-up like this ↓

Thank you ☺



COVER SHEET

PLEASE INCLUDE THIS COVER SHEET WITH YOUR PACKET

This project will need to be delivered on Thursday 19 August 2021 between 9am - 5pm with reports due to be uploaded between 1-21 July 2021

ID: 0765-052

Student: Zara Hutchinson
Gender: F
Parent: M
Year Level: 7-8
Group Entry: N
Students: 1
Category: Models & Invention
Title: The EnviroJax
Keycode: SNAGRVVL

Coordinator: Maria Carusio
School Phone: 08 9372 6550

144-2199

OSA RISK ASSESSMENT FORM

for all entries in (✓) ☐ Models & Inventions and ☐ Scientific Inquiry

This must be included with your report, log book or entry. One form per entry.

NAME: _____ ID: _____

Activity: Give a brief outline of what you are planning to do

In my investigation I plan on:

Are there possible risks? Consider the following:

- Chemical risks: Are you using chemicals? If so, check with your teacher that any chemicals to be used are on the approved list for school. Check the safety requirements for their use, such as eye protection and stomach facilities, availability of running water, use of gloves, a well-ventilated area or fume cupboard.
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- Electrical risks: Are you using mains (240) volt electricity? How will you make sure that this is safe? Could you use a battery instead?
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Risks	How I will control/manage this risk

(Attach another sheet if needed.)

Risk Assessment indicates that this activity can be safely carried out

RISK ASSESSMENT COMPLETED BY (student name(s)): _____

SIGNATURE(S): _____

☐ By ticking this box, I/we state that my/our project adheres to the listed criteria for this Category.

TEACHER'S NAME: _____

SIGNATURE: _____ DATE: _____