Log book

Day	Activities	Comments
15 Jan	Researched topics	Wanted to do an experiment so researched in websites
17 Jan	Researched Topics	Shortlisted Effective tooth cleaning methods Handwashing methods Solar power equipment such as desalination
18 Jan	Found topic on oil spills	https://kids.earth.org/life-on-land/how-oil-spills-affect-the-environment/ https://kids.kiddle.co/Oil_spill https://www.sciencing.com/oil-spill-information-kids-5444185/ https://www.britannica.com/science/oil-spill
20 Jan	Finalized topic	Oil pollution in waters and cleaning techniques
23-30 Jan	Further researched online	Finalized to do a research project
03 Feb	Explored experiments	Explored cleanup methods Booms Absorbents Dispensers
04 Feb	Explored possible experiments for home	Sponges Paper towels Sieves
06 Feb	Explored nano methods	
07 Feb	Explored nano particles that are safe at home	
10 Feb	Finalized sorbents for testing	Cotton Pad Sponge Coffee filterDish Soap Popsicle stick

		Aluminum foil Fine Mesh Sieve Ferrofluid
15 Feb	Ordered materials	Petri dishes Ferro fluid
17 Feb	Developed Hypothesis	In light of this water pollution issue and exploring its remediation, I based my project objective on No 1 to Perform an experiment to see how oil reacts with water no 2 To test the effectiveness of different oil spill cleanup methods, such as booms, skimmers, dispersants, and nanoparticles through sorbent materials My hypothesis is that among the various methods used to separate oil from water, nanoparticles will be the most effective. This will demonstrate that nanoparticle ans are one of the most efficient solution for cleaning up oil spills.
01 - 05 March	Conducted experiments	
07 March	Researched experimental analytical options	
10 March	Started on powerpoint	
13 March	Talking points on presentation	
15 March	Pictures of testing evidence	
18 March	CYSF project details and Ethics form	
19-20 March	Completed powerpoint	
20 March	recorded video	

21 March	CYSF Online submission	

Research

Oil plays a vital role in our daily lives as one of the world's primary energy sources. However, the same resource that fuels our world can also cause devastating environmental disasters. Pipelines, tankers, and offshore rigs that transport petroleum sometimes malfunction or break, releasing tons of oil into nature. When oil spills into oceans, rivers, and lakes, it severely damages ecosystems, harming marine life, polluting water sources, and disrupting food chains.

The issue of oceanic oil spills became a global concern in the 1960s with the expansion of petroleum exploration and the introduction of massive supertankers capable of transporting over 500,000 metric tons of oil. While these advancements improved energy supply, they also increased the risk of catastrophic spills, threatening coastal habitats and biodiversity.

Understanding oil spills and finding effective cleanup solutions is crucial for environmental preservation.

An oil spill is the accidental release of liquid petroleum hydrocarbons products into a body of water, either by an oil tanker ship, offshore oil rig, pipelines and even recreational vehicles

Some main causes of oil spills

1.**Tanker Accidents** that is ships carrying oil can collide, run aground, or sink, leading to large spills.
2.Oil rigs can have blowouts, equipment failures, or pipeline leaks.
3.Corrosion, damage, or poor maintenance can cause pipelines to rupture.
4.Spills can occur during the extraction, refining, or transportation process.
5.Dumping oil waste into oceans or rivers, often illegally, contributes to spills.
6.Earthquakes, storms or tsunamis can cause infrastructure causing oil spills
7.War and Sabotage – Oil infrastructure can be targeted during conflicts, vandalism or terrorism acts

Various oil spill cleanup methods are

No 1. Physical Methods such as

●Booms or floating barriers that prevent oil from spreading further in water.
●Skimmer machines remove oil from the water’s surface.
●Absorbents Materials like sponges, sawdust, or synthetic pads soak up the oil.
●Vacuum Trucks are Large vehicles that suck up oil from shorelines and water surfaces.

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No 2. Chemical Methods such as

●Dispersants Chemicals sprayed on oil to break it into smaller droplets
●Solidifiers that Turn oil into a solid make removing it easier.

No 3. Biological Methods such as

● Oil-eating microbes bacteria that break down oil into non-toxic substances.
●Nutrient Additives that Help natural bacteria grow and speed up oil degradation.
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No 4 Burning & Washing such as

●In-Situ Burning where Oil is burned off the water's surface to reduce the spill quickly

And High-Pressure Washing that Sprays hot water to remove oil from shorelines

No 5. Are Manual Cleanup such as Shoveling & Scraping

No 6. Are Nano-Absorbents. They include

●Nanoparticles like silica, carbon nanotubes, iron-based nanoparticles, nano-enhanced bacteria and graphene-based materials

Water molecules are **polar** which means one end has a slight negative charge, the other a slight positive charge. Thus the water molecules can form hydrogen bonds and attach to other molecules that are also polar, like each other.

Oil molecules are **nonpolar** which means they can't form hydrogen bonds with water molecules.

This results in water and oil not being able to mix. Oil is lighter than water, so it floats on top of the water without mixing in.

❖ **Nanotechnology** as an efficient oil separation method

Magnetic nanoparticles (like iron oxide) are mixed with oil, making it magnetically responsive. Strong magnets can then pull the oil away from water without absorbing excess liquid.

Advantages include:

- Targets oil with high precision.
- Quick and efficient than traditional methods
- Oil can potentially be recovered and reused
- Prevents water absorption

Why don't oil and water mix?
Water and oil do not mix. They are said to be immiscible. This is because water is a polar molecule – its structure means that is has a positive charge one end and a negative charge the other end. Water molecules stick together because the positive end of one water molecule is attracted to the negative end of another.
The structure of an oil molecule is non polar. Its charge is evenly balanced rather than having one positive and one negative end.

Booms are physical barriers that stop the oil from spreading from an area. By keeping the oil in one area, it makes clean up easier. Booms can also be used to protect areas by stopping the oil from spreading to certain areas. One of our experiments will challenge students to build a boom to see if they can stop the spread of the oil.

Another approach is to use a **Skimmer**. These machines and devices help to collect the oil from the water. There are a few different ways this can be done by either scooping up the oil, or by using absorption techniques to collect the oil. We will try a few different skimmer techniques in our experiment.

Dispersants can also be used in the water as part of oil spill cleanup, but unlike other approaches that remove the oil, in this case it is simply spreading the oil out and diluting it. The chemicals, pollution and oil are still in the waterways. We will see this in action in our experiment.

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the other a slight positive charge. The polarity means those water molecules can form hydrogen bonds and attach to other molecules that are also polar, this includes other water molecules. It is like little magnets attracting each other.

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