



Learning Scientific Skills Outside the Classroom

Scientific Skills

Observing	Predicting	Concluding Specific skill – explain their findings using scientific language
Country of Origin	Suggested Age Range	Suggested Theme
 UK	7-9	Earth and Space
Location outside the classroom		Benefits of using this location
Any location outside		Pupils need ultraviolet light from the sunlight outside
Learning Objectives – Scientific Skills		Learning Objectives – Knowledge
To observe the change in colour of a UV bead over a period of time To use their prior knowledge to make a prediction about the suitability of materials To conclude their findings and explain which material is the most suitable for an astronaut and why		To know that ultraviolet light from the Sun is dangerous to our skin and eyes To know that some materials are better at blocking ultraviolet light than others To know that astronauts in space are at greater risk of exposure to ultraviolet light
Key Vocabulary		
Scientific skills vocabulary – observe, observing, look, predict, predicting, conclude, concluding, communicate, explain, repeat Knowledge vocabulary – sky, space, Earth, atmosphere, Sun, UV, light, ultraviolet, index, exposure, astronaut, opaque, material, protection		
Resources / Equipment		
<ul style="list-style-type: none"> Equipment to test how good materials are at blocking ultraviolet light from the sun – ultraviolet beads, plastic dishes, samples of different materials e.g. cotton, aluminium foil, polyester, wool, denim Equipment to measure intensity of ultraviolet light – ultraviolet sun index chart Equipment for recording – paper and pencils 		
Teaching Activities		
<p>Discuss – Go outside and look up at the sky? What do you see? What is the sky? What is above the clouds?</p> <p>Explain – The sky is the space around the Earth which you can see when you are outside and look upwards. However, the sky includes everything above the Earth including things you cannot always see such as the atmosphere and outer space. <i>Optional website to explain what's in space in more detail:</i> https://spaceplace.nasa.gov/story-whats-in-space/en/</p> <p>Discuss – What do we mean by outer space and what could we find there? Where are we now? What is Earth?</p> <p>Explain – The Earth is a planet in space surrounded by an atmosphere, a thick layer of gas which keeps us warm, gives us oxygen to breathe and is where our weather happens. The Earth's atmosphere can also help to protect our planet by acting as a barrier between the Earth and harmful light from the Sun known as ultraviolet (UV) light (some children might know this as rays or radiation, explain that they are right but we are going to use the term UV light today - this will be more easily understood by all children). Explain that UV light is invisible to our eyes. It is produced by the Sun and can be damaging to our skin and eyes.</p>		
	Discuss – Does anyone live in space? What is an astronaut? What do they do? Where do they live?	
	Image – Show children some images of the International Space Station (ISS) and discuss what it might be like for astronauts living there.	
	Explain – Astronauts in space are at increased risk from the harmful effects of ultraviolet light because there is no atmosphere in space to protect them, they must	



therefore wear protective clothing and visors when outside the ISS. Explain that today they are going to investigate what materials are best at blocking out ultraviolet light and would therefore be the most suitable material for an astronaut's spacesuit. They are going to use ultraviolet beads and observe how they change colour over time when they are exposed to the Sun. The children will record these changes in a table and use the results to decide which material would be the most suitable for an astronaut. Explain that the UV index is a measure of the strength of the ultraviolet light – the higher the UV index, the more UV light goes through the material.

Predict – Show children the range of materials available to test and ask them to write a short prediction about which one they think will be most suitable and why. Remind them to use their prior knowledge of materials to support their prediction.

Demonstrate – Show children the ultraviolet beads, demonstrate how they work when they are exposed to UV light and explain how they can use the UV index chart to measure the change in colour observed. Demonstrate how to use the colour to measure the UV index.



Activity – Allow children some time to explore the beads and investigate what happens when they take them out into the sunlight, indoors or hide them under a material. Also encourage them to practise checking the colour of their bead against the index chart.

Demonstrate – Discuss with children how they could use these beads to test the materials and then demonstrate how this will be done. Children will go indoors so the beads return to colourless and place one ultraviolet bead in a clear plastic dish with the piece of material to be tested covering the top of the dish. This is repeated for each material they want to test. They will then put the dish on an opaque object (so UV light cannot enter underneath) and will take it outside for 1 minute. After a minute they will come back indoors to check the colour against the ultraviolet index chart and record their result in a table.



Discuss – How will they make this a fair test? They are changing the type of material so all other factors must be kept the same. Will they need a control? Should they repeat the test with the same material more than once to ensure their results are accurate?

Activity – Children complete the investigation and record their results in a pre-drawn table. *N.B. Lower attainers could use a table with the materials written in for them already whereas higher attainers could be challenged to draw their own results table rather than using the pre-prepared version.*

Discuss – What did they find out about the different materials? Which one is the most suitable for making an astronaut's spacesuit? How do they know? Was their prediction correct?

Conclude – Children write a concluding statement explaining which material they think would be the most suitable for an astronaut's spacesuit and justifying their answer using their results from the experiment.

Examples of children's work and teacher comments from country of origin



The visual aspect of this experiment was beneficial to the children because they could observe the changes in the colour of the beads and understood that this only happened when exposed to sunlight. The experiment works best when it is a sunny day rather than a cloudy day.