Sun-Smart Innovations

Description	**Materials**
Students will begin to explore visible and invisible light, highlighting the power of invisible light with UV demonstrations and hands-on problem solving and innovating to protect themselves from UV light. By creating bracelets with UV-reactive beads, they can explore the effect of invisible wavelengths of light, and innovate solutions using real and found materials to protect their bracelet.	- UV-reactive beads & string or pipe cleaners to make bracelets - Optional: regular pony beads to supplement - Sunscreen - Clear zipper bags (for testing sunscreen) - Hats, clothing, sunglasses - Optional: Clipboards, paper, crayons for innovation (designing + refining)
Explicit Teaching Points	**Specific Expectations**
• Visible & Invisible Light: visible light means the portion of the spectrum of light that human eyes can detect, these wavelengths of light give us the colours we can actually see. Invisible light, on the other hand, includes wavelengths that are shorter or longer than the spectrum of visible light, and include infrared and ultraviolet. Ultraviolet, or UV, carries higher energy and can cause negative effects like sunburn, sun bleaching/fading, and fluorescence, which are important concepts for children to understand for safety. You can explain it to your students by talking about the colours they can see and doing a demonstration with a UV light and the UV beads you'll be using in the activity – even though we can't see the light, we can see its effect on the beads!	1.5 – use oral and non-verbal communication strategies when communicating their thinking, reflecting, and problem solving in various contexts 1.6 - demonstrate an understanding of explicitly taught vocabulary, including commonly used and specialized words, and begin to develop morphological awareness when communicating messages and ideas 13.1 – use a variety of strategies to solve problems, including problems arising in social situations 14.2 – make predictions and observations while exploring, investigating, designing, and creating 14.3 – select and use materials, tools, and equipment to carry out investigations and to construct prototypes, models, and structures 14.4 – design build, test, and improve prototypes, models, and structures,

• Innovation: innovation focuses on improving and enhancing a tool, product, or process instead of creating something from scratch like when we're inventing. It requires us to identify a gap or problem, and modify existing approaches to improve in our problem-solving. Innovation supports strong problem-solving skills, the engineering design process, and iterative thinking (taking a step-by-step approach and chunking problems). Students understand it best by talking about things being better, and using directed questions instead of general, broad problems. Think of asking "how can we make X better/faster/stronger", and encoura ging them to identify what is working, and what isn't. This approach allows them to connect existing solutions to previous learning of helpful strategies. • Cause & effect: recognizing the relationship between actions (the cause) and their outcomes (effects) is a fundamental logical skill, as well as an important tool in behaviour and social skills. It's essential for problem-solving, and helps learners make predictions and explain what is happening in their observations. Children understand it best by demonstrating and narrating concrete examples, like "when I	using components of engineering design 14.5 - identify practices that maximize safety and lessen the risk of injury, including the risk of concussion, for themselves and others, and demonstrate an understanding of the importance of these practices

push the blocks with my hand, they fall over". • Sun Safety: protecting our bodies from the harmful effects of the sun like ultraviolet radiation is an essential safety skill. We can use protective clothing, seeking shade or shelter, applying sunscreen, and planning our schedules to be out of the sun during high-radiation times of day. Sun safety is an essential part of long-term health and helps students make choices that lessen the risk of injury. Keeping our bodies safe is a familiar concept for most students, so tie it in to that and talk about how sunburns can be both uncomfortable and dangerous but that we can make safe and healthy choices by using sunscreen, wearing hats, and finding shade!	

Provocation (Introductory Book, WOW Demo, etc)

Teacher read-aloud - Picture book focusing the sun. We suggest *We Learn from the Sun* by David Bouchard

Learning Plan

Introduction

After read-aloud, introduce students to the activity by asking questions that help them make real-world connections, like “Have you ever gotten a sunburn?”. Use this to introduce the idea that there is light that we can see, like the colours in a rainbow, and light that we cannot see, which can sometimes be dangerous or harmful! Ask them how they avoid getting sunburnt, celebrate their ideas and either build on them to connect to explicit teaching points, or simply encourage sharing as a gateway to the accompanying video. The accompanying video has explanations of the explicit teaching points to support the learning.

Making a bracelet

Distribute UV-reactive beads (and additional pony beads to supplement if UV beads are in short supply), and string or pipe cleaners to create a bracelet. Students can tie on their wrists later, but should leave OFF for testing UV reactivity. Model how to thread beads onto the string or pipe cleaner, and highlight the light/white colour of the UV beads while indoors. Encourage them to make predictions about how the beads will change based on the level of light outside that day (i.e., sunny vs. cloudy).

Testing UV Reactivity & Innovating Solutions

Head outdoors and invite students to observe how their beads change colour in the sunlight. Were their predictions correct? Then, remind them of their challenge to protect their bracelets and practice sun safety, and provide common sun protection materials such as sunscreen and baggies to protect the bracelet, sunglasses, hats, long-sleeved clothing, etc. Encourage students to combine these materials with found materials they can access outside, highlighting that living and growing things need to be left as is. Their goal is to innovate the best sun protection strategy, and to redesign and add/take away materials to keep the beads from changing colour as best as they can. Guide them to notice what worked, what didn’t, and how they could improve. If it is helpful to the students in their design and iteration process, provide paper and crayons to encourage the engineering and innovation design process.

Communication & Consolidation

Have students share their UV protection solutions with small groups, or as a whole class, encouraging them to explain all of the iterations and steps they took, and why they selected the materials that they did. Encourage them to use comparison language, such as lighter, darker, more, and less. As a class, discuss common strategies in both materials selected, and problem-solving processes, reinforcing practical solutions to sun safety they can apply in their own behaviours, as well as helpful or successful ways to innovate solutions to problems. You can end by highlighting the value of redesigning a solution, their resilience in problem-solving, and by attaching the bracelets to their wrists

Consolidation/Extension

- This is a great activity to repeat on days with different amounts of visible sunlight. Bright days, cloudy days, partly-cloudy days – really any change will give your students more information and experience with understanding how UV can reach us!
- There are lots of other UV-reactive materials you can try! Iron-on vinyl, stickers, even UV-sensitive paper! Making cyanotype sun prints is a great way to create beautiful art that demonstrates materials blocking light!
- Build this into talks about weather – when considering what to wear outside for recess, you can talk about UV readings as well as precipitation and wind to make better clothing decisions for outdoor play!
- Use this as a springboard to encourage cause-and-effect language in their descriptions, wondering questions, and other methods of communication. Descriptions like “when I used a small leaf…the beads still changed colour!” and questions such as “I wonder what will happen if you used a larger leaf?” will encourage cause-and-effect thinking, build literacy and communication skills, and reinforce innovative thinking!

Notes/Context/Reminders	Assessment
• Be sure to place the bracelet in a baggie before applying sunscreen! This ensures we can keep wearing the bracelets after and they aren't a huge mess to deal with! • If it's a low UV day and you're not noticing much change, that is still a great opportunity to talk about testing and retesting as part of the scientific method! Sometimes, scientists don't get the results they were expecting, but that doesn't mean scrapping the experiment, it means the door is open to try again, or innovate another solution! • Keep your beads in a dark bag or container until you're ready to use them, and be sure to test them before distributing to students. Not all materials are created equally, and some UV beads may not work if they were being stored in direct sunlight, or they may come labelled as UV-reactive and won't be! • Remind students not to look directly at the sun! They can see the sun's effects by examining the beads. Especially since UV light is invisible, there is no need to look directly into the sun at all! • If you're looking to include more Indigenous perspectives, especially for an outdoor activity like this, please reach out to the Indigenous Education Lead at your school board who can help connect you to resources, community members, and other authentic and locally relevant relationships that can help enrich your programming.	Pedagogical Documentation – observation, student questions, action plan for next steps Success Criteria *Students will:* • Use oral and non-verbal communication strategies to communicate their thinking and problem-solving • Demonstrate an understanding of vocabulary such as ultraviolet and innovation • Use a variety of strategies to problem solve • Make predictions and observations while investigating and designing • Select and use materials and tools to carry out their investigation and construct prototypes • Design, build, test and improve their prototypes using components of engineering design • Identify sun-safe practices