NEEF SunWise

www.NEEFusa.org/SunWise

Introduction

NEEF SunWise

Introduction

ACKNOWLEDGMENTS

The 2018 version of the SunWise Tool Kit was created with support from Johnson & Johnson Consumer Inc.

Special thanks to the following individuals who were partners in the development, review, and previous updates of the SunWise Tool Kit.

- Debi Brennan, Central Middle School, Tinley Park, IL
- David Buller, PhD, AMC Cancer Research Center
- Karen Emmons, PhD, and Jodie Zwirn, MPH Dana Farber Cancer Institute
- Alan Geller, RN, MPH, Harvard University
- Robin Hornung, MD, MPH, Seattle Children's Hospital and Regional Medical Center
- Joni Mayer, PhD, San Diego State University
- Sharon McKenna, Arizona Department of Health Services

Thanks to the following organizations for their support of the SunWise Program since its inception:

- American Academy of Dermatology
- American Cancer Society
- Anti-Cancer Council of Victoria (Australia)
- Centers for Disease Control and Prevention
- Children's Melanoma Prevention Foundation
- Colette Coyne Melanoma Awareness Campaign
- Dermatology Nurses Association
- Environment Canada
- Henry Ford Medical Center
- Melanoma Foundation of New England
- National Association of Health Education Centers
- National Council on Skin Cancer Prevention
- National Oceanic and Atmospheric Administration
- Prevent Cancer Foundation
- Science Explorers, University of Colorado
- SHADE Foundation of America
- Sun Safety Alliance
- Sun Safety for Kids
- The Skin Cancer Foundation
- US EPA Headquarters and Regional Offices
- WeatherBug
- Women's Dermatologic Society

Why Sun Safety Education?

Overexposure to ultraviolet (UV) radiation is the primary environmental risk factor in the development of UV-related health effects. With one in five Americans developing skin cancer in their lifetime, education about sun safety is a vital step toward reducing risk and improving public health. Children are of particular concern, since unprotected exposure to the sun during youth puts them at increased lifetime risk for skin cancer. Other adverse health effects resulting from overexposure to UV radiation include eye damage and cataracts, immune system suppression, and premature aging of the skin.

Overexposure to the sun is an important health issue for all skin types. Many people believe that only lighter-skinned people need to be concerned about these effects. Though it is true that darker skin has more natural pigment, which acts as a protectant, darker skin is still susceptible to many of the damaging effects of UV radiation. The risk of other UV-related health effects is not dependent upon skin type.

The good news is that UV-related health effects are largely preventable by instituting sun-protection practices early and consistently. Educators in formal and informal settings can play a major role in protecting children by teaching and modeling sun safety behaviors.

The SunWise Program

In 1998, after a successful collaboration with educators, medical professionals, environmental organizations, meteorologists, parents, and children, the US Environmental Protection Agency (EPA) developed the SunWise Program to help educators raise sun safety awareness and foster behavior change. The program, designed to meet the diverse needs of schools and communities nationwide, helps students learn about the science of the sun, the risks of overexposure to the sun, and what can be done to protect themselves from the sun's harmful UV rays.

In 2015, EPA transitioned the SunWise Program to the National Environmental Education Foundation (NEEF), where it is being integrated into NEEF programs and reaching new audiences.

Recognizing the many issues schools and educators are asked to address daily, the SunWise Tool Kit provides maximum flexibility—elements can be used as stand-alone teaching tools or to complement existing classroom activities and/or school curricula.

The SunWise Tool Kit activities are standards-based, cross-curricular, and innovative in their design. They encourage students to explore, assess, and understand their natural environment and those factors that affect their health. They also encourage students to be physically active, while protecting themselves from UV radiation at the same time. Ultimately, students will develop skills that will help them think critically, work cooperatively, and solve problems creatively, thus enabling them to make sound decisions about their health and environment. Students and teachers alike will increase their awareness of simple steps they can take to protect themselves from overexposure to the sun.

The time commitment necessary to implement SunWise is minimal, while the potential payoff is enormous.

For more information and resources, visit the SunWise website, **www.NEEFusa.org/SunWise**.

To learn more about the history of the SunWise Program, visit **www.epa.gov/sunsafety/history-sunwise-program-epa**.

How to Use the SunWise Tool Kit

The SunWise Program is designed to help educators raise sun safety awareness by addressing the science of the sun, the risk of overexposure to its ultraviolet (UV) radiation, and what students and their families can do to protect themselves from overexposure. This tool kit has been designed for K-8 formal and informal educators from all over the United States and its territories. It will be used by schools and programs with diverse requirements, curricula, and student bodies. Across our nation, seasons, climate, and geography can differ dramatically. With so many variables, SunWise recognizes the need for maximum flexibility and encourages educators to adapt the tool kit components to meet their specific needs.

The time commitment necessary to implement SunWise can be minimal, as the activities can be easily integrated into existing curricula or completed as stand-alone activities. It is the educator's choice as to how much time is invested. Using this tool kit and educating children about sun safety now can make a difference in their future health.

We envision the SunWise Tool Kit as a dynamic learning tool. Over the course of its life it will be updated with additional activities and other learning tools focused on sun safety and the environment. We encourage your feedback and ideas.

Tool Kit Organization

The tool kit is divided into the following eight sections:

1. Introduction
2. How to Use the SunWise Tool Kit
3. K-2 Activities
4. 3-5 Activities
5. 6-8 Activities
6. UV Meter Activities
7. SunWisdom
8. Resources

The activities are color-coded by grade level: K-2, blue; 3-5, green; 6-8 purple. The activities are designed to engage your students while ensuring that a sun safety message is being transmitted in a manner suitable to their skills and abilities.

For grades K-2, we have provided activities for students who are beginning to read and write, learning introductory scientific concepts, and performing simple mathematics. The activities are short, simple, and fun—important elements for students at this grade level who have relatively short attention spans.

For grades 3-5, we have provided activities for students who are able to read and write more fluently, are familiar with scientific concepts, and are performing more complicated mathematics. These activities range in length of time and complexity, stimulating student interest while conveying the appropriate sun safety messages.

For grades 6-8, we have provided activities for students who are able to read and write fluently, have worked with scientific processes, and are performing complicated mathematics. On average, these activities will be longer and more complex, but just as enjoyable as the others. These activities will encourage the use of higher order thinking skills.

The *Student Pages* can be easily printed and photocopied. The *Educator Pages* are intended to be kept as a reference and notes page. These pages are organized by grade level and subject matter. Keep in mind that activities might fall into more than one subject area. On each *Educator Page*, you will find a section called *Learning Objectives*. In this section you will see how the educational messages about science, risk, and/or prevention are integrated into the activity and what we hope your students will learn. We know it is important for teachers to assess what their students have learned; therefore, we have included *Assessments* in the activities. Assessments serve as a measurement of the students' understanding of each activity's learning objectives.

Some of the activities contain classroom Discussion Points. As an integral part of the learning process, these discussion points will help you focus your students on the lessons' messages, which will assist them in relating what they have learned to their behavior in daily life.

Supplemental Activities are short and meaningful assignments that students can complete on their own. These activities are

brief, yet worthwhile, because they ultimately teach a very important lesson—sun safety.

Matrices of the Academic Standards are provided for each grade level to help you find which educational criteria an activity meets. In developing these activities, an education expert verified that each activity meets the proper national standards for science, mathematics, health, physical education, social studies, and English language arts.

The SunWisdom section contains fact sheets and other materials that will give you the background information necessary to easily and thoroughly implement the SunWise Program.

Resources are an indispensable part of any classroom and are provided to help you enrich the SunWise activities.

Educational Standards

HEALTH

www.cdc.gov/healthyyouth/sher/standards/

The health activities were reviewed according to the National Health Education Standards.

Standard 1
Students will comprehend concepts related to health promotion and disease prevention to enhance health.

Standard 2
Students will analyze the influence of family, peers, culture, media, technology, and other factors on health behaviors.

Standard 3
Students will demonstrate the ability to access valid information and products and services to enhance health.

Standard 4
Students will demonstrate the ability to use interpersonal communication skills to enhance health and avoid or reduce health risks.

Standard 5
Students will demonstrate the ability to use decision-making skills to enhance health.

Standard 6
Students will demonstrate the ability to use goal-setting skills to enhance health.

Standard 7
Students will demonstrate the ability to practice health-enhancing behaviors and avoid or reduce health risks.

Standard 8
Students will demonstrate the ability to advocate for personal, family, and community health.

PHYSICAL EDUCATION

www.shapeamerica.org/standards/pe/

The physical education activities were reviewed according to the National Physical Education Standards.

Standard 1
Demonstrates competency in a variety of motor skills and movement patterns.

Standard 2
Applies knowledge of concepts, principles, strategies, and tactics related to movement and performance.

Standard 3
Demonstrates the knowledge and skills to achieve and maintain a health-enhancing level of physical activity and fitness.

Standard 4
Exhibits responsible personal and social behavior that respects self and others.

Standard 5
Recognizes the value of physical activity for health, enjoyment, challenge, self-expression and/or social interaction.

ENGLISH LANGUAGE ARTS

www.corestandards.org/ELA-Literacy

The English language arts activities were reviewed according to the Common Core English Language Arts Standards. The ELA Standards are divided into the following strands:

Reading: Literature (RL)
Reading: Informational Text (RI)
Reading: Foundational Skills (RF)
Writing (W)
Speaking and Listening (SL)
Language (L)

Each strand has a strand-specific set of College and Career Readiness Anchor Standards that are identical across all grades, and each grade also has grade-specific standards that correspond to the anchor standards.

MATHEMATICS

www.corestandards.org/Math

The math activities were reviewed according to the Common Core Math Standards.

Geometry
Measurement and Data
Number and Operations in Base Ten
The Number System
Operations and Algebraic Thinking
Ratios and Proportional Relationships

SCIENCE

www.nextgenscience.org/next-generation-science-standards

The science activities were reviewed according to the Next Generation Science Standards. The Standards are comprised of the following disciplinary core ideas:

Physical Sciences
Life Sciences
Earth and Space Sciences
Engineering, Technology, and Applications of Science

SOCIAL STUDIES

www.socialstudies.org/standards

The social studies activities were reviewed according to the National Council for the Social Studies (NCSS) standards. The themes that form the framework of the social studies standards are:

Standard 1
Culture

Standard 2
Time, Continuity, and Change

Standard 3
People, Places, and Environments

Standard 4
Individual Development and Identity

Standard 5
Individuals, Groups, and Institutions

Standard 6
Power, Authority, and Governance

Standard 7
Production, Distribution, and Consumption

Standard 8
Science, Technology, and Society

Standard 9
Global Connections

Standard 10
Civic Ideals and Practices

Grades K–2

NEEF SunWise

K-2 Educational Standards

Educational Standards

Health				*English Language Arts*								*Sunwise Activity Title*	*Subject*
Health-Enhancing Behaviors and Risks	Goal-Setting Skills	Decision-Making Skills	Health Concepts	Determine the Meaning of Words (RI.K.4; RI.1.4; RI.2.4)	Describe with Relevant Details, Expressing Ideas and Feelings (SL.K.4; SL1.4; SL.2.4)	Participate in Shared Research Projects (W.K.7; W.1.7; W.2.7)	Confirm Understanding of Text Read Aloud by Asking Questions (SL.K.3; SL.1.3; SL.2.3)	Participate in Collaborative Conversations (SL.K.1; SL.1.1; SL.2.1)	Use a Combination of Drawing, Dictating and Writing to Write Narratives (W.K.3; W.1.3; W.2.3)	Actively Engage in Group Reading Activities (RL.K.10; SL.1.1b; SL.2.1b)	Ask and Answer Questions about Key Details in a Text (RI.K.1; RI.1.1; RI.2.1)		
							X	X	X	X	X	A SunWise Legend	English/LA, Social Studies
			X									Hot Potato with the Sun	Health, PE
												A SunWise Beach Party	Math
X	X	X										Speedy Sun Relay Race	PE, Health
	X											Sunny Says	PE, Health
				X								Watch Your Shadow	Science, English/LA
				X	X	X		X				The Sun Shines Around the World	Science, English/LA, Social Studies
				X	X	X		X				SunWise Animals	Science, English/LA
												Supplemental	
												Wacky Paper Sunglasses	Art, Science
				X								SunWise Word Search	English/LA

Educational Standards

Social Studies		*Science*				*Physical Education*			*Mathematics*			*Sunwise Activity Title*	*Subject*
People, Places, and Environment	Culture	Patterns of Sunrise and Sunset Can Be Observed, Described, and Predicted (1-ESS1-1)	All Animals Have Body Parts That Provide Information About Their Surroundings (1-LS1-1D)	All Organisms Have External Parts That Protect Them (1-LS1-1)	Patterns in Behavior That Help Animals Survive (1-LS1-2)	Exhibits Responsible Personal and Social Behavior That Respects Self and Others	Applies Knowledge of Concepts Related to Movement and Performance	Demonstrates Competency in a Variety of Motor Skills and Movement Patterns	Number and Operations in Base Ten	Operations and Algebraic Thinking	Measurement and Data		
	X											A SunWise Legend	English/LA, Social Studies
						X	X	X				Hot Potato with the Sun	Health, PE
									X		X	A SunWise Beach Party	Math
						X	X	X				Speedy Sun Relay Race	PE, Health
						X	X	X				Sunny Says	PE, Health
		X										Watch Your Shadow	Science, English/LA
X	X		X	X								The Sun Shines Around the World	Science, English/LA, Social Studies
			X									SunWise Animals	Science, English/LA
												Supplemental	
				X								Wacky Paper Sunglasses	Art, Science
												SunWise Word Search	English/LA

*Please note that the standards listed in the above table have been paraphrased.
For more information on the standards used, please refer to the Educational Standards section of the tool kit.

A SunWise Legend

WISE HEART SAVES THE DAY[1]

Once upon a time, a very long time ago, there lived a young Native American boy who was both smart and kind and who longed to make the world a better place for his people. His name was Wise Heart, and he belonged to the Cahto Tribe that lived in what is now Northern California. The world in which Wise Heart lived was cold and barren, with few plants or trees. During the day, his world was gloomy and grim, lit by only a faint, dim light that seemed to come from very far away. At night, his world was always cloaked in deep darkness, a darkness that was broken only by the campfire and the torches that the elders alone were allowed to carry.

Wise Heart knew that the world had not always been such a dark and gloomy place. Sometimes as his tribe huddled around the campfire at night, the elders told stories—ancient stories—of a time when a bright light they called the Sun had warmed the world during the day, while its distant relatives, the Moon and Stars, had filled the night. Wise Heart had also seen the ancient tribal cave paintings that showed a world filled with the bright light of the Sun and with towering trees and plants. Whenever Wise Heart or the other children asked the elders how the world had lost its Sun, Moon, and Stars, the elders would become quiet and warn the children not to ask such questions.

One night, while Wise Heart slept, he dreamed of the beautiful, Sun-filled world that he had seen in the cave paintings. There were blue skies, trees laden with delicious fruit, and smaller plants with fragrant flowers. Then, in his dream, he heard the sound of a fiercely shrieking wind, and the Sun suddenly seemed to be torn from the sky, leaving only a dim glow in its wake. Wise Heart woke from his dream troubled and unable to fall back asleep.

When the dim light of day returned, Wise Heart cautiously approached the oldest and most respected of the elders, a stooped old man named Running Water. The boy recounted his dream and asked the old man if he knew what had happened to the Sun so many years before. At first Running Water scolded the boy and warned him not to wonder about such things. Finally, however, seeing the boy's determination to know the truth, Running Water relented. He told the boy that many years before, an Evil Spirit had become jealous of the brilliance and warmth of the Sun and had stolen it from the sky and hidden it in a deep canyon on the far side of the world. The Evil Spirit had also stolen the Moon and Stars and hidden them away as well so that the humans would not have enough light to be able to search for and free the Sun from its captor. From that day on, Running Water explained, the world had been dimly lit. Bound with thick ropes to a giant boulder, the Sun could make only a few of its rays reach above the edge of the deep canyon.

All that day Wise Heart thought about Running Water's words. He watched his people as they struggled to survive by eating the few fish in the stream and few small plants on the hillsides. By the time darkness fell, Wise Heart had made a decision.

He would journey across the mountains, to the far side of the world. He would find the deep canyon where the Sun, Moon, and Stars were being held by the Evil Spirit, and somehow, he would free them. That, he decided, was how he would help make the world better for his people.

Early the next evening, Wise Heart secretly set out for the distant mountains, carrying only a skin of water, some dried fish, and a sharp knife. As he traveled, he asked the kind spirits of his people to help him, and they did. Guided by a fierce and powerful eagle and thousands of fireflies, Wise Heart found his way through the steep, dark mountain range. A sure-footed mountain goat led him to the edge of the deep canyon in which the Evil Spirit was guarding the Sun, Moon, and Stars. Just at that moment, a traveling family of field mice offered to chew through the ropes that bound the Sun, Moon, and Stars while Wise Heart distracted the Evil Spirit. Accepting their offer of help, Wise Heart climbed cautiously over the rim of the canyon and slowly began to climb down the steep cliff toward the canyon floor below. Just as he reached the bottom, the silence was suddenly pierced by the same sound of shrieking wind that he had heard in his dream. The Evil Spirit, red-faced and shaking with rage, stepped between Wise Heart and the Sun, Moon, and Stars and demanded to know why the boy had intruded in his canyon. Before Wise Heart could answer, the Evil Spirit noticed the boy's water skin and demanded that he be given some water to quench his thirst and to cool his sun-scorched body. In reply, Wise Heart said, "Powerful spirit, I am happy to give you all my water, but first let me add some special herbs that will quench your thirst and cool your sun-scorched body better than plain water." The Evil Spirit agreed, and after Wise Heart had added the herbs, which were really sleeping herbs, he drank the water greedily. Soon after, the Evil Spirit fell asleep.

Immediately, as if on cue, the family of mice began gnawing through the thick ropes that held the Sun, Moon, and Stars captive. When they had almost completed their task, the Evil Spirit, feeling the heat of the Sun's rays as it slowly began to ascend into the sky, awoke from his slumber. With a piercing shriek, the Evil Spirit rushed to recapture the Sun. Just before he could do so Wise Heart cut through the remaining fragments of rope with his knife. With the ends of the rope held tightly in his hands, Wise Heart and the mice sailed into the sky. A short time later, as the Sun passed over Wise Heart's village, they all jumped safely into the soft boughs of the tallest fir trees. From there, Wise Heart looked up to see the first and most beautiful sunrise that he would ever see.

Wise Heart returned to his tribe as a hero. The people hailed him as the Sun Guard and thanked him for returning light and warmth to the day and light to the night. Almost immediately, the trees and plants began to grow larger, and the people danced and celebrated in the warmth and brightness of the Sun. After several hours, however, the people began to complain. They said, "It's too hot! I'm thirsty!" Others complained of feeling tired and of their skin feeling red and sore. Wise Heart was amazed that his gift that had at first caused so much joy was now causing so much pain and discomfort. He thought for a moment and then quickly led his tribe to the river's edge. There he told his people to drink deeply and to coat their skin with mud from the riverbank. He told them, "The mud will soothe your skin and protect it from the powerful rays of the Sun," and they found that he was right. Now Wise Heart was truly a hero. His tribe could now enjoy

the Sun and all the beauty it gave to the world, without being hurt by its powerful rays. Even today, Wise Heart is a hero, for though he did not know it, he had developed the first sunscreen with an SPF of 45!

The legend with illustrations is available for iBook at the Children's Melanoma Prevention Foundation website, **www.melanomaprevention.org.**

[1] This story has been adapted from traditional tales by Jane Shanny and Mary Ellen Maguire-Eisen of the Children's Melanoma Prevention Foundation.

A SunWise Legend

ESTIMATED TIME

30-45 minutes

SUPPLIES

- ✔ Map of the United States (for display)
- ✔ Paper for drawing
- ✔ Crayons or markers

LEARNING OBJECTIVE

The students will learn that people from all over the world have different stories about the sun. Before the story is read, ask the students about the power of the sun, both good and bad. Write their ideas on the paper and then cover it up. After reading the story assess what they have learned by asking them to write a story about the sun and why it is important to people around the world.

DIRECTIONS

Read to your students "Wise Heart Saves the Day," a legend about the origin of the sun inspired by the Native American Cahto Tribe of California (on the Student Page of this activity). Discuss with them the location of California in relation to where you are located. While doing this, explain to them that people from all over the world have different ideas and beliefs about the sun. Discuss what they remember from the story. Ask them why the sun is so important that people from all over the world tell stories about it (e.g., it makes plants grow, provides light). Ask students to make up and illustrate their own story about the sun.

Hot Potato with the Sun

ESTIMATED TIME

Educator's discretion

SUPPLIES

- ✔ Ball (preferably yellow)
- ✔ Music

DIRECTIONS

Have the students make a large circle and pretend the ball is the sun. Students pass the ball to each other as music plays. When the music stops, the student with the ball should say one way to protect themselves from the sun. For more SunWise tips, please see the *Sun Wisdom* section of the tool kit.

Students should do the SunWise Word Search supplemental activity located in the back of the K-2 section of the tool kit as a follow-up to this activity.

DID YOU KNOW?

Hippos secrete their own oily pink sunscreen.

STUDENT PAGE

SunWise Beach Party

DIRECTIONS

You and some of your classmates are having a SunWise Beach Party. What will you bring? Look out because some of your classmates might not be 100% SunWise! Answer the questions.

QUESTIONS

How many students bring  ?

3 6 2 4

How many students bring  ?

7 4 3 5

How many students bring  ?

6 3 5 7

How many students bring  ?

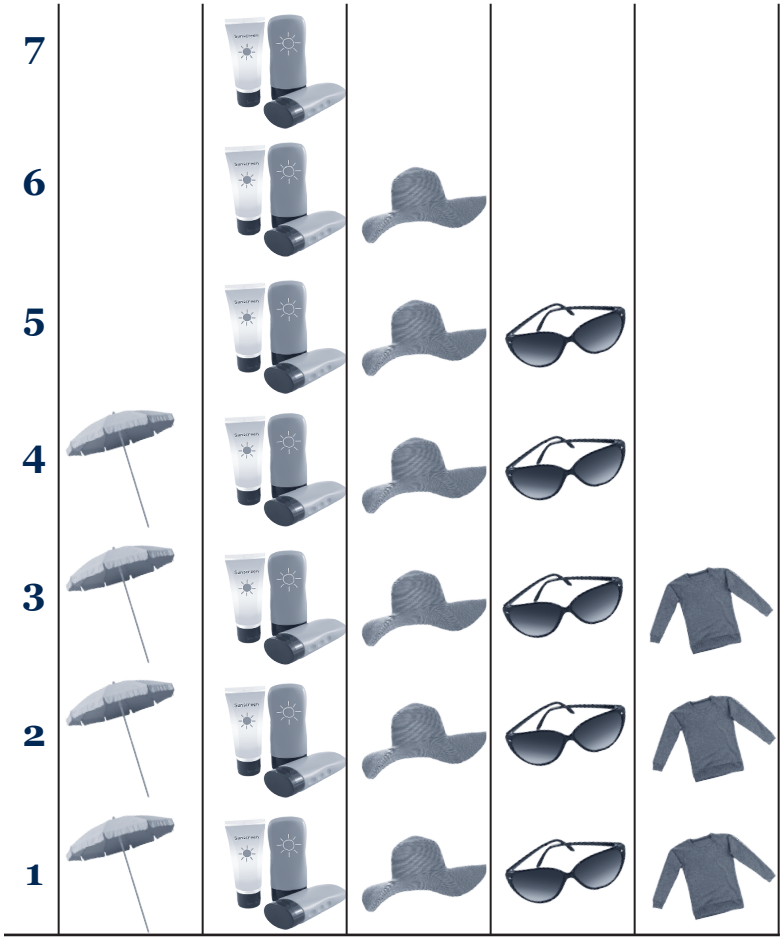
4 6 2 5

How many students bring  ?

7 2 3 6

How many students bring all SunWise items?

7 1 5 3



A SunWise Beach Party

ESTIMATED TIME

15-20 minutes

SUPPLIES

- ✔ Paper
- ✔ Crayons or pencils

LEARNING OBJECTIVE

The objective of this activity is to have students answer questions and interpret data about the variety of ways they can protect themselves from the sun's harmful UV rays. After completing this activity, students should understand that using sunscreen, hats, sunglasses, long-sleeved shirts, and umbrellas are examples of SunWise behavior. Assess whether the students understand they must protect themselves from the sun's harmful UV rays by asking them to draw a picture of their SunWise family on a visit to the beach or park.

DIRECTIONS

In preparation for this activity, discuss with your students the importance of being SunWise. Share with students the prevention steps listed in the *Sun Wisdom* section of the tool kit.

QUESTIONS AND ANSWERS

How many students bring  ?

3 6 2 **4**

How many students bring  ?

7 4 3 5

How many students bring  ?

6 3 5 7

How many students bring  ?

4 6 2 **5**

How many students bring  ?

7 2 **3** 6

How many students bring all SunWise items?

7 1 5 **3**

DID YOU KNOW?

Camels have bumps over their eyes that act as built-in sun hats to help keep out bright sunlight.

Speedy Sun Relay Race

DIRECTIONS

One student in your group will be the "model." The model's job is to dress in SunWise clothes as fast as possible with the help of the team. Across the field will be a pile of clothes. Each team member, besides the model, will take turns running to the pile, selecting one SunWise item, and running it back to the model. The first team to have a completely SunWise model is the winner!

DID YOU KNOW?

Rhinos use mud as a natural sunblock. They roll over in the mud to make sure they have a thick coating on their skin to protect themselves from the sun.

Speedy Sun Relay Race

ESTIMATED TIME

30 minutes

SUPPLIES

- ✔ A field or other open space with 20 yards of room

One set of the following SunWise and non-SunWise clothes and items for each team:

- ✔ Long-sleeved shirt (preferably with collar)
- ✔ Long pants (optional)
- ✔ Hats (wide-brimmed, cowboy)
- ✔ Sunglasses
- ✔ Empty bottles of sunscreen, some with broad spectrum SPF 30 and higher, some with lower SPFs.
- ✔ Shoes (optional)
- ✔ Various other articles of clothing that are not SunWise, like tank tops, t-shirts, shorts, visors, etc.

Note: Make sure that the clothes are large enough for each student to put on and take off easily.

LEARNING OBJECTIVE

This activity will challenge students to think quickly about SunWise behavior by selecting correct SunWise clothes when presented with several options. Assess whether the students learned how these clothes will help protect them from the sun's harmful UV rays by asking them the following questions:

1. What are three items that the model is wearing that you would pick to protect yourself? Explain why you chose these three items.
2. How many of you dress like the model when you play outside? Why do you think dressing like this is safer for you?
3. What will you remember to put on before you leave your house to protect yourself from UV rays? Explain why you would take these actions.

DIRECTIONS

Organize the students into teams of five or more and line them up at the start of the racecourse. Place the pile of clothes at the other end of the racecourse.

Have each team select one student to be the SunWise model. This student will stay at the starting point of the race, donning SunWise clothes. The other team members should each take turns running to the pile of clothes, selecting one item, and bringing it back to the model.

The first team to have a completely SunWise model is the winner. The SunWise models should be wearing a protective hat, long-sleeved shirt, and sunglasses, and be carrying a bottle of sunscreen with broad spectrum SPF 30 or higher. Incorrectly dressed models must decide what they are missing, and the other team members must continue bringing back items until the model is sun safe.

Sunny Says

ESTIMATED TIME

20 minutes

LEARNING OBJECTIVE

This activity will teach children to distinguish between the helpful and harmful effects of the sun. Assess the students by asking them to tell you the effects of overexposure to the sun and not wearing sunscreen and proper clothing. They should also list some positive effects of the sun.

DISCUSSION POINT

Discuss with the students the importance of protecting themselves from the sun. Too much sun can hurt the skin and eyes. On the other hand, the sun is beneficial because it helps our bodies make vitamins and helps things grow, such as fruits, vegetables, flowers, and trees (which provide protective shade).

DIRECTIONS

The format follows "Simon Says."

For example:
Sunny Says grow like a tree.
Sunny Says put your hat on.
Take your hat off.
Sunny Says protect your nose.
Sunny Says sprout like a flower.
Sunny Says put your shades on.
Take your shades off.
Sunny Says look at your watch.
Sunny Says find your shadow.
Sunny Says put sunscreen on your nose.
Sunny Says put sunscreen on your arms.
Sunny Says read the SPF number on the sunscreen container.

Students responding to a non-"Sunny Says" command will be eliminated from play. Continue the game until there is a winner.

PHYSICAL EDUCATION VARIATION:

Have children line up side-by-side or in small groups or teams of two to three students. Children take three big jumps (giant steps, or other appropriate movement) forward after every correct response. Those who respond incorrectly remain still but advance the next time they respond correctly. The goal is to reach the other side of the field as either an individual or team. The first individual or team at the finish can share with others what they know to be correct "Sunny Says" actions and why it is important to know and practice this behavior.

Watch Your Shadow

DIRECTIONS

Using the sun as your light, you are going to trace your shadow. Choose a partner and stand in the sun on the sidewalk or blacktop. With a piece of chalk, your partner will trace your shadow starting from your feet. Write your name in your shadow.

Later in the day, trace your shadow again. Remember to position your feet in the same spot.

QUESTIONS

1. Is your shadow always the same size?

2. Can the moon make shadows?

3. What is the shadow rule?

Watch Your Shadow

ESTIMATED TIME

At least two 15-minute intervals during one day, plus time for discussion

SUPPLIES

- ✔ Chalk (use different color chalk for each time of day you trace your shadow)
- ✔ School yard with dark cement or blacktop
- ✔ Clear, sunny day
- ✔ Watch or clock

LEARNING OBJECTIVE

The objective of this activity is to demonstrate to students what causes a shadow, how shadows change from morning to afternoon, and how they can tell by the length of their shadows what times of day they should seek protection from the sun's harmful UV rays. Ask the students to guess how their shadow will change during the day. Once the day is over, ask them to compare their prediction to the actual shape and size of their shadow. Have students explain why the movement of the earth over the course of the day causes shadows to change.

DIRECTIONS

Take the students outside in the morning. Have students choose a partner. Instruct the students to trace their partner's shadow using a piece of chalk on the cement surface of the schoolyard. They should begin tracing the shadow from the feet. Have students write their names in their shadows. Write the time students traced their shadows so later they can see how the different positions of their shadows correlate to the time of day.

Go outside around noon and have each student stand on the feet of their first shadow tracing. Instruct them to have their partner retrace their new shadow on top of the original. If there is time, go outside in the afternoon and have students retrace their shadows again.

DISCUSSION

Discuss how shadows are formed. A shadow is a dark figure or image cast onto the ground by our bodies blocking the light of the sun. Both the sun and the moon can create shadows. We have noticeable shadows throughout the day; however, our shadows are much shorter closer to noon when the sun is overhead. Explain to the students that when their shadows are long (during the early and late parts of the day) the sun is not as intense. When their shadows are short (during the middle part of the day) the sun is more intense, and they are at a greater risk from the sun's damaging UV rays. Mention that visible light causes shadows, not UV rays. UV rays are present even on cloudy days. Nevertheless, the shadow rule is a good indication of UV intensity. Teach the students the shadow rule, "Watch your shadow. Short shadow, seek shade!" Review the SunWise tips in the *Sun Wisdom* section of the tool kit.

QUESTIONS AND ANSWERS

1. Is your shadow always the same size?
   No. Your shadow is long in the early morning and late afternoon, and short during the midday.
2. Can the moon make shadows?
   Yes. When there is a full moon, the light is bright enough to create a shadow, but no UV rays are emitted from the moon.
3. What is the shadow rule?
   "Short shadow, seek shade!"

DID YOU KNOW?

Polar bears have special eyelids that act like sunglasses and shield their eyes from the blinding glare from the sun's rays reflecting off of the snow.

The Sun Shines Around the World

ESTIMATED TIME

20-45 minutes

SUPPLIES

- ✔ Map of the world (for display)
- ✔ Magazines and photos of foreign places and people

LEARNING OBJECTIVE

This activity teaches students about a variety of ways people all over the world protect themselves from the sun's harmful UV rays. It also helps students understand that all organisms have external parts that are used in different ways to survive, and that all organisms have body parts that capture and convey different kinds of information. After completing this activity, students should be able to describe at least two different ways individuals from the country investigated practice sun safety.

DIRECTIONS

Assign students to work in small groups. Each group should choose a country to research. Perhaps you have been on an exciting trip and would like to share your photos or postcards with your students. If necessary, provide a list of countries that have different climates than the United States to help students with their selections. Discuss the chosen locale, its people, and customs, especially pertaining to sun protection. Use the questions to stimulate discussion and to reinforce SunWise lessons.

If students are not able to do short research projects, provide them with pictures from four different countries, including pictures of people, houses, clothing, and landscapes from each country. Have students take one set of pictures and work in groups to discuss the questions.

VOCABULARY WORDS

Custom — A habit or an established way of doing something.

Weather — The daily conditions of the atmosphere at a geographic location during a specific time frame in terms of temperature, sunshine, wind velocity, precipitation, etc. Weather is what you see outside day-to-day. Weather conditions can change by the hour, or even by the minute.

Climate — Climate is the average of weather over several decades or longer for a geographic area.

QUESTIONS AND ANSWERS

1. What is the name of the country researched?
Students should be able to name the country.

2. Where is the country?
Students should be able to point to the location of the region on the map.

3. What types of houses do the people live in?
Answers should match according to the country researched.

4. What kinds of clothes do the people wear?
Answers should match according to the country researched.

5. What are three differences between your home state or town and the place researched?
Answers should match according to the student's home state or town and the country researched.

6. Describe the climate of the country.
Students should compare the climate of the country to the United States.

7. What are the average temperatures in the summer and winter?
Answers should match according to the country researched.

8. Based on the climate of the country, would you predict that people who live there need to protect themselves from the sun? Describe how people who live in the country protect themselves from the weather, including the sun.
Students should be able to describe at least two different ways individuals from the country researched practice sun safety.

9. Why is it important to protect your body from the weather, including the sun? Which of your body parts are most important to protect from the weather/sun?
Answers should reflect students' understanding and the country researched.

10. If your eyes were damaged, how would your life be different?
Answers should reflect students' understanding.

Who Am I? SunWise Animals

Animals have special body parts and behaviors to protect them from the sun. Can you guess who these animals are?

SUNWISE CLUE:

From morning 'til evening, I avoid the sun's rays. Eucalyptus trees shade me and keep me cool through the days!

Who Am I?

SUNWISE CLUE:

In water and mud I love to stay. My body makes an oily pink sunscreen to protect my skin so I can play!

Who Am I?

SUNWISE CLUE:

I put dirt and sand on my back to block out the sun, and drink trunks full of water. Being thirsty is no fun!

Who Am I?

SUNWISE CLUE:

My black eye ring "sunglasses" protect my eyes from the sun's glare. I'm the coolest "kat" around with a social flair.

Who Am I?

Courtesy of Sunwise Stampede – San Diego Zoo

Who Am I? SunWise Animals

ESTIMATED TIME

20-30 minutes

SUPPLIES

- ✔ Paper
- ✔ Pens or pencils
- ✔ Crayons or markers

LEARNING OBJECTIVE

The aim of this activity is for students to learn the importance of protecting their eyes and skin from overexposure to the sun's harmful UV rays. By understanding animal adaptations for sun protection and drawing a sun-safe habitat for zoo animals, students will draw connections to the ways they can protect themselves from overexposure to the sun. Assess if they have learned how to protect their eyes and skin from UV radiation by asking what they should do when they play outside.

DIRECTIONS

Describe to the students the situation of Sammy the sea lion, who is living at the zoo without any shade in his habitat. Explain to the students that the sun can damage Sammy's eyes and skin if he doesn't have any shade, especially since the sun can reflect off the water of his swimming pool. Have the students draw an improved habitat that will help keep Sammy's eyes healthy.

Teach the students about animals that have specialized body parts or behaviors to protect them from the sun. Use the "Who Am I? SunWise Animals" student page as a guide. Have students learn about the animals and where they live, and then make associations about how all animals, including humans, need to protect themselves from the sun.

Ask the students to think of ways that they can keep their eyes and skin safe in the sun. Explain that some important ways to avoid overexposure to the sun include wearing sunglasses (appropriate sunglasses block 99-100% of UV rays), applying sunscreen with broad spectrum SPF 30 or higher, wearing a wide-brimmed hat, seeking shade when UV rays are most intense (between 10 a.m. and 4 p.m.), paying attention to the UV Index when planning outdoor activities, and watching out for reflective surfaces, such as water, snow, and sand.

ACTIVITY ENRICHMENT

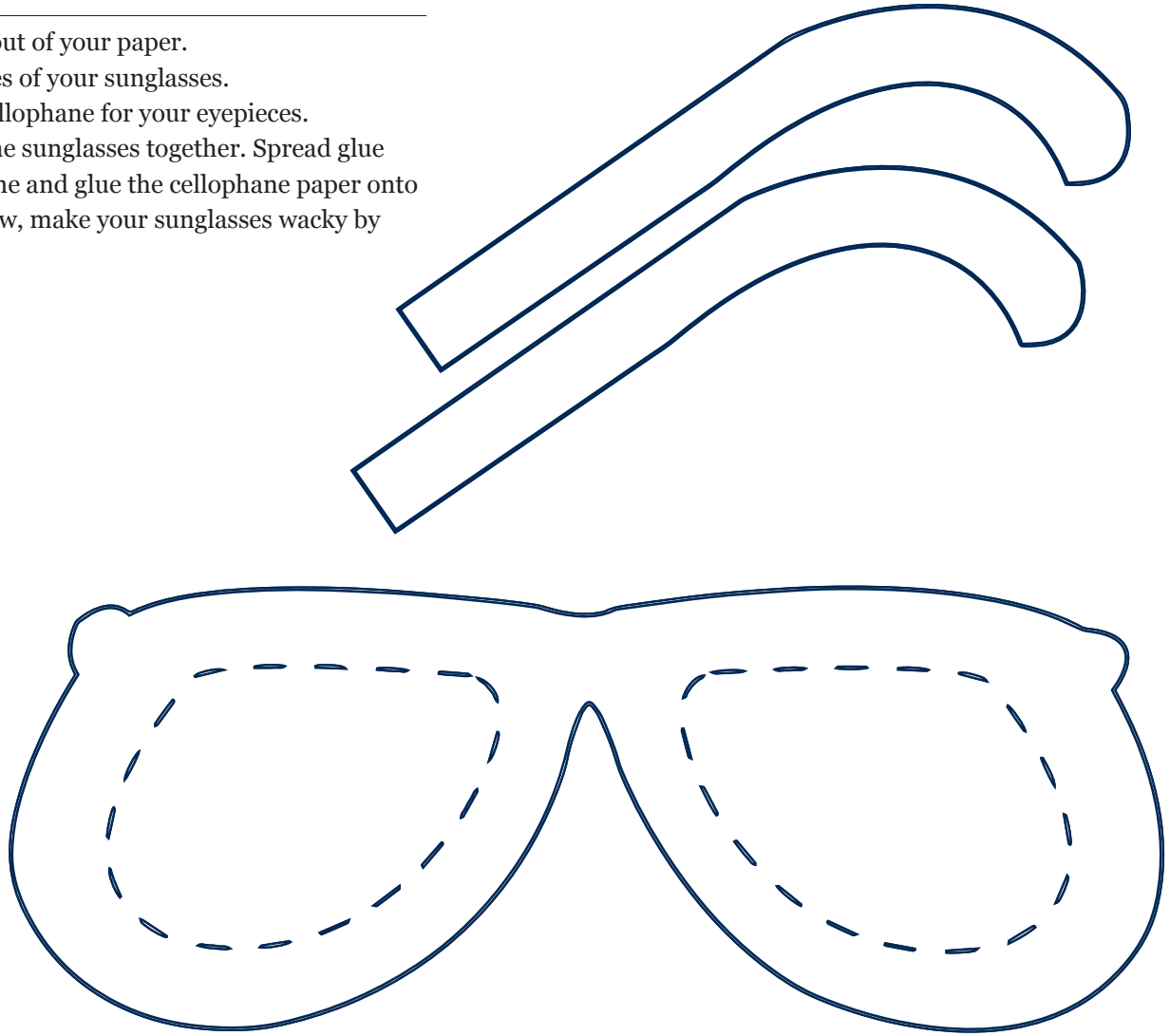
Connect this activity with a visit to your local zoo or aquarium. Plan a sun-safe animal tour to look for the animals on the "Who Am I? SunWise Animals" student page.

Student Page Answers: Koala, elephant, hippopotamus, meerkat

Wacky Paper Sunglasses *Supplemental Activity*

DIRECTIONS

1. Cut the sunglasses out of your paper.
2. Cut out the eyepieces of your sunglasses.
3. Choose a color of cellophane for your eyepieces.
4. Glue the pieces of the sunglasses together. Spread glue on the eyepiece frame and glue the cellophane paper onto your sunglasses. Now, make your sunglasses wacky by decorating them!



Wacky Paper Sunglasses *Supplemental Activity*

ESTIMATED TIME

20 minutes

SUPPLIES

- ✔ Scissors
- ✔ Glue
- ✔ Pencil
- ✔ Cellophane sheets in various colors
- ✔ Crayons or other decorations
- ✔ Colorful construction paper (optional)

LEARNING OBJECTIVE

The objective of this activity is to demonstrate the importance of wearing sunglasses to protect your eyes from the sun's harmful UV rays. Assess the students by asking them what they know about sunglasses and eye protection before starting the activity. Afterwards, ask what they learned from this lesson. Did it teach them anything new about cataracts and the importance of wearing sunglasses? What will they do differently now when outside?

DISCUSSION

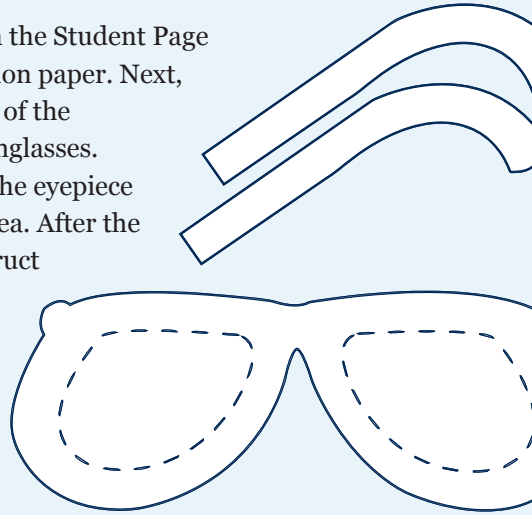
Discuss with students the importance of wearing sunglasses. Explain that appropriate sunglasses provide 99-100% UV protection, which will reduce sun exposure to your eyes. UV rays can cause cataracts and other eye damage.

Cataracts are a form of eye damage in which a loss of transparency in the lens of the eye clouds vision. Discuss with students what it would be like if their eyes were damaged or if they were blind. Ask them how their lives would be different. Next, discuss with students how their eyes help them. Ask them what they would have trouble doing or knowing if they couldn't see.

DIRECTIONS

If time permits, create your own pair of wacky sunglasses to show your class. You may also want to copy the sunglasses template and alter it to become a "connect the number dots" activity.

Instruct students to either cut out the sunglasses provided on the Student Page or draw and cut their own out of a colorful piece of construction paper. Next, students should cut out the eyepieces. You should have some of the cellophane pieces cut out in squares to fit the frame of the sunglasses. Instruct the students to spread the glue around the edges of the eyepiece and place each cellophane piece within the eyepiece frame area. After the glue is dry, students can decorate the rest of the glasses. Instruct students that the cellophane they are using for the lenses in the sunglasses does NOT protect against UV rays. Explain to students how to look for and read the tag found on sunglasses in the store so that they will select glasses that offer adequate protection.



SunWise Word Search *Supplemental Activity*

DIRECTIONS

Find and circle the SunWise words.

HAT

LIP BALM

LONG SHORTS

SHIRT

PANTS

SUNGLASSES

SUNSCREEN

TREE

SHADE

L	A	B	C	D	P	E	F	S	G	H
I	I	J	K	L	A	M	N	U	O	S
P	Q	P	R	S	N	T	U	N	U	H
W	X	Y	B	Z	T	A	B	S	E	I
A	E	F	G	A	S	H	I	C	D	R
T	R	E	E	K	L	L	M	R	A	T
O	P	Q	R	S	T	M	U	E	H	W
H	A	T	X	Y	Z	A	B	E	S	D
E	F	G	H	I	J	K	L	N	M	N
L	O	N	G	S	H	O	R	T	S	O
S	U	N	G	L	A	S	S	E	S	P

SunWise Word Search *Supplemental Activity*

WORD SEARCH WORDS

HAT

LIP BALM

LONG SHORTS

SHIRT

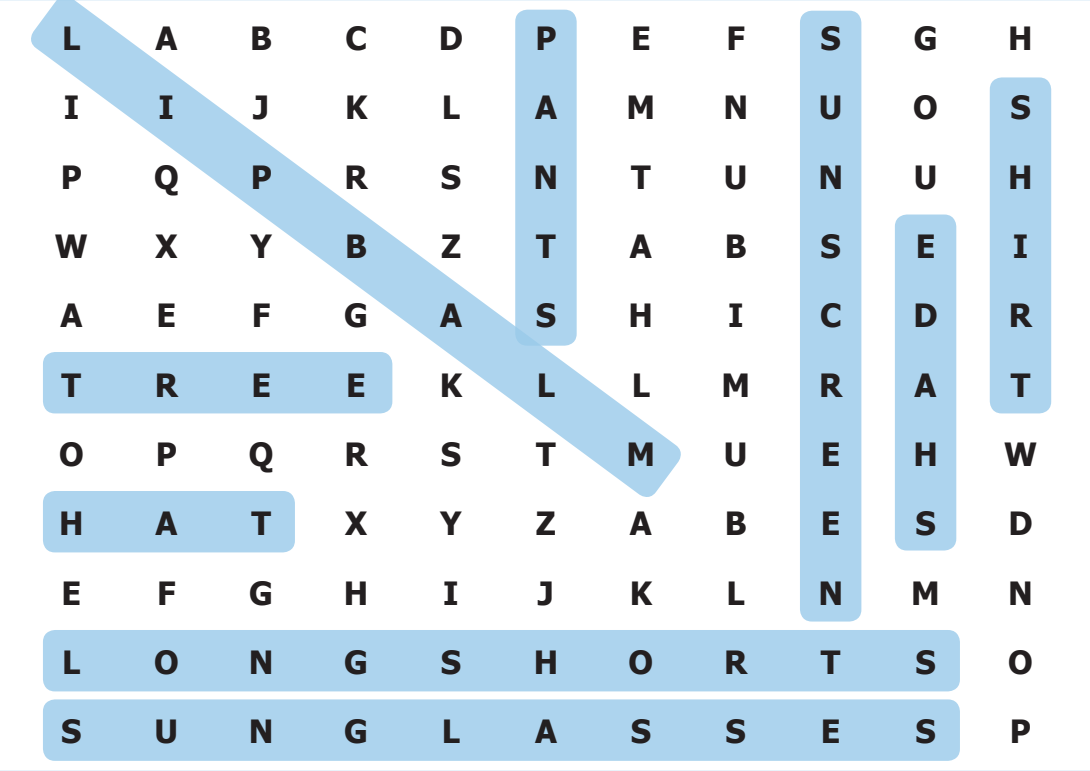
PANTS

SUNGLASSES

SUNSCREEN

TREE

SHADE



Grades 3–5

NEEF SunWise

3-5 Educational Standards

Educational Standards

Mathematics			*Health*								*English Language Arts*								
Operations and Algebraic Thinking	Number and Operations in Base Ten	Measurement and Data	Personal, Family, and Community Health	Health-Enhancing Behaviors and Risks	Goal-Setting Skills	Decision-Making Skills	Interpersonal Communication	Health Information and Products	Influence Factors on Health Behaviors	Health Concepts	Determine the Meaning of Words (RI.3.4; RI.4.4; RI.5.4)	Engage in Collaborative Discussions (SL.3.1; SL.4.1; SL.5.1)	Report on a Topic Using Facts and Relevant Details (SL.3.4; SL.4.4; SL.5.4)	Draw on Information from Multiple Print or Digital Sources (W.4.9; W.5.9)	Integrate Information from Print or Digital Sources (W.3.8; W.4.8; W.5.8)	Conduct Short Research Projects to Build Knowledge (W.3.7; W.4.7; W.5.7)	Write Informative Texts to Convey Ideas and Information Clearly (W.3.2; W.4.2; W.5.2)	*SunWise Activity Title*	*Subject*
			X	X		X	X		X	X		X					X	Sun Scoop	English/LA, Health, Science
											X							SunWise Word Scramble	English/LA
												X			X	X		SunWise Virtual Trip	English/LA, Social Studies
								X	X	X		X	X	X				The Sun Shines Around the World	English/LA, Science, Social Studies, Health
												X		X			X	Sun Myths from the Internet	English/LA, Social Studies
			X	X						X								Personal Skin Assessment	Health, PE, Social Studies
		X																SunWise Survey	Math
X	X																	SunWise Word Problems	Math
X	X	X								X								Measure Your Shadow	Math, Health, Science
				X	X	X												Speedy Sun Relay Race	PE, Health
												X						Sun Science	Science, English/LA
												X						The Ozone and Me	Science, English/LA
																		UV Frisbee Science	Science
																		Map a SunWise School Yard	Social Studies, Science

Educational Standards

SunWise Activity Title	*Subject*	*English Language Arts*						*Health*								*Mathematics*		
		Write Informative Texts to Convey Ideas and Information Clearly (W.3.2; W.4.2; W.5.2)	Conduct Short Research Projects to Build Knowledge (W.3.7; W.4.7; W.5.7)	Integrate Information from Print or Digital Sources (W.3.8; W.4.8; W.5.8)	Draw on Information from Multiple Print or Digital Sources (W.4.9; W.5.9)	Report on a Topic Using Facts and Relevant Details (SL.3.4; SL.4.4; SL.5.4)	Engage in Collaborative Discussions (SL.3.1; SL.4.1; SL.5.1)	Determine the Meaning of Words (RI.3.4; RI.4.4; RI.5.4)	Health Concepts	Influence Factors on Health Behaviors	Health Information and Products	Interpersonal Communication	Decision-Making Skills	Goal-Setting Skills	Health-Enhancing Behaviors and Risks	Personal, Family, and Community Health	Measurement and Data	Number and Operations in Base Ten	Operations and Algebraic Thinking
Be a SunWise Traveler	Math, Social Studies, English/LA, Science		X			X											X	X	X
A SunWise Legend	English/LA, Social Studies						X												
Keep an Eye on Sun Safety	English/LA, Science		X			X	X												
Supplemental																			
Sunny Crossword	English/LA																		
WordWise	English/LA																		
UV Meter Activities																			
What Works? Effectively Blocking UV Rays	Science																		
Chart and Graph UV Intensity	Science, Math																X	X	
Reflecting UV Radiation	Science, Math																X	X	

Educational Standards

Social Studies				*Science*						*Physical Education*					
Global Connections	Individual Development and Identity	People, Places, and Environments	Culture	Engineering, Technology, and Application of Science (3-5-ETS1)	Daily Changes in the Length and Direction of Shadows; Different Positions of the Sun (5-ESS1-2)	Plants and Animals Have Structures That Serve Function in Survival (4-LS1-1)	Earth's Systems (5-ESS2-1)	The Universe and its Stars: The Sun is a Star (5-ESS1-1)	Weather and Climate (3-ESS2-2)	Exhibits Responsible Personal and Social Behavior That Respects Self and Others	Demonstrates the Knowledge and Skills to Achieve and Maintain Fitness	Applies Knowledge of Concepts Related to Movement and Performance	Demonstrates Competency in a Variety of Motor Skills and Movement Patterns	*SunWise Activity Title*	*Subject*
								X						Sun Scoop	English/LA, Health, Science
														SunWise Word Scramble	English/LA
X		X												SunWise Virtual Trip	English/LA, Social Studies
		X							X					The Sun Shines Around the World	English/LA, Science, Social Studies, Health
X			X											Sun Myths from the Internet	English/LA, Social Studies
	X		X								X			Personal Skin Assessment	Health, PE, Social Studies
														SunWise Survey	Math
														SunWise Word Problems	Math
				X	X									Measure Your Shadow	Math, Health, Science
										X		X	X	Speedy Sun Relay Race	PE, Health
								X						Sun Science	Science, English/LA
							X							The Ozone and Me	Science, English/LA
X		X	X		X									Map a SunWise School Yard	Social Studies, Science
X		X							X					Be a SunWise Traveler	Math, Social Studies, English/LA, Science
			X											A SunWise Legend	English/LA, Social Studies
						X								Keep an Eye on Sun Safety	English/LA, Science

Educational Standards

Social Studies				*Science*						*Physical Education*				*SunWise Activity Title*	*Subject*
Global Connections	Individual Development and Identity	People, Places, and Environments	Culture	Engineering, Technology, and Application of Science (3-5-ETS1)	Daily Changes in the Length and Direction of Shadows; Different Positions of the Sun (5-ESS1-2)	Plants and Animals Have Structures That Serve Function in Survival (4-LS1-1)	Earth's Systems (5-ESS2-1)	The Universe and its Stars: The Sun is a Star (5-ESS1-1)	Weather and Climate (3-ESS2-2)	Exhibits Responsible Personal and Social Behavior That Respects Self and Others	Demonstrates the Knowledge and Skills to Achieve and Maintain Fitness	Applies Knowledge of Concepts Related to Movement and Performance	Demonstrates Competency in a Variety of Motor Skills and Movement Patterns		
														Supplemental	
														Sunny Crossword	English/LA
														WordWise	English/LA
														UV Meter Activities	
				X										What Works? Effectively Blocking UV Rays	Science
				X										Chart and Graph UV Intensity	Science, Math
				X										Reflecting UV Radiation	Science, Math

**Please note that the standards listed in the above table have been paraphrased. For more information on the standards used, please refer to the Educational Standards section of the tool kit.*

Sun Scoop

DIRECTIONS

Use a video camera, computer, pencil and paper, or any other recording device to develop a news story. Story angles could include the health effects of overexposure to the sun, sun protection, or how the UV Index works.

Gather the facts (who, what, when, where, why, and how) using resources such as the internet, encyclopedias, or your local newspaper. Interview an expert. This could be a science teacher, nurse, or local weather forecaster. Write a lead and the rest of the story. As a guide, answer the three questions below. Be prepared to share your news story with your peers.

Talk with the editor of your school or local paper about printing the news story. Ask your teacher or principal if you can read it over the PA system during morning announcements.

VOCABULARY WORDS

Story Angle — The topic or approach to a news story.

Who, What, When, Where, Why, and How — Questions that form the basic building blocks of any news story. A story might answer some or all of these questions.

Lead — The most important part of the story. The lead is always the first paragraph and it explains some of the who, what, when, where, why, and how questions.

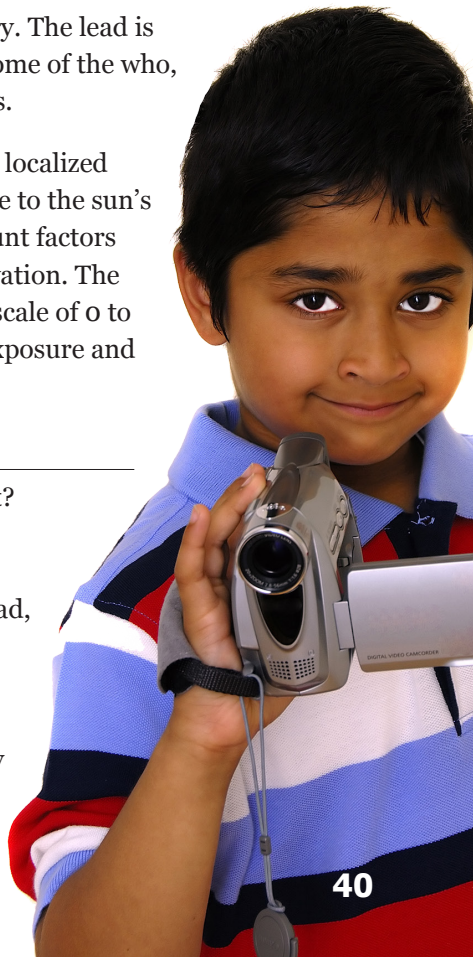
UV Index — The UV Index provides a daily, localized forecast of the expected risk of overexposure to the sun's ultraviolet radiation (UV), taking into account factors including cloud coverage, location, and elevation. The UV Index predicts UV intensity levels on a scale of 0 to 11+, where < 2 indicates a low risk of overexposure and 11+ indicates an extreme risk.

QUESTIONS

1. What questions will you ask the expert? Explain why you chose the questions.

2. What is the most important part, or lead, of your story? Give three reasons why you chose that particular lead.

3. Construct an argument to support why you chose the facts you selected to include in your story.



Sun Scoop

ESTIMATED TIME

30-60 minutes

SUPPLIES

- ✔ Video camera, computer, or any other recording device (optional)
- ✔ Paper and pencils
- ✔ Research materials (encyclopedias, newspapers, computers)

ADDITIONAL RESOURCES

The National Elementary Schools Press Association. **www.nespa.ua.edu**

The Learning Network: Teaching and Learning with the New York Times. **www.nytimes.com/section/learning**

LEARNING OBJECTIVE

The objective of this activity is to have students work collaboratively to conduct short research projects to understand that: 1) the sun is a star and appears larger and brighter than other stars because it's closer to earth; 2) the sun is important to humans and other life on earth; and 3) the sun can also be harmful to life on earth, especially humans.

This activity uses research and journalism to raise awareness about the science and risk of the sun's harmful UV rays and about ways to be SunWise. Assess what students have learned by asking them to include the following in their story: at least three ways to be SunWise (refer to the SunWise tips in the Sun Wisdom section of the tool kit); the effects of ignoring these precautionary measures; and some background information about the sun and UV radiation.

DIRECTIONS

Provide students time to research the sun and the ways it helps and harms life on earth. If possible, arrange for a science teacher, nurse, or local weather forecaster to serve as an expert for students to interview. Have the students respond to the questions below as a group and then write their stories individually or in groups.

QUESTIONS AND ANSWERS

1. What questions will you ask the expert? Explain why you chose the questions.
   Students should list 3-5 questions and provide justification for each.
2. What is the most important part, or lead, of your story? Give three reasons why you chose that particular lead.
   Students should select one fact as the lead and give three reasons why they chose that particular lead.
3. Construct an argument to support why you chose the facts you selected to include in your story.
   Students should list the facts they will include in their story and construct an argument to support why each fact was chosen.

SunWise Word Scramble

DIRECTIONS

Unscramble this list of words.

nsu _____

cksluobn _____

nrusbun _____

lmeo _____

sgalusnses _____

nlgosevelestirh _____

tha _____

niksrecnac _____

aebhc _____

ratluloietvysra _____

swlrknie _____

neswisu _____

coptert _____

luberlma _____

esdha _____

znoeo _____

ntirfelceo _____

mmnaaleo _____

ntvopeerin _____

QUESTIONS

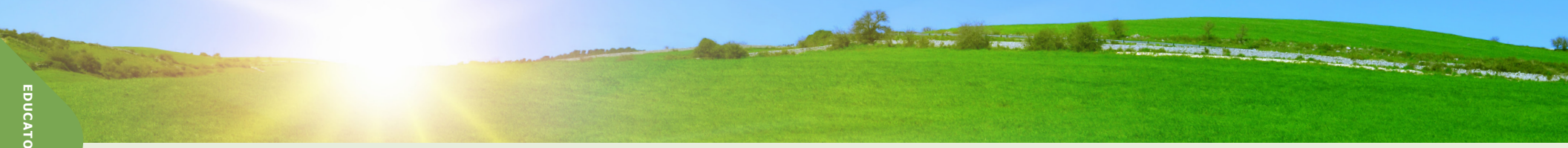
1. What does UV stand for? Can you see or feel UV rays?

2. What forms a thin shield around the earth and protects us from the sun's harmful UV rays?

3. At what time is the sun at its highest point in the sky?

4. During what hours should you limit your exposure to the sun?

5. What are some effects of too much exposure to the sun?



SunWise Word Scramble

ESTIMATED TIME

15-20 minutes

DIRECTIONS

By unscrambling the SunWise words the students will be exposed to key vocabulary associated with sun safety. Have a sun safety discussion before you assign the task to start the students thinking about certain SunWise vocabulary.

UNSCRAMBLED SUNWISE WORDS

sun
sunblock
sunburn
mole
sunglasses
long sleeve shirt
hat
skin cancer
beach
ultraviolet rays
wrinkles
sunwise
protect
umbrella
shade
ozone
reflection
melanoma
prevention

QUESTIONS AND ANSWERS

1. What does UV stand for? Can you see or feel UV rays?
   Ultraviolet. No.
2. What forms a thin shield around the earth and protects us from the sun's harmful UV rays?
   The thin shield around the earth is known as the ozone layer.
3. At what time is the sun at its highest point in the sky?
   Solar noon.
4. During what hours should you limit your exposure to the sun?
   You should limit your exposure to the sun between 10 a.m. and 4 p.m.
5. What are some effects of too much exposure to the sun?
   Some of the effects of too much exposure to the sun are wrinkles, skin cancer, and eye damage.

PHYSICAL EDUCATION VARIATION:

The educator should write the 19 scrambled words from the activity in chalk on a concrete play surface without letting students see the words. Students line up about 50 yards away and take turns trying to decipher the first word. The first student runs to the first word. If they can decipher the word, they write it next to the scrambled version. If they don't decipher the word, they run back and hand the chalk to the next student until all words have been revealed. Educators might want to mention the words to students ahead of time when discussing sun safety with the students. Older students may choose to create their own word scramble. Divide students into groups. One group creates 15 scrambled SunWise words; another group must unscramble the words. Groups then trade off. The first group timed as the fastest wins. Larger groups might require 30 or more words. Additional words can be found throughout the SunWise tool kit.

SunWise Virtual Trip

DIRECTIONS

People all over the world enjoy the sun in different ways. Some may enjoy the beach, while others may take hiking trips in the mountains, and others attend outdoor athletic or cultural events. No matter where you go or what you do, it is important to be SunWise.

Plan a pretend expedition to anywhere in the world. Use the suggested websites on this page to "travel" to your chosen place. Make sure you pack everything you need to protect yourself against the sun's harmful UV rays. Write a letter to the other students and tell them about your trip and what you have learned. In your letter, answer the 10 questions below. Read your letter to the group.

Have fun on your trip! You'll discover many things about different people, their countries, and the sun.

VOCABULARY WORDS

Weather — The daily conditions of the atmosphere at a geographic location during a specific time frame in terms of temperature, sunshine, wind velocity, precipitation, etc. Weather is what you see outside day-to-day. Weather conditions can change by the hour, or even by the minute.

Climate — Climate is the average of weather over several decades or longer for a geographic area.

SOME SUGGESTED VACATION SPOTS:

Galapagos
www.galapagos.org

Spain
www.spain.info

India
www.incredibleindia.org

Kenya
www.magicalkenya.com

Australia
www.australia.com

Antarctica
www.expeditions.com/destinations/antarctica

OTHER RESOURCES TO HELP YOU PICK A PLACE TO VISIT:

www.geographia.com

www.kids.nationalgeographic.com

RESOURCES TO LEARN ABOUT THE WEATHER AT YOUR VACATION SPOT AND SUNWISE PRACTICES:

www.weather.com

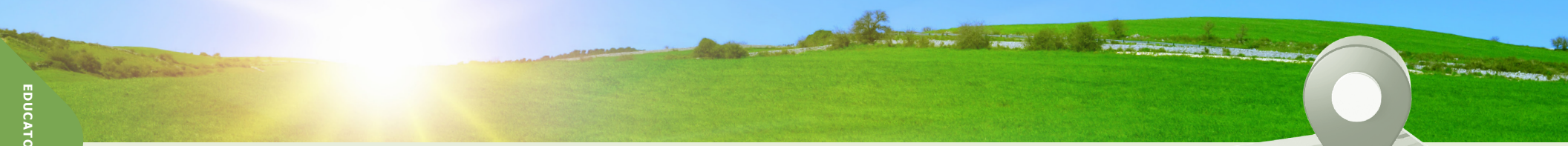
www.intellicast.com

www.weatherbase.com

www.NEEFusa.org/SunWise

WHEN WRITING YOUR LETTER, ANSWER THE FOLLOWING QUESTIONS:

1. How did you protect your skin and eyes while on your vacation?
2. What did you pack for your trip?
3. What did you do on your trip?
4. What do people in the country that you visited do for recreation? Where do they vacation?
5. What kind of outdoor activities do they like?
6. What is the climate like? How many days of the year does the sun shine?
7. How do the local people stay cool (or warm)?
8. How do people protect their skin and eyes from the sun?
9. What kind of clothes do people wear?
10. What types of houses do people live in?



SunWise Virtual Trip

ESTIMATED TIME

45 minutes (students may work in preassigned groups of three or four students)

SUPPLIES

1. Map of the world
2. Computers

LEARNING OBJECTIVES

This activity gives students the opportunity to learn about different cultures, develop internet research skills, and think about their sun exposure during recreational activities (and associated risks). Assess the students by asking them to compose a letter to the other students that includes the answers to the questions and tips for being SunWise.

DIRECTIONS

Divide the students into small groups. Discuss places they would like to visit. Have each group pick a location and use the suggested websites to research the answers to the questions. You may want to develop a list of possible sites and make sure there are no duplicate locations. Students will write a letter to report on their findings, being sure to include the answers to the ten questions.

QUESTIONS AND ANSWERS

Answers should reflect students' research on their location.

1. How did you protect your skin and eyes from the sun? *Use sunscreen, wear sunglasses, wear a wide-brimmed hat, etc.*
2. What did you pack for your trip?
3. What did you do on your trip?
4. What do people in the country that you visited do for recreation? Where do they vacation?
5. What kind of outdoor activities do they like?
6. What is the climate like? How many days of the year does the sun shine?
7. How do the local people stay cool/warm?
8. How do people protect their skin and eyes? Answers should reflect students' research on their location and include precautionary actions such as using sunscreen, wearing sunglasses, and limiting time in the midday sun.
9. What kinds of clothes do people wear?
10. What types of houses do people live in?

PHYSICAL EDUCATION AND SOCIAL STUDIES VARIATION:

After choosing their expedition location, have students try or demonstrate the native sports and activities of that country. This activity can be coordinated with social studies lessons or an all-school cultural event. Try bocce ball, petanque, speedaway, rugby, badminton, croquet, or soccer, or make up your own versions of rugby, lacrosse, and games that will be new to participants and age appropriate. They can even dress in the country's native clothing or discuss how citizens in these countries protect their skin. This event might also be used as an outreach vehicle to include parents or community members who have experience with activities native to other countries.

The Sun Shines Around the World

DIRECTIONS

Use encyclopedias, magazines and periodicals (National Geographic, for example), books, and the internet to research your assigned country and answer the questions below.

Use the information gathered from researching your assigned country to hold a fashion show. Model clothes that are good examples of what to wear to protect against the sun's harmful ultraviolet (UV) rays in all seasons.

Choose spring and summer clothing such as knee-length shorts, wide-brimmed hats, long-sleeved or elbow-length shirts, and sunglasses. Choose fall and winter clothing such as long-sleeved shirts, long pants, light jackets or coats, hats, and sunglasses. Keep in mind cultural customs and traditions that are practiced when selecting clothing items.

Decide who will be the fashion show hosts. The hosts will explain to the audience what each model is wearing and point out the outfit's SunWise features.

Another group of students will DJ the fashion show. They will play the music for each model's walk down the runway or stage.

DID YOU KNOW?

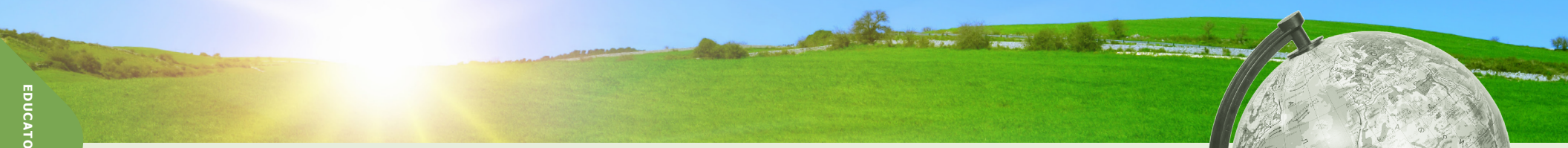
Don't forget that your lips absorb UV rays and are particularly cancer prone. Wear lip balm with broad spectrum SPF 30 or higher sunscreen when you go outside.

VOCABULARY WORDS

Custom — A habit or an established way of doing something.

QUESTIONS

1. What is the name of the country you researched?
2. What continent is the country in?
3. What kinds of clothes do the people of this country wear?
4. Describe one custom that people in this country practice to protect themselves from the sun.
5. Why should you wear protective clothing in the sun?
6. Can you get a sun burn in the fall and winter? Why or why not?
7. What are three differences between your state or hometown and the country you researched?



The Sun Shines Around the World

ESTIMATED TIME

60-90 minutes

SUPPLIES

- ✔ Map of the world (for display)
- ✔ Research materials (encyclopedias, travel or geography magazines, computers)
- ✔ Summer, fall, and winter clothes
- ✔ Music/radio
- ✔ Runway or stage area
- ✔ SunWise items such as sunglasses, umbrellas, wide-brimmed hats, broad spectrum SPF 30 and higher sunscreen, etc.

LEARNING OBJECTIVE

This activity teaches students about a variety of ways people all over the world protect themselves from the sun's harmful UV rays. Assess comprehension by having students describe ways individuals from the country investigated are SunWise.

Students will become familiar with clothing that protects against the sun's harmful rays. Assess the students' understanding by asking them what they wear during different seasons. Ask students what they will wear to be SunWise.

DIRECTIONS

Assign each student or pair of students a country to research or have them choose their own. Instruct students to respond to the questions.

Students will use information gathered from their assigned research to hold a fashion show. Students will model good examples of clothes to wear in each of the seasons, which protect against the sun's harmful UV rays. The fashion show can be held indoors or outdoors, depending on the weather.

Discuss the different clothes that are worn throughout the year in the country researched. Depending on the group size, have three students model clothes for each season. Spring and summer clothing could be knee-length shorts, wide-brimmed hats, long-sleeved or elbow-length shirts, and sunglasses. Fall and winter clothing can include long-sleeved shirts, long pants, light jackets or coats, hats, and sunglasses. Students can carry a bottle of broad spectrum SPF 30 or higher sunscreen.

Choose students to be the fashion show hosts. The hosts will explain to the audience what each model is wearing and point out the outfit's SunWise features.

Another group of students will DJ the fashion show. They will play the music for each model's walk down the runway or stage.

QUESTIONS AND ANSWERS

Answers should match the country researched.

1. Why should you wear protective clothing in the sun?
   To prevent skin cancer, wrinkled skin, sunburn, and eye damage.
2. Can you get a sunburn in the fall and winter? Why?
   Yes. The sun's rays are still strong in the fall and winter, and UV is reflected off snow and ice. UVA is consistently present all year.

ADDITIONAL RESOURCES

www.geographia.com
Geographia offers information on housing, clothing, and customs of countries throughout the world.

www.kids.nationalgeographic.com

Sun Myths from the Internet

DIRECTIONS

While exploring the internet, read a story about the origin of the sun according to Japanese history.

Visit the website *"Windows to the Universe."* Follow the steps to find the story:

1. Open the internet browser on your computer.
2. Type this address into the Location Toolbar: **www.windows.ucar.edu**
3. When you are at a home page called "Windows to the Universe," click on the *"Culture"* tab.
4. Now click on *"Myth."*
5. Now click on *"Sun."*
6. At the top of the page you can choose a reading level (Beginner, Intermediate, Advanced).
7. Finally, click *"Japanese: Amaterasu"* to read the story about the sun from Japanese culture.

Now visit the SunWise website:

1. Type this address into the Location Toolbar: **www.NEEFusa.org/SunWise**
2. Read about the many ways to stay protected while in the sun.

VOCABULARY WORD

Myth — An invented story; a belief that is often false about a person, place or thing; a traditional or legendary story, especially one that involves gods or heroes and explains certain occurrences.

Sun Myths from the Internet

ESTIMATED TIME

30-45 minutes

SUPPLIES

✔ Computers

LEARNING OBJECTIVE

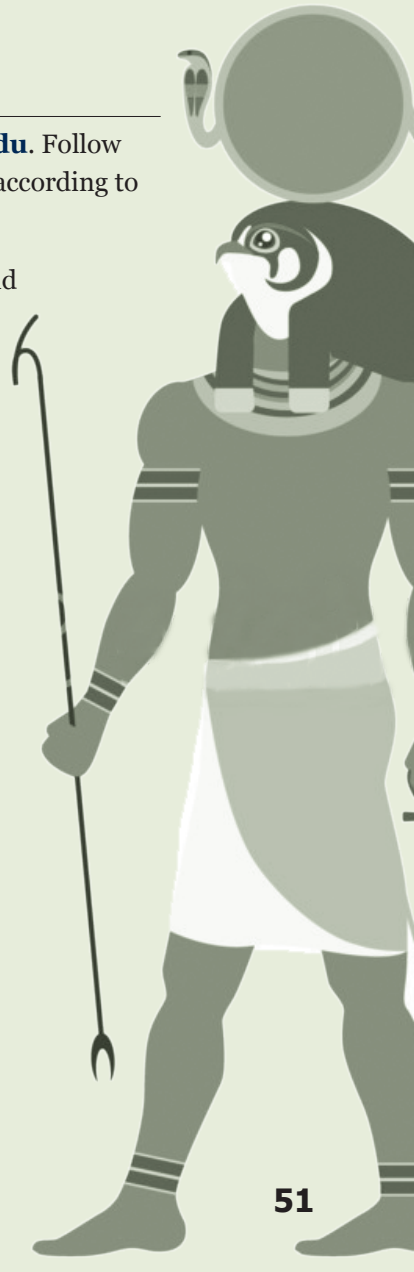
While becoming familiar with the internet, the students will learn about how different cultures perceive the origins and history of the sun. The students will also visit the SunWise website to read about the various steps they should take to be safe in the sun. Assess what they have learned by asking them to write their own story about the origin of the sun, making sure to incorporate SunWise actions.

DIRECTIONS

Visit the website "Windows to the Universe," **www.windows.ucar.edu**. Follow the steps on the Student Page to find the story. Suggest a reading level according to students' abilities.

Now visit the SunWise website, **www.NEEFusa.org/SunWise** to find the SunWise actions.

Have students write a story about the origin of the sun.



Personal Skin Assessment

Risk Factor	*Yes*	*No*
Light or fair skin		
Blue, green, or hazel eye color		
Blonde or red hair		
Freckles when in the sun		
Burn when in the sun		
40 or more moles		
Family or personal history of skin cancer		
Living in the Sunbelt area of the United States where UV rays are very strong (Arizona for example)		
Living in high altitudes		
Two or more blistering sunburns		
Taking medications that increase the skin's photosensitivity (some antibiotics and antihistamines)		

Adapted from Project S.A.F.E.T.Y., *Risk and Risk Factors*, Elementary Safety Lesson Five.

Personal Skin Assessment

ESTIMATED TIME

30 minutes

SUPPLIES

- ✔ Markers or crayons
- ✔ Magazines (optional)
- ✔ Glue (optional)

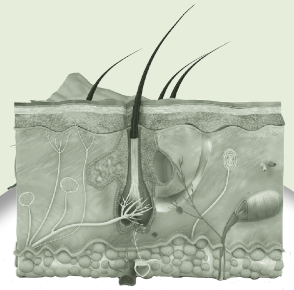
LEARNING OBJECTIVE

After completing this activity, students will understand the need to be careful about exposure to the sun's harmful UV rays. Students who possess several risk factors will develop a heightened sense of their own risk. To assess student comprehension of the risk and prevention message, form groups of three to make fliers, posters, or collages that depict SunWise individuals.

DIRECTIONS

Educators are cautioned to be sensitive to the privacy concerns of students during this activity. Also be aware that students may answer no to all the questions, thereby allowing for the misconception that they are not at risk for overexposure to UV radiation.

Instruct students to evaluate their own risk factors, checking off yes or no in each column. Have students raise their hands in response to each question as you read it aloud. Using the fact sheets (located in the *SunWisdom* section of the tool kit) as your guide, discuss the prevention steps with the students. Stress the importance of protection from the sun's harmful UV rays, especially for individuals who have several risk factors. Remind students that everyone is equally at risk for eye damage.



DID YOU KNOW?

The skin is the largest, most visible organ of the body and is the fastest growing part of the body. It makes up 16% of the body's weight.

SunWise Survey

DIRECTIONS

Are you SunWise? Are your classmates? Is your family? Find out what you know about being SunWise.

SUNWISE SURVEY QUESTIONS

Circle an answer for each of the questions below.

Self

The sun can hurt my skin.
True *False*

I think I look healthier with a tan.
True *False*

When I am outside in the sun during the summer, I wear sunscreen.
True *False*

Sun protection factor (SPF) indicates the level of protection a sunscreen provides from UVB. Which SPF number is the minimum I should use?
4 *30* *40* *I don't know*

I need to use the most sun protection when the UV Index is:
1 *5* *11 +* *I don't know*

School

How sun-safe are our school grounds?
Not sun-safe
Somewhat sun-safe
Sun-safe
100% sun-safe

How do you know our school grounds are or are not sun-safe? What are the rules for using sunscreen and wearing hats in our school?

Home

How many people in your home have ever had a sunburn? How many times?

Do people in your home wear sunscreen, sunglasses, or a hat? If so, when?

After completing your individual SunWise survey, follow along as your peers tally up their responses. When you are finished, answer the questions below.

QUESTIONS

1. What percentage of students believe the sun can hurt their skin?

2. What percentage of students believe they look healthier with a tan?

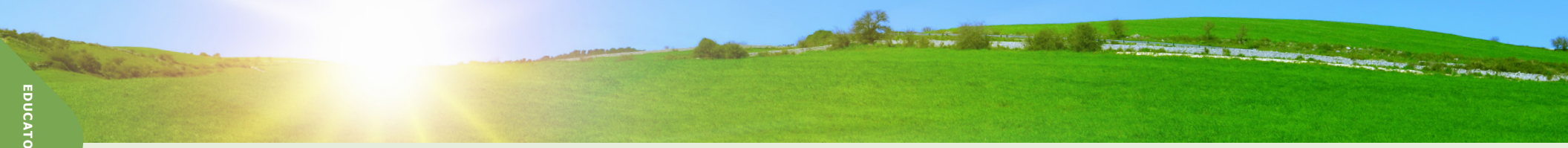
3. Make a bar graph depicting the percentage of the students that choose each sunscreen SPF. What was the most popular response? How many more people choose the most popular response over the least popular response?

4. What percentage of students chose a UV Index level of 11+ as requiring the most sun protection?

5. How many students think your school grounds are at least "sun-safe?"

6. Read the example SunWise word problem, and then write your own.
My family of five went camping this summer. My brother and my father both got sunburned. Forty percent of my family was not SunWise.

My family of _____ went to _____ this summer. My _____ got sunburned. _____of my family was not SunWise.



SunWise Survey

ESTIMATED TIME

20 minutes

SUPPLIES

- ✔ Pencil
- ✔ Calculator (optional)
- ✔ Graph paper (optional)

LEARNING OBJECTIVE

The objective of this activity is to help students understand the variety of ways they can protect themselves from the sun's harmful UV rays. After completing this activity, students will understand that using sunscreen, hats, sunglasses, and the UV Index are examples of SunWise behavior. Assess whether the students understand they must protect themselves from the sun's harmful UV rays by asking them whether the activity taught them something new about being SunWise. Finally, ask your students what they will do differently now.

DIRECTIONS

In preparation for this activity, create a simple chart on the chalkboard listing the SunWise Survey questions (including all possible answers) along the left vertical axis and numbers by five along the top horizontal axis. After the students answer the questions on their individual SunWise Survey, compile the data from the entire group. Appoint one student to be the reporter and a different student to be the recorder. The reporter should read each question aloud. The students should respond as a group by a show of hands. The recorder should record the responses, and with the help of the educator, calculate totals for SunWise Survey questions. Now, instruct your students to make some statistical generalizations about their SunWise behavior.

QUESTIONS AND ANSWERS

1. What percentage of students believe the sun can hurt their skin?
   Answers will vary.
2. What percentage of students believe they look healthier with a tan?
   Answers will vary. Ask if people look healthier with wrinkles. Explain that up to 90% of visible changes to the skin commonly thought to be caused by aging are actually caused by sun exposure.
3. Make a bar graph depicting the percentage of students that choose each sunscreen SPF. What was the most popular response? How many more people choose the most popular response over the least popular response?
   Answers will vary.
4. What percentage of students chose a UV Index level of 11+ as requiring the most sun protection?
   Answers will vary.
5. How many students think your school grounds are at least "sun-safe?"
   Answers should include the total number of students with responses "sun-safe" and "100% sun-safe."
6. Read the example SunWise word problem, and then write your own.
   Answers will vary.

SunWise Word Problems

DIRECTIONS

Answer the following word problems about SunWise products and behavior.

1. If you buy a dozen wide-brimmed hats for $132.00, how much do you pay per hat?

2. If you stand on the corner and sell the hats you bought in question #1 for $15.00 each to people at risk of being overexposed to the sun's UV rays, how much will you make in profit?

3. Sunscreen A comes in a 36 oz. bottle and sells for $6.24. Sunscreen B comes in a 28 oz. bottle and costs $6.08. Sunscreen C comes in a 42 oz. bottle and costs $6.85. Which sunscreen is cheaper per ounce?

4. A new SunWise school is being built for grades 1-6. A school board regulation states that each first and second grade classroom can have no more than 20 students. Classrooms for the other grades (3-6) can have no more than 28. If the community where they're building the school has 220 SunWise students in the first and second grade, and 616 in the other four grades, how many rooms should the new building have?

SunWise Word Problems

ESTIMATED TIME

40-50 minutes

LEARNING OBJECTIVE

This activity will reinforce the prevention message of sun safety. Assess whether students understand the importance of protecting themselves from harmful UV rays by asking them to make a list of all the SunWise products they can think of. Use items from the problems as a starting point.

DIRECTIONS

Have the students solve the following word problems. (The variables in the problems below are not scientifically accurate.)

QUESTIONS AND ANSWERS

1. If you buy a dozen wide-brimmed hats for $132.00, how much do you pay per hat?
   $11.00
2. If you stand on the corner and sell the hats you bought in question #1 for $15.00 each to people at risk of being overexposed to the sun's UV rays, how much will you make in profit?
   $48.00
3. Sunscreen A comes in a 36 oz. bottle and sells for $6.24. Sunscreen B comes in a 28 oz. bottle and costs $6.08. Sunscreen C comes in a 42 oz. bottle and costs $6.85. Which sunscreen is cheaper per ounce?
   Sunscreen C
4. A new SunWise school is being built for grades 1-6. A school board regulation states that each first and second grade classroom can have no more than 20 students. Classrooms for the other grades (3-6) can have no more than 28. If the community where they're building the school has 220 SunWise students in the first and second grade, and 616 in the other four grades, how many rooms should the new building have?
   33 classrooms

Measure Your Shadow

DIRECTIONS

Using the sun as your light, you are going to trace your shadow. But first, on a piece of paper, make a data chart with two columns and three rows. On the top of your data chart label one column "time" and the other "measurement." On the side of your data chart at the start of each row, write "first shadow," "second shadow," and "third shadow."

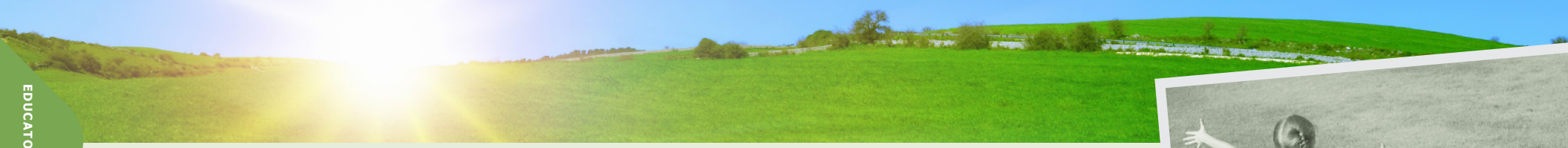
Choose a partner and stand in the sun. With a piece of chalk, your partner will trace your shadow starting from your feet. Write your name inside your traced shadow and record the time and the length measurement of your shadow in your chart.

Later in the day, have your partner trace your shadow again. Remember to position your feet in the same spot and face in the same direction as before.

Repeat a third time. Remember to face the same direction as before.

QUESTIONS

1. What makes your shadow?
2. Do you always have a shadow?
3. Have you ever seen your shadow at night? How did that happen? Can you think of other ways you might see your shadow at night?
4. Is your shadow always the same size? If your shadow isn't always the same size, give your reasoning for your shadow being a different size.
5. Record the number of hours and minutes between your first, second, and third shadow measurement. Make a prediction about what will happen to the length of your shadow over this time period. (You will be checking your answer as you record your measurements!)
6. What is the difference between the measurements?
7. What is the shadow rule?



Measure Your Shadow

SUPPLIES

- ✔ Chalk (have a different color for each time the students trace their shadow)
- ✔ Paper and pencil
- ✔ School yard with dark cement or blacktop
- ✔ A clear sunny day
- ✔ Watch or clock
- ✔ Yardstick/meter stick

ESTIMATED TIME

At least three 15-minute intervals during one day, plus time for discussion.

LEARNING OBJECTIVE

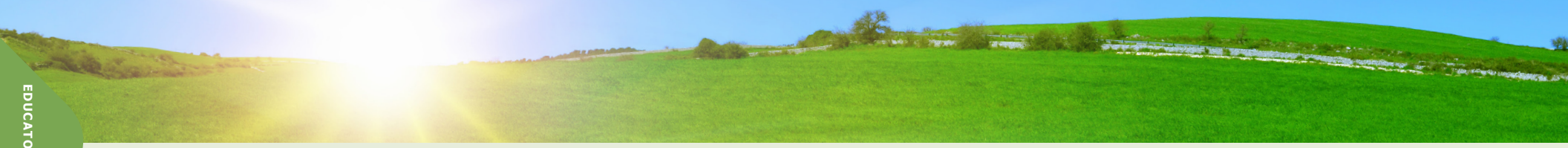
The objective of this activity is to have students understand the movements of the earth over the course of a day and demonstrate why this movement causes a shadow. Have students collect evidence on how shadows change from morning to evening, and how they can tell by the length of their shadows what times of day they should seek protection from the sun's harmful UV rays. Ask the students to predict how their shadows will change during the day. Once the day is over, ask them to compare their prediction to the actual shape and size of their shadows. Assess what they have learned by asking them to explain the shadow rule.

DIRECTIONS

Instruct the students to make a data chart on a piece of paper to record the time they traced the shadows and the size of the shadows. Also, each student should record their own height for comparison. The data chart will need two columns and three rows. The top of the data chart should be labeled "time" and "measurement." The side of the data chart should be labeled "first shadow," "second shadow," and "third shadow." If necessary, draw the data chart on the board to show how it should look.

You should take the students outside three times during the day (once around noon). Have students choose a partner. Instruct the students to trace their partner's shadow using a piece of chalk on the cement surface of the schoolyard. They should begin tracing the shadow from the feet. They should write their names inside their shadows. Students should use the yardstick to measure the length of the shadows each time they trace them. Students should record the measurement and time in their charts.

When everyone goes back outside later in the day, have each student stand on the feet of their own shadow and have their partner retrace their new shadow on top of the original. Again, they should record the measurement and time in their data charts.



DISCUSSION

Discuss how shadows are formed. A shadow is a dark figure or image cast onto the ground by our bodies intercepting the light of the sun. Both the sun and the moon can create shadows. We have noticeable shadows throughout the day; however, our shadows are much shorter closer to noon when the sun is overhead. Explain to the students that when their shadows are long (during the early and late parts of the day) the sun is not as intense. When their shadows are short (during the middle part of the day) the sun is more intense, and they are at a greater risk from the sun's damaging UV rays. Also mention that visible light, not UV rays, causes shadows. UV rays are present even on cloudy days. Nevertheless, the shadow rule is a good indication of UV intensity. Tell the students the shadow rule, *"Watch your shadow. Short shadow, seek shade!"*

QUESTIONS AND ANSWERS

1. What makes your shadow?
The rays of the sun shining on one side of your body generate a shadow that is projected away from your body.

2. Do you always have a measurable shadow?
Yes. When the sun is overhead at noon, the projection of the shadow is much shorter than it is during the rest of the day.

3. Have you ever seen your shadow at night? How did that happen? Can you think of other ways you might see your shadow at night?
Yes. When there is a full moon, the light can create a shadow, but the moon does not emit UV rays. Other sources of light, such as a street lamp, can create a shadow, but they also do not emit UV rays.

4. Is your shadow always the same size? If your shadow isn't always the same size, give your reasoning for your shadow being a different size.
No. Your shadow is long in the early morning and late afternoon; your shadow is short during midday. This is because of the earth's movement over the course a day.

5. Record the number of hours and minutes between your first, second, and third shadow measurement. Make a prediction about what will happen to the length of your shadow over this time period.
Students should count the hours and minutes on a watch or clock to find the number. They should predict that the length of their shadow will change throughout the day.

6. What is the difference between your measurements?
Students should subtract to find the answer.

7. What is the shadow rule?
"Short shadow, seek shade!"

Speedy Sun Relay Race

DIRECTIONS

One student in your group will be the "model." The model's job is to dress in SunWise clothes as fast as possible with the help of the team. Across the field will be a pile of clothes. Each team member, besides the model, will take turns running to the pile, selecting one sun-safe item, and running it back to the model. The first team to have a completely SunWise model is the winner!

DID YOU KNOW?

Meerkats have black rings around their eyes that absorb the sun's rays and protect their eyes from sun damage.

Speedy Sun Relay Race

ESTIMATED TIME

30 minutes

SUPPLIES

- ✔ A field or other open space with 20 yards of room

One set of the following SunWise and non-SunWise clothes and items for each team:

- ✔ Long-sleeved shirt (preferably with collar)
- ✔ Long pants (optional)
- ✔ Hats (wide-brimmed, cowboy)
- ✔ Sunglasses
- ✔ Empty bottles of sunscreen, some with broad spectrum SPFs of 30 and higher, some with lower SPFs
- ✔ Umbrella (optional)
- ✔ Various other articles of clothing that are not SunWise, like tank tops, t-shirts, shorts, visors, etc.

Note: Make sure that the clothes are large enough for each student to put on and take off easily.

LEARNING OBJECTIVE

This activity will challenge students to think quickly about SunWise behavior by selecting correct sun-safe clothes in a competitive environment. Students will learn that wearing SunWise clothes is another way to be safe in the sun, and they'll get some exercise, too! As an assessment, have the students examine the non-winning teams' clothes after the race and suggest corrections.

DIRECTIONS

Organize the students into teams of five or more and line them up at the start of the racecourse. Place the piles of clothes at the other end of the racecourse.

Have each team select one student to be the SunWise model. This student will stay at the start point of the race, donning SunWise clothes. The other team members should each take turns running to the pile of clothes, selecting one item, and running it back to the model to wear.

The first team to have a completely and appropriately dressed SunWise model, and that is able to explain why the model is SunWise, is the winner. The SunWise models should be wearing a protective hat, long-sleeved shirt, long pants (optional), and sunglasses, and be carrying a bottle of broad spectrum SPF 30 sunscreen or higher.

Sun Science

DIRECTIONS

The sun's light has an effect on everything. Try these experiments to see what the sun's effect will be over a week's time.

- Put a sheet of newspaper by the window in the direct sunlight. Put another piece in the shade.
- Place a whole piece of fruit, such as an apple, in the sun, and another in the shade.
- Put some solid objects with interesting shapes on a piece of construction paper. You can try spelling your name with plastic letters. Leave the paper in the sun for a week, then remove the objects.

QUESTIONS

1. How does the sun affect the newspaper over the course of a week?

2. How does the sunlight affect the fruit's decomposition?

3. What do you see on the construction paper after a week?

Sun Science

ESTIMATED TIME

Ten minutes to set up the experiments, one week for them to run, and 30 minutes for discussion

SUPPLIES

- ✔ Newspaper
- ✔ Construction paper
- ✔ Paper or plastic letters or other uniquely shaped objects
- ✔ Apple or other thick-skinned fruit

LEARNING OBJECTIVE

This activity will make a mental and visual connection for students between the damaging effects that the sun has on the experimental objects, and what the sun's harmful UV rays can do to their own skin cells. The students will also have visual evidence of how being protected will guard against or prevent sun damage. Assess the students' comprehension by asking them to predict the effects of the sun on their skin, eyes, and other objects over a period of time. Students should show understanding of the differences of the sun's effects on organic versus inorganic matter.

DIRECTIONS

Have the students place a sheet of newspaper in a sunny spot and another in the shade. Leave the paper for a week. Place an apple or other whole piece of fruit in the sun as well. Have the students place some uniquely shaped solid objects on pieces of construction paper in the sun. They can use plastic letters to spell out their names. Leave the objects out for a week. After a week, view and discuss the results of these experiments with the students. Once the students have had the opportunity to view the sun's effect on various items, ask them to imagine how the sun affects their skin when they are exposed to its harmful rays without protection. Remind them that the fruit is made of cells just like they are.

QUESTIONS AND ANSWERS

1. How does the sun affect the newspaper over the course of a week?
The newspaper left in the sun is faded/yellowed. Assess whether students make the connection between the fading of the paper, and the sun's possible effects on their own skin.

2. How does the light affect the fruit's decomposition?
The fruit in the sun decomposed faster than the fruit left in the shade. Assess whether the students comprehend that the sun's harmful UV rays can have some of the same unhealthy effects on their own skin cells.

3. What do you see on the construction paper after a week?
The objects protected the portion of the paper they covered from fading. Discuss how clothing helps protect students' skin from the sun.

The Ozone and Me

DIRECTIONS

Label the following on the illustration of the earth and its atmosphere:

- ✔ Earth
- ✔ Sun
- ✔ Earth's four major systems:
  - Geosphere—the solid portions
  - Hydrosphere—the liquid water components of earth
  - Atmosphere—the gases surrounding earth
  - Biosphere—the zone of life on earth
- ✔ Two parts of the atmosphere:
  - Stratosphere
  - Troposphere
- ✔ Ozone layer
- ✔ Sources of ozone depleting substances (ODS)

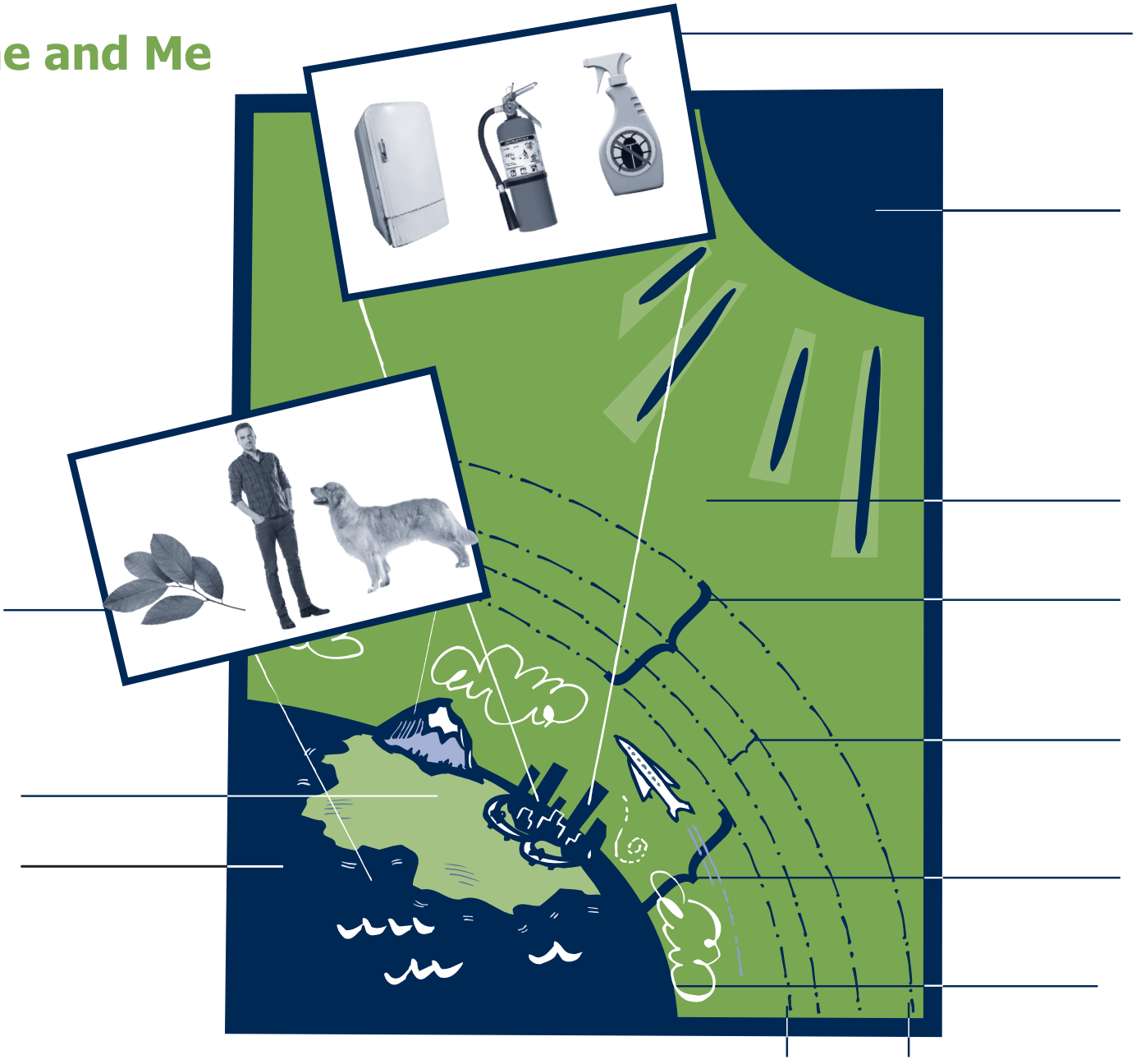
QUESTIONS

1. What is the stratospheric ozone layer and what does it do?
2. What causes the hole in the stratospheric ozone layer (ozone layer depletion)?
3. What human-made objects use CFCs and HCFCs?
4. Why are we concerned about ozone layer depletion?
5. What is being done to reduce the effects of stratospheric ozone layer depletion?
6. What is "bad" ozone? What causes it?
7. What happens when we are exposed to UV rays?

Create an illustrated tri-fold brochure explaining either 1) what you learned about the importance of the ozone layer; or 2) the possible causes of ozone depletion.

This activity is adapted from *Sun Smart,* published by the Anti-Cancer Council of Victoria.

The Ozone and Me



The Ozone and Me

ESTIMATED TIME

30 minutes

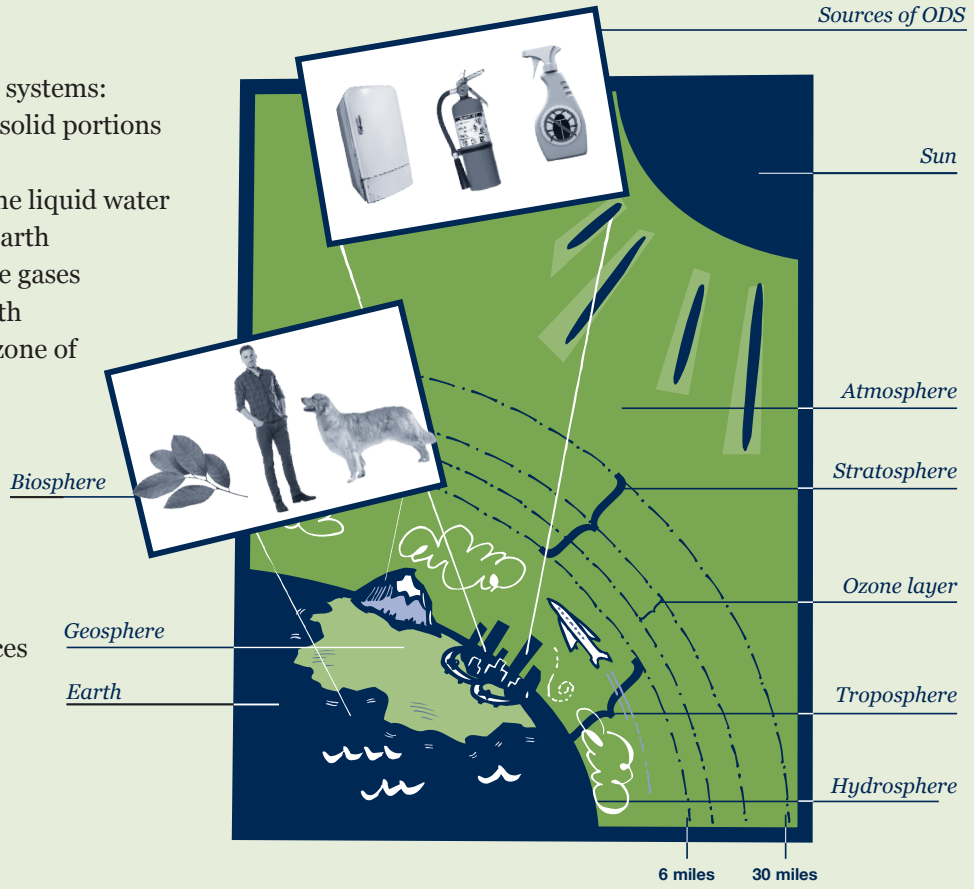
LEARNING OBJECTIVE

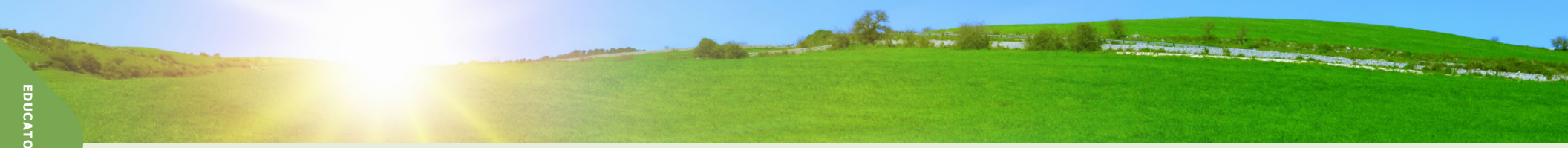
The objective of this activity is to teach students basic information about the ozone layer, the possible causes of its depletion, and how it is connected with their personal health and well-being. Students should understand that the earth has four major systems that interact in multiple ways to affect the earth's surface, materials, and processes. This interaction also affects humans and their existence on earth. Assess whether the students understand the connection between the depletion of the ozone layer and the need to protect themselves from the harmful rays of the sun. Ask them if their behavior will change once they've completed the lesson and how.

DIRECTIONS

Instruct the students to label the following in the illustration of the earth and its atmosphere:

- ✔ Earth
- ✔ Sun
- ✔ Earth's four major systems:
  - Geosphere—the solid portions of earth
  - Hydrosphere—the liquid water components of earth
  - Atmosphere—the gases surrounding earth
  - Biosphere—the zone of life on earth
- ✔ Two parts of the atmosphere:
  - Stratosphere
  - Troposphere
- ✔ Ozone layer
- ✔ Sources of ozone depleting substances (ODS)





DISCUSSION

Discuss each of the earth's systems and how they interact. Then move to a more specific discussion of the atmosphere and explain the presence of ozone in the atmosphere and discuss why ozone is good up high and bad nearby, its effects, and what measures are being taken because of ozone layer depletion. For more information on ozone, see the *SunWisdom* section of the tool kit.

QUESTIONS AND ANSWERS

1. What is the stratospheric ozone layer and what does it do?
A thin layer of naturally occurring gas in the stratosphere that protects life on earth from the sun's harmful UV rays.

1. What causes damage to the stratospheric ozone layer (ozone layer depletion)?
The use of chlorofluorocarbons (CFCs) and other chemical substances.

2. What human-made objects use CFCs and HCFCs?
Air conditioners, refrigerators, fire extinguishers, aerosols, foams, and solvents.

3. Why are we concerned about ozone layer depletion?
Ozone protects us from harmful UV rays. Without ozone, these rays can easily pass through the atmosphere and reach the earth's surface. For each 1% drop in ozone levels (i.e., 1% increase in ozone layer depletion), scientists estimate about 1% more UVB will reach the earth's surface.

4. What is being done to reduce the effects of stratospheric ozone layer depletion?
Countries around the world have signed a treaty—The Montreal Protocol—promising to reduce and then eliminate use of ozone-depleting substances.

5. What is "bad" ozone? What causes it?
Bad ozone is found in the troposphere and contributes to smog. High levels can make it difficult to breathe and cause eye irritation and headaches. Emissions from cars, some factories, gasoline vapors, and chemical solvents, in the presence of strong sunlight and hot weather, form bad ozone.

6. What happens when we are exposed to UV rays?
Exposure to UV rays can cause sunburn, skin cancer, eye damage, immune system suppression, and premature aging of the skin.

As a culminating activity, have students create an illustrated tri-fold brochure explaining either 1) what they learned about the importance of the ozone layer; or 2) the possible causes of ozone depletion.

For additional information, visit: **www.ucar.edu/learn/1.htm**

Map a SunWise School Yard

DIRECTIONS

You are a civil engineer, and your job is to design a new SunWise school yard.

Your SunWise school yard will need to have everything other school yards need, such as a play space, exploration areas, trees and shrubs, benches, and paths.

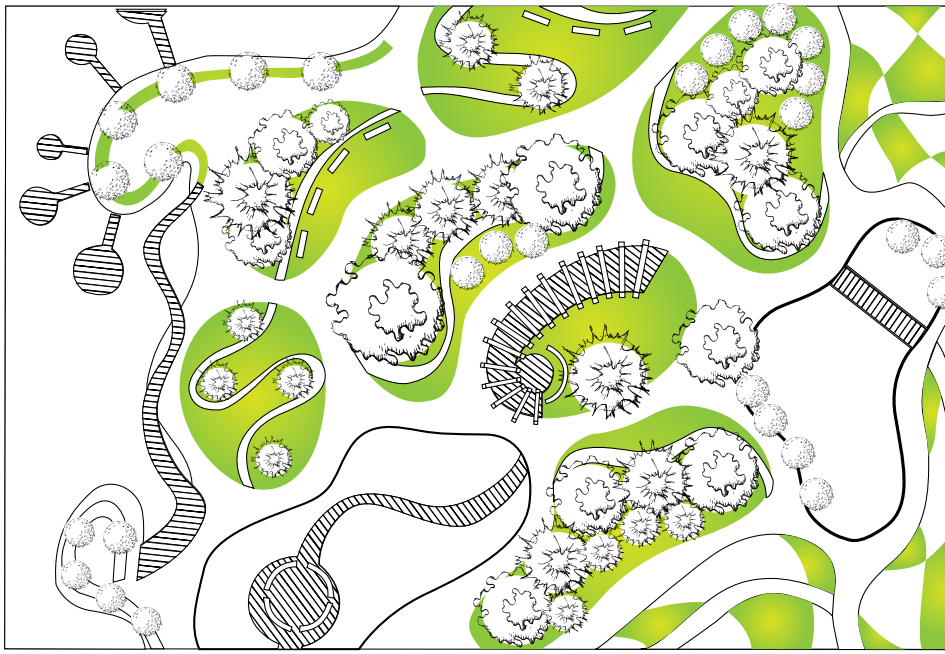
Draw a map of a school yard. You'll want to provide plenty of shade for the students to help them avoid overexposure to the sun's harmful UV rays. Pay attention to areas like the athletic fields and playground. How can challenging areas like these be made SunWise? Don't forget the trees! Remember to consider where the sun will be in the sky at various times of the day and mark your map with north, south, east, and west.

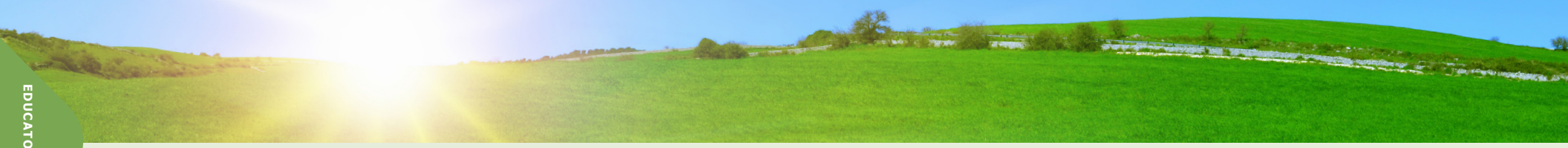
Mark all the SunWise features of your school yard. Create a legend for your map.

VOCABULARY WORDS

Civil Engineer — An engineer trained in the design and construction of public works.

Legend — The part of a map that explains the symbols used on the map.





Map a SunWise School Yard

ESTIMATED TIME

40-50 minutes

SUPPLIES

- ✔ Colored pens and pencils
- ✔ Ruler
- ✔ Paper or poster board

PHYSICAL EDUCATION VARIATION:

Have students walk around and map their school to determine areas where additional shade would be beneficial in terms of trees and shade structures (requires paper, pen, and surface to write on). This activity can also be coordinated with other content areas (e.g., science and social studies for environmental impact and improvements to the community). It can also be structured as a student service learning project where students could coordinate a fundraising activity to purchase trees and/or erect a shade structure. Groups can also split up, with each member responsible for identifying at least two areas that would benefit from shade.

LEARNING OBJECTIVE

This activity allows students to evaluate sun protection on a larger scale. It will help students visualize the connection between their environment and SunWise behavior. Students will need to understand the movement of the sun across the sky over the course of the day and consider that movement when they create their school yard.

Ask students to think about where they spend time outdoors and if those places are SunWise. Assess student comprehension by having the students write a paragraph comparing areas in their neighborhoods to the same areas in the school yard they've mapped. How are they different? How could their neighborhoods and school yards be made more SunWise?

DIRECTIONS

Tell the students that they are civil engineers whose job is to design new SunWise school yards. Their school will need to have everything other school yards need—a play space, exploration area, trees and shrubs, benches, and paths, for example.

The students will draw a map of their school yard. They should provide shade to help students avoid overexposure to the sun's harmful UV rays. They will mark all the SunWise features of their school yards. The students will then create legends for their maps.

DISCUSSION

Discuss the features of your own school yard. Ask students to identify the most SunWise areas around your school yard. Ask students to share how they will be SunWise when they spend time in the school yard.

STUDENT PAGE

Be a SunWise Traveler

DIRECTIONS

You are planning a trip. Use maps and websites to research your assignment and answer the questions below. Be prepared to share your findings.

VOCABULARY WORD

Mean — The average value of a set of numbers. A mathematical value that is intermediate between other values.

ACTIVITIES AND QUESTIONS

1. Using a US map, identify where you live.

2. Using a US map, identify where you would like to visit. Why would you like to visit this location? What time of year would you like your visit to occur?

3. Using the UV Index maps located on the EPA website, **www.epa.gov/sunsafety/uv-index-1**, identify what the UV Index mean (average) is where you live at this time of the year.

4. Using the UV Index maps located on the EPA website, **www.epa.gov/sunsafety/sun-safety-monthly-average-uv-index**, identify what the UV Index mean (average) is where you would like to visit and at the time of year your visit would occur.

5. What do you notice about your local UV Index in comparison to the UV Index at the location and time you want to visit?

6. Are there similarities and differences? Why?

7. What SunWise action steps should you take when visiting your destination?

Be a SunWise Traveler

ESTIMATED TIME

45-60 minutes (students may work individually or in small groups)

SUPPLIES

- ✔ Maps of the United States
- ✔ Computers
- ✔ Action Steps for Sun Protection (see *SunWisdom* section of the tool kit)

LEARNING OBJECTIVE

This activity gives students the opportunity to learn about how people all over the US need to protect themselves from the sun's harmful UV rays. It will help students make connections and comparisons between their local environment and SunWise behaviors they practice when visiting other parts of the country.

BACKGROUND/TALKING POINTS

People often travel to locations with extreme UV intensity, especially in comparison to the UV intensity at that time of year in the traveler's city or town. Additionally, travelers may not realize how intense the sun is at that time of year and may not adequately prepare for the UV radiation that they are exposed to, resulting in severe sunburns. Studies have shown that as much as 88% of sunburns in children occur during sunny vacations. A serious potential problem surfaces when you combine this information with the fact that sunburn is a risk factor for skin cancer. By raising awareness of the dangers specifically associated with travel/vacations to UV intense destinations, the goal is for children and their caregivers to receive no sunburns during travel/vacations.

In addition:

- UV rays are reflected by snow, sand, water, and pavement. Fresh snow may reflect up to 80% of the incident UV radiation. This is important at higher altitudes and latitudes. Sand and water also reflect up to 25% and 5% of UV radiation, respectively, and can increase UV exposure at the beach.
- The closer you get to the equator, the more intense the UV rays. This occurs because the sun is more directly overhead, causing a shorter distance for the sun's rays to travel through the atmosphere, and there is naturally less ozone in the stratosphere in the tropics.
- The higher in altitude you go, the more intense the UV rays become because there is less atmosphere for the UV to travel through.

DIRECTIONS

Engage students by asking them if they have a US state or city in mind that they would like to travel to someday. Or ask them if they have a friend or relative who lives in another state or city that they might like to visit. Have students identify the place they would like to visit along with the time of year they would like to do this traveling. Students will identify the UV Index mean (average), both where they live and at the place they would like to visit, then make a connection or comparison of the two locations. They will then identify SunWise action steps they should take when visiting their choice of destinations. Instruct students to respond to the activities and questions individually or in pairs. Then, have them share their findings with the other students.

STUDENT ACTIVITIES AND QUESTIONS

Answers should reflect students' research on their location.

1. Using a US map, identify where you live.

2. Using a US map, identify where you would like to visit. Why would you like to visit this location? What time of year would you like your visit to occur?

3. Using the UV Index maps located on the EPA website, **www.epa.gov/sunsafety/uv-index-1**, identify what the UV Index mean (average) is where you live at this time of the year.

4. Using the UV Index maps located on the EPA website, **www.epa.gov/sunsafety/sun-safety-monthly-average-uv-index**, identify what the UV Index mean (average) is where you would like to visit and at the time of year your visit would occur.

5. What do you notice about your local UV Index in comparison to the UV Index at the location and time you want to visit?

6. Are there similarities and differences? Why?

7. What SunWise action steps should you take when visiting your destination?

STUDENT PAGE

A SunWise Legend

WISE HEART SAVES THE DAY[1]

Once upon a time, a very long time ago, there lived a young Native American boy who was both smart and kind and who longed to make the world a better place for his people. His name was Wise Heart, and he belonged to the Cahto Tribe that lived in what is now Northern California. The world in which Wise Heart lived was cold and barren, with few plants or trees. During the day, his world was gloomy and grim, lit by only a faint, dim light that seemed to come from very far away. At night, his world was always cloaked in deep darkness, a darkness that was broken only by the campfire and the torches that the elders alone were allowed to carry.

Wise Heart knew that the world had not always been such a dark and gloomy place. Sometimes as his tribe huddled around the campfire at night, the elders told stories—ancient stories—of a time when a bright light they called the Sun had warmed the world during the day, while its distant relatives, the Moon and Stars, had filled the night. Wise Heart had also seen the ancient tribal cave paintings that showed a world filled with the bright light of the Sun and with towering trees and plants. Whenever Wise Heart or the other children asked the elders how the world had lost its Sun, Moon, and Stars, the elders would become quiet and warn the children not to ask such questions.

One night, while Wise Heart slept, he dreamed of the beautiful, Sun-filled world that he had seen in the cave paintings. There were blue skies, trees laden with delicious fruit, and smaller plants with fragrant flowers. Then, in his dream, he heard the sound of a fiercely shrieking wind, and the Sun suddenly seemed to be torn from the sky, leaving only a dim glow in its wake. Wise Heart woke from his dream troubled and unable to fall back asleep.

When the dim light of day returned, Wise Heart cautiously approached the oldest and most respected of the elders, a stooped old man named Running Water. The boy recounted his dream and asked the old man if he knew what had happened to the Sun so many years before. At first Running Water scolded the boy and warned him not to wonder about such things. Finally, however, seeing the boy's determination to know the truth, Running Water relented. He told the boy that many years before, an Evil Spirit had become jealous of the brilliance and warmth of the Sun and had stolen it from the sky and hidden it in a deep canyon on the far side of the world. The Evil Spirit had also stolen the Moon and Stars and hidden them away as well so that the humans would not have enough light to be able to search for and free the Sun from its captor. From that day on, Running Water explained, the world had been dimly lit. Bound with thick ropes to a giant boulder, the Sun could make only a few of its rays reach above the edge of the deep canyon.

All that day Wise Heart thought about Running Water's words. He watched his people as they struggled to survive by eating the few fish in the stream and few small plants on the hillsides. By the time darkness fell, Wise Heart had made a decision.

He would journey across the mountains, to the far side of the world. He would find the deep canyon where the Sun, Moon, and Stars were being held by the Evil Spirit, and somehow, he would free them. That, he decided, was how he would help make the world better for his people.

Early the next evening, Wise Heart secretly set out for the distant mountains, carrying only a skin of water, some dried fish, and a sharp knife. As he traveled, he asked the kind spirits of his people to help him, and they did. Guided by a fierce and powerful eagle and thousands of fireflies, Wise Heart found his way through the steep, dark mountain range. A sure-footed mountain goat led him to the edge of the deep canyon in which the Evil Spirit was guarding the Sun, Moon, and Stars. Just at that moment, a traveling family of field mice offered to chew through the ropes that bound the Sun, Moon, and Stars while Wise Heart distracted the Evil Spirit. Accepting their offer of help, Wise Heart climbed cautiously over the rim of the canyon and slowly began to climb down the steep cliff toward the canyon floor below. Just as he reached the bottom, the silence was suddenly pierced by the same sound of shrieking wind that he had heard in his dream. The Evil Spirit, red-faced and shaking with rage, stepped between Wise Heart and the Sun, Moon, and Stars and demanded to know why the boy had intruded in his canyon. Before Wise Heart could answer, the Evil Spirit noticed the boy's water skin and demanded that he be given some water to quench his thirst and to cool his sun-scorched body. In reply, Wise Heart said, "Powerful spirit, I am happy to give you all my water, but first let me add some special herbs that will quench your thirst and cool your sun-scorched body better than plain water." The Evil Spirit agreed, and after Wise Heart had added the herbs, which were really sleeping herbs, he drank the water greedily. Soon after, the Evil Spirit fell asleep.

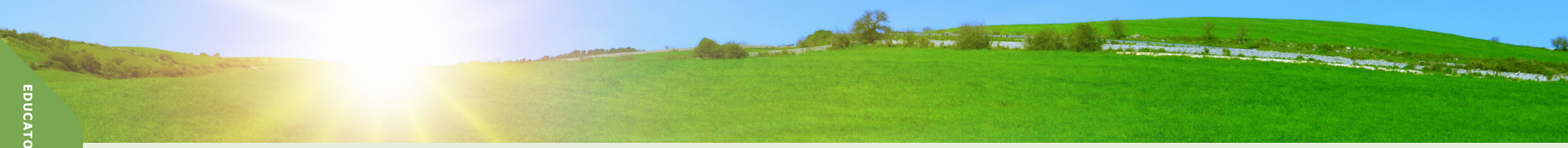
Immediately, as if on cue, the family of mice began gnawing through the thick ropes that held the Sun, Moon, and Stars captive. When they had almost completed their task, the Evil Spirit, feeling the heat of the Sun's rays as it slowly began to ascend into the sky, awoke from his slumber. With a piercing shriek, the Evil Spirit rushed to recapture the Sun. Just before he could do so Wise Heart cut through the remaining fragments of rope with his knife. With the ends of the rope held tightly in his hands, Wise Heart and the mice sailed into the sky. A short time later, as the Sun passed over Wise Heart's village, they all jumped safely into the soft boughs of the tallest fir trees. From there, Wise Heart looked up to see the first and most beautiful sunrise that he would ever see.

Wise Heart returned to his tribe as a hero. The people hailed him as the Sun Guard and thanked him for returning light and warmth to the day and light to the night. Almost immediately, the trees and plants began to grow larger, and the people danced and celebrated in the warmth and brightness of the Sun. After several hours, however, the people began to complain. They said, "It's too hot! I'm thirsty!" Others complained of feeling tired and of their skin feeling red and sore. Wise Heart was amazed that his gift that had at first caused so much joy was now causing so much pain and discomfort. He thought for a moment and then quickly led his tribe to the river's edge. There he told his people to drink deeply and to coat their skin with mud from the riverbank. He told them, "The mud will soothe your skin and protect it from the powerful rays of the Sun," and they found that he was right. Now Wise Heart was truly a hero. His tribe could now enjoy

the Sun and all the beauty it gave to the world, without being hurt by its powerful rays. Even today, Wise Heart is a hero, for though he did not know it, he had developed the first sunscreen with an SPF of 45!

The legend with illustrations is available for iBook at the Children's Melanoma Prevention Foundation website, **www.melanomaprevention.org**

1 This story has been adapted from traditional tales by Jane Shanny and Mary Ellen Maguire-Eisen of the Children's Melanoma Prevention Foundation.



A SunWise Legend

ESTIMATED TIME

One hour

SUPPLIES

- ✔ Large paper
- ✔ Markers and/or crayons
- ✔ Book-making supplies/Paper for drawing

LEARNING OBJECTIVE

The students will learn that people from all over the world have different stories about the sun. Before the story is read, ask the students what they know about the power of the sun, both good and bad. Write their ideas on the board/paper. After reading the story assess what they have learned by asking them to write a story about the sun and why it is important to people around the world.

DIRECTIONS

Read to your students "Wise Heart Saves the Day," a legend about the origin of the sun inspired by the Native American Cahto Tribe of California (on the Student Page of this activity). Discuss with them the location of California in relation to where you are located. While doing this, explain to them that people from all over the world have different ideas and beliefs about the sun. Discuss what they remember from the story. Ask them why the sun is so important that people from all over the world tell stories about it (e.g., it makes plants grow, provides light).

After discussing the legend and the sun with your students, ask them to write their own legend about the sun. Have them illustrate their short stories to make books. Once students have finished their book, have some share their legends with their peers. To help your students get started, ask them to consider the following questions:

1. During what period of time does your sun legend take place?
2. Where does your sun legend take place?
3. In your sun legend, who is the main character(s)?
4. What powers does your main character(s) have?
5. What effect or change has your character(s) made?

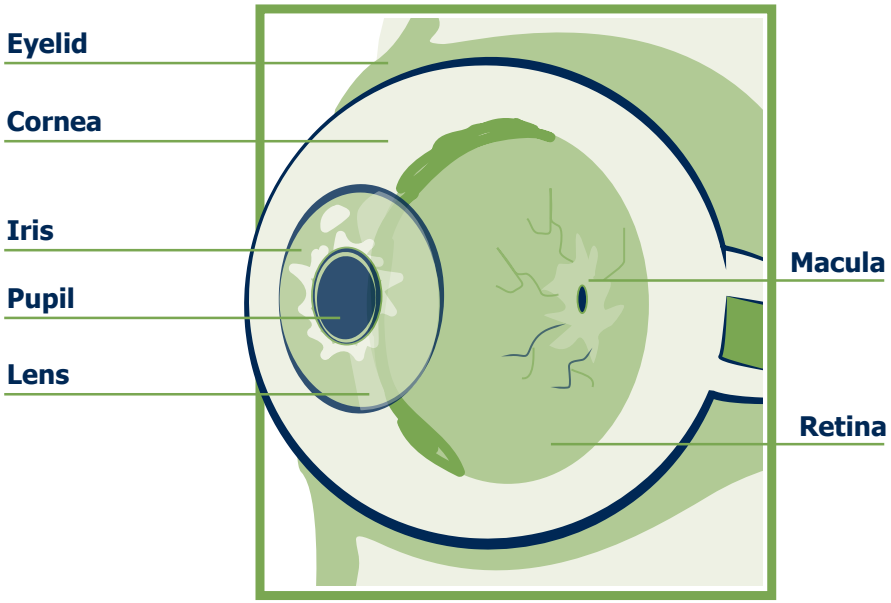
Keep an Eye on Sun Safety

DIRECTIONS

UV radiation can cause damage to the eyes of both animals and humans. One example of eye damage is a cataract. A cataract is the clouding of the eye's lens, which makes it difficult to see. Sea lions and seals that live in a zoo may develop cataracts because of not enough shade in their enclosure or because of looking up at the sun during feeding and training with the zookeeper. In addition, the reflection from the water causes extra UV exposure for both the animals and the visitors at the zoo.

Design an outdoor zoo exhibit for seals and sea lions that helps protect their eyes and the zoo visitors' eyes from too much sun exposure. How should visitors dress for a SunWise day at the zoo?

Many animals have natural adaptations that protect them from the sun. Find examples of these animal adaptations by visiting the website of your local zoo. In your exhibit design, include signs that point visitors in the direction of these animals.



VOCABULARY WORDS

Cataract — A clouding of the eye's lens that can blur vision.

Lens — A transparent structure in the eye that helps focus light.

Keep an Eye on Sun Safety

ESTIMATED TIME

30-45 minutes

SUPPLIES

- ✔ Paper
- ✔ Pens or Pencils

LEARNING OBJECTIVE

The aim of this activity is for students to learn the importance of protecting their eyes from overexposure to the sun's harmful UV rays. By understanding animal adaptations for sun protection and designing a sun-safe enclosure for zoo animals, students will draw connections to the ways they can protect themselves from overexposure to the sun. Assess if they have learned how to protect their eyes from UV radiation by facilitating an evaluation of each group's exhibit design.

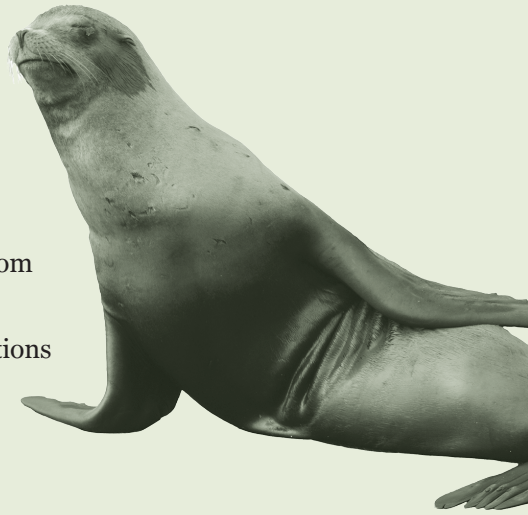
DIRECTIONS

Assign groups to collaborate on the design of a sun-safe outdoor exhibit for seals and sea lions. Before the students begin, have a brief discussion on the damaging effects that UV radiation has on the eyes of both animals and humans (for additional background information on cataracts and UV-induced eye damage, refer to the "The Sun, UV Radiation, and Your Eyes" on the American Academy of Ophthalmology website: **www.aao.org/eye-health/tips-prevention/sun**). Use the following questions to guide a discussion:

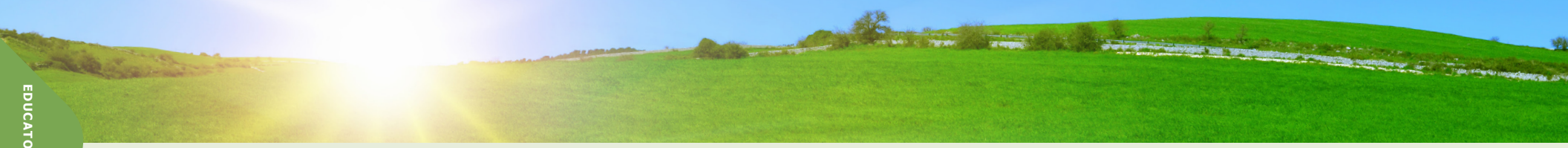
1. Does the exhibit design provide enough shade for the animals?
2. Do the visitors have a shaded area where they can watch the animals?
3. How should visitors dress for a sun-safe day at the zoo?
4. Where can zoo visitors find other sun-safe animals?

Describe to the students how seals and sea lions in zoos can be prone to cataracts due to the following:

- lack of shade in the enclosure;
- reflection of UV rays from the water and from the light surfaces of the tank/enclosure;
- looking up toward the sun during feeding and training with the zookeepers; and
- living longer in captivity than in the wild (in addition to overexposure to UV radiation, cataracts can also develop from old age).



Ask students to brainstorm animals that have natural adaptations to protect themselves from the sun. The students may research animal adaptations on your local zoo's website or you can guide them to examples of adaptations using the



Who Am I? SunWise Animals student handout available in the K-2 section of the SunWise tool kit. Explain to the students that humans can "adapt" too with simple sun safety habits. For eye protection, these habitats include the following: avoiding overexposure to the sun; wearing a wide-brimmed hat and sunglasses with 99-100% UVA/UVB protection; seeking shade when the sun's UV rays are most intense between 10 a.m. and 4 p.m.; checking the UV Index; and using extra caution around reflective surfaces such as water, snow, and sand.

When the students have finished their exhibits, lead them in a discussion to evaluate each design. Relate the issue of eye protection to the students' environments. Ask the students where they might get the most UV exposure in their daily lives. Remind the students that sun safety is important for all outdoor activities, including recess at school, swimming, boating, biking, soccer, baseball, etc. Ask the students to think of ways they can better protect their eyes from too much sun exposure.

ADDITIONAL RESOURCE

Who Am I? SunWise Animals student handout, available in the K-2 section of the SunWise tool kit.

STUDENT PAGE

Sunny Crossword *Supplemental*

DIRECTIONS

Answer the questions and fill in the crossword puzzle with the answers.

Across

1 The right type of these will block almost 100% of the UV radiation that can cause damage to your eyes.

4 Small, brownish spots on the skin that can increase in number with exposure to sunlight.

6 NEEF school program that promotes sun safety.

8 A _____ brimmed hat will protect your face, neck, and ears.

9 The most serious form of skin cancer.

10 _____ are most at risk for overexposure to UV radiation because their young skin is thinner and more easily damaged.

12 UV is an acronym for _____ .

13 If your _____ is shorter than you are when you're outside, it's time to seek shade.

15 Everyone is affected by UV radiation. Skin color doesn't exclude anyone from its effects, but if you have _____ skin you are at higher risk for skin cancer.

Down

1 Use this with at least broad spectrum SPF 30, and apply properly to protect against skin damage.

2 The time the sun is at its highest, which means its rays have less distance to travel through the atmosphere and the intensity is greatest.

3 Initials for sun protection factor.

5 Abbreviation for chlorofluorocarbon, one of the chemicals that destroys the fragile ozone layer.

7 The sun's rays are stronger at high altitudes and closer to the _____.

8 Overexposure to the sun can cause skin cancer, eye damage, and _____.

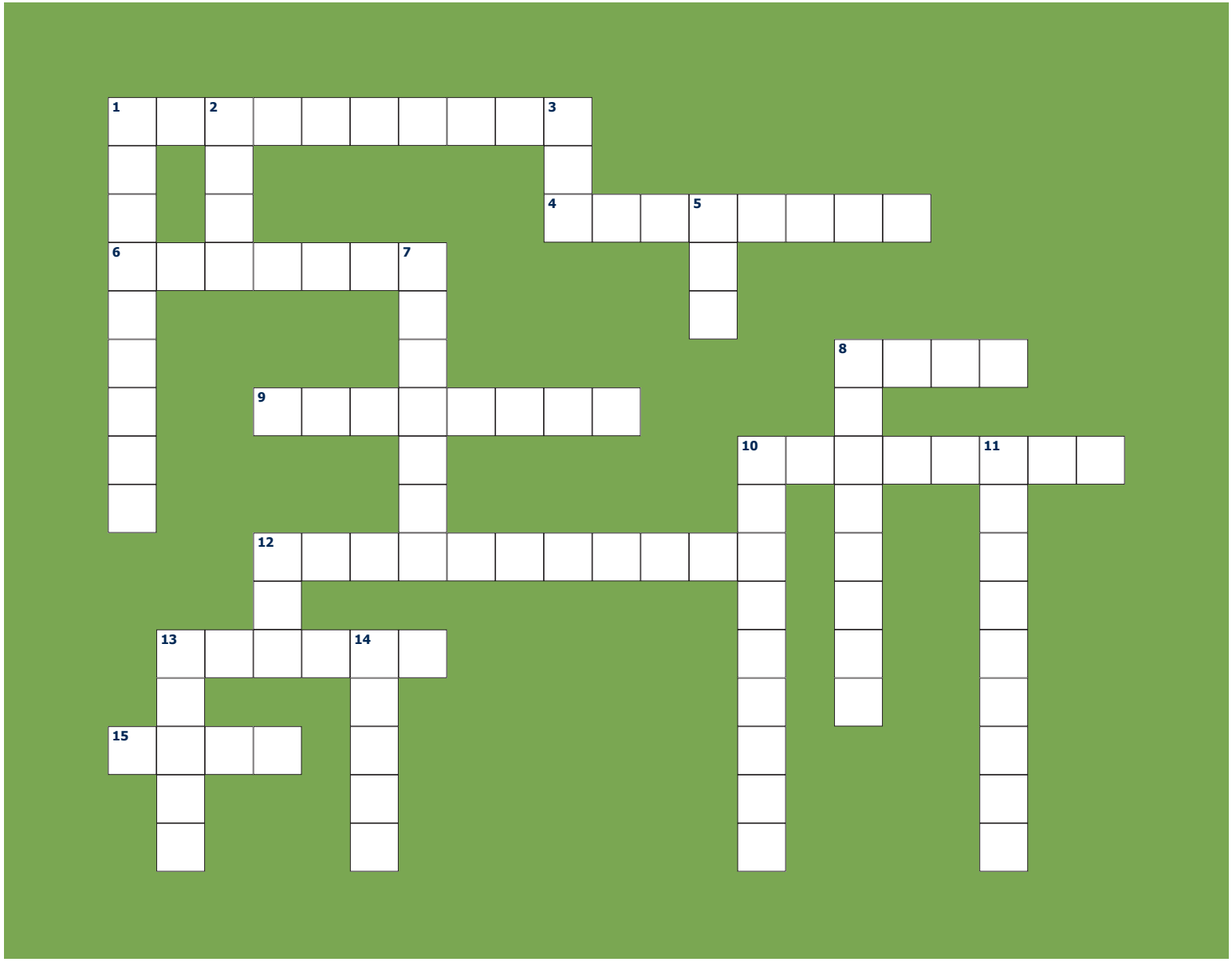
10 Eye damage that occurs when there is a loss of transparency in the lens, which clouds your vision.

11 It is UV _____, not the warmth or the brightness of the sun that causes damage to our skin.

12 This type of radiation is not absorbed by the ozone layer and can cause a lot of damage to our bodies.

13 You can find protection from the sun's UV rays under the _____ of trees and umbrellas.

14 A gas found in two layers of the atmosphere with the same chemical structure; it is bad at ground level and good high above the earth.


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

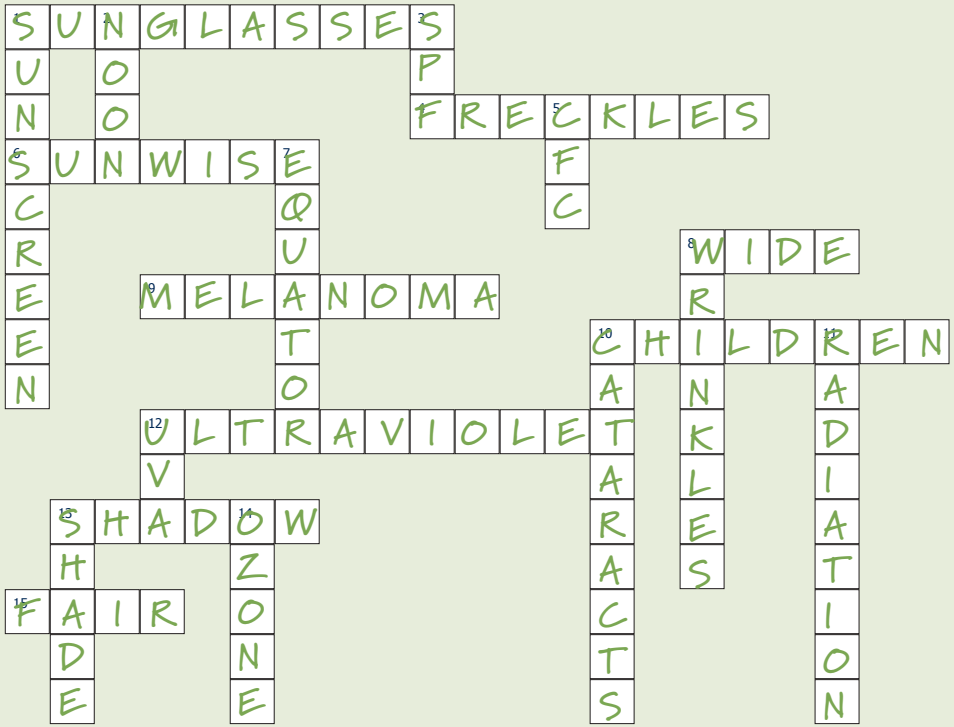
Sunny Crossword *Supplemental*

ESTIMATED TIME

10-15 minutes

LEARNING OBJECTIVE

This activity promotes the idea of protection from overexposure to the sun. Students will learn about the adverse health effects of UV radiation and how to avoid them.



CLUES AND ANSWERS

Across

1 The right type of these will block almost 100% bof the UV radiation that can cause damage to your eyes. *(Sunglasses)*

4 Small, brownish spots on the skin that can increase in number with exposure to sunlight. *(Freckles)*

6 NEEF school program that promotes sun safety. *(SunWise)*

8 A _____ brimmed hat will protect your face, neck, and ears. *(Wide)*

9 The most serious form of skin cancer. *(Melanoma)*

10 _____ are most at risk for overexposure to UV radiation because their young skin is thinner and more easily damaged. *(Children)*

12 UV is an acronym for _____. *(Ultraviolet)*

13 If your _____ is shorter than you are when you're outside, it's time to seek shade. *(Shadow)*

15 Everyone is affected by UV radiation. Skin color doesn't exclude anyone from its effects, but if you have _____ skin you are at higher risk for skin cancer. *(Fair)*

Down

1 Use this with at least broad spectrum SPF 30, and apply properly to protect against skin damage. *(Sunscreen)*

2 The time the sun is at its highest, which means its rays have less distance to travel through the atmosphere and the intensity is greatest. *(Noon)*

3 Initials for sun protection factor. *(SPF)*

5 Abbreviation for chlorofluorocarbon, one of the chemicals that destroys the fragile ozone layer. *(CFC)*

7 The sun's rays are stronger at high altitudes and closer to the _____. *(Equator)*

8 Overexposure to the sun can cause skin cancer, eye damage, and _____. *(Wrinkles)*

10 Eye damage that occurs when there is a loss of transparency in the lens, which clouds your vision. *(Cataracts)*

11 It is UV _____, not the warmth or the brightness of the sun, that causes damage to our skin. *(Radiation)*

12 This type of radiation is not absorbed by the ozone layer and can cause a lot of damage to our bodies. *(UVA)*

13 You can find protection from the sun's UV rays under the _____ of trees and umbrellas. *(Shade)*

14 A gas found in two layers of the atmosphere with the same chemical structure; it is bad at ground level and good high above the earth. *(Ozone)*

STUDENT PAGE

WordWise *Supplemental*

DIRECTIONS

Be WordWise! Look up each of the following words in the dictionary and write the definitions. Then create a sentence for each word. Make sure the reader can understand what the word means in the sentence. For example, if the word is "sunscreen," a sentence like, "I bought sunscreen at the store" does not help the reader understand what sunscreen is. However, a sentence like, "I applied sunscreen on my skin before I went outside to play so that I wouldn't get a sunburn" helps the reader know that sunscreen is some kind of protection from the sun that you put on your skin.

Sun

Solar

Epidermis

Ultraviolet Radiation

Suntan

Intensity

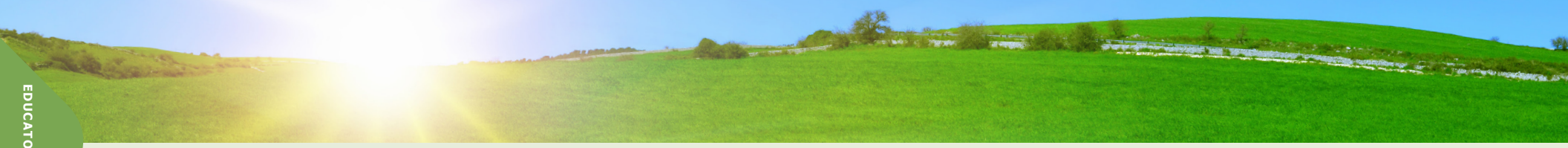
Atmosphere

Ozone

Ozone Layer

Pigment

Melanoma



WordWise *Supplemental*

ESTIMATED TIME

45-50 minutes

SUPPLIES

Dictionary

DIRECTIONS

The students should define each of the words and then use them in a sentence that somehow expresses the meaning of the word.

Sun — A star of medium brightness, around which the earth revolves. The sun provides the earth with its light and heat from 93 million miles away.

Solar — Of or relating to the sun; caused or produced by the action of the sun's light.

Epidermis — The outer layer of the skin of a vertebrate animal.

Ultraviolet Radiation — Radiation with a wavelength too small to be visible to the naked eye.

Suntan — Browning of the skin's pigment, caused by damage from exposure to the sun's UV rays.

Intensity — Strength, power, or energy.

Atmosphere — The whole mass of air and other gases surrounding the earth.

Ozone — A gas that forms in the atmosphere when three atoms of oxygen are combined. It can be good or bad depending on its location.

Ozone Layer — A layer in the stratosphere, which is located 6-30 miles above the earth's surface. It protects people from the damaging effects of the sun's rays by absorbing some UV radiation.

Pigment — Coloring material in the skin cells of plants and animals.

Melanoma — A usually malignant tumor containing dark pigment; a type of skin cancer.

ADDITIONAL ACTIVITIES

Using the words they defined, have students create:

- A short story for a younger audience
- A four to eight frame comic strip

Grades 6–8

NEEF SunWise

6-8 Educational Standards

								Educational Standards											
Health								*English Language*											
Personal, Family, and Community Health	Health-Enhancing Behaviors and Risks	Goal-Setting Skills	Decision-Making Skills	Interpersonal Communication	Health Information and Products	Influence Factors on Health Behaviors	Health Concepts	Evaluate the Soundness of Reasoning and Relevance and Sufficiency of Evidence (RI.6.8; RI.7.8; RI.8.8)	Determine Two or More Central Ideas in an Informational Text (RI.6.2; RI.7.2; RI.8.2)	Determine the Meaning of Words and Phrases As They Are Used in an Informational Text (RI.6.4; RI.7.4; RI.8.4)	Write Narratives to Develop Events (W.6.3; W.7.3; W.8.3)	Write Informative/Explanatory Texts (W.6.2; W.7.2; W.8.2)	Present Claims and Findings (SL.6.4; SL.7.4; SL.8.4)	Analyze the Main Ideas and Supporting Details Presented in Diverse Media and Formats (SL.6.2; SL.7.2; SL.8.2)	Engage in a Range of Collaborative Discussions (SL.6.1; SL.7.1; SL.8.1)	Conduct Short Research Projects to Answer a Question (W.6.7; W.7.7; W.8.7)	*SunWise Activity Title*	*Subject*
X	X				X					X			X	X	X	X	A Sunny Performance	English/LA, Health
	X												X		X		SunWise Show	English/LA, Health
X	X		X	X		X	X						X	X	X	X	Sun Scoop	English/LA, Health, Science
	X											X	X	X		X	SunWise Virtual Trip	English/LA, Health, Social Studies
											X						Sun Mythology	English/LA, Social Studies
									X		X			X		X	Sunsational Scientists in History	English/LA, Social Studies
													X	X		X	The Sun Shines Around the World	English/LA, Science, Social Studies
X					X		X		X						X		Why Does Winter Make Some People SAD?	English/LA, Health
X	X						X								X		Personal Skin Assessment	English/LA, Health, PE, Social Studies
																	Bargain Shopper	Math
															X	X	Skin Cancer in Your State	English/LA, Math
	X												X				SunWise Surveyor	English/LA, Health, Math, Science

Educational Standards

SunWise Activity Title	*Subject*	*English Language*									*Health*								
		Conduct Short Research Projects to Answer a Question (W.6.7; W.7.7; W.8.7)	Engage in a Range of Collaborative Discussions (SL.6.1; SL.7.1; SL.8.1)	Analyze the Main Ideas and Supporting Details Presented in Diverse Media and Formats (SL.6.2; SL.7.2; SL.8.2)	Present Claims and Findings (SL.6.4; SL.7.4; SL.8.4)	Write Informative/Explanatory Texts (W.6.2; W.7.2; W.8.2)	Write Narratives to Develop Events (W.6.3; W.7.3; W.8.3)	Determine the Meaning of Words and Phrases As They Are Used in an Informational Text (RI.6.4; RI.7.4; RI.8.4)	Determine Two or More Central Ideas in an Informational Text (RI.6.2; RI.7.2; RI.8.2)	Evaluate the Soundness of Reasoning and Relevance and Sufficiency of Evidence (RI.6.8; RI.7.8; RI.8.8)	Health Concepts	Influence Factors on Health Behaviors	Health Information and Products	Interpersonal Communication	Decision-Making Skills	Goal-Setting Skills	Health-Enhancing Behaviors and Risks	Personal, Family, and Community Health
You Are the Architect	English/LA, Health, Math, Science, Art				X												X	
Detecting UV Light Using Tonic Water	English/LA, Science		X															
Gumdrop Science	Science																	
Be a SunWise Traveler	English/LA, Health, Math, Social Studies	X			X												X	
A SunWise Legend	English/LA, Social Studies		X															
Keep an Eye on Sun Safety	English/LA, Health, Science		X							X							X	
Wild for Sun Protection	Science, English/LA	X			X												X	
UV ABCs	Science, Health, English/LA	X			X							X						
Supplemental																		
SunWise Flier	English/LA		X															
SunWise Word Problems	Math																	
UV Meter Activities																		
What Works? Effectively Blocking UV Rays	Science																	
Chart and Graph UV Intensity	Science, Math																	
Reflecting UV Radiation	Science, Math																	

Educational Standards

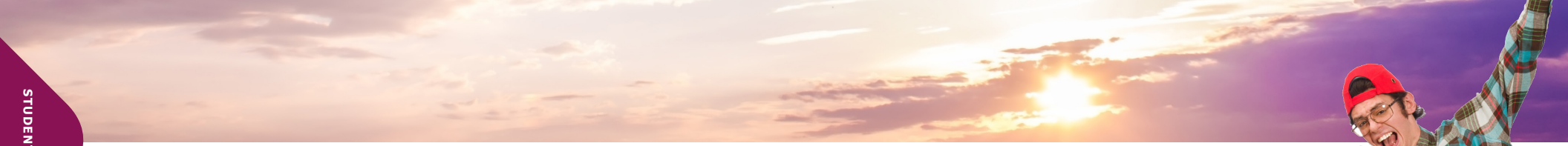
SunWise Activity Title	*Subject*	*Mathematics*			*Physical Education*			*Science*									*Social Studies*			
		The Number System	Ratios and Proportional Relationships	Geometry	Demonstrates Competency in a Variety of Motor Skills and Movement Patterns	Demonstrates the Knowledge and Skills to Achieve and Maintain Fitness	Exhibits Responsible Personal and Social Behavior That Respects Self and Others	Humans Are Dependent on Their Environmental Resources (MS-ESS3-1)	Patterns of Motion of the Sun Can Be Observed, Described, Predicted, and Explained (MS-ESS1-1)	When Light Shines on an Object, It Is Reflected, Absorbed, or Transmitted Through the Object(MS-PS4-2)	Substances React Chemically in Characteristic Ways (MS-PS1-2)	Human Activities Alter the Biosphere (MS-ESS3-3)	Engineering, Technology, and Application of Science (MS-ETS1)	Culture	People, Places, and Environments	Individual Development and Identity	Global Connections
	A Sunny Performance																			
	SunWise Show																			
	Sun Scoop							X												
	SunWise Virtual Trip																			X
	Sun Mythology																	X		X
	Sunsational Scientists in History																X			
	The Sun Shines Around the World							X								X				
	Why Does Winter Make Some People SAD?																			
	Personal Skin Assessment					X								X						
	Bargain Shopper	X																		
	Skin Cancer in Your State	X	X																	
	SunWise Surveyor	X	X	X					X											
	You Are the Architect		X	X					X											
	Detecting UV Light Using Tonic Water									X	X									

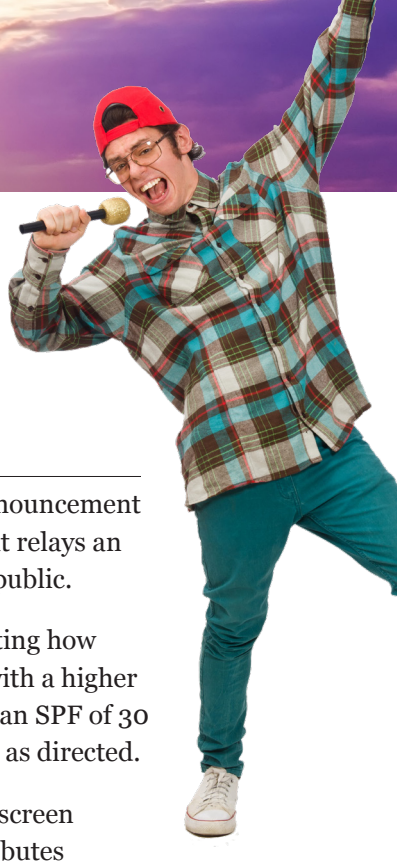
Educational Standards

Social Studies				*Science*						*Physical Education*			*Mathematics*				
Global Connections	Individual Development and Identity	People, Places, and Environments	Culture	Engineering, Technology, and Application of Science (MS-ETS1)	Human Activities Alter the Biosphere (MS-ESS3-3)	Substances React Chemically in Characteristic Ways (MS-PS1-2)	When Light Shines on an Object, It Is Reflected, Absorbed, or Transmitted Through the Object(MS-PS4-2)	Patterns of Motion of the Sun Can Be Observed, Described, Predicted, and Explained (MS-ESS1-1)	Humans Are Dependent on Their Environmental Resources (MS-ESS3-1)	Exhibits Responsible Personal and Social Behavior That Respects Self and Others	Demonstrates the Knowledge and Skills to Achieve and Maintain Fitness	Demonstrates Competency in a Variety of Motor Skills and Movement Patterns	Geometry	Ratios and Proportional Relationships	The Number System	*SunWise Activity Title*	*Subject*
					X											Gumdrop Science	Science
X	X	X													X	Be a SunWise Traveler	English/LA, Health, Math, Social Studies
			X													A SunWise Legend	English/LA, Social Studies
									X							Keep an Eye on Sun Safety	English/LA, Health, Science
									X							Wild for Sun Protection	Science, English/LA
									X							UV ABCs	Science, Health, English/LA
																Supplemental	
																SunWise Flier	English/LA
																SunWise Word Problems	Math
																UV Meter Activities	
				X												What Works? Effectively Blocking UV Rays	Science
				X												Chart and Graph UV Intensity	Science
				X												Reflecting UV Radiation	Science

*Please note that the standards listed in the above table have been paraphrased. For more information on the standards used, please refer to the Educational Standards section of the tool kit.

STUDENT PAGE





A Sunny Performance

DIRECTIONS

Use creativity, imagination, and artistic abilities to write a poem, rap or song, radio or television commercial, public service announcement (PSA), skit, or one-act play about being SunWise.

Decide which medium you want to use. Brainstorm ideas for your project and determine the kind of message you want to relay. Ideas may include the following:

- the beneficial effects of sunlight contrasted with adverse health effects of overexposure to the sun; sun protection methods—like avoiding burning, avoiding tanning, using broad spectrum SPF 30 or higher sunscreen, wearing protective clothing, and seeking shade;
- the UV Index;
- geographic locations where you need to be extra careful;
- the ozone layer; and
- the seasons.

Visit the SunWise website, **www.NEEFusa.org/SunWise**, and discover what you can do to protect yourself from the sun's harmful UV rays. After you complete your project, present or perform your finished product. You may even want to make a recording or a video to share!

VOCABULARY WORDS

Public Service Announcement (PSA) — A brief announcement distributed by television, radio, or print media that relays an educational and/or social message to the general public.

SPF or Sun Protection Factor — A number indicating how protective a sunscreen is against UVB radiation, with a higher SPF offering greater protection. A sunscreen with an SPF of 30 blocks 97% of incoming UVB radiation when used as directed.

Broad Spectrum — A label indicating that the sunscreen protects against both UVA radiation (which contributes to skin cancer and early aging) and UVB radiation, which is responsible for sunburn. This label indicates that the sunscreen offers UVA protection that is proportional to its UVB protection.

Ultraviolet (UV) Radiation — While not visible to the human eye, ultraviolet (UV) radiation is part of the energy radiated from the sun. It is responsible for sunburns and other adverse health effects.

UV Index — The UV Index provides a daily, localized forecast of the expected risk of overexposure to the sun's ultraviolet radiation (UV), taking into account factors including cloud coverage, location, and elevation. The UV Index predicts UV intensity levels on a scale of 0 to 11+, where < 2 indicates a low risk of overexposure and 11+ indicates an extreme risk.

A Sunny Performance

ESTIMATED TIME

40-50 minutes

SUPPLIES

- ✔ Information on sun safety (from the internet, fact sheets in the SunWisdom section, etc.)
- ✔ Video camera, computer, pencil and paper, or any other recording device (optional)

LEARNING OBJECTIVE

The aim of this activity is for students to: 1) learn various ways to protect themselves from overexposure to the sun's harmful UV rays; and 2) understand how the use of specific words and phrases influences meaning and helps convey ideas, including the use of figurative language, technical meaning, and connotation. By researching ideas for their performance, the students will become familiar with SunWise messages. Assess group performances to determine if students have learned about the steps to be SunWise. Have students in the audience evaluate the effectiveness of performances by identifying the main message of the group and pointing out what language the group used that helped convey their message.

Use the following questions to guide a discussion:

1. What was this group's message? Were they convincing?
2. What will you do differently now to be SunWise?

DIRECTIONS

Assign groups to collaborate on the production of a poem, rap or song, radio or television commercial, public service announcement (PSA), skit, or one-act play with a SunWise message. Before the students begin, have a brief discussion about the beneficial effects of sunlight, the adverse health effects of overexposure to the sun, sun protection, the UV Index, geographic locations where you need to be extra careful, the ozone layer, and the seasons.

Also, ask them to think of other PSAs, commercials, or advertisements that have been particularly effective (anti-bullying, anti-smoking, anti-violence, etc.) and to carefully consider how their language can help to effectively convey their message.

Instruct the groups to choose a presentation medium and then brainstorm ideas for the message they would like to relay. The students can visit the SunWise website (**www.NEEFusa.org/SunWise**), or you can copy fact sheets from the SunWisdom section of this tool kit. When the students have finished developing and rehearsing their project, have them present it to the other students. If equipment is available, record or make a video of their performances.

SunWise Show

DIRECTIONS

You know the importance of sunlight to life on earth, the need to be safe in the sun, and the dangers of overexposure to the sun's harmful rays, but some younger children in your local elementary school may not. Help them learn about being SunWise by creating a show.

First, make a list of all the important SunWise rules. Using the list, write a simple script for your show. The script should point out why it's important to be SunWise.

Create the props for your show. You can make puppets out of old socks. A cardboard box or similar item can serve as a stage. Remember your audience is young children, so develop the script accordingly. Once your script and props are ready, rehearse your show. Perform your production for younger students.

QUESTIONS

1. Why is it important to be SunWise?

2. How can children be SunWise?

SunWise Show

ESTIMATED TIME

120-150 minutes (2-3 class periods)

SUPPLIES

- ✔ Socks
- ✔ Glue
- ✔ Decorations for puppets, including buttons, beads, and pom-poms for eyes and noses
- ✔ Bottle caps and jar lids for making hats, eyes, or ears
- ✔ Cardboard box for a stage
- ✔ Construction paper to decorate the stage
- ✔ Computer with presentation software (optional)

LEARNING OBJECTIVE

This activity will give students an opportunity to play the role of SunWise instructor, while at the same time encouraging them to brush up on their own sun safety knowledge. It will also educate younger children about sun safety. Review SunWise concepts with the students before they begin work on their production.

DIRECTIONS

Divide the students into groups. Each group will write a script for a SunWise show that will be presented to younger students. The script should stress the importance of being safe in the sun and how the audience can be SunWise.

Next, if necessary, each group will create props for its show. Puppets can be made out of socks and other decorations. Have materials available for students to create props that are sun safe, such as hats with a wide brim and sunglasses. Stages can be fashioned from cardboard boxes and decorated with construction paper. Students can also create presentations using PowerPoint or another presentation software. Be available to answer students' questions if you use presentation software.

Once the groups have completed scripts and props, they should rehearse their productions before presenting to younger students.

QUESTIONS AND ANSWERS

1. Why is it important to be SunWise?
Being safe in the sun means avoiding overexposure to the sun's harmful UV rays, which can cause skin cancer and other health problems like heat exhaustion and heat stroke.

2. How can children be SunWise?
Being SunWise involves wearing a sun-safe hat, sunscreen with broad spectrum SPF of 30 or higher, and sunglasses; seeking shade whenever possible; limiting time in the midday (10 a.m. – 4 p.m.) sun; etc.

Sun Scoop

DIRECTIONS

Use a video camera, computer, pencil and paper, or any other recording device to develop a news story. Story angles could include: how the sun impacts our lives, the health effects of overexposure to the sun, what people do to protect themselves from the sun, or how the UV Index works.

First, select a topic for your news story. Then, gather the facts (who, what, when, where, why, and how) using resources such as the internet, encyclopedias, or your local newspaper. Interview an expert. This could be a science teacher, nurse, or local weather forecaster. Write a lead and the rest of the story. As a guide, answer the three questions below. Be prepared to share your news story.

Talk with the editor of your school or local paper about printing the news story. Ask your teacher or principal if you can read it over the PA system during morning announcements.

VOCABULARY WORDS

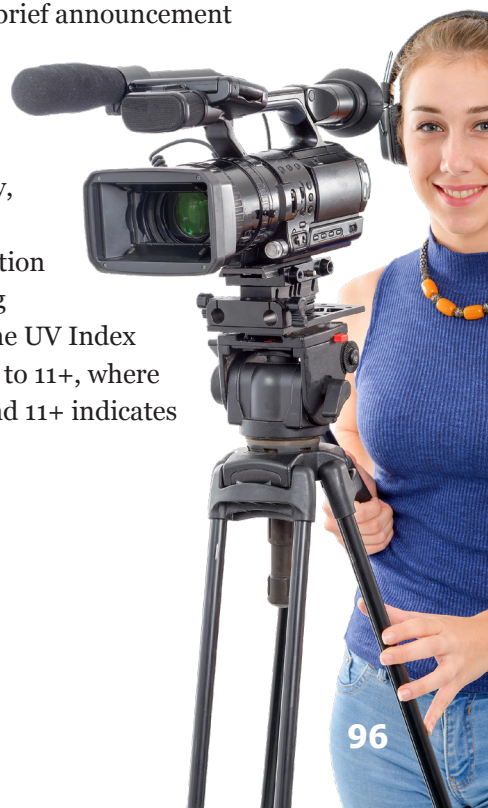
Story Angle — The topic or approach to a news story.

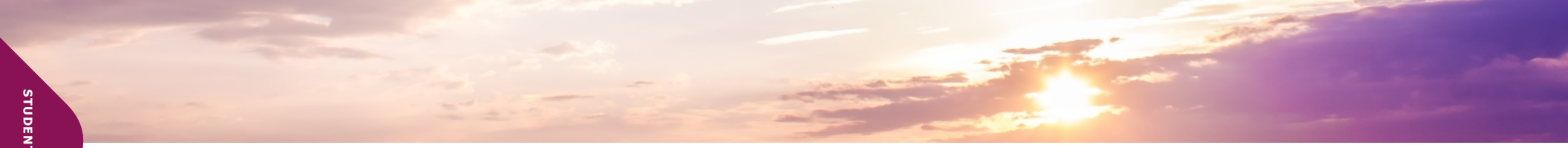
Who, What, When, Where, Why, and How — Questions that form the basic building blocks of any news story. A story might answer some or all of these questions.

Lead — The most important part of the story. The lead is always the first paragraph, and it answers some of the who, what, when, where, why, and how questions.

Public Service Announcement (PSA) — A brief announcement distributed by television, radio, or print media that relays an educational and/or social message to the general public.

UV Index — The UV Index provides a daily, localized forecast of the expected risk of overexposure to the sun's ultraviolet radiation (UV), taking into account factors including cloud coverage, location, and elevation. The UV Index predicts UV intensity levels on a scale of 0 to 11+, where < 2 indicates a low risk of overexposure and 11+ indicates an extreme risk.





QUESTIONS

1. Who is your expert and why did you select them? Prepare a short bio on your expert and include their credentials in your news story.

2. What questions will you ask the expert? Explain why you chose the questions.

3. What is the most important part—or lead—of your story? Give three reasons why you chose that particular lead.

4. Of the facts gathered, which ones should be included in your story? Construct an argument to support why you chose these facts.

Using your answers to the above questions, design and create two Public Service Announcements (PSAs) to share what you learned through this experience. One PSA should be written for adults and the other for lower elementary-age children. Be sure to choose terminology/vocabulary that is age-specific in both situations.

Sun Scoop

ESTIMATED TIME

30-60 minutes

SUPPLIES

- ✔ Video camera, computer, smart phone, or any other recording device (optional)
- ✔ Paper and pencils
- ✔ Research materials (encyclopedias, magazines, newspapers, or computers)

LEARNING OBJECTIVE

This activity uses journalism to raise awareness about the science and risk of overexposure to the sun's harmful UV rays and ways to be SunWise. Assess what students have learned by asking them to include the following in their story: information about how the sun impacts our lives; at least three ways to be SunWise; the effects of ignoring these precautionary measures; and some background information about the sun and UV radiation.

DIRECTIONS

Assign each student, or group of students, a story angle. If possible, arrange for a science teacher, nurse, or local weather forecaster to visit your students. Let the students interview the "expert." Have the students respond to the questions below as a group and then write their stories individually or in groups.

QUESTIONS AND ANSWERS

1. Who is your expert and why did you select them? Prepare a short bio on your expert and include their credentials in your news story.
   Students should name their expert and summarize their credentials in a short bio.
2. What questions will you ask the expert? Explain why you chose the questions.
   Students should list 3-5 questions and provide justification for their selections.
3. What is the most important part—or lead—of your story? Give three reasons why you chose that particular lead.
   Students should select one fact as the lead and provide three reasons for their selection.
4. Of the facts gathered, which ones should be included in your story? Construct an argument to support why you chose these facts.
   Students should list the other facts they will include in their story and construct an argument for their selections.

Design and create two Public Service Announcements (PSAs) to share what you learned through this experience. One PSA should be written for adults and the other for lower elementary-age children. Be sure to choose terminology/vocabulary that is age-specific in both situations.

Students should construct two age-specific PSAs demonstrating what they have learned.

ADDITIONAL RESOURCES

The National Elementary Schools Press Association.
www.nespa.ua.edu

The Learning Network: Teaching and Learning with the New York Times.
www.nytimes.com/section/learning

SunWise Virtual Trip

DIRECTIONS

People all over the world enjoy being outdoors in different ways. Some may spend a day at the beach, others may take hiking trips in the mountains, and others attend outdoor athletic or cultural events. No matter where you go or what you do, it is important to be SunWise.

Plan a trip and make sure you have everything you need to protect yourself from overexposure to the sun's harmful UV rays. Pick a destination and use the suggested websites to help answer questions about it. While researching the destination, consider how the location's weather and climate influences the behavior of the people who live there. Write a letter to the other students and tell them about your trip and what you have learned. Be sure to give tips on how to be SunWise. Use the ten questions below as a guide for your letter. Read your letter to the other students.

Have fun on your trip! The internet has many "travel" sites. You'll do some research and discover many things about different people, the places where they live, and how they interact with the sun.

Some suggested international destinations:

- Galapagos - **www.galapagos.org**
- Spain - **www.spain.info**
- India - **www.incredibleindia.org**
- Kenya - **www.magicalkenya.com**
- Australia - **www.australia.com**
- Antarctica - **https://www.expeditions.com/destinations/polar-regions/antarctica**

Other resources to help you pick a place to visit:

- **www.geographia.com**

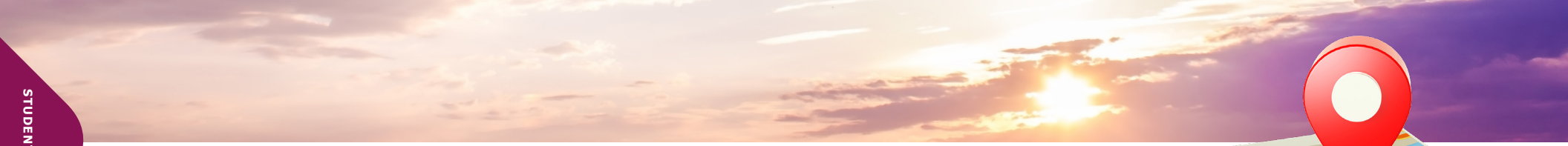
VOCABULARY WORDS

Weather — The daily conditions of the atmosphere at a geographic location during a specific time frame in terms of temperature, sunshine, wind velocity, precipitation, etc. Weather is what you see outside day-to-day. Weather conditions can change by the hour, or even by the minute.

Climate — Climate is the average of weather over several decades or longer for a geographic area.

Resources to learn about the weather/climate at your chosen destination and SunWise practices:

- **www.weather.com**
- **www.intellicast.com**
- **www.weatherbase.com**



QUESTIONS

1. How did you protect your skin and eyes while on your trip?

2. What did you pack for your trip?

3. What did you do on your trip?

4. What do people in the country you visited do for recreation? Where do they like to take trips?

5. What kind of outdoor activities do they like?

6. What is the climate like? What is the country's environment?

7. How do the local people stay cool/warm?

8. What kinds of clothes do people wear?

9. What type of houses do people live in?

10. How do people protect their skin and eyes?

11. How does the country's environment influence the behavior of the people who live there?

SunWise Virtual Trip

ESTIMATED TIME

45 minutes

LEARNING OBJECTIVES

This activity gives students the opportunity to learn about different cultures, develop internet research skills, and think about their interaction with the sun during recreational activities. This research may alert them to the risks associated with outdoor activities in the sun. Assess what they have learned about these risks by making sure they include SunWise tips in the letter they compose.

DIRECTIONS

Divide the students into small groups suitable for your group size and setup. Discuss possible "destinations" they would like to visit. Have each group pick a location and use the suggested websites to research the answers to the questions. You may want to develop a list of possible sites and make sure there are no duplicate locations. Students will compose a letter to the other students that includes the answers to the questions. The groups will then share their letter with the other students.

Some suggested international destinations:

- Galapagos - **www.galapagos.org**
- Spain - **www.spain.info**
- India - **www.incredibleindia.org**
- Kenya - **www.magicalkenya.com**
- Australia - **www.australia.com**
- Antarctica - **www.expeditions.com/destinations/antarctica**

Other resources to help you pick a place to visit:

- **www.geographia.com**

Resources to learn about the weather/climate at your chosen destination and SunWise practices:

- **www.weather.com**
- **www.intellicast.com**
- **www.weatherbase.com**

QUESTIONS

Answers to questions 2-9 should reflect students' research on their location.

1. How did you protect your skin and eyes while on your trip?
   Do not burn, avoid tanning, use broad spectrum sunscreen with SPF 30 or higher, cover up and wear sunglasses, seek shade, and check the UV Index.
2. What did you pack for your trip?
3. What did you do on your trip?
4. What do people in the country you visited do for recreation? Where do they like to take trips?
5. What kind of outdoor activities do they like?
6. What is the climate like? What is the country's environment?
7. How do the local people stay cool/warm?
8. What kinds of clothes do people wear?
9. What type of houses do people live in?
10. How do people protect their skin and eyes?
11. How does the country's environment influence the behavior of the people who live there?

PHYSICAL EDUCATION AND SOCIAL STUDIES VARIATION:

After choosing their trip location, have students try or demonstrate the native sports and activities of that country. This activity can be coordinated with social studies lessons or an all-school cultural event. Try bocce ball, petanque, speedaway, rugby, badminton, croquet, or soccer, or make up your own versions of rugby, lacrosse, and games that will be new to participants and age appropriate. You can even dress in the country's native clothing or discuss how citizens in these countries protect their skin. This event might also be used as an outreach vehicle to include parents or community members who have experience with activities native to other countries.

Sun Mythology

DIRECTIONS

Read the sun myth "Odhinn, One-Eyed Warrior" for inspiration, and then write your own original sun myth. Be creative. Your sun myth may focus on a fictitious or actual cultural group or figure.

"ODHINN, ONE-EYED WARRIOR"[1]

Odhinn is a Norse sun god. Odhinn is also known as Woden. The Germanic word "wuten" means "to rage."

Befitting a lord of the sun, Odhinn is often depicted dressed as a warrior. His armor is forged in the sacred metal of solar deities. He wears a chest-plate of pure gold. On his head is a golden-horned helmet. His weapon is the golden spear forged magically by dwarfs, and he rides an eight-legged horse across the sky.

As a warrior lord, Odhinn is served by the Valkyries, warrior maids who participate in every earthly battle and determine its outcome. Odhinn is also the inspiration behind the famed berserkers, warriors crazed with the fury of the battle.

The sun god has one eye. It is said that he gave the other eye for the gift of magic mead, a drink of poetic inspiration and knowledge. Odhinn plucked his eye from its socket and dropped it into the well of Mimir so he could drink from the magic waters and gain infinite wisdom.

The great inspiration of the enchanted well had a powerful effect on the warrior. He became known as a great healer and as the god of poetry. Still, he retained his position as the sun god, and in his battle fury, he was known as the One-Eyed Warrior.

To start writing your own sun myth, answer the following questions:

1. During what period of time does your sun myth take place?
2. Where does your sun myth take place?
3. In your sun myth, who are the main character(s)?
4. What powers does your main character(s) have?
5. What effect or change has your character(s) made?

[1] Adapted from the book *Sun Lore: Folktales and Sagas from Around the World*, by Gwydion O'Hara

Sun Mythology

ESTIMATED TIME

30-45 minutes

SUPPLIES

✔ Sun myth texts listed below or others you discover on your own.

Krupp, Dr. E.C. 1992. *Beyond the Blue Horizon: Myths and Legends of the Sun, Moon, Stars, and Planets.*

McDermott, Gerald. 1974. *Arrow to the Sun: A Pueblo Indian Tale.*

O'Hara, Gwydion. 1997. *Sun Lore: Folktales and Sagas from Around the World.*

St Rain, Tedd. Ed. 1999. *Sun Lore of All Ages: A Survey of Solar Mythology, Folklore, Customs, Worship, Festivals, and Superstition.*

Luomala, Katharine. 1988. *Oceanic, American Indian and African Myths of the Snaring Sun.*

Windows to the Universe website: **www.windows2universe.org/mythology/myths_stories_art.html**

LEARNING OBJECTIVE

The students will learn that people from all over the world have different stories about the sun. Before reading the story, ask students what they know about the sun. For example, the sun's location in our galaxy; its life as a star; and its importance to the ecosystem of the planet. Write their ideas on the board.

After reading the story, assess what students have learned by comparing their own knowledge about the sun with that of other ancient cultures (the Norse, for example).

DIRECTIONS

Use the example myth on the Student Page or other sun myth texts as a catalyst for a group discussion about the many cultures that have myths and folklore associated with the sun. Read one or two sun myths aloud or make photocopies of additional texts for silent reading.

Instruct your students to write their own sun myth. To get them started, have them answer the questions listed after the reading. Encourage students to use descriptive and colorful language. Their myths should focus either on a fictitious or actual cultural group or figure.

Once your students complete their assignment, have volunteers read their myths aloud. After sharing a number of original sun myths, engage students in a discussion about the importance of the sun as a powerful energy supply and a source of life on earth.

DISCUSSION

Why do so many cultures, past and present, revere the sun? Possible answers include: In ancient times, people were afraid of the sun because they did not understand its motion across the sky; the sun is a producer of crops, and as such, they consider the sun a generous god; scientists study the sun as an example of a medium-sized Class III star that is merely one of 200-300 billion in this galaxy alone, but sustains all life on earth.

STUDENT PAGE

Sunsational Scientists in History

DIRECTIONS

Research and write short paragraphs about these topics and historic people:

- Ptolemy
- Geocentrism
- Heliocentrism
- Nicolas Copernicus
- Galileo Galilei

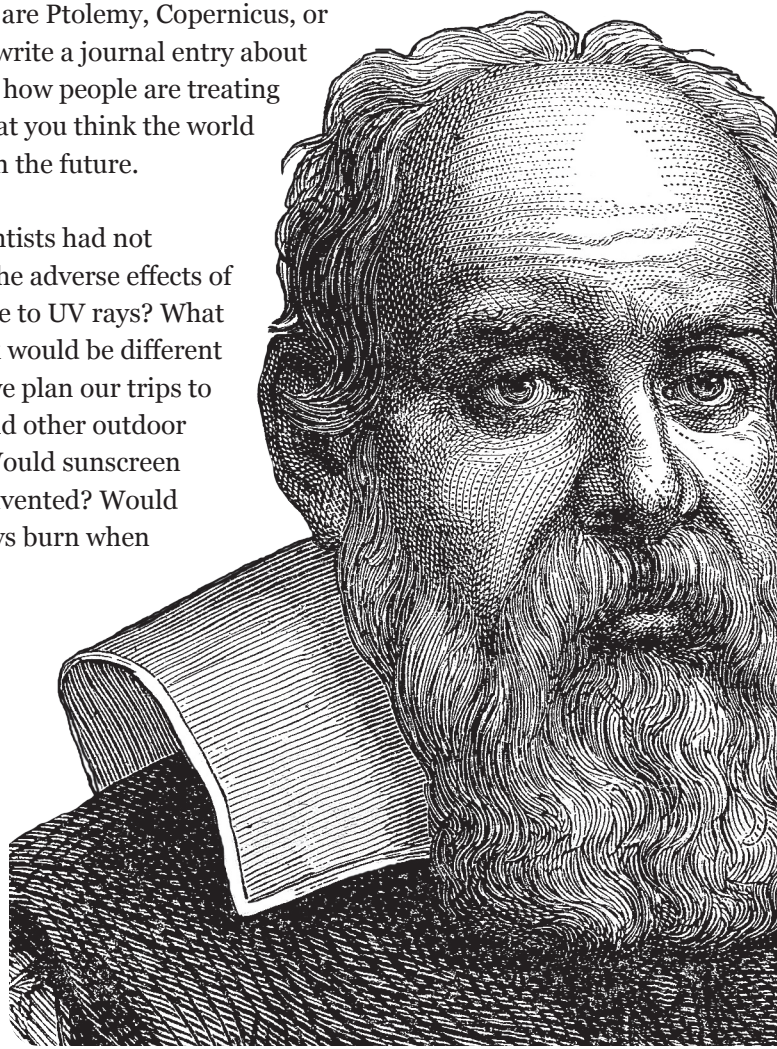
Find a correlation between the topics and people. Discuss your findings with other students to piece the history together.

Draw a picture or write a short story about how you believe the world would be different if we still thought the sun revolved around the earth.

QUESTIONS

1. Pretend you are Ptolemy, Copernicus, or Galileo and write a journal entry about your beliefs, how people are treating you, and what you think the world will be like in the future.

2. What if scientists had not discovered the adverse effects of overexposure to UV rays? What do you think would be different about how we plan our trips to the beach and other outdoor activities? Would sunscreen have been invented? Would people always burn when outside?



Sunsational Scientists in History

ESTIMATED TIME

30-45 minutes

SUPPLIES

✔ Access to the school library and/or the internet

LEARNING OBJECTIVE

Through this investigation, the students will learn about the scientists and societal beliefs that contributed to the information we now know about the sun. Use the questions to assess correlations the students have made from their research.

DIRECTIONS

Take your students to the library to do research on the astronomical history of the sun.

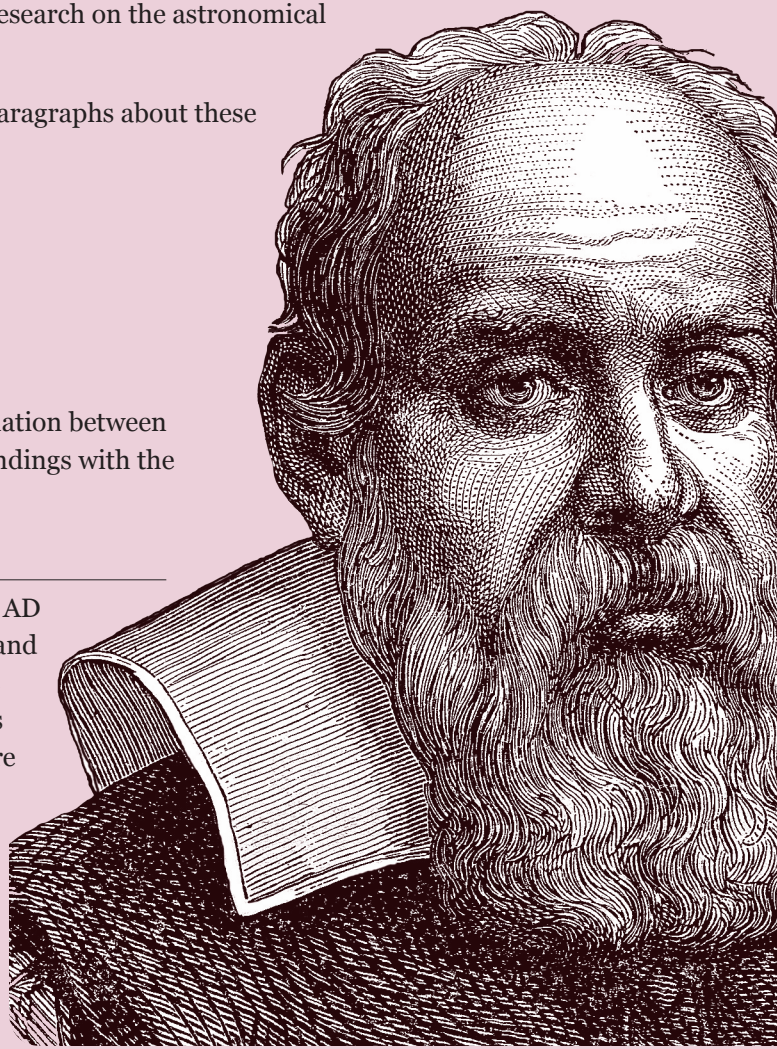
Students will research and write short paragraphs about these topics and historic people:

- Ptolemy
- Geocentrism
- Heliocentrism
- Nicolas Copernicus
- Galileo Galilei

Students should be able to see the correlation between the topics and the people. Discuss the findings with the students and piece the history together.

WHAT IS THE CORRELATION?

Ptolemy, believed to have lived between AD 100 and 170, was a famous astronomer and mathematician, even though most of his theories were later proven incorrect. His theories formed the foundation for future astronomers and mathematicians. His theories dominated the scientific field until the 16th century. He considered the earth as the center of the universe (geocentrism).



Nicolas Copernicus was a Polish astronomer who lived between 1473 and 1543. Before his time, people believed in the Ptolemaic (named after the Greek astronomer Ptolemy) model of the solar system. This model showed that the earth was the center of the universe, but it did not work well enough to predict the positions of the planets. In 1543, Copernicus started a scientific revolution when he published a theory called heliocentrism, which stated that all the planets, including earth, revolved around the sun.

Galileo Galilei was an Italian astronomer and physicist who lived between 1564 and 1642. He challenged ancient beliefs that heavenly bodies, like stars and planets, were divine and therefore perfect. In 1609, Galileo became the first person to use a telescope to look at the universe. He discovered sunspots, craters, and peaks in earth's moon. After his great discoveries, he published a book about sunspots and discussed Ptolemaic and Copernican theories.

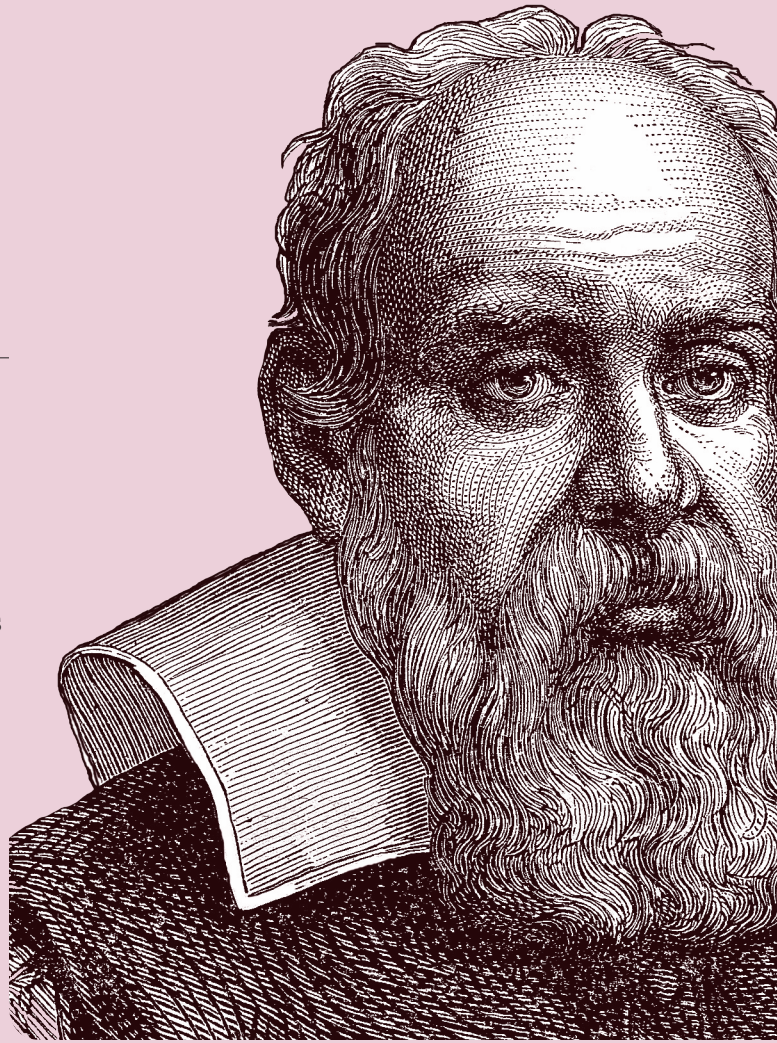
QUESTIONS AND ANSWERS

1. Pretend you are Ptolemy, Copernicus, or Galileo and write a journal entry about your beliefs, how people are treating you, and what you think the world will be like in the future.
Students should correctly describe the beliefs of their chosen astronomer and the persecution that astronomer underwent. Students should come up with creative ideas of what the world will be like in the future.

2. What if scientists didn't discover the adverse effects of overexposure to the sun's UV rays? What do you think would be different about how we plan our trips to the beach and other outdoor activities? Would sunscreen have been invented? Would people always burn when outside?
Possible answers include: People would not consider the harmful impacts of overexposure to the sun's UV rays when they plan trips to the beach; sunscreen may never have been invented, since people would not know that they need to protect themselves from the sun; people may burn frequently when they are outside.

ADDITIONAL RESOURCE

Windows to the Universe website:
www.windows2universe.org/people/ren_epoch.html



The Sun Shines Around the World

DIRECTIONS

Use encyclopedias, periodicals, books, or the internet to research your assigned country and answer the questions below. Be prepared to share your findings.

QUESTIONS

1. What is the name of the country you researched?
2. On what continent is the country?
3. What countries or physical features border the country?
4. In what types of houses do the people of this country live? Of what are the houses made? How do the houses help the people of this country protect themselves from the sun?
5. What kinds of clothes do the people of this country wear?
6. Describe a few customs that people in this country have that protect them from the sun.
7. What are at least three differences between your state and the country you researched?
8. Summarize how the environment of the country influences the behavior of the people who live there.

The Sun Shines Around the World

ESTIMATED TIME

20-45 minutes

SUPPLIES

- ✔ Map of the world (for display)
- ✔ Research materials (encyclopedias, travel or geography magazines, or computers)

LEARNING OBJECTIVE

This activity will teach students about a variety of ways people all over the world protect themselves from overexposure to the sun's harmful UV rays.

Students will understand how a country's environment influences the behavior of the people who live there.

After completing the activity, students should be able to describe different ways individuals from the country researched are SunWise.

DIRECTIONS

Assign a student or pair of students to research a country. Instruct the students to use the questions below as a guide.

QUESTIONS AND ANSWERS

Answers should match the country researched.

1. What is the name of the country you researched?
2. On what continent is the country?
3. What countries or physical features border the country? Student should name bordering countries, bodies of water, etc.
4. In what types of houses do the people of this country live? Of what are the houses made? How do the houses help the people of this country protect themselves from the sun?
5. What kinds of clothes do the people of this country wear?
6. Describe a few customs that people in this country have that protect them from the sun.
7. What are at least three differences between your state and the country you researched?
8. Summarize how the environment of the country influences the behavior of the people who live there.

ADDITIONAL RESOURCE

Geographia: **www.geographia.com**
Geographia offers a variety of information on housing, clothing, and customs of countries throughout the world.

Why Does Winter Make Some People SAD?

VOCABULARY WORDS

Lethargy — The quality or state of being lazy, sluggish, or indifferent.

Melatonin — A chemical produced in the pineal gland of the brain that tells the body when it is nighttime and makes people feel tired.

Pineal Gland — The specific area of the brain that produces melatonin.

Serotonin — A chemical in the brain that regulates our moods (like happiness, anger, and aggression).

DIRECTIONS

Read the information provided describing Seasonal Affective Disorder (SAD) and answer the questions.

What is SAD?

Overexposure to ultraviolet (UV) radiation from the sun can damage skin and eyes and cause skin cancer. But despite these and other harmful effects, the sun is necessary for life to survive on earth. Too little sunlight can contribute to Seasonal Affective Disorder (SAD). Human beings and animals react to changing seasons with changes in mood and behavior. Most people find they eat and sleep slightly more in winter and dislike the dark mornings and short days.

At night the pineal gland in our brain produces melatonin to make us sleepy and when morning comes the sunlight triggers the pineal gland to stop producing melatonin so we can wake up.

During the winter months there is less light and we produce more melatonin, which can make many people feel more tired than they would in the spring, summer, and fall. Although no one is sure exactly why too much melatonin can make us feel sad, it may be caused by lowering another chemical in the brain called serotonin. In many people, feelings of depression are caused by too little serotonin in the brain.

For some people, symptoms are severe enough to affect their ability to lead normal lives. These people may be suffering from SAD, also known as winter depression. People with SAD may have trouble with sleeping, overeating, depression, and lethargy, as well as other physical and mental problems.

Whom does SAD affect?

Across the world, the incidence of SAD increases with distance from the equator, where the nights get very long during the winter (except in areas where there is a lot of snow on the ground, which helps to reflect sunlight and keep our melatonin levels down). People with SAD have symptoms from around September until April. The symptoms are worse during the darkest months. Both children and adults can suffer from SAD. It usually affects more women than men.

How can SAD be treated?

SAD can be treated with daily exposure to bright light. Making sure to spend some time outside each day can help people to feel better. Some people with SAD also use a special machine, called a "light box," which they shine on themselves in order to keep their melatonin levels down. These machines produce visible light but do not emit harmful UV rays. The light produced by a light box is about as bright as a spring morning on a clear day. As little as 15 to 30 minutes of light box therapy helps some people to feel better.

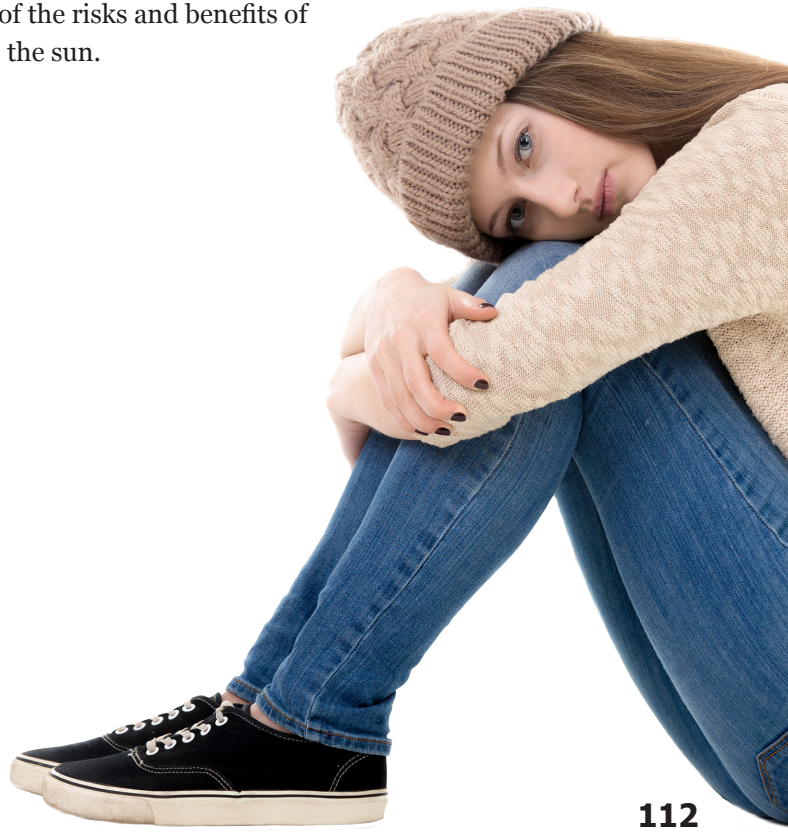
QUESTIONS

1. Pretend you are a doctor. List three questions you would ask your patients to determine if they have SAD.

2. Consider the symptoms of SAD. Can you make an educated guess about the causes of SAD? List three possible causes of SAD.

3. If you noticed that one of your friends was frequently tired and grumpy during your winter vacation, what would you recommend he or she do?

4. Make a list of the risks and benefits of exposure to the sun.



Why Does Winter Make Some People SAD?

ESTIMATED TIME

30-45 minutes

LEARNING OBJECTIVE

This activity will help students understand the science of the sun and its good effects on people. Students will read a short selection about Seasonal Affective Disorder (SAD). They will propose a cause for SAD after "diagnosing" the problem. Review their answers to question number four to assess if they understand the risks and benefits of exposure to the sun.

DIRECTIONS

After instructing students to read the information provided describing SAD, ask them to answer the questions. If they have trouble answering the questions, help them by sharing some of the additional information provided. Discuss the cause and treatment of SAD with the students.

What is SAD?

Overexposure to ultraviolet (UV) radiation from the sun can damage skin and eyes and cause skin cancer. But despite these and other harmful effects, the sun is necessary for life to survive on earth. Too little sunlight can also contribute to Seasonal Affective Disorder (SAD). Human beings and animals react to changing seasons with changes in mood and behavior. Most people find they eat and sleep slightly more in winter and dislike the dark mornings and short days.

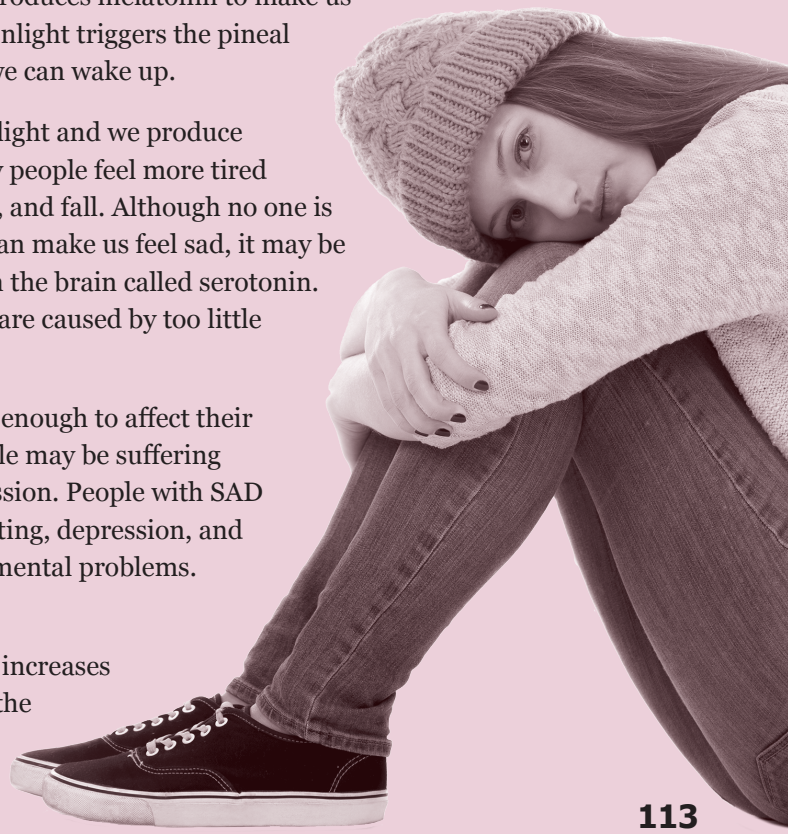
At night the pineal gland in our brain produces melatonin to make us sleepy and when morning comes the sunlight triggers the pineal gland to stop producing melatonin so we can wake up.

During the winter months there is less light and we produce more melatonin, which can make many people feel more tired than they would in the spring, summer, and fall. Although no one is sure exactly why too much melatonin can make us feel sad, it may be caused by lowering another chemical in the brain called serotonin. In many people, feelings of depression are caused by too little serotonin in the brain.

For some people, symptoms are severe enough to affect their ability to lead normal lives. These people may be suffering from SAD, also known as winter depression. People with SAD may have trouble with sleeping, overeating, depression, and lethargy, as well as other physical and mental problems.

Whom does SAD affect?

Across the world, the incidence of SAD increases with distance from the equator, where the nights get very long during the winter



(except in areas where there is a lot of snow on the ground, which helps to reflect sunlight and keep our melatonin levels down). People with SAD have symptoms from around September until April. The symptoms are worse during the darkest months. Both children and adults can suffer from SAD. It usually affects more women than men.

How can SAD be treated?

SAD can be treated with daily exposure to bright light. Making sure to spend some time outside each day can help people to feel better. Some people with SAD also use a special machine, called a "light box," which they shine on themselves in order to keep their melatonin levels down. These machines produce visible light but do not emit harmful UV rays. The light produced is about as bright as a spring morning on a clear day. As little as 15 to 30 minutes of light box therapy helps some people to feel better.

QUESTIONS AND ANSWERS

1. Pretend you are a doctor. List three questions you would ask your patients to determine if they have SAD.
   Possible answers: 1) Do you find you sleep more in the winter? 2) During the winter, do you have many mood swings? 3) Do you eat more during the winter months?
2. Consider the symptoms of SAD. Can you make an educated guess about the causes of SAD? List three possible causes of SAD.
   Possible answers: lack of sunlight, decreased levels of serotonin, increased levels of melatonin.
3. If you noticed that one of your friends was frequently tired and grumpy during your winter vacation, what would you recommend he or she do?
   Possible answers before group discussion include: get more rest, get more exercise, or spend more time with friends and family. Possible answers after group discussion include: spend time outside on sunny days, visit a sunny place, or talk to a doctor to see if a light box would be right for you.
4. Make a list of the risks and benefits of exposure to the sun.
   Risks include: skin cancer, cataracts, premature aging of the skin, and suppression of the immune system. Benefits include: alleviation of depression caused by SAD, and vitamin D synthesis.

ADDITIONAL RESOURCES

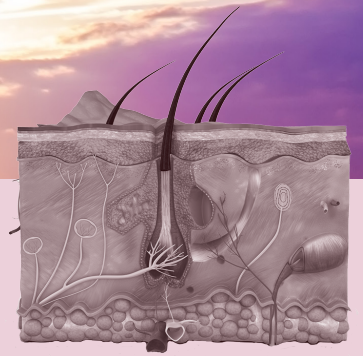
Information about SAD from Mayo Clinic: **www.mayoclinic.org/diseases-conditions/seasonal-affective-disorder/symptoms-causes/syc-20364651**

Nemour Foundation is one of the largest nonprofit organizations devoted to children's health. Their website is written in a question and answer format using non-clinical language. The site provides fundamental information about SAD: **kidshealth.org/en/teens/sad.html?WT.ac=ctg**

Personal Skin Assessment

Risk Factor	SELF		Family Member 1		Family Member 2		Family Member 3	
	Yes	No	Yes	No	Yes	No	Yes	No
Light or fair skin								
Blue, green, or hazel eye color								
Blonde or red hair								
Freckles when in the sun								
Burn when in the sun								
40 or more moles								
Family or personal history of melanoma								
Living in the Sunbelt								
Living in high altitudes								
Two or more blistering sunburns								
Exposure to UV radiation from tanning machines or medical treatment								
Taking medications that increase the skin's photosensitivity (some antibiotics and antihistamines)								

Adapted from *Project S.A.F.E.T.Y., Risk and Risk Factors, Elementary Safety Lesson Five.*



Personal Skin Assessment

ESTIMATED TIME

One 30 minute period and one 15 minute period (or optional homework exercise)

LEARNING OBJECTIVE

After completing this activity, students will understand the need to be careful when at risk of overexposure to harmful UV rays. Students who possess risk factors will develop a heightened sense of their own risk. To assess student comprehension of the risk and prevention message, ask them to make a flier, poster, or collage that depicts individuals being SunWise.

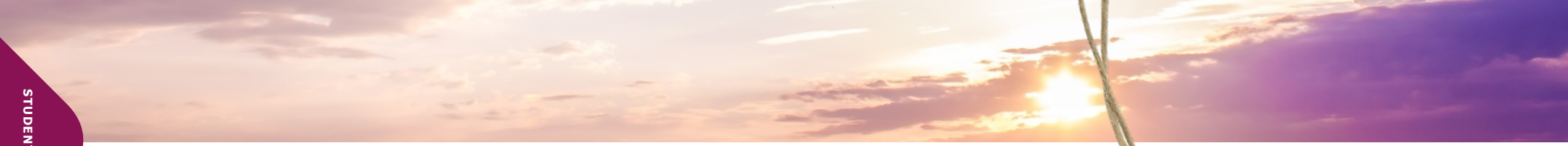
DIRECTIONS

Educators are cautioned to be sensitive to the privacy concerns of students during this activity. Also be aware that students may answer no to all the questions, thereby allowing for the misconception that they are not at risk for overexposure to UV radiation.

Instruct students to evaluate their own risk factors, checking off yes or no in each column. Have students go back to their seats and by a show of hands, take a count of the responses on the risk assessment. Ask students to predict on paper the risk level of their family members. As a homework assignment, have students evaluate their families for risk factors. During the next time period, assign one student to be a recorder on the whiteboard of five to ten randomly selected responses you read aloud.

Discuss risk factors with the students and ask students to list ways to prevent overexposure to the sun. Have them relate what they learned about tanning booths.

Using the fact sheets (located in the SunWisdom section of the tool kit) as your guide, discuss the prevention steps with the students. Stress the importance of protection from harmful UV rays, especially for individuals who have several risk factors.



Bargain Shopper

DIRECTIONS

Make a list of items you might purchase to use as protection against the sun's harmful UV rays.

Now "go shopping" for these items. Look for them in magazine or newspaper ads, catalogs, or on the internet. Check whether you have some of the products at home—they may still have a price tag. Develop a list that compares the prices for different items and brands.

Imagine that you have $50 to spend on your protective items. Describe how you will use that money to buy SunWise items. Keep in mind that some SunWise items may be free.

Share your list with other students and see who was able to buy the most for $50.

Bargain Shopper

ESTIMATED TIME

45 minutes (Students may also spend some time doing research as homework.)

SUPPLIES

- ✔ Newspaper sales flyers
- ✔ Catalogs
- ✔ Computer

LEARNING OBJECTIVE

The objective of this activity is to help students understand the variety of ways in which they can protect themselves from the sun's harmful UV rays. After completing this activity, students should understand that using broad spectrum sunscreen, hats, and sunglasses are examples of SunWise behavior. Assess whether the students understand that they must protect themselves from the sun's harmful UV rays by asking them to draw a diagram depicting their preparation for their next visit to the park or beach. Look for the gathering of sun safety gear as a key preparation element.

DIRECTIONS

Instruct students to develop lists of items used to protect against the sun's harmful UV rays. For example: broad spectrum sunscreen with SPF 30 or higher, sunglasses, long-sleeved shirts, umbrellas, etc. Have the students "go shopping" for these items by looking up prices in advertisements, on the internet, or at home. They should then develop a list of prices for each item. The list may duplicate some items (e.g., one cost for Brand X sunscreen and another for Brand Y).

Tell the students that they have $50 with which to purchase SunWise items for a day at the beach, a ski trip, or any type of outing. They should figure out how to maximize their budget while still buying all the necessary items. Students can include "free" items, such as "staying indoors" or "eating lunch in the shade" in their budget.

Ask the students to share their lists with other students and see who was able to buy the most for $50.

Skin Cancer in Your State

DIRECTIONS

The estimated number of new melanoma cases diagnosed per year in each state is provided, along with the total population of each state.

Calculate the percentage of individual cases of melanoma in each state by dividing the number of new cases by the total state population. Figure the percentage to three decimal places, and write it on the line provided for only 10 states, including your own. Then plot the data in the bar graph for the states you chose. Next, figure out the ratio of new cancer cases in those 10 states.

QUESTIONS

1. How high is the risk in your state?

2. Rank the 10 states in order from lowest to highest risk. How does the risk in your state compare to others? Why are there differences?

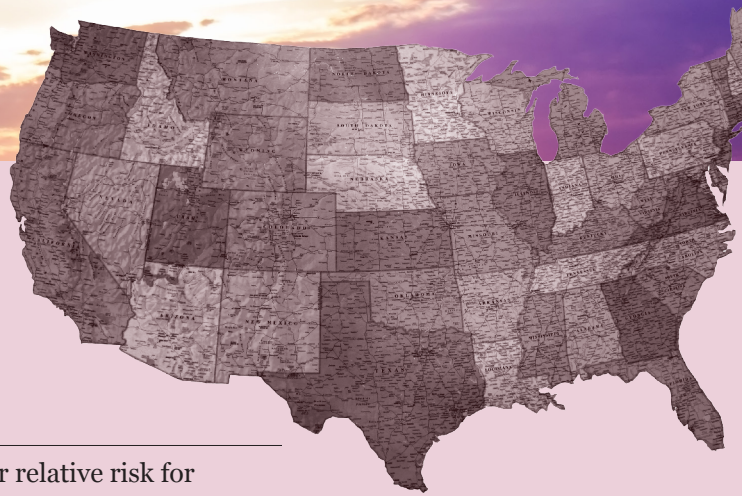
Skin Cancer in Your State

ESTIMATED US MELANOMA CASES, 2016				
State	*New Melanoma Cases**	*Population***	*Percentage*	*Ratio*
Alabama	1,390	4,863,300		
Alaska	100	741,894		
Arizona	1,510	6,931,071		
Arkansas	340	2,988,248		
California	8,560	39,250,017		
Colorado	1,460	5,540,545		
Connecticut	680	3,576,452		
Delaware	320	952,065		
District of Columbia	110	681,170		
Florida	6,200	20,612,439		
Georgia	2,540	10,310,371		
Hawaii	410	1,428,557		
Idaho	490	1,683,140		
Illinois	2,500	12,801,539		
Indiana	1,460	6,633,053		
Iowa	1,000	3,134,693		
Kansas	820	2,907,289		
Kentucky	1,450	4,436,974		
Louisiana	620	4,681,666		
Maine	340	1,331,479		
Maryland	1,590	6,016,447		
Massachusetts	1,380	6,811,779		
Michigan	2,560	9,928,300		
Minnesota	1,220	5,519,952		
Mississippi	490	2,988,726		
Missouri	1,610	6,093,000		

ESTIMATED US MELANOMA CASES, 2016				
State	*New Melanoma Cases**	*Population***	*Percentage*	*Ratio*
Montana	350	1,042,520		
Nebraska	470	1,907,116		
Nevada	440	2,940,058		
New Hampshire	290	1,334,795		
New Jersey	2,470	8,944,469		
New Mexico	450	2,081,015		
New York	4,250	19,745,289		
North Carolina	2,850	10,146,788		
North Dakota	190	757,952		
Ohio	2,880	11,614,373		
Oklahoma	570	3,923,561		
Oregon	1,530	4,093,465		
Pennsylvania	3,750	12,784,227		
Rhode Island	210	1,056,426		
South Carolina	1,540	4,961,119		
South Dakota	210	865,454		
Tennessee	1,850	6,651,194		
Texas	2,920	27,862,596		
Utah	840	3,051,217		
Vermont	180	624,594		
Virginia	2,340	8,411,808		
Washington	2,440	7,288,000		
West Virginia	640	1,831,102		
Wisconsin	1,350	5,778,708		
Wyoming	180	585,501		
TOTAL	76,380	323,127,513		

* 2016 melanoma statistics are from the American Cancer Society: **www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/annual-cancer-facts-and-figures/2016/estimated-number-of-new-cases-for-selected-cancers-by-state-us-2016.pdf**

** For more information about the estimated 2016 US Census data by state, visit: **https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=PEP_2016_PEPANNRES&src=pt**



Skin Cancer in Your State

ESTIMATED TIME

40-50 minutes

LEARNING OBJECTIVE

This activity will raise student awareness of skin cancer statistics. It will also help students gauge the risk they incur from their environment and reinforce the SunWise message, while they practice math skills. Assess whether they understand the importance of protecting themselves from harmful UV rays by asking them to make a bar chart that demonstrates risk in their state and nine others.

DIRECTIONS

This exercise will show students their relative risk for melanoma, as determined by location. It will also give them practice in calculating percentages and ratios, working with decimals, and graphing data.

The estimated melanoma rates by state, from the American Cancer Society, and the estimated state populations, from the US Census Bureau, are listed. The students should calculate the percentage (to three decimal places) of people in 10 states, including their own, expected to be diagnosed with skin cancer. They will then graph the information to get a sense of the effects of skin cancer on the population. To further understand these effects, have the student calculate ratios in the space provided.

QUESTIONS AND ANSWERS

1. How high is the risk in your state?
Students should answer based on their calculations.

2. Rank the states in order from lowest to highest risk. How does the risk in your area compare to others? Why are there differences?
Answers will vary and should address location of state. Students should have each state ranked from 1-10, and note their state's risk relative to other states.

3. What can you do to lower your risk for getting skin cancer?
Do not burn. Limit time in the midday sun, seek shade, always use broad spectrum sunscreen with SPF 30 or higher, wear a hat, cover up, wear sunglasses that block UV radiation, avoid sunlamps and tanning parlors, and check the UV Index.

SKIN CANCER IN YOUR STATE ESTIMATED US MELANOMA CASES, 2016				
State	*New Melanoma Cases**	*Population***	*Percentage*	*Ratio*
Alabama	1,390	4,863,300	0.029%	1:3,499
Alaska	100	741,894	0.013%	1:7,419
Arizona	1,510	6,931,071	0.022%	1:4,590
Arkansas	340	2,988,248	0.011%	1:8,789
California	8,560	39,250,017	0.022%	1:4,585
Colorado	1,460	5,540,545	0.026%	1:3,795
Connecticut	680	3,576,452	0.019%	1:5,259
Delaware	320	952,065	0.034%	1:2,975
District of Columbia	110	681,170	0.016%	1:6,192
Florida	6,200	20,612,439	0.030%	1:3,325
Georgia	2,540	10,310,371	0.025%	1:4,059
Hawaii	410	1,428,557	0.029%	1:3,484
Idaho	490	1,683,140	0.029%	1:3,435
Illinois	2,500	12,801,539	0.020%	1:5,121
Indiana	1,460	6,633,053	0.022%	1:4,543
Iowa	1,000	3,134,693	0.032%	1:3,135
Kansas	820	2,907,289	0.028%	1:3,545
Kentucky	1,450	4,436,974	0.033%	1:3,060
Louisiana	620	4,681,666	0.013%	1:7,551
Maine	340	1,331,479	0.026%	1:3,916
Maryland	1,590	6,016,447	0.026%	1:3,784
Massachusetts	1,380	6,811,779	0.020%	1:4,936
Michigan	2,560	9,928,300	0.026%	1:3,878
Minnesota	1,220	5,519,952	0.022%	1:4,525
Mississippi	490	2,988,726	0.016%	1:6,099
Missouri	1,610	6,093,000	0.026%	1:3,784

SKIN CANCER IN YOUR STATE ESTIMATED US MELANOMA CASES, 2016				
State	*New Melanoma Cases**	*Population***	*Percentage*	*Ratio*
Montana	350	1,042,520	0.034%	1:2,979
Nebraska	470	1,907,116	0.025%	1:4,058
Nevada	440	2,940,058	0.015%	1:6,682
New Hampshire	290	1,334,795	0.022%	1:4,603
New Jersey	2,470	8,944,469	0.028%	1:3,621
New Mexico	450	2,081,015	0.022%	1:4,624
New York	4,250	19,745,289	0.022%	1:4,646
North Carolina	2,850	10,146,788	0.028%	1:3,560
North Dakota	190	757,952	0.025%	1:3,989
Ohio	2,880	11,614,373	0.025%	1:4,033
Oklahoma	570	3,923,561	0.015%	1:6,883
Oregon	1,530	4,093,465	0.037%	1:2,675
Pennsylvania	3,750	12,784,227	0.029%	1:3,409
Rhode Island	210	1,056,426	0.020%	1:5,031
South Carolina	1,540	4,961,119	0.031%	1:3,222
South Dakota	210	865,454	0.024%	1:4,121
Tennessee	1,850	6,651,194	0.028%	1:3,595
Texas	2,920	27,862,596	0.010%	1:9,542
Utah	840	3,051,217	0.028%	1:3,632
Vermont	180	624,594	0.029%	1:3,470
Virginia	2,340	8,411,808	0.028%	1:3,595
Washington	2,440	7,288,000	0.033%	1:2,987
West Virginia	640	1,831,102	0.035%	1:2,861
Wisconsin	1,350	5,778,708	0.023%	1:4,281
Wyoming	180	585,501	0.031%	1:3,253
TOTAL	76,380	323,127,513	0.024%	1:4,231

SunWise Surveyor

DIRECTIONS

You are a surveyor. You measure and map land areas and have been assigned to determine the current availability of shade on your school's property. This will help school administrators decide if the grounds are sun safe.

Take a survey of the grounds during a period when students are using them. Don't forget to be SunWise as you walk around the school!

Begin by drawing a map of the school grounds. Observe and mark on the map the most popular places where students congregate and play. These play areas can include sports fields, jungle gyms, blacktops, eating areas, and any other places where kids hang out.

Survey and mark the parts of the play areas that are covered in shade. Take note of what time of day it is, and how the movement of the sun might affect the shaded areas. Measure the dimensions of the play areas and write down your results. Then, measure the shade-covered portions of these areas. For circular-shaped areas, such as under a tree, measure the diameter of the shady spot. Record your results.

QUESTIONS

1. What is the total area of the play areas on your school's grounds?

2. What is the total area of the portions of those play areas covered by shade?

3. What percentage of the play areas on your school's grounds are sun safe?

4. How will the shaded play areas change with the movement of the sun?

5. What changes would you suggest for the play areas to increase the shaded areas in the playground?

SunWise Surveyor

ESTIMATED TIME

45-90 minutes (1-2 class periods)

SUPPLIES

- ✔ Clipboards (optional)
- ✔ Measuring tapes, yardsticks, or meter sticks

LEARNING OBJECTIVE

This activity will raise student awareness of daytime exposure to the sun. Students will also become more aware of the motion of the sun and that its movements can be observed, described, and predicted. Students will focus on the amount of shade provided for their outdoor hours at school, and the importance of providing sun-safe areas on the property. They will also describe the movement of the sun across the sky in the course of a single day and over the course of a year, and describe how the movement affects shaded areas in outdoor areas of the school. Assess student comprehension by asking students to design a SunWise playground (see the "You Are the Architect" activity).

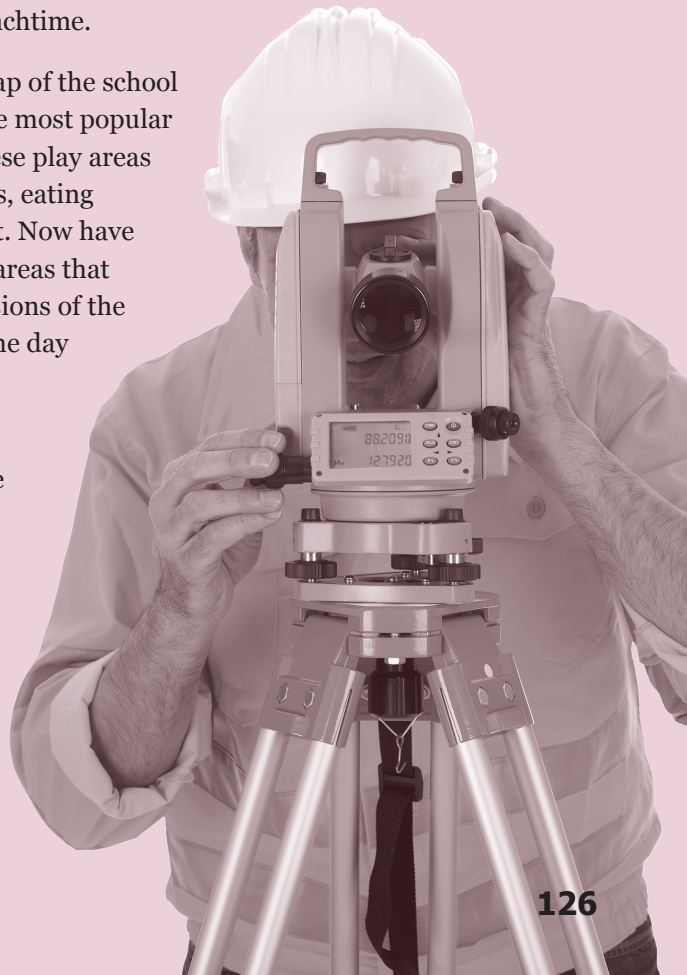
DIRECTIONS

Tell your students that they are surveyors who have been assigned to determine the current availability of shade on your school's property in order to help school administrators decide if the grounds are sun safe.

Have the students take a survey of the grounds during a period of time when students are present, such as recess or lunchtime.

Have the students begin by drawing a scaled map of the school grounds, observing and marking on the map the most popular places where students congregate and play. These play areas can include sports fields, jungle gyms, blacktops, eating areas, and any other places where kids hang out. Now have students survey and mark the parts of the play areas that are covered in shade and consider if the dimensions of the shaded areas might change over the course of the day and the school year.

Have the students measure the dimensions of the play areas, record their results, and measure the shade-covered portions of these areas. For circular-shaped areas, such as under a tree, students will measure the diameters and calculate the areas of the shady spot, and write down these results as well.



QUESTIONS AND ANSWERS

1. What is the total area of the play areas on your school's grounds?
   Answers will vary. Students will determine this figure by using algebraic formulas to calculate the area of each play area and then adding the sums together. A = l x w
2. What is the total area of the portions of those play areas covered by shade?
   Answers will vary. Students will determine this figure by using algebraic formulas to calculate the area of each shade-covered area and then adding the sums together.
3. What percentage of the play areas on your school's grounds are sun safe?
   This answer will be determined by dividing the total area of shady spots by the total area of the play areas.
4. How will the shaded play areas change with the movement of the sun?
   Answers will vary, but should reflect an understanding of the motion of the sun.
5. What changes would you suggest for the play areas to increase the shaded areas in the playground?
   Answers will vary.

This activity was adapted from California Department of Health Services, School Shade Protocol, Cancer Prevention and Nutrition Section.

ADDITIONAL RESOURCE

CDC's Shade Planning for America's Schools:
www.cdc.gov/cancer/skin/pdf/shade_planning.pdf

You Are the Architect

DIRECTIONS

You are an architect who has been selected to submit a design proposal for a SunWise playground. First, get together with the other students and brainstorm ideas. You need to consider the ways that many of today's playgrounds fail to protect children from overexposure to the sun's harmful rays.

HOW CAN THESE PROBLEMS BE SOLVED?

Blueprint your idea for a SunWise playground structure, taking into account the movement of the sun across the sky over the course of a single day and over the course of a year. Then, build a model of it for presentation. Present your design proposal. Be sure to discuss how your design offers superior protection from overexposure to the sun's harmful rays.

VOCABULARY WORDS

Blueprint — A detailed construction plan that includes measurements and building materials information.

Brainstorm — Developing new ideas through unrestrained participation in discussion.

DID YOU KNOW?

Some spiders can spin silk that glistens in UV light. They weave it into shapes that look like flower petals to attract unsuspecting bugs. Sadly, humans can't see any of this.

You Are the Architect

ESTIMATED TIME

60-90 minutes

SUPPLIES

- ✔ Toothpicks
- ✔ Popsicle sticks
- ✔ Glue (for paper and/or wood)
- ✔ Construction paper
- ✔ Scissors
- ✔ Pipe cleaners
- ✔ Scotch tape
- ✔ Rubber bands
- ✔ String/yarn

DIRECTIONS

Tell your students that they have been selected to submit a design proposal for new SunWise playground structures for a local elementary school. Brainstorm ideas with the group of how to build a SunWise playground. Remember to discuss potential problems and how to solve them. Ask students to consider the movement of the sun across the area where the playground is to be constructed. Have a discussion about how this information should be used when planning a SunWise outdoor area.

Have the students draw plans/blueprints of their ideas. You may want to have them work in teams. Ask the students to make a model of their favorite idea.

Have the students present their ideas to the group and explain the advantages their SunWise model has over typical playgrounds.

Detecting UV Light Using Tonic Water

DIRECTIONS

In this activity, you will use tonic water to do an experiment with ultraviolet light. Fill the beaker labeled "tonic" almost to the brim with tonic water. Fill the other beaker almost to the brim with tap water.

Place the beakers outside, so that direct sunlight strikes the surface of the liquid in both beakers. Hold a black piece of paper or cloth behind the beakers.

Observe the surfaces of the tonic and tap waters in the two beakers. Write a paragraph describing what happened in the experiment. Be sure to use all of the vocabulary words when writing your explanation. Then answer the questions.

VOCABULARY WORDS

Fluorescence — Luminescence caused by the absorption of a photon at one wavelength that triggers the emission of another photon usually at a longer wavelength. The absorbed photon is typically in the ultraviolet range, and the emitted light is usually in the visible range.

Ultraviolet light — Electromagnetic radiation that has a shorter wavelength than visible light and is not visible to the human eye.

Photon — The elementary particle that is the carrier of electromagnetic radiation of all wavelengths, including ultraviolet light and visible light.

Wavelength — In a periodic wave, the distance between identical points (e.g., peaks) in consecutive cycles. Examples of waves are light and sound waves. Visible light includes a wavelength range of 400-700 nanometers and a color range of violet through red.

QUESTIONS

1. What differences do you see between the two beakers?
2. What time of day is it? Where is the sun in the sky?
3. How might the position of the sun affect your results?
4. What is contained in the sunlight that causes these results?

This activity is adapted from the Project LEARN module, Ozone in Our Atmosphere.

Detecting UV Light Using Tonic Water

ESTIMATED TIME

40-50 minutes

SUPPLIES

- ✔ Two beakers, labeled “tap water” and “tonic water”
- ✔ Tonic water
- ✔ Tap water
- ✔ Black paper or cloth
- ✔ Sunlight

LEARNING OBJECTIVE

This activity will demonstrate the presence of UV light in sunlight. When a photon of UV energy is absorbed, it is re-emitted by the quinine in tonic water as a photon of visible light. This process is called fluorescence.

The amount of fluorescence that occurs is influenced by the amount of UV. This will reinforce the concept that UV light is always present in sunlight, although invisible to the naked eye. Have students write a paragraph explaining what has happened in this experiment, using the following words: fluorescence, photon, wavelength, ultraviolet light. The students should demonstrate the ability to research the scientific background of a certain phenomenon. Students should show comprehension of the idea that it is the size of the UV wavelengths that causes them to appear invisible. But when a photon of UV energy is absorbed in the tonic water, the quinine re-emits the energy as a photon of visible light.

After completing the tonic water experiment, students will investigate the chemical reactions that were involved in the changes of the tonic water and the tap water. Students will also understand that when light shines on an object, it is reflected, absorbed, or transmitted through the object depending on the objects’ materials and the frequency (color) of the light.

DIRECTIONS

Fill the beaker labeled “tonic” almost to the brim with tonic water. Fill the other beaker almost to the brim with tap water. Place the beakers outside, so that direct sunlight strikes the surface of the liquid in both beakers. Ask the students to predict what they might observe.

Hold a black piece of paper or cloth behind the beakers. Have the students look across the surfaces of the two beakers.

QUESTIONS AND ANSWERS

1. What differences do you see?
The top ¼ inch of the tonic water should glow blue.

2. What time of day is it? Where is the sun in the sky?
Answers will vary.

3. How might the position of the sun affect your results?
Best results occur around noon when the sun is directly overhead. The higher the sun is in the sky, the shorter the distance the UV light must travel through the ozone layer, allowing more UV radiation to reach the earth's surface.

4. What is contained in the sunlight that causes these results?
UV radiation. Students should grasp the concept that UV radiation is always present in sunlight.

Gumdrop Science

DEFINITIONS

Define the following terms:

Diatomic molecule

Triatomic molecule

Chlorofluorocarbons (CFCs)

Hydrochlorofluorocarbons (HCFCs)

Ultraviolet (UV) radiation

Stratosphere

Catalyst

QUESTIONS

As you observe the Gumdrop Science demonstration, answer the questions below.

1. What effect does an increase in HCFCs and CFCs in the stratosphere have on ozone? What effect will that have on us?

2. How is the breakup of ozone in the stratosphere similar to its formation?

3. Why is ozone good in the stratosphere and bad in the troposphere?

Gumdrop Science

ESTIMATED TIME

40-50 minutes

SUPPLIES

- ✔ Gumdrops in the following colors: black (carbon), red (oxygen), green (chlorine), yellow (fluorine) and white (hydrogen)[1]
- ✔ Toothpicks
- ✔ Flashlight
- ✔ Transparent colored plastic sheets, preferably blue, to cover the flashlight lens
- ✔ White piece of paper

1 The colors used in this model are based on the Institute of Physics color scheme, one employed by several producers of molecular modeling sets. If the suggested colors of gumdrops are not available, please substitute with colors that are available, making sure to be consistent in the colors you use to represent each element.

LEARNING OBJECTIVE

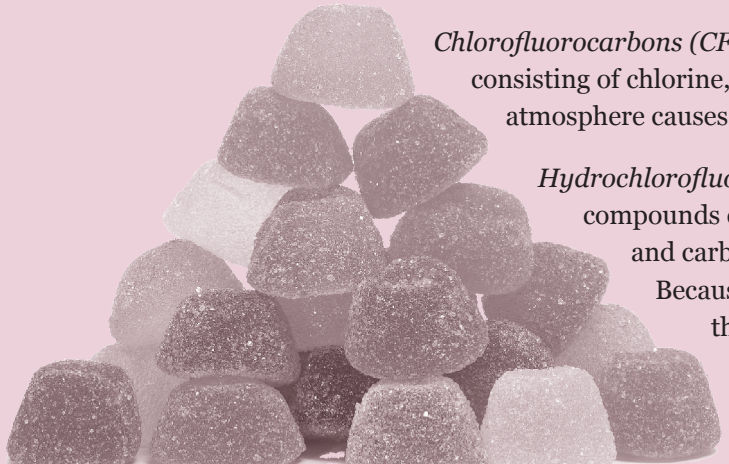
This activity will demonstrate to students the photochemical reactions involved in the creation and destruction of stratospheric ozone on a molecular level. It will emphasize the damage caused by man-made hydrochlorofluorocarbons (HCFCs) and chlorofluorocarbons (CFCs) in our atmosphere. The students will be able to explain the role of stratospheric ozone, demonstrate the formation of ozone, identify the sources of stratospheric ozone layer depletion, and explain why HCFCs and CFCs are destructive to the ozone layer.

Assess the students' comprehension of the HCFC/CFC problem and their absorption of this lesson into their world view: ask students to make a list of everyday products that use or formerly used HCFCs, and formulate a plan for reducing or eliminating the need for HCFCs in their lives.

DEFINITIONS

Diatomic molecule — A diatomic molecule is composed of two atoms. Diatomic oxygen (O_2) is present in the air we breathe.

Triatomic molecule — A triatomic molecule is composed of three atoms. Triatomic oxygen (O_3) is also known as ozone.



Chlorofluorocarbons (CFCs) — Man-made chemical compounds consisting of chlorine, fluorine, and carbon. Releasing CFCs into the atmosphere causes ozone layer depletion.

Hydrochlorofluorocarbons (HCFCs) — Man-made chemical compounds consisting of hydrogen, chlorine, fluorine, and carbon, which also deplete the ozone layer. Because HCFCs are less harmful to the ozone layer than CFCs, they have been used as an interim replacement for CFCs.

Ultraviolet (UV) Radiation — While not visible to the human eye, ultraviolet (UV) radiation is part of the energy radiated from the sun. It is responsible for sunburns and other adverse health effects.

Stratosphere — A layer of the atmosphere above the troposphere, 6 to 30 miles above the earth's surface, where the ozone layer is located.

Catalyst — A substance that modifies and increases the rate of a chemical process without being consumed in the process.

QUESTIONS AND ANSWERS

1. What effect does an increase in HCFCs and CFCs in the stratosphere have on stratospheric ozone? What effect will that have on us?

Increased HCFCs and CFCs in the stratosphere have destroyed many ozone molecules for several decades and continue to weaken the ozone layer that protects us from the sun's harmful UV rays. One CFC molecule can destroy up to 100,000 ozone molecules.

2. How is the breakup of ozone in the stratosphere similar to its formation?

Both processes involve UV radiation.

3. Why is ozone good in the stratosphere and bad in the troposphere?

In the stratosphere, ozone partially filters UV radiation. In the troposphere, ozone is a major component of smog.

BACKGROUND INFORMATION

Ozone, a triatomic molecule of oxygen (O_3), is made when short-wavelength UV radiation breaks the bonds of diatomic oxygen (O_2) in the stratosphere. The freed single oxygen atoms (O) are highly reactive and bond with diatomic oxygen to form ozone. This is a naturally occurring process in the stratosphere that is kept in balance, unless man-made chemicals like HCFCs or CFCs are introduced.

CFCs are the primary cause of ozone layer depletion around the world, but since 1996, the production of CFCs has been prohibited in the United States. HCFCs, which are also ozone depleting but less harmful than CFCs, have replaced CFCs in many applications. Although the United States is incrementally decreasing the use of HCFCs, they can still be found in some home air-conditioners, refrigerated display cases in supermarket stores, and foam products.

When HCFCs or CFCs reach the stratosphere, they react with UV light, and a chlorine atom is released. The chlorine atom, acting as a catalyst, then bonds with an ozone molecule and destroys it by pulling away the third oxygen atom. Then, the free atoms of oxygen destroy the weak bond between the oxygen and chlorine, pulling it away to form O_2. This process replaces the chlorine atom, which is then free to repeat the process for decades, thereby destroying ozone faster than it can be replaced naturally.

The ozone layer is found in the stratosphere, between 6 and 30 vertical miles from the earth's surface. As ozone in the stratosphere is depleted, more harmful UV radiation can penetrate through the layer and reach the earth. In humans, increased UV radiation can cause cataracts, skin cancer, immune system weakening, and premature aging of the skin.

DIRECTIONS

Natural Ozone Layer Formation

Instruct the students to connect three or four pairs of red gumdrops with a toothpick to simulate diatomic oxygen molecules, which are present in the air we breathe.

Have another student shine the flashlight on one of these molecules, with a colored plastic sheet covering the lens, simulating UV radiation from the sun.

The molecule bombarded with UV radiation will break apart, leaving two single oxygen atoms. The blue plastic represents the short UV wavelengths that are responsible for the breakup of diatomic oxygen. The individual oxygen atoms are now free to join the other diatomic oxygen molecules to form triatomic oxygen, or ozone.

Unnatural Ozone Layer Depletion

In the stratosphere, ozone meets up with HCFCs such as HCFC-22. Have the students make a model of HCFC-22 using one black gumdrop for the carbon, two yellow gumdrops for the fluorine, one green gumdrop for the chlorine, and one white gumdrop for the hydrogen. Stick three toothpicks into the carbon to form what looks like a three-legged stool. Put the chlorine atom on one free toothpick end and the fluorine atoms on the other two. With the "stool" standing on the desk, put another toothpick in the carbon and attach the hydrogen to it. Also, have the ozone models from above and a free oxygen atom handy.

Lay the HCFC molecule and the ozone side-by-side on a white piece of paper, representing the stratosphere. Bombard them with simulated UV radiation from your flashlight. The flashlight should be covered with a different colored plastic sheet, representing a longer wavelength of UV light. This UV radiation will cause one chlorine atom (green gumdrop) to break off the HCFC. The free chlorine then attacks ozone molecules, breaking them up into diatomic and single oxygen molecules, and combines with the free oxygen (red gumdrop). This newly formed molecule is unstable, and the oxygen atom breaks free again to join another free oxygen atom and form diatomic oxygen. This leaves the chlorine atom free to attack and break up other ozone molecules, a destructive process that goes on for decades.

STUDENT PAGE

Be a SunWise Traveler

DIRECTIONS

You are planning a trip. Use maps and websites to research your assignment and answer the questions below. Share your findings.

VOCABULARY WORD

Mean — The average value of a set of numbers. A mathematical value that is intermediate between other values.

ACTIVITIES AND QUESTIONS

1. Using US map, identify where you live.
2. Using a US map, identify where you would like to visit. Why would you like to visit this location? What time of year would you like your visit to occur?
3. Using the UV Index maps located on the EPA website, **www.epa.gov/sunsafety/uv-index-1**, identify what the UV Index mean (average) is where you live at this time of the year.
4. Using the UV Index maps located on the EPA website, **www.epa.gov/sunsafety/sun-safety-monthly-average-uv-index**, identify what the UV Index mean (average) is where you would like to visit and at the time of year your visit would occur.
5. What do you notice about your local UV Index in comparison to the UV Index at the location you want to visit during the time you want to visit?
6. Are there similarities and differences? Why?
7. What SunWise action steps should you take when visiting your destination?
8. Develop a "SunWise Travel Alert" for your destination. Be sure to list the conditions that a traveler is likely to encounter and sun-safe behaviors they should practice. This alert may be in the form of a poster, newspaper ad, TV or radio announcement, or a web page.

Be a SunWise Traveler

ESTIMATED TIME

45-60 minutes (students may work individually or in small groups)

SUPPLIES

- ✔ Maps of the United States
- ✔ Computers
- ✔ Action Steps for Sun Protection (see SunWisdom section of the tool kit)

LEARNING OBJECTIVE

This activity gives students the opportunity to learn about how people all over the US need to protect themselves from the sun's harmful UV rays. It will help students make connections and comparisons between their local environment and sun-safe behaviors they practice when visiting other parts of the country.

BACKGROUND/TALKING POINTS

People often travel to, or vacation in, locations with extreme UV intensity, especially in comparison to the UV intensity at that time of year in the traveler's city or town. Additionally, travelers may not realize how intense the sun is at that time of year and may not adequately prepare for the UV radiation that they are exposed to, resulting in severe sunburns. Studies have shown that as much as 88% of sunburns in children occur during sunny vacations. A serious potential problem surfaces when you combine this information with the fact that sunburn is a risk factor for skin cancer. By raising awareness of the dangers specifically associated with travel/vacations to UV intense destinations, our goal is for children and their caregivers to receive no sunburns during travel/vacations.

In addition:

- UV rays are reflected by snow, sand, water, and pavement. Fresh snow may reflect up to 80% of the incident UV radiation. This is important at higher altitudes and latitudes. Sand and water also reflect up to 25% and 5% of UV radiation, respectively, and can increase UV exposure at the beach.
- The closer you get to the equator, the more intense the UV rays. This occurs because the sun is more directly overhead, causing a shorter distance for the sun's rays to travel through the atmosphere, and there is naturally less ozone in the stratosphere in the tropics.
- The higher in altitude you go, the more intense the UV rays become because there is less atmosphere for the UV to travel through.

DIRECTIONS

Engage students by asking them if they have a US state or city in mind that they would like to travel to someday. Or ask them if they have a friend or relative who lives far away that they might like to visit. Have students identify the place they would like to visit along with the time of year they would like to do this traveling. Students will identify the UV Index mean (average) where they live and the place they would like to visit, then make a connection or comparison of the two locations. They will then identify SunWise action steps they should take when visiting their choice of destinations. Instruct students to respond to the activities and questions individually or in pairs. Then, have them share their findings with the group.

STUDENT ACTIVITIES AND QUESTIONS

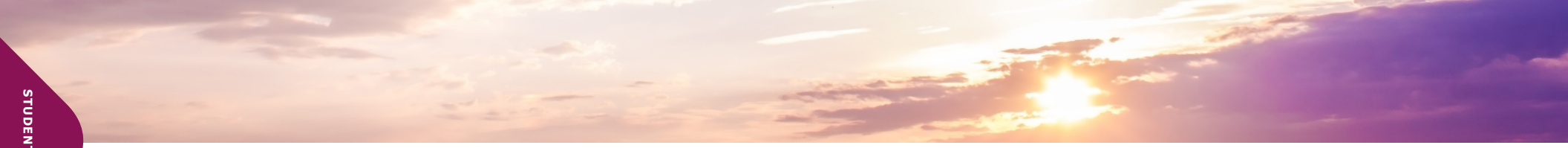
Answers should reflect students' research on their location.

1. Using a US map, identify where you live.
2. Using the US map, identify where you would like to visit. Why would you like to visit this location? What time of year would you like your visit to occur?
3. Using the UV Index maps located on the EPA website, **www.epa.gov/sunsafety/uv-index-1**, identify what the UV Index mean (average) is where you live at this time of the year.
4. Using the UV Index maps located on the EPA website, **www.epa.gov/sunsafety/sun-safety-monthly-average-uv-index**, identify what the UV Index mean (average) is where you would like to visit and at the time of year your visit would occur.
5. What do you notice about your local UV Index in comparison to the UV Index at the location you want to visit during the time you want to visit?
6. Are there similarities and differences? Why?
7. What SunWise action steps should you take when visiting your destination?
8. Develop a "SunWise Travel Alert" for your destination. Be sure to list the conditions that a traveler is likely to encounter and sun-safe behaviors they should practice. This alert may be in the form of a poster, newspaper ad, TV or radio announcement, or a web page.

RESOURCES TO LEARN MORE ABOUT YOUR DESTINATION

www.intellicast.com/Travel/Library/Browse.aspx

www.weatherbase.com



A SunWise Legend

WISE HEART SAVES THE DAY[1]

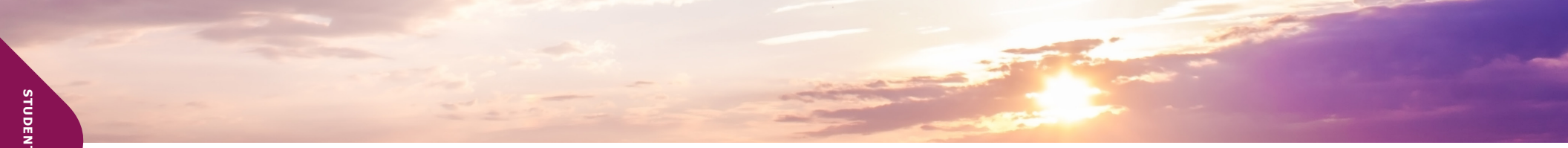
Once upon a time, a very long time ago, there lived a young Native American boy who was both smart and kind and who longed to make the world a better place for his people. His name was Wise Heart, and he belonged to the Cahto Tribe that lived in what is now Northern California. The world in which Wise Heart lived was cold and barren, with few plants or trees. During the day, his world was gloomy and grim, lit by only a faint, dim light that seemed to come from very far away. At night, his world was always cloaked in deep darkness, a darkness that was broken only by the campfire and the torches that the elders alone were allowed to carry.

Wise Heart knew that the world had not always been such a dark and gloomy place. Sometimes as his tribe huddled around the campfire at night, the elders told stories—ancient stories—of a time when a bright light they called the Sun had warmed the world during the day, while its distant relatives, the Moon and Stars, had filled the night. Wise Heart had also seen the ancient tribal cave paintings that showed a world filled with the bright light of the Sun and with towering trees and plants. Whenever Wise Heart or the other children asked the elders how the world had lost its Sun, Moon, and Stars, the elders would become quiet and warn the children not to ask such questions.

One night, while Wise Heart slept, he dreamed of the beautiful, Sun-filled world that he had seen in the cave paintings. There were blue skies, trees laden with delicious fruit, and smaller plants with fragrant flowers. Then, in his dream, he heard the sound of a fiercely shrieking wind, and the Sun suddenly seemed to be torn from the sky, leaving only a dim glow in its wake. Wise Heart woke from his dream troubled and unable to fall back asleep.

When the dim light of day returned, Wise Heart cautiously approached the oldest and most respected of the elders, a stooped old man named Running Water. The boy recounted his dream and asked the old man if he knew what had happened to the Sun so many years before. At first Running Water scolded the boy and warned him not to wonder about such things. Finally, however, seeing the boy's determination to know the truth, Running Water relented. He told the boy that many years before, an Evil Spirit had become jealous of the brilliance and warmth of the Sun and had stolen it from the sky and hidden it in a deep canyon on the far side of the world. The Evil Spirit had also stolen the Moon and Stars and hidden them away as well so that the humans would not have enough light to be able to search for and free the Sun from its captor. From that day on, Running Water explained, the world had been dimly lit. Bound with thick ropes to a giant boulder, the Sun could make only a few of its rays reach above the edge of the deep canyon.

All that day Wise Heart thought about Running Water's words. He watched his people as they struggled to survive by eating the few fish in the stream and few small plants on the hillsides. By the time darkness fell, Wise Heart had made a decision.

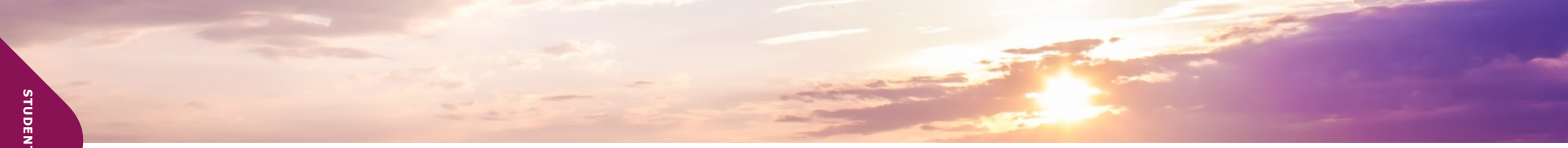


He would journey across the mountains, to the far side of the world. He would find the deep canyon where the Sun, Moon, and Stars were being held by the Evil Spirit, and somehow, he would free them. That, he decided, was how he would help make the world better for his people.

Early the next evening, Wise Heart secretly set out for the distant mountains, carrying only a skin of water, some dried fish, and a sharp knife. As he traveled, he asked the kind spirits of his people to help him, and they did. Guided by a fierce and powerful eagle and thousands of fireflies, Wise Heart found his way through the steep, dark mountain range. A sure-footed mountain goat led him to the edge of the deep canyon in which the Evil Spirit was guarding the Sun, Moon, and Stars. Just at that moment, a traveling family of field mice offered to chew through the ropes that bound the Sun, Moon, and Stars while Wise Heart distracted the Evil Spirit. Accepting their offer of help, Wise Heart climbed cautiously over the rim of the canyon and slowly began to climb down the steep cliff toward the canyon floor below. Just as he reached the bottom, the silence was suddenly pierced by the same sound of shrieking wind that he had heard in his dream. The Evil Spirit, red-faced and shaking with rage, stepped between Wise Heart and the Sun, Moon, and Stars and demanded to know why the boy had intruded in his canyon. Before Wise Heart could answer, the Evil Spirit noticed the boy's water skin and demanded that he be given some water to quench his thirst and to cool his sun-scorched body. In reply, Wise Heart said, "Powerful spirit, I am happy to give you all my water, but first let me add some special herbs that will quench your thirst and cool your sun-scorched body better than plain water." The Evil Spirit agreed, and after Wise Heart had added the herbs, which were really sleeping herbs, he drank the water greedily. Soon after, the Evil Spirit fell asleep.

Immediately, as if on cue, the family of mice began gnawing through the thick ropes that held the Sun, Moon, and Stars captive. When they had almost completed their task, the Evil Spirit, feeling the heat of the Sun's rays as it slowly began to ascend into the sky, awoke from his slumber. With a piercing shriek, the Evil Spirit rushed to recapture the Sun. Just before he could do so Wise Heart cut through the remaining fragments of rope with his knife. With the ends of the rope held tightly in his hands, Wise Heart and the mice sailed into the sky. A short time later, as the Sun passed over Wise Heart's village, they all jumped safely into the soft boughs of the tallest fir trees. From there, Wise Heart looked up to see the first and most beautiful sunrise that he would ever see.

Wise Heart returned to his tribe as a hero. The people hailed him as the Sun Guard and thanked him for returning light and warmth to the day and light to the night. Almost immediately, the trees and plants began to grow larger, and the people danced and celebrated in the warmth and brightness of the Sun. After several hours, however, the people began to complain. They said, "It's too hot! I'm thirsty!" Others complained of feeling tired and of their skin feeling red and sore. Wise Heart was amazed that his gift that had at first caused so much joy was now causing so much pain and discomfort. He thought for a moment and then quickly led his tribe to the river's edge. There he told his people to drink deeply and to coat their skin with mud from the riverbank. He told them, "The mud will soothe your skin and protect it from the powerful rays of the Sun," and they found that he was right. Now Wise Heart was truly a hero. His tribe could now enjoy



the Sun and all the beauty it gave to the world, without being hurt by its powerful rays. Even today, Wise Heart is a hero, for though he did not know it, he had developed the first sunscreen with an SPF of 45!

The legend with illustrations is available for iBook at the Children's Melanoma Prevention Foundation website, **www.melanomaprevention.org**.

1 This story has been adapted from traditional tales by Jane Shanny and Mary Ellen Maguire-Eisen of the Children's Melanoma Prevention Foundation.

A SunWise Legend

ESTIMATED TIME

One hour

SUPPLIES

- ✔ Large paper
- ✔ Markers

LEARNING OBJECTIVE

The students will learn that people from all over the world have different stories about the sun. Before the story is read, ask the students about the power of the sun, both good and bad. Write their ideas on the paper. After reading the story assess what they have learned by asking them to research other legends about the sun or to perform a skit about the sun and why it is important to people around the world.

DIRECTIONS

Have the group read "Wise Heart Saves the Day," a legend about the origin of the sun inspired by the Native American Cahto Tribe of California (on the Student Page of this activity). After the group has finished reading, explain to them that people from all over the world have different ideas and beliefs about the sun. Discuss what they remember from the story and the lessons it shares about the sun and sun safety. Ask them why the sun is so important that people from all over the world tell stories about it (e.g., it makes plants grow, provides light). Ask them what other stories or legends they have heard about the sun and why they think so many cultures—past and present—revere the sun.

After discussing the legend and the sun, additional activities can include:

- Ask your students to research other legends and mythology about the sun and sun gods (e.g., Ra, the ancient Egyptian sun god, Apollo from Roman and Greek mythology, Amaterasu from Japanese mythology, or Sol from Norse mythology). Ask your students to explain why they think the sun and the sun gods and goddesses were so important to these ancient cultures.
- Divide the students into groups and have each group create a skit to present to the other students about the sun, its importance to people around the world, and its power.

Keep an Eye on Sun Safety

DIRECTIONS

UV radiation can cause damage to the eyes of both animals and humans. One example of eye damage is a cataract. A cataract is the clouding of the eye's lens, which makes it difficult to see. Sea lions and seals that live in a zoo may develop cataracts when there is not enough shade in their enclosure or because of looking up at the sun during feeding and training with the zookeeper. In addition, the reflection from the water causes extra UV exposure for both the animals and the visitors at the zoo.

Design an outdoor zoo exhibit for seals and sea lions that helps protect their eyes and the zoo visitors' eyes from too much sun exposure. How should visitors dress for a SunWise day at the zoo?

Many animals have natural adaptations that protect them from the sun. Find examples of these animal adaptations by visiting the website of your local zoo or one of these websites:

- **www.smithsonianmag.com/science-nature/ask-an-expert-do-animals-get-sunburned-28218217/**
- **www.accuweather.com/en/weather-news/how-animals-like-hippos-elephants-and-whales-protect-themselves-from-the-sun/70001992**

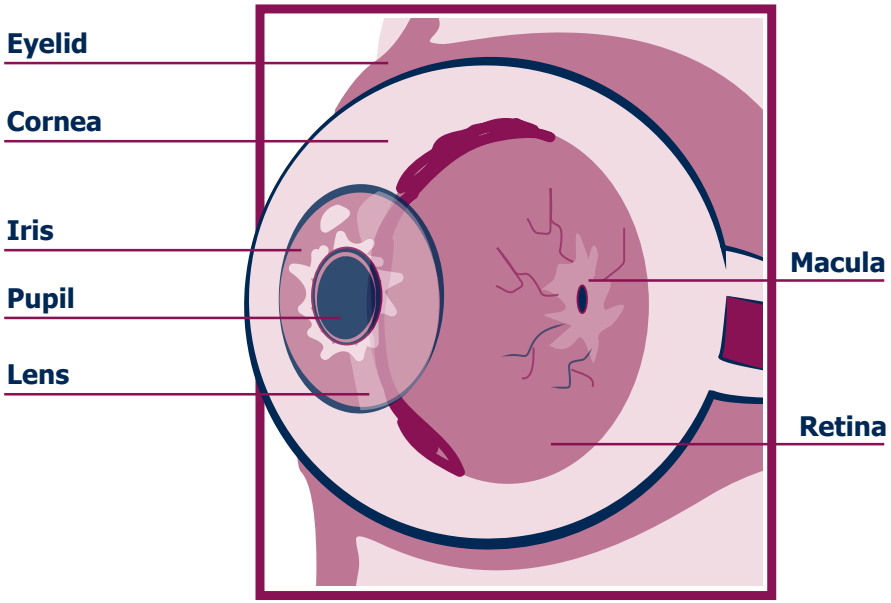
In your exhibit design, include signs that point visitors in the direction of these animals.

VOCABULARY WORDS

Cataract — A clouding of the eye's lens that can blur vision.

Lens — A transparent structure in the eye that helps focus light.

DIAGRAM



Keep an Eye on Sun Safety

ESTIMATED TIME

30-45 minutes

SUPPLIES

- ✔ Paper
- ✔ Pens or Pencils

LEARNING OBJECTIVE

The aim of this activity is for students to learn the importance of protecting their eyes from overexposure to the sun's harmful UV rays. By understanding animal adaptations for sun protection and designing a SunWise enclosure for zoo animals, students will draw connections to the ways they can protect themselves from overexposure to the sun. Assess if they have learned how to protect their eyes from UV radiation by facilitating an evaluation of each group's exhibit design.

DIRECTIONS

Assign groups to collaborate on the design of a SunWise outdoor exhibit for seals and sea lions. Before the students begin, have a brief discussion on the damaging effects that UV radiation has on the eyes of both animals and humans (for additional background information on cataracts and UV-induced eye damage, refer to the "The Sun, UV Radiation, and Your Eyes" on the American Academy of Ophthalmology website: **www.aao.org/eye-health/tips-prevention/sun**). Use the following questions to guide a discussion:

1. Does the exhibit design provide enough shade for the animals?
2. Do the visitors have a shaded area where they can watch the animals?
3. How should visitors dress for a SunWise day at the zoo?
4. Where can zoo visitors find other SunWise animals?

Describe to the students how seals and sea lions in zoos can be prone to cataracts due to the following: 1) lack of shade in the enclosure; 2) reflection of UV rays from the water and from the light surfaces of the tank/enclosure; 3) looking up toward the sun during feeding and training with the zookeepers; and 4) living longer in captivity than in the wild (in addition to overexposure to UV radiation, cataracts can also develop from old age).

Ask students to brainstorm animals that have natural adaptations to protect themselves from the sun. The students may research animal adaptations on your local zoo's website or you can guide them to examples of adaptations using the *Who Am I? SunWise Animals* student handout available in the K-2 section of the SunWise tool kit. Explain to the students that humans can "adapt," too, with simple sun safety habits. For eye protection,

these habitats include the following: avoiding overexposure to the sun; wearing a wide-brimmed hat and sunglasses with 99-100% UVA/UVB protection; seeking shade when the sun's UV rays are most intense between 10 a.m. and 4 p.m.; checking the UV Index; and using extra caution around reflective surfaces such as water, snow, and sand.

When the students have finished their exhibits, lead them in a discussion to evaluate each design. Relate the issue of eye protection to the students' environments. Ask the students where they might get the most UV exposure in their daily lives. Remind the students that sun safety is important for all outdoor activities, including recess at school, swimming, boating, biking, soccer, baseball, etc. Ask the students to think of ways they can better protect their eyes from too much sun exposure.

ACTIVITY ENRICHMENT

- Have students brainstorm activities and occupations that may lead to a person's eyes being exposed to excessive UV radiation. Answers may include sports (baseball, skiing, swimming, surfing, etc.) and outdoor jobs (fishing, construction, landscaping, farming, etc.). Ask the students how they could protect their eyes during each activity.
- In addition to overexposure to UV radiation, risk of cataracts also increases with age. Ask the students if they know of anyone who has cataracts or other eye damage. Offer the students the opportunity to interview that person and report back to the group. Remind the students to ask their interviewee about previous sun exposure and sun protection habits.
- Have the students experience what it is like to have cataracts by taking an old pair of glasses and applying a light coat of non-toxic snow spray. Students can take turns wearing the glasses.
- Connect this activity with a visit to your local zoo or aquarium. Plan a sun-safe animal tour using the *Who Am I? SunWise Animals student* handout available in the K-2 section of the SunWise tool kit.

Wild for Sun Protection

DIRECTIONS FOR ACTIVITY 1

Use the internet and other resources to investigate ways animals protect themselves from overexposure to the sun's harmful UV rays. Complete the activities and answer the questions below. Then, share your findings.

VOCABULARY WORDS

Habitat — The area or natural environment where a particular organism, such as a plant or animal, lives.

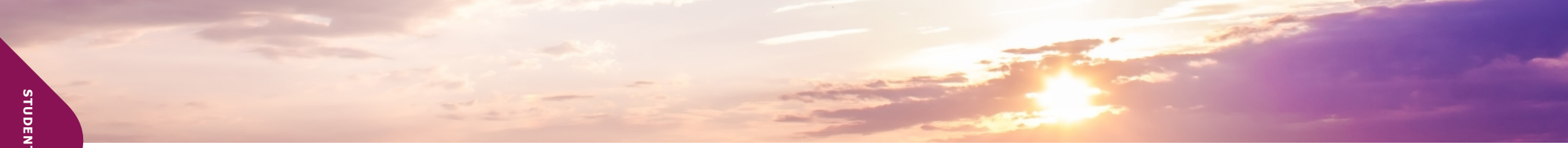
Adaptation — An alteration or adjustment in a physical or behavioral trait that makes an organism such as a plant or animal better suited to live in its habitat.

Pigmentation — A substance such as chlorophyll or melanin that gives color to plant, animal, or human tissue.

Ecosystem — A complex set of relationships between a community of living organisms such as plants and animals in conjunction with their environment.

ACTIVITIES AND QUESTIONS

1. Using the internet and other resources, investigate how three animals protect themselves from overexposure to the sun's harmful UV rays and complete the provided chart.
2. What is the specific environment of the animal? In your answer, include a description of the climate, landforms, temperature, wind, rain, soil, and amount of sun exposure.
3. What characteristics of your animal make it well suited to its environment? In your answer, include both physical features and behaviors.
4. Select one animal from your chart and construct an argument on how increases in temperature and increases in exposure to UV rays would affect that animal's chances for survival.
5. How might the animal's ecosystem be affected if it were eliminated? Support your arguments with facts from your research.
6. Present your argument to the group in a three minute presentation.



DIRECTIONS FOR ACTIVITY 2

Using the internet and other resources, investigate recent findings on skin damage in whales. Your research should specifically focus on the rising incidence of "sunburn cells," or skin cells damaged by UV radiation. Then, identify possible causes of this problem. After you complete your research, meet with the other team to compare notes and discuss possible solutions to the problem. Determine a way to present your findings.

RESEARCH FINDINGS CHART

Animal #1	Habitat	Physical Adaptations	Behavioral Adaptations
Animal #2	Habitat	Physical Adaptations	Behavioral Adaptations
Animal #3	Habitat	Physical Adaptations	Behavioral Adaptations
Notes for argument			

Wild for Sun Protection

ESTIMATED TIME

30-60 minutes per activity

SUPPLIES

- ✔ Research materials
- ✔ Internet access

LEARNING OBJECTIVE

The aim of this activity is for students to expand their knowledge of animal adaptations in terms of anatomy and behaviors that aid in their survival in a particular habitat. After completing the activity, students should understand that animals have specific physical and behavioral adaptations that allow them to survive in a particular environment. Specifically, they should understand that animals living in places with a lot of sun exposure have unique biological defenses that help protect them from overexposure to the sun's harmful UV rays.

DIRECTIONS FOR ACTIVITY 1

Divide the students into small teams suitable for your group size and setup. Have each team use the internet and other resources to investigate ways animals protect themselves from overexposure to the sun's harmful UV rays. You may want to provide some suggested examples. Students will select three animals, complete the provided chart, and write a summary that includes answers to the following questions:

1. What is the specific environment of the animal? In your answer, include a description of the climate, landforms, temperature, wind, rain, soil, and amount of sun exposure.
2. What characteristics of your animal make it well suited to its environment? In your answer, include both physical features and behaviors.

DIRECTIONS FOR ACTIVITY 2

Divide the students into two teams. Have each team investigate recent findings on skin damage in whales, specifically focusing on the rising incidence of "sunburn cells," or skin cells damaged by UV radiation. They will identify possible causes of this problem. After researching, have the two teams meet together to compare notes and discuss possible solutions to the problem. Then, have the teams determine a way to present their findings to the group.

ADDITIONAL RESOURCES

- Acute sun damage and photo protective responses in whales: **http://rspb.royalsocietypublishing.org/content/278/1711/1581**
- Desert Animals: **www.desertusa.com/animals.html**

UV ABCs

DIRECTIONS

Research ultraviolet (UV) radiation and answer the questions below. Present your findings with other students.

QUESTIONS

1. What types of energy come from the sun?

2. What is UV radiation and how does it travel to earth?

3. Why are UV rays harmful to living organisms?

4. How can humans protect themselves from harmful UV rays?

5. What are the three types of UV radiation, and which types can be absorbed by the ozone layer?

6. What is the stratospheric ozone layer?

7. Describe the phenomenon that we call the ozone hole. What did scientists determine was the cause of the ozone hole?

8. What is being done to address the ozone depletion problem?

UV ABCs

ESTIMATED TIME

2-3 periods of 45 minutes

LEARNING OBJECTIVE

Students will understand ultraviolet (UV) radiation: what it is, where it comes from, what it does, what stops it, and how it varies over the course of a day or a year.

RECOMMENDED RESOURCES TO LEARN ABOUT UV RADIATION

- NSF Polar Programs UV Monitoring Network: **uv.biospherical.com/student/page3.html**
- SunWise Program: **www.NEEFusa.org/SunWise**

DIRECTIONS

Assign students to small groups and have them investigate UV radiation using the guiding questions. After students have finished their research, have them present their findings to the group by creating a digital slideshow (using PowerPoint or another presentation software), a poster, or a skit.

For more information about UV radiation, please review the SunWisdom section of the tool kit.

VOCABULARY

Ultraviolet (UV) Radiation — While not visible to the human eye, ultraviolet (UV) radiation is part of the energy radiated from the sun. It is responsible for sunburns and other adverse health effects.

Electromagnetic Radiation — A form of energy which exhibits wave-like behavior as it travels through space. Ultraviolet rays are one type of electromagnetic radiation.

Wavelength — In a periodic wave, the distance between identical points (e.g., peaks) in consecutive cycles. Examples of waves are light and sound waves. Visible light includes a wavelength range of 400-700 nanometers and a color range of violet through red.

Ozone Layer — A layer in the stratosphere, which is located 6-30 miles above the earth's surface. It protects people from the damaging effects of the sun's rays by absorbing some UV radiation.

QUESTIONS

1. What types of energy come from the sun?
   Heat, light, and radiation or electromagnetic radiation.
2. What is UV radiation and how does it travel to earth?
   UV radiation is electromagnetic radiation that has a shorter wavelength than visible light. UV radiation travels in waves to earth.
3. Why are UV rays harmful to living organisms?
   UV rays are very powerful. They can change the chemical structure of molecules and cause cell damage and deformities by mutating genetic code.
4. How can humans protect themselves from harmful UV rays?
   Answers should include: do not burn, avoid tanning, use sunscreen, cover up, seek shade, and check the UV Index.
5. What are the three types of UV radiation, and which types can be absorbed by the ozone layer?
   The three types of UV radiation are UVA, UVB, and UVC. UVA is not absorbed by the ozone layer, UVB is partially absorbed by the ozone layer, and UVC is completely absorbed by the ozone layer and atmosphere.
6. What is the stratospheric ozone layer?
   The ozone layer forms a thin shield high up in the sky—between six and 30 miles above the earth's surface. The ozone layer protects life on earth from the sun's UV rays.
7. Describe the phenomenon that we call the ozone hole. What did scientists determine was the cause of the ozone hole?
   In the 1980s, scientists began finding clues that the ozone layer was going away or being depleted—causing holes in the ozone layer. Chlorofluorocarbons (CFCs) were used a lot in industry and in households to keep things cold and to make foam and soaps. Strong winds carry CFCs into the stratosphere where UV radiation breaks them apart, releasing chlorine atoms. The chlorine atoms break apart ozone molecules in the stratosphere.
8. What is being done to address the ozone depletion problem?
   Countries around the world, including the United States, have seen the threats caused by ozone depletion and agreed to a treaty called the Montreal Protocol. This Protocol will help humans to stop making and using ozone-eating chemicals.

SunWise Flier *Supplemental*

DIRECTIONS

Let's make a SunWise flier on the computer.

Use fun images and text to communicate your message. Your flier should teach people how they can protect themselves from the sun's harmful UV rays. Brainstorm ideas with your group before you begin.

Helpful Ideas for Your Flier

Decide on a theme for your flier. Your theme should focus on having fun and being SunWise.

Think about designing your flier in a fun way that shows action. Show students participating in activities during all seasons. You could also focus on one season and make different scenes showing people being SunWise (e.g., a summer scene at the beach or in the park). Make sure you show people wearing SunWise items to reinforce your flier theme.

SAFETY TIPS YOU CAN USE FOR YOUR FLIER

Do Not Burn. Overexposure to the sun is the most preventable risk factor for skin cancer.

Avoid Sun Tanning and Tanning Beds. UV rays from tanning beds and the sun cause skin cancer and wrinkling. If you want to look like you've been in the sun, consider using a sunless self-tanning product, but continue to use sunscreen with it.

Generously Apply Broad Spectrum Sunscreen. Generously apply sunscreen to all exposed skin using a sun protection factor (SPF) of at least 30 that provides broad spectrum protection from both ultraviolet A (UVA) and ultraviolet B (UVB) rays. Reapply every two hours, even on cloudy days, and after swimming or sweating.

Wear Protective Clothing. Wear protective clothing, such as a long-sleeved shirt, pants, a wide-brimmed hat, and sunglasses, when possible.

Seek Shade. Seek shade when appropriate, remembering that the sun's UV rays are strongest between 10 a.m. and 4 p.m.

Use Extra Caution Near Water, Snow, and Sand. Water, snow, and sand reflect the damaging rays of the sun, which can increase your chance of sunburn.

Check the UV Index. The UV Index provides important information to help you plan your outdoor activities in ways that prevent overexposure to the sun's rays. Developed by the National Weather Service and EPA, the UV Index is issued daily nationwide.

Get Vitamin D Safely. Get Vitamin D safely through a diet that includes foods fortified with Vitamin D. Don't seek the sun.

Early Detection of Melanoma Can Save Your Life. Carefully examine all of your skin once a month. A new or changing spot should be evaluated.

SunWise Flier *Supplemental*

ESTIMATED TIME

30-45 minutes

SUPPLIES

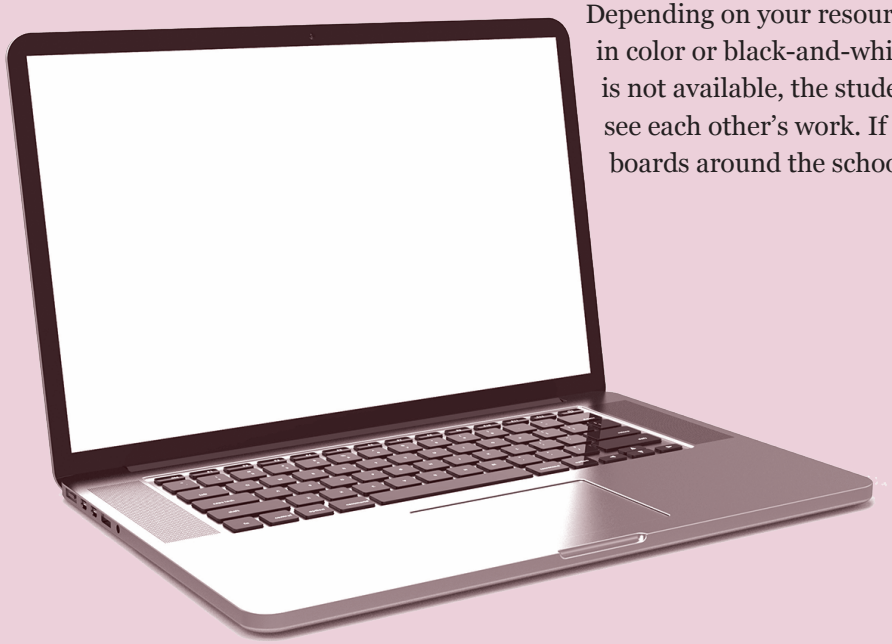
✔ Computer

DIRECTIONS

Instruct students that they will be creating a flier that teaches people about protecting themselves from overexposure to the sun's harmful UV rays.

To help students get started, hold a brainstorming session. Touch on issues such as the health effects of overexposure to the sun and the ways we can protect ourselves.

Students should also incorporate the SunWise safety tips into their flier. These tips can be found in the SunWisdom section of this Tool Kit or on the SunWise website, **www.NEEFusa.org/SunWise**.



Depending on your resources, ask the students to print out their fliers in color or black-and-white and present them to the group. If printing is not available, the students can rotate around the computer lab to see each other's work. If possible, post the students' work on bulletin boards around the school.

SunWise Word Problems *Supplemental*

DIRECTIONS

Answer the following word problems about SunWise products and behavior.

1. There are two SPF numbers whose sum is 90. Four times the first equals twice the second. What are the numbers?
2. Three bottles of sunscreen and two pairs of sunglasses weigh 32 ounces. Four bottles of sunscreen and three pairs of sunglasses weigh 44 ounces. All bottles of sunscreen weigh the same, and all pairs of sunglasses weigh the same. What is the weight of two bottles of sunscreen and one pair of sunglasses?
3. A clothing company can make long-sleeved shirts for $4 each with a daily overhead of $600. If they sell shirts at $5.20 each, how many shirts must they sell to have a profit of 10% above their daily cost?
4. Scientists use a mathematical formula to calculate the UV Index. When calculating the UV Index, one factor they use is a value representing the total effect a given day's UV radiation will have on skin. This value is then adjusted for the effects of elevation and clouds. UV radiation at the earth's surface increases about 6% per kilometer above sea level. Clear skies allow 100% of the incoming UV radiation from the sun to reach the surface, whereas scattered clouds transmit 89%, broken clouds transmit 73%, and overcast conditions transmit 31%. Once adjusted for elevation and clouds, this value is then divided by a conversion factor of 25 and rounded to the nearest whole number. This results in a number that typically ranges from zero to the mid-teens. This value is the UV Index.
   The formula for calculating the UV Index is:

   (UV radiation effect on skin) x (percent elevation) x (sky conditions)/ conversion factor = UV Index

   Now, calculate the UV Index for three days using the following information. The UV radiation effect on skin is 300 for each day. You live one kilometer above sea level. The first day has clear skies, the second day has scattered clouds, and the third day has overcast conditions. What is the UV Index for each day?

SunWise Word Problems *Supplemental*

ESTIMATED TIME

40-50 minutes

DIRECTIONS

Have the students solve the following word problems. The variables in the problems are not scientifically accurate.

QUESTIONS AND ANSWERS

1. There are two SPF numbers whose sum is 90. Four times the first equals twice the second. What are the numbers?
   30, 60
2. Three bottles of sunscreen and two pairs of sunglasses weigh 32 oz. Four bottles of sunscreen and three pairs of sunglasses weigh 44 oz. All bottles of sunscreen weigh the same, and all pairs of sunglasses weigh the same. What is the weight of two bottles of sunscreen and one pair of sunglasses?
   (2 x 8) + 4 = 20 oz.
3. A clothing company can make long-sleeved shirts for $4 each with a daily overhead of $600. If they sell shirts at $5.20 each, then how many shirts must they sell to have a profit of greater than 10 percent above their daily cost?
   550 shirts
4. Scientists use a mathematical formula to calculate the UV Index. When calculating the UV Index, one factor they use is a value representing the total effect a given day's UV radiation will have on skin. This value is then adjusted for the effects of elevation and clouds. UV radiation at the earth's surface increases about 6% per kilometer above sea level. Clear skies allow 100% of the incoming UV radiation from the sun to reach the surface, whereas scattered clouds transmit 89%, broken clouds transmit 73%, and overcast conditions transmit 31%. Once adjusted for elevation and clouds, this value is then divided by a conversion factor of 25 and rounded to the nearest whole number. This results in a number that typically ranges from zero to the mid-teens. This value is the UV Index.
   The formula for calculating the UV Index is:
   (UV radiation effect on skin) x (percent elevation) x
   (sky conditions)/ conversion factor = UV Index

Now, calculate the UV Index for three days using the following information. The UV radiation effect on skin is 300 for each day. You live one kilometer above sea level. The first day has clear skies, the second day has scattered clouds, and the third day has overcast conditions. What is the UV Index for each day?

Day 1: 300 x 1.06 x 1.00 / 25 = 13

Day 2: 300 x 1.06 x 0.89 / 25 = 11

Day 3: 300 x 1.06 x 0.31 / 25 = 4

For more information on how the UV Index is calculated visit the EPA website: **www.epa.gov/sunsafety/calculating-uv-index-0**

Supplemental Material

NEEF SunWise

UV Meter

Daily reporting of ultraviolet (UV) intensity will enable students to understand the scientific concepts related to ozone layer depletion and UV radiation. It will help them modify their outdoor behaviors to limit exposure and future incidences of adverse health effects.

This section includes instructions for operating a hand-held UV meter. It also includes three activities that are aligned with the national educational standards as identified on the educational standards pages in the grades 3-5 and 6-8 sections of the tool kit. Good luck with your UV monitoring efforts!

UV METER ACTIVITIES

1. What Works? Effectively Blocking UV Rays
2. Chart and Graph UV Intensity
3. Reflecting UV Radiation

HAND-HELD UV METER: DEVICE OPERATING INSTRUCTIONS

The activities in this section require the use of an ultraviolet (UV) meter. If you choose to purchase a hand-held UV meter, several vendors can be found on the internet. We urge you to check the open market for price, quality, and delivery terms before purchasing any items. NEEF cannot endorse the products and services of these vendors.

Some hand-held UV meters measure the intensity of the sun's UV rays based upon the UV Index (UVI) scale of 0 to 11+ (low to extreme).

UV INDEX VALUES

UV Index values depict intensity levels on a 0 to 11+ scale in the following way:

Index Number	*Intensity Level*
< 2	Low
3 to 5	Moderate
6 to 7	High
8 to 10	Very High
11+	Extreme

While you should always take precautions against overexposure, you should take special care to adopt safeguards such as broad spectrum SPF 30 or higher sunscreen, hats, sunglasses, protective clothing, etc., as the UV Index value gets higher.

PRECAUTIONS

- Use your meter to monitor only the sun's natural radiation. It should never be used to measure UV from artificial sources such as tanning beds.
- Staying in the shade does not provide complete protection from UV radiation due to the scattering effect of UV radiation.

- High temperature and humidity may lead to incorrect results. Do not leave the device in conditions of high humidity or temperature for long periods.
- The meter may fail to operate correctly if the sensor window is not kept clean. Remove dirt with a piece of soft cloth moistened in alcohol (ethanol, isopropanol). Use cleaning fluids sparingly.
- Upon leaving the factory, the meter is carefully calibrated. Improper handling (water immersion, strong shocks) may alter the meter's parameters. Handle with care.

Your UV meter should not replace your common sense or current method of avoiding skin and eye damage from the sun.

ABOUT THE UV INDEX

The UV Index, developed by the National Weather Service and the US Environmental Protection Agency (EPA), provides a forecast of the expected risk of overexposure to the sun and indicates the degree of caution you should take when working, playing, or exercising outdoors. The UV Index predicts UV intensity on a 0 to 11+ scale, where < 2 indicates a low risk of overexposure, and 11+ means an extreme risk. Calculated on a next-day basis for every zip code across the United States, the UV Index takes into account clouds and other local conditions that affect the amount of UV radiation reaching the ground in different parts of the country.

For more information on UV radiation and the UV Index, read the fact sheets that can be found in the SunWisdom section of the SunWise toolkit (available at **www.NEEFusa.org/SunWise**).

What Works? Effectively Blocking UV Rays

DIRECTIONS

Take the UV meter outside. Check and record the unfiltered UV level.

Next, cover the meter with a plastic bag and apply sunscreen on the outside of the bag over the sensor area. Check and record the UV level and sunscreen SPF number. Try this for a variety of sunscreens with different SPF numbers. Use a clean bag for each sunscreen application.

Next, try the same experiment with sunglasses. Cover the UV meter sensor area with different pairs of sunglasses. Record your results.

Lastly, try it with different types and colors of cloth.

VOCABULARY WORDS

Sensor — The area on the UV meter that senses the UV level.

SPF — Sun Protection Factor; a number indicating how protective a sunscreen is against UVB rays.

QUESTIONS

1. What SPF number seems to be the most protective against the sun's harmful UV rays? How much of a difference did it make?

2. Which pair of sunglasses filtered out the most UV rays? Were they UV sunglasses?

3. What kind of cloth filtered out the most UV rays? Was there any difference in similar types of cloth but with different colors?

4. From what you have learned from this experiment, what precautions should you take when going outside in order to protect yourself from the sun's harmful UV rays?

What Works? Effectively Blocking UV Rays

ESTIMATED TIME

40-50 minutes

SUPPLIES

- ✔ UV meter
- ✔ Plastic bags
- ✔ Pairs of UV and non-UV sunglasses
- ✔ Variety of sunscreens with different SPF numbers
- ✔ Variety of fabric pieces

LEARNING OBJECTIVE

This activity will show students that different sunscreens, coverings, and sunglasses can have a real effect on UV levels. This will emphasize to students the need to wear sunscreen, while at the same time helping them distinguish the effectiveness of different SPF numbers. Assess student comprehension by asking them to predict what levels of protection different materials would offer, other than the ones you've tried in the experiment.

DIRECTIONS

Take the UV meter outside. Have one student check and record the unfiltered UV level. Next, have the class take turns covering the UV meter with plastic bags and applying different sunscreens on the outside of the plastic bag over the sensor area. Make sure the students apply an even amount, no thicker than you would apply on your body. Have the students check and record the UV reading and sunscreen SPF number with each sunscreen. Try this for a variety of sunscreens with different SPF numbers. Use a clean bag for each sunscreen application.

Next, try the same experiment with sunglasses. Have the class cover the UV meter sensor area with different pairs of sunglasses and record the results. Finally, try covering the sensor with different types and colors of cloth and record the results.

QUESTIONS AND ANSWERS

1. What SPF number seems to be the most protective against the sun's harmful UV rays? How much of a difference did it make?
   Since SPF 15 filters out 93% of UVB radiation, and SPF 30 filters out 97%, there should be little noticeable difference with SPF numbers higher than 15; there should be a difference between SPF 4 and SPF 15.
2. Which pair of sunglasses filtered out the most UV rays? Were they UV sunglasses?
   Answers may vary. Yes, if the UV reading was low.
3. What kind of cloth filtered out the most UV rays? Was there any difference in similar types of cloth but with different colors?
   Answers will vary. Generally, tighter weave provides greater protection.
4. Given what you have learned from this experiment, what precautions should you take when going outside in order to protect yourself from the sun's harmful UV rays?
   Answers will vary, but students might say wearing broad spectrum sunscreen with SPF 30 or higher, UV blocking sunglasses, and tightly-woven clothing.

Chart and Graph UV Intensity

DIRECTIONS

Working with a partner or group, take turns going outside to record the UV intensity with the UV meter and the weather conditions (sunny, cloudy, rainy, etc.) at approximately the same time each day.

Record your findings in a logbook or chart.

After all the data is recorded, graph and analyze your data.

QUESTIONS

1. What difference does the weather make in the UV intensity each day?

2. On which days are the sun's UV rays the most dangerous? The least? Why?

Chart and Graph UV Intensity

ESTIMATED TIME

This activity should take a few minutes each day for recording data. The graphing and discussion should take 40-50 minutes once the data is collected. The entire activity could last one to two weeks, depending on how the class is divided.

SUPPLIES

- ✔ UV meter
- ✔ Logbook or chart for data

LEARNING OBJECTIVE

This activity will emphasize that harmful UV rays are present in any type of weather, not just when it is sunny outside. Students should always be SunWise, even on a cloudy day. Assess student comprehension of this message by asking the class to make a list of the clothing they wore each day of the experiment. Ask them how they would change their clothing and behavior now, knowing that there were UV rays present even on the cloudy days.

DIRECTIONS

Divide the students into pairs or groups. Each pair will take turns going outside to record the UV intensity with the UV meter and the weather conditions (sunny, cloudy, rainy, etc.) at approximately the same time each day. Students may also use the EPA UV Index website, **www.epa.gov/sunsafety/uv-index-1**, to retrieve current UV readings and past UV data.

Students should record their findings in the logbook or chart that you provide.

After all the data is recorded, instruct the students to graph and analyze the data.

QUESTIONS AND ANSWERS

1. What difference does the weather make in the UV intensity of each day?
The sun's UV rays are less affected by the weather than many students would think.

2. On which days are the sun's UV rays the most dangerous? The least? Why?
UV rays on cloudy days, as well as sunny days, can cause damage to unprotected skin and eyes. UVB rays fluctuate with time of day and season. UVA rays are consistent throughout the day and year and can pass through clouds.

STUDENT PAGE

Reflecting UV Radiation

DIRECTIONS

In this activity, you will determine the changes in UV intensity by comparing UV readings between direct sunlight and a variety of reflective surfaces.

Using the chart below, record the correct values taken from the UV meter as the meter is placed in a variety of scenarios.

Scenarios	*UV Meter Reading*
In direct sunlight	
In shade	
Reflecting off sand	
Reflecting off water	
Reflecting off aluminum foil	

QUESTIONS

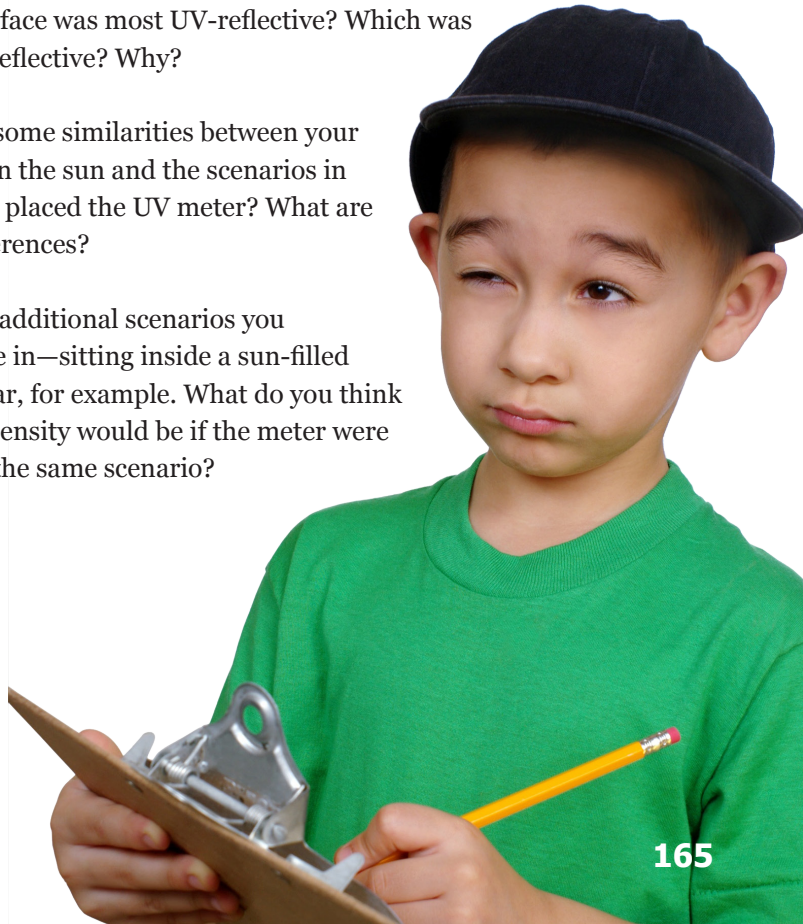
1. In which scenario was the UV intensity the greatest? What was the UV reading?

2. In which scenario was the UV intensity the least? What was the UV reading?

3. Which surface was most UV-reflective? Which was least UV-reflective? Why?

4. What are some similarities between your behavior in the sun and the scenarios in which you placed the UV meter? What are some differences?

5. List some additional scenarios you participate in—sitting inside a sun-filled room or car, for example. What do you think the UV intensity would be if the meter were placed in the same scenario?



Reflecting UV Radiation

ESTIMATED TIME

30 minutes

SUPPLIES

- ✔ UV meter
- ✔ Plastic bag (to protect the UV meter)
- ✔ A large bowl, bucket, or dishpan
- ✔ One lb. of sand
- ✔ One gallon of water
- ✔ Aluminum foil (enough to line the bowl)

LEARNING OBJECTIVE

The goal of this activity is to demonstrate changes in UV intensity by comparing UV readings from direct sunlight and a variety of reflective surfaces. Assess the prior knowledge of the students by asking them to predict readings caused by the different surfaces and why they selected those values. After the activity, discuss their results. Compare their predictions with their actual results.

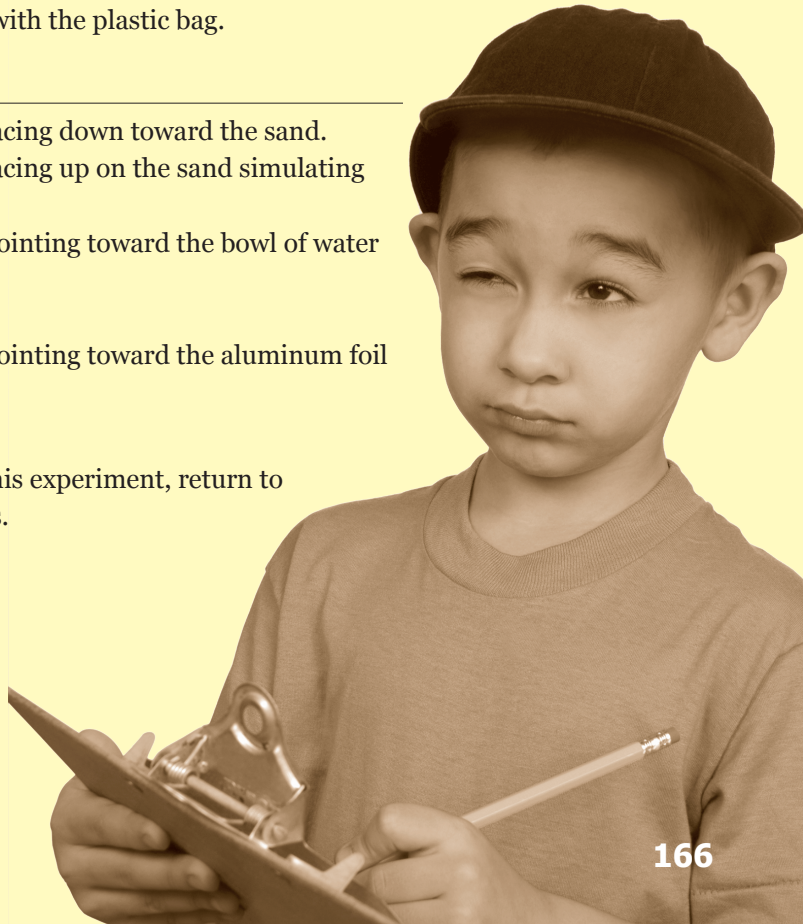
DIRECTIONS

Take students outside on a sunny day. Choose a location that offers students proper shade coverage, but allows you to place the experiment materials in direct sunlight. Take a UV reading using the UV meter. Have students record the UV reading in the appropriate space on the chart provided, or one that they have constructed to collect data. Use the UV meter in the scenarios listed and instruct the students to record the readings in the appropriate spaces on their chart. Remember, the UV meter is not waterproof. Don't forget to protect it with the plastic bag.

UV METER SCENARIOS

- Take a reading with the UV meter facing down toward the sand.
- Take a reading with the UV meter facing up on the sand simulating sunbathing.
- Take a reading with the UV meter pointing toward the bowl of water placed in the sun.
- Take a reading with the UV meter pointing toward the aluminum foil placed in the sun.

After your students have completed this experiment, return to your classroom to discuss the findings.



QUESTIONS AND ANSWERS

1. In which scenario was the UV intensity the greatest? What was the UV reading?
   Answers will vary.
2. In which scenario was the UV intensity the least? What was the UV reading?
   Answers will vary.
3. Which surface was most reflective? Which was least reflective? Why?
   Answers will vary.
4. What are some similarities between your behavior in the sun and the scenarios you placed the UV meter in? What are some differences?
   The scenarios were designed to mimic our behavior in the sun. Differences would include the use of broad spectrum sunscreen, sunglasses, or protective clothing; the use of these items would add protection from the UV rays.
5. List some additional scenarios you participate in; sitting inside a sun-filled room or car, for example. What do you think the UV intensity would be if the meter was placed in the same scenario?
   Try it out. The answers will vary depending on whether the windows are treated to block UV rays. Car windshields generally protect against UVA and UVB, while the side windows are not as protective.

SunWisdom

Action Steps for Sun Protection

While some exposure to sunlight can be enjoyable, too much can be dangerous. Overexposure to ultraviolet (UV) radiation in sunlight can result in a painful sunburn. It can also lead to more serious health effects, including skin cancer, premature aging of the skin, and other skin problems; cataracts and other eye damage; and immune system suppression. Children particularly need sun protection education, since unprotected exposure to the sun during youth puts them at an increased lifetime risk for skin cancer.

Be SunWise

Most people are not aware that skin cancer, while largely preventable, is the most common form of cancer in the United States, with more than 5 million cases diagnosed each year. By following a number of simple steps, you can still enjoy your time in the sun while protecting yourself from overexposure. In cooperation with a number of leading public health organizations, the US Environmental Protection Agency (EPA) developed these action steps to help you and your family be SunWise. Other than staying indoors, no single step can fully protect you from overexposure to UV radiation, so use as many of the following actions as possible.

Do Not Burn

Overexposure to the sun is the most preventable risk factor for skin cancer.

Avoid Sun Tanning and Tanning Beds

UV rays from tanning beds and the sun cause skin cancer and wrinkling. If you want to look like you've been in the sun, consider using a sunless self-tanning product, but continue to use broad spectrum sunscreen with SPF 30 or higher with it.

Apply Sunscreen

Apply sunscreen to all exposed skin using a sun protection factor (SPF) of 30 or higher that provides broad-spectrum protection from both ultraviolet A (UVA) and ultraviolet B (UVB) rays. Reapply every two hours, even on cloudy days, and after swimming or sweating.

Wear Protective Clothing

Wear protective clothing, such as a long-sleeved shirt, pants, a wide-brimmed hat, and sunglasses, when possible.

Seek Shade

Seek shade when you can, remembering that the sun's UV rays are strongest between 10 a.m. and 4 p.m.

Use Extra Caution Near Water, Snow, and Sand
Water, snow, and sand reflect the damaging rays of the sun, which can increase your chance of sunburn.

Check the UV Index
The UV Index provides important information to help you plan your outdoor activities in ways that prevent overexposure to the sun's rays. Developed by the National Weather Service and EPA, the UV Index is issued daily nationwide.

Get Vitamin D Safely
Get Vitamin D safely through a diet of foods fortified with Vitamin D. Don't seek the sun.

Check Your Skin
Early detection of melanoma can save your life. Carefully examine all of your skin once a month. A new or changing spot should be evaluated by a health care provider.

Use as Directed: Getting the Most Out of Sunscreen

The US Food and Drug Administration (FDA) is the federal agency responsible for regulating sunscreens. Effective June 18, 2012, FDA issued final regulations that established a standard test for over-the-counter (sold without a prescription) sunscreen products that determine which products are allowed to be labeled as "broad spectrum."

Prior FDA rules on sunscreens dealt almost exclusively with protection against sunburn, which is primarily caused by ultraviolet B (UVB) radiation from the sun, and did not address ultraviolet A (UVA) radiation, which contributes to skin cancer and early skin aging. After reviewing the latest science, FDA determined that sufficient data are available to establish a "broad spectrum" test for determining a sunscreen product's UVA protection. Passing the broad spectrum test shows that the product provides UVA protection that is proportional to its UVB protection.

Sunscreen products that pass the broad spectrum test are allowed to be labeled as "broad spectrum." These "broad spectrum" sunscreens protect against both UVA and UVB rays. Scientific data demonstrated that products that are "Broad Spectrum SPF 15 [or higher]" have been shown to reduce the risk of skin cancer and early skin aging when used with other sun protection measures, in addition to helping prevent sunburn. Other sun protection measures include limiting time in the sun and wearing protective clothing.

The SunWise program follows the recommendation of the National Council on Skin Cancer Prevention to use SPF 30 or higher sunscreen. The SPF value indicates the level of sunburn protection provided by the sunscreen product. All sunscreens must be tested according to an SPF test procedure. The test measures the amount of ultraviolet (UV) radiation exposure it takes to cause sunburn when a person is using a sunscreen in comparison to how much UV exposure it takes to cause sunburn when they do not use a sunscreen. The product is then labeled with the appropriate SPF value indicating the amount of sunburn protection provided by the product. Higher SPF values provide greater sunburn protection. Because SPF values are determined from a test that measures protection against sunburn caused by ultraviolet B (UVB) radiation, SPF values only indicate a sunscreen's UVB protection. However, sunscreens that pass the broad spectrum test have demonstrated that they also provide ultraviolet A (UVA) protection that is proportional to their UVB protection. To pass the broad spectrum test, sunscreens with higher SPF values provide higher levels of UVA protection as well. Therefore, under the label requirements, a higher SPF value for sunscreens labeled "Broad Spectrum SPF [value]" will indicate a higher level of protection from both UVA and UVB radiation.

FDA advises the public to be aware that no sunscreens are "waterproof" because all sunscreens eventually wash off. Sunscreens can only be labeled as "water resistant" if they are tested according to the required SPF test procedure. Sunscreens labeled "water resistant" are also required to state whether the sunscreen remains effective for 40 minutes or 80 minutes when swimming or sweating, and all sunscreens will be required to provide directions on when to reapply.

In summary, the final rule includes the following requirements:

- **Broad spectrum designation.** Sunscreens that pass FDA's broad spectrum test procedure, which measures a product's ultraviolet A (UVA) protection relative to its ultraviolet B (UVB) protection, may be labeled as "Broad Spectrum SPF [value]" on the front label. For broad spectrum sunscreens, SPF values also indicate the amount or magnitude of overall protection. Broad spectrum SPF products with SPF values higher than 15 provide greater protection and may claim additional uses, as described in the next bullet.
- **Use claims.** Only broad spectrum sunscreens with an SPF value of 15 or higher can claim to reduce the risk of skin cancer and early skin aging if used as directed with other sun protection measures. Non-broad spectrum sunscreens and broad spectrum sunscreens with an SPF value between 2 and 14 can only claim to help prevent sunburn.
- **"Waterproof," "sweatproof," or "sunblock" claims.** Manufacturers cannot label sunscreens as "waterproof" or "sweatproof," or identify their products as "sunblocks," because these claims overstate their effectiveness. Sunscreens also cannot claim to provide sun protection for more than two hours without reapplication or to provide protection immediately after application (for example—"instant protection") without submitting data to support these claims and obtaining FDA approval.
- **Water resistance claims.** Water resistance claims on the front label must indicate whether the sunscreen remains effective for 40 minutes or 80 minutes while swimming or sweating, based on standard testing. Sunscreens that are not water resistant must include a direction instructing consumers to use a water resistant sunscreen if swimming or sweating.
- **Drug Facts.** All sunscreens must include standard "Drug Facts" information on the back and/or side of the container.

ADDITIONAL RESOURCES FROM FDA

Tips to Stay Safe in the Sun: From Sunscreen to Sunglasses
https://www.fda.gov/ForConsumers/ConsumerUpdates/ucm049090.htm

Sunscreen: How to Help Protect Your Skin from the Sun
https://www.fda.gov/ForConsumers/ConsumerUpdates/ucm239463.htm

Questions and Answers: FDA announces new requirements for over-the-counter (OTC) sunscreen products marketed in the US
https://www.fda.gov/forconsumers/consumerupdates/ucm258468.htm

If used as directed with other sun protection measures, Product A reduces the risk of skin cancer and early skin aging, as well as helps prevent sunburn. Only products labeled with both "broad spectrum" AND SPF 15 or higher have been shown to provide all these benefits.

Products B and C have not been shown to protect against skin cancer and early skin aging. They have been shown only to help prevent sunburn.

Health Effects of Sun Overexposure

Since the appearance of an "ozone hole" over the Antarctic in the 1980s, Americans have become aware of the health threats posed by depletion of stratospheric ozone, which protects the earth from the sun's harmful ultraviolet (UV) rays. This fact sheet provides a quick overview of the major health problems linked to overexposure to UV radiation:

- Skin cancer (melanoma and nonmelanoma)
- Premature aging of the skin and other skin problems
- Cataracts and other eye damage
- Immune system suppression

Understanding these risks and taking a few sensible precautions will help you enjoy the sun while lowering your chances of sun-related health problems later in life.

SKIN CANCER

One in five Americans will develop skin cancer in their lifetime. Medical research is helping us understand the causes and effects of skin cancer. Many health and education groups are working to reduce the incidence of this disease, of which more than 5 million cases are diagnosed each year.

MELANOMA

Melanoma, the most serious form of skin cancer, is characterized by the uncontrolled growth of pigment-producing cells. One American dies of melanoma every hour. In 2017, an estimated 87,110 new cases of invasive melanoma will be diagnosed in the United States. Many dermatologists believe there may be a link between childhood sunburns and melanoma later in life. The rate of new melanoma cases in this country doubled from 1982 to 2011, and the rise is expected to continue.

NONMELANOMA SKIN CANCERS

Nonmelanoma skin cancers are generally less deadly than melanomas. Nevertheless, left untreated, they can spread, causing disfigurement and more serious health problems. More than 4 million Americans are treated for nonmelanoma skin cancer each year. There are two primary types of nonmelanoma skin cancers.

Basal Cell Carcinomas are the most common type of skin cancer tumors. They usually appear as small, fleshy bumps or nodules on the head and neck, but can occur on other skin areas. Basal cell carcinoma grows slowly, and rarely spreads to other parts of the body. It can, however, penetrate to the bone and cause considerable damage.

Squamous Cell Carcinomas are tumors that may appear as nodules or as red, scaly patches. This cancer can develop into large masses, and unlike basal cell carcinoma, it can spread to other parts of the body.

These two cancers have a cure rate as high as 95% if detected and treated early. The key is to watch for signs and seek medical treatment.

OTHER SKIN DAMAGE

Other UV-related skin problems include actinic keratoses and premature aging of the skin. Actinic keratoses are skin growths that occur on body areas exposed to the sun. The face, hands, forearms, and the "V" of the neck are especially susceptible to this type of lesion.

Although premalignant, actinic keratoses are a risk factor for squamous cell carcinoma. Look for raised, reddish, rough-textured growths and seek prompt medical attention if you discover them. Chronic overexposure to the sun also causes premature aging, which over time can make the skin become wrinkled, thick, and leathery. Since it occurs gradually, often manifesting itself many years after the majority of a person's sun exposure, premature aging is often regarded as an unavoidable, normal part of growing older. With proper protection from UV radiation, however, most premature aging of the skin can be avoided.

CATARACTS AND OTHER EYE DAMAGE

Cataracts are a form of eye damage in which a loss of transparency in the lens of the eye clouds vision. If left untreated, cataracts can lead to blindness. Research has shown that UV radiation increases the likelihood of certain cataracts. Although curable with modern eye surgery, cataracts diminish the eyesight of millions of Americans and cost billions of dollars in medical care each year. Other kinds of eye damage include pterygium (tissue growth that can block vision), skin cancer around the eyes, and degeneration of the macula (the part of the retina where visual perception is most acute). All of these problems can be lessened with proper eye protection.

IMMUNE SUPPRESSION

Scientists have found that overexposure to UV radiation may suppress proper functioning of the body's immune system and the skin's natural defenses. All people, regardless of skin color, may be vulnerable to effects, including impaired response to immunization and an increased sensitivity to sunlight that may result from interactions with certain medications.

Ozone: Good Up High, Bad Nearby

WHAT IS OZONE ANYWAY?

Ozone (O_3) is made naturally in the atmosphere when three oxygen atoms join together to form a colorless gas. Ozone can have good or bad effects, depending on where it's located in the atmosphere. One way to remember this is, "good up high, bad nearby."

GOOD UP HIGH

The "Good" Ozone Layer: Earth's Sunscreen

The earth is wrapped in layers of air called the atmosphere. "Good" ozone is in the earth's upper atmosphere, 10 to 30 miles above the surface. Life couldn't exist without this protective ozone, which is also called the "ozone layer."

The sun gives off light, heat, and other types of radiation. Too much UV (ultraviolet) radiation can cause skin cancer, cataracts, and harm plants and animals. Ozone high in the atmosphere absorbs, or takes in, some of the sun's harmful UV rays before they reach the ground. Just as sunscreen helps protect your skin from getting burned, ozone up high works like earth's sunscreen.

THE OZONE HOLE IS NOT A HOLE

Although we say "hole in the ozone layer" or "ozone hole," there's no actual hole. Instead, the protective layer contains less good ozone than it used to. This thinning is found all over the earth, but the biggest losses are over the North and South Poles. That's because ozone destruction is worse when it's very cold.

To see current levels of ozone over the South Pole, go to: **ozonewatch.gsfc.nasa.gov**.

The trouble with ozone destruction starts when certain chemicals used in air conditioners, fire extinguishers, insulating foams, and solvents are let out during use. These chemicals eventually reach the upper atmosphere and are broken down by the sun's radiation, releasing chlorine and bromine atoms. These atoms take away one of the oxygen atoms from ozone and use them to make other substances. Chlorine and bromine atoms are catalysts, meaning they can speed up a chemical reaction without changing, and can repeat the destructive cycle again with another ozone molecule. So one chlorine or bromine atom can destroy thousands and thousands of ozone molecules, causing ozone to disappear much faster than nature can replace it.

People often confuse the ozone hole with global warming, but they are two different problems.

IS ANYONE DOING ANYTHING ABOUT THE OZONE HOLE (THAT'S NOT A HOLE)?

The Montreal Protocol is an international treaty that protects the ozone layer by phasing out the manufacture and use of ozone-depleting chemicals. It was enacted in 1989, and all of the countries in the world have signed it. Many ozone-depleting chemicals are now illegal to use, or are only used in small quantities. Because of the Montreal Protocol, levels of most ozone-depleting chemicals in the atmosphere have slowly gone down. Based on current trends, scientists today expect the hole to return to 1980 levels by 2070.

Today, any products in the US containing CFCs and other ozone-depleting chemicals must have warning labels. The US also prohibits the release of refrigerants used in car and home air conditioners into the air because they still use ozone-depleting chemicals.

WHY CAN'T WE JUST MAKE MORE OZONE?

Ozone molecules are constantly being made and destroyed by the sun's ultraviolet light in natural processes. Normally, the amount made and the amount destroyed is about the same, so nothing changes. Think of the amount of ozone as the water level in a bathtub with the faucet running and the drain open. If you turn on the water just right, you can make the amount of water leaving the bathtub equal to the amount coming in, so that the water level never changes. But right now, the drain has gotten faster, and the amount of ozone destroyed is more than the ozone being made.

A big reason we can't make more ozone to send into the upper atmosphere is because it would take a LOT of energy. In the atmosphere, this huge amount of energy comes from the sun. We also don't have a way to transport the ozone to the right places in the atmosphere.

Since we can't make more ozone, the solution is to slow the flow down the drain back to its normal rate. And the only way to do that is to stop using ozone-depleting chemicals.

BAD NEARBY

What Causes "Bad" Ozone?

"Bad" ozone is found at ground level. In cities, it's made when emissions from vehicles, power plants, chemical plants, and other sources react with heat and sunlight. The hotter the day and the stronger the sun, the more ground-level ozone is formed. That's why ground-level ozone is usually worse on windless, hot summer afternoons. High levels of ground-level ozone are mainly a concern for people from April 1–September 30.

You're most likely to find high levels of "bad" ozone in urban areas. You might hear it called "smog." However, other areas can also have high ozone levels when winds blow pollution hundreds of miles from their original sources.

HOW DOES "BAD" OZONE AFFECT ME?

Even at low levels, breathing ozone can cause chest pains, coughing, nausea, throat irritation, and congestion. It can also worsen heart and lung diseases, like emphysema, bronchitis, and asthma. The more ozone pollution a person breathes, the more permanent damage it can do to their lungs.

Healthy people can also find it harder to breathe when exposed to ozone pollution. Because it usually forms in hot weather, anyone who spends time outdoors in the summer may be affected, particularly children, older people, outdoor workers, and people exercising. Millions of Americans live in areas where ozone levels are higher than the national health standards, and should pay attention to ozone levels when the weather is hot and sunny.

WAYS TO PROTECT YOUR HEALTH ON BAD OZONE DAYS:

- Use the Air Quality Index (AQI). The AQI uses colors and numbers to tell you how much pollution is in the air: **www.airnow.gov**.
- Use the EPA's Activity Guidelines at your school and sports practices to keep your kids healthy: **www.epa.gov/airnow/flag/school-chart-2014.pdf**.
- Do outdoor activities early in the morning and after 6 p.m.
- Pay attention to any breathing or lung problems you might have.

HOW ARE WE DEALING WITH OZONE POLLUTION?

The Clean Air Act Amendments of 1990 require the US Environmental Protection Agency, the states, and cities to carry out programs that reduce emissions of ozone-forming chemicals from sources like cars, industry, power plants, and consumer products. Power plants are reducing emissions, companies are developing cleaner cars and fuels, many gas stations are using special nozzles at the pumps to recapture gasoline vapors, and vehicle inspection programs are being improved to reduce emissions.

WHAT CAN I DO?

We can control some things, and some things we can't. Here are some things you can do. And remember, lots of small steps add up to big differences!

TO LIMIT "BAD," NEARBY OZONE

- Keep your car tuned-up and running well.
- Carpool, use mass transit, walk, bicycle, and plan trips efficiently to reduce driving, especially on hot summer days.
- Be careful not to spill gas when filling up your car or gas-powered lawn equipment. During the summer, fill your gas tank during cooler evening hours.
- Make sure your car's tires are properly inflated and your wheels are aligned.
- Participate in your local utility's energy conservation programs.
- Seal containers of household cleaners, workshop solvents, and garden chemicals to prevent chemicals from evaporating into the air. Dispose of them properly.

TO PROTECT "GOOD" OZONE UP HIGH

- Have your car, home air conditioner, and refrigerator checked for leaks.
- Make sure that the technicians working on your air conditioners and refrigerator are certified to recover the refrigerant, as required by law.
- Find out from your local government the best way to get rid of old refrigerators and air conditioners.

HOW CAN I PROTECT MYSELF FROM UV RAYS?

- Use the UV (ultraviolet) index: The UV Index tells you how strong the sun's rays will be for the day: **www.epa.gov/sunsafety**.
- Don't get burned: Sunburns, especially for children, significantly increase the risk of getting skin cancer over your lifetime.
- Avoid sun tanning and tanning beds: The UV radiation causes skin cancer and wrinkling.
- Use enough sunscreen: At least 15 minutes before going outside, put sunscreen on all exposed skin. Sunscreen should have a sun protection factor (SPF) of at least 30 and provide broad spectrum protection from both ultraviolet A (UVA) and ultraviolet B (UVB) rays. Reapply every two hours, even on cloudy days, and after swimming or sweating.
- Wear protective clothing, such as a long-sleeved shirt, pants, a wide-brimmed hat, and sunglasses, when possible.
- Seek shade when you can. Remember, the sun's rays are strongest from 10 a.m. to 4 p.m.
- Use extra caution near water, snow, and sand: They reflect the sun's rays, which can increase your chance of sunburn.
- Get vitamin D safely: Choose foods fortified with Vitamin D. Don't seek the sun.

THE SHADOW RULE

Look for your shadow to estimate your UV exposure:

- If your shadow is taller than you are (in the early morning and late afternoon), you're probably getting less UV exposure.
- If your shadow is shorter than you are (around midday), you are getting higher levels of UV radiation. Seek shade and protect your skin and eyes.

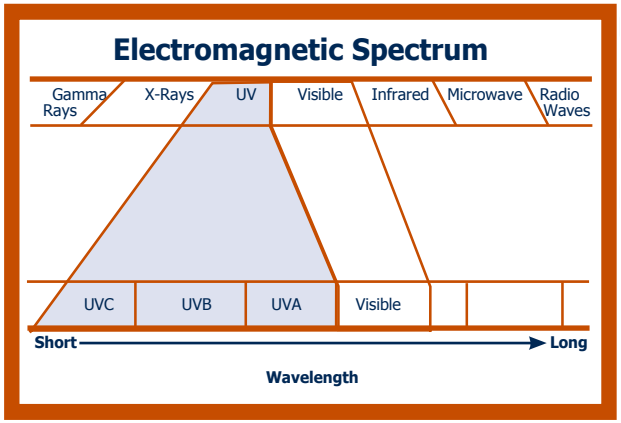
UV Radiation

The sun radiates energy over a broad spectrum of wavelengths. Ultraviolet (UV) radiation, which has a shorter wavelength than either visible blue or violet light and is not visible to the human eye, is responsible for sunburns and other adverse health effects (Diagram A). Fortunately for life on earth, our atmosphere's stratospheric ozone layer shields us from most UV radiation. What gets through the ozone layer, however, can cause the following problems, particularly for people who spend time outdoors without sun protection:

- Skin cancer
- Premature aging of the skin
- Suppression of the immune system
- Cataracts and other eye damage

Because of these serious health effects, you should limit your exposure to UV radiation and protect yourself when outdoors.

Diagram A



TYPES OF UV RADIATION

Scientists classify UV radiation into three types or bands—UVA, UVB, and UVC.

- UVA: Not absorbed by the ozone layer.
- UVB: Mostly absorbed by the ozone layer, but some does reach the earth's surface.
- UVC: Completely absorbed by the ozone layer and oxygen in the atmosphere.

UVA and UVB that reach the earth's surface contribute to the serious health effects listed above.

UV LEVELS DEPEND ON A NUMBER OF FACTORS

The level of UV radiation that reaches the earth's surface can vary, depending on many factors. Each of the following factors can increase your risk of UV radiation overexposure and its consequent health effects.

STRATOSPHERIC OZONE

The ozone layer absorbs most of the sun's UV rays, but the amount of absorption varies depending on the time of year and other natural phenomena. This absorption has also decreased as the ozone layer has thinned, due to the release of ozone-depleting substances that have been widely used in industry.

TIME OF DAY

The sun is at its highest in the sky around noon. At this time, the sun's rays have the least distance to travel through the atmosphere and UVB levels are at their highest. In the early morning and late afternoon, the sun's rays pass through the atmosphere at an angle and their intensity is greatly reduced.

TIME OF YEAR

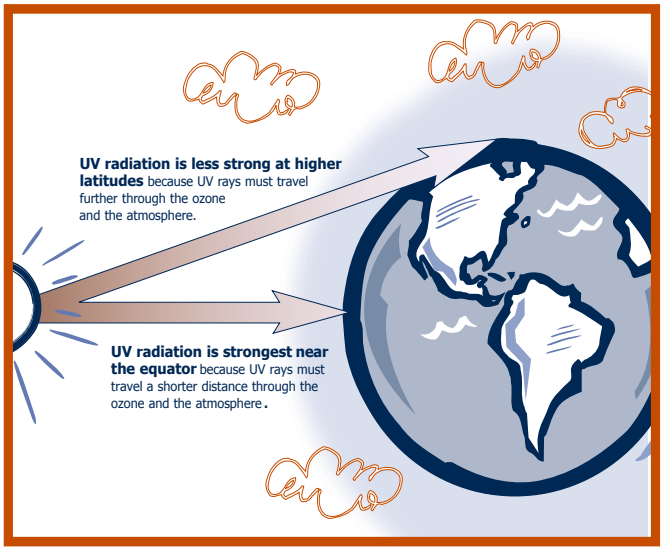
The sun's angle varies with the seasons, causing the intensity of UVB rays to change. UVB intensity tends to be highest during the summer months. The intensity of UVA rays is relatively constant throughout the year.

LATITUDE

The sun's rays are strongest at the equator, where the sun is most directly overhead and UV rays must travel the least distance through the atmosphere (Diagram B).

Ozone also is naturally thinner in the tropics compared to the mid and high latitudes, so there is less ozone to absorb the UV radiation as it passes through the atmosphere. At higher latitudes the sun is lower in the sky, so UV rays must travel a greater distance through ozone-rich portions of the atmosphere and, in turn, expose those latitudes to less UV radiation.

Diagram B



ALTITUDE

UV intensity increases with altitude because there is less atmosphere to absorb the damaging rays. Thus, when you go to higher altitudes, your risk of overexposure increases.

WEATHER CONDITIONS

Cloud cover reduces UVB levels, but not completely. Depending on the type and thickness of the cloud cover, it is possible to burn—and increase your risk for long-term skin and eye damage—on a cloudy day.

REFLECTION

Some surfaces, such as snow, sand, concrete, or water, can reflect much of the UV radiation that reaches them. Because of this reflection, UV intensity can be deceptively high even in shaded areas.

What Is the UV Index?

Some exposure to sunlight can be enjoyable; however, too much could be dangerous. Overexposure to the sun's ultraviolet (UV) radiation can cause immediate effects, such as sunburn, and long-term problems, such as skin cancer and cataracts. The UV Index, which was developed by the National Weather Service and the US Environmental Protection Agency (EPA), provides important information to help you plan your outdoor activities to prevent overexposure to the sun's rays.

The UV Index provides a daily forecast of the expected risk of overexposure to the sun. The Index predicts UV intensity levels on a scale of 0 to 11+, where < 2 indicates a low risk of overexposure and 11+ signifies an extreme risk. Calculated on a next-day basis for every ZIP Code across the United States, the UV Index takes into account clouds and other local conditions that affect the amount of UV radiation reaching the ground in different parts of the country.

UV Index Number	Exposure Level
2 or less	Low
3 to 5	Moderate
6 to 7	High
8 to 10	Very High
11+	Extreme

SUNWISE ACTION STEPS

By taking a few simple precautions daily, you can greatly reduce your risk of sun-related illnesses. To be SunWise, consider taking the following action steps daily:

- Do not burn.
- Avoid sun tanning and tanning beds.
- Generously apply sunscreen.
- Wear protective clothing, including a hat, sunglasses, and full-length clothing.
- Seek shade.
- Use extra caution near water, snow, and sand.
- Check the UV Index.
- Get Vitamin D Safely.

Early detection of melanoma can save your life. Carefully examine all of your skin once a month. A new or changing spot should be evaluated.

WHAT IS THE UV ALERT?

EPA issues a UV Alert when the level of solar UV radiation reaching your local area is predicted to be unusually intense for the time of year. The UV Alert is a warning, and it offers simple steps you can take to protect yourself and your family. The UV Alert consists of the SunWise action steps and is posted by zip code and city, state at **www.epa.gov/sunsafety**.

WHAT DOES THE UV ALERT MEAN?

The UV Alert is based on the UV Index, which EPA provides with the support of the National Weather Service. EPA only issues a UV Alert when the UV Index is predicted to be 6 or higher and unusually intense for the time of year. In some parts of the United States, the UV Index rarely or never reaches this level, so your local area may never receive a UV Alert.

UV Alert days are not the only days you need to protect yourself. EPA recommends that you take the SunWise action steps every day, regardless of the season. Because children typically spend more time outdoors than adults, it is especially important that children take these steps. Even if you have darker skin, EPA recommends that you act SunWise to reduce your risk of skin cancer, cataracts, and other UV-related health problems.

WHERE CAN I FIND THE UV INDEX AND UV ALERT FORECASTS FOR MY AREA?

You can find the UV Index and UV Alert forecasts for your area in your local newspaper, on television, and by visiting EPA's sun safety website at **www.epa.gov/sunsafety**. Enter your zip code. The resulting UV forecast will indicate if there is a UV Alert.

Resources

American Academy of Dermatology
www.aad.org

American Academy of Pediatrics
www.aap.org

American Cancer Society
www.cancer.org

American Meteorological Society
www.ametsoc.org

American School Health Association
www.ashaweb.org

Centers for Disease Control and Prevention
www.cdc.gov/cancer

Children's Melanoma Prevention Foundation
www.melanomaprevention.org

Colette Coyne Melanoma Awareness Campaign (CCMAC)
www.ccmac.org

Melanoma Research Foundation
www.melanoma.org

National Aeronautics and Space Administration (NASA)
www.nasa.gov

National Cancer Institute
www.cancer.gov

National Council on Skin Cancer Prevention
www.skincancerprevention.org

National Oceanic and Atmospheric Administration (NOAA)
www.noaa.org

National Safety Council
www.nsc.org

National Science Foundation
www.nsf.gov

National Weather Service
www.cpc.ncep.noaa.gov

National Wildlife Federation
www.nwf.org

Prevent Cancer Foundation
www.preventcancer.org

Richard David Kann Melanoma Foundation
www.melanomafoundation.com

SHADE Foundation of America
www.shadefoundation.org

SHAPE America
www.shapeamerica.org

The Skin Cancer Foundation
www.skincancer.org

SunSmart Programme
www.sunsmart.com.au

US Department of Health and Human Services
www.hhs.gov

World Health Organization INTERSUN Programme
www.who.int/uv/en