

SOUTH COAST REPERTORY

2008 Educational Touring Production

TEACHER'S GUIDE



Written by Richard Helleesen

Music and Lyrics by Michael Silversher

Directed by John-David Keller

**Honorary Producers
The Boeing Company
The Capital Group Companies Charitable Foundation**

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I. THE PLAY

SYNOPSIS

Ursula the Polar Bear is alarmed because her frozen Arctic home has started to melt away. Deciding to take matters into her own paws, she journeys south and ends up sharing Alex’s freezer with the ice cream and trying to keep herself cool while in search of some answers. The word on the ice floe is that humans are to blame, but Alex refuses to believe that anything he’s doing can have an effect on conditions so far removed from his daily life. Ursula wonders if the Earth’s thermostat might not be broken, so she climbs into the A/C vent to investigate, with Alex right behind her. They quickly find themselves at Central Heating and Cooling with Jo and Fred, who teach them the difference between “weather” and “climate,” and confirm the fact that temperatures worldwide are definitely on the rise. Next, at the Greenhouse Open House, two famous scientists from the past who first studied this problem a century ago explain exactly why we’re getting warmer. Lastly, at the Powerhouse, they hear from Nat the Hat and Doreen how power consumption by humans affects climate change and what can be done to stop the process before it’s too late. Promising to do whatever it takes to help get Ursula and her family back onto solid ice as soon as possible, Alex declares, “We all live in this world, so we should all look out for each other.”

CHARACTERS

ALEX – 21st-century boy who’s tuned in, plugged in and switched on big time
URSULA – furry white visitor from the North Pole (or thereabouts)
JO and FRED – who run hot and cold at Central Heating and Cooling
JOSEPH FOURIER – French mathematician who first identified the “Greenhouse Effect”
SVANTE ARRHENIUS – Swedish chemist who first cautioned about global warming
NAT THE HAT – fossil fuel guy who’s all about consuming resources
DOREEN – renewable energy girl who’s all about saving resources

SCENES and SETTINGS

Time: Now
Place: Here, and Beyond the Thermostat
Scene 1 – Alex’s House
Scene 2 – Central Heating and Cooling
Scene 3 – The Greenhouse
Scene 4 – The Power House
Scene 5 – The Arctic

SONGS

Tune Up, Plugged In, Switched On Alex
Gimme Ice Ursula
We’re Getting Warmer Jo & Fred
Everyone Thought I Was Crazy Fourier & Arrhenius
Get the Power Nat the Hat
Renewable Energy Doreen
Gimme Ice (reprise) Ursula
We’re Getting Warmer (reprise) Alex & Ursula

GLOSSARY

Alaska: U. S. state in the northwestern-most part of the North American continent. The Arctic is Alaska's most remote wilderness area.

Arctic Circle: line of latitude that marks the boundary of the Arctic. North of this latitude there are periods of continuous night in the winter and continuous day in the summer.

Atmosphere: mixture of gases surrounding the Earth. The Earth's atmosphere consists of 79.1% nitrogen (by volume), 20.9% oxygen, 0.036% carbon dioxide, and trace amounts of other gases.

Canada: country occupying most of northern North America, extending from the Atlantic Ocean in the east to the Pacific Ocean in the west and northward into the Arctic Ocean. It is the world's second largest country by total area, and shares land borders with the United States to the south and northwest (Alaska).

Carbon cycle: exchange of carbon between living organisms and the environment. Carbon dioxide is taken from the atmosphere by photosynthesizing plants and returned by the respiration of plants and animals.

Carbon Dioxide (CO₂): colorless, odorless, non-poisonous gas that is a normal part of the atmosphere and contributes the most to human-induced global warming as a by-product of fossil fuel combustion.

Climate: long-term average weather of a region including typical weather patterns, the frequency and intensity of storms, cold spells, and heat waves.

Climate Change: refers to changes in long-term trends in the average climate, such as changes in average temperatures, whether due to natural variability or as a result of human activity.

Drought: period of abnormally dry weather long enough to cause serious shortages of water for agriculture and other needs in the affected area.

Electricity: flow of electrical power or charge. It is a secondary energy source which means that we get it from the conversion of other sources, like coal, natural gas, oil, and nuclear power, which are called primary sources. In the United States, electrical energy is often measured in kilowatt-hours (kWh).

Energy: capability of doing work (potential energy) or the conversion of this capability to motion (kinetic energy). Energy has several forms, some of which can be easily changed to another form useful for work

Environment: the external physical conditions such as air, water, temperature, etc. that affect an organism's growth and survival.

Fluorescent Light: type of bulb that differs from an ordinary (incandescent) bulb in the efficiency with which it uses electricity to create light. 90% of the energy consumed by an incandescent bulb is wasted, which is why they heat up so quickly. One fluorescent bulb can outlast up to 13 incandescent bulbs and although more expensive to purchase, they can end up saving 8 to 12 times their cost over the life of the bulb.

Fossil Fuel: general term for buried combustible deposits of organic materials, formed from decayed plants and animals that have been converted to crude oil, coal, natural gas, or heavy oils by exposure to heat and pressure in the Earth's crust over hundreds of millions of years. Most of the world's convertible energy comes from fossil fuels that are burned to produce heat.

Generator: device that converts mechanical energy into electrical energy. A generator moves electric current but does not create electric charge.

Geothermal: pertaining to the internal heat of the earth.

Glacier: large body of continuously accumulating land-based ice and compacted snow, formed in mountain valleys or at the poles, that deforms under its own weight and slowly moves.

Global Warming: progressive gradual rise of the Earth's average surface temperature thought to be caused in part by higher concentrations of greenhouse gases in the atmosphere.

Greenhouse Effect: trapping and build-up of heat in the atmosphere near the Earth's surface. Some of the heat flowing back toward space from the Earth's surface is absorbed by water vapor, carbon dioxide, ozone, and several other gases and then re-radiated back toward the Earth's surface. If the concentrations of these "greenhouse gases" rise, the average temperature of the lower atmosphere will gradually increase.

Greenhouse Gas: any gas that absorbs infrared radiation in the atmosphere.

Hibernation: deep sleep during the winter for some animals. Most bears are not true hibernators because they will occasionally wake up and walk around during the winter. Pregnant female polar bears, however, always hibernate in their dens over the winter, emerging with their young in the spring.

Ice Floe: floating chunk of sea ice less than six miles wide at its greatest dimension. Wider chunks are called “ice fields.” A thick mass of ice covering coastal land and extending out over the sea so that the extended portion floats is known as an “ice shelf.”

Joseph Fourier (1768-1830): French mathematician and physicist who discovered in 1824 that gases in the atmosphere might increase the Earth’s surface temperature—now known as the “greenhouse effect.”

Northern Lights: a luminous atmospheric phenomenon that causes bands of lights to appear in the night sky of the northern polar region, also called the “aurora borealis.”

North Pole: point in the middle of the Arctic Ocean at which all directions point south. Although the North Pole has been frozen solid for hundreds of thousands—perhaps millions—of years, scientists expect that the Arctic Ocean may become completely ice-free during the summer months before 2015.

Pack Ice: floating ice, found especially in polar regions, that has formed itself into a solid mass covering a large area. The term “sea ice” refers to pack ice that covers the Arctic Ocean.

Paddle Wheel: large wheel, generally built of a steel framework, which is fitted with numerous paddle blades around the outside edge. In the water, the bottom quarter or so of the wheel is underwater. Rotation of the paddle wheel produces thrust, forward or backward as required.

Polar Bear: largest carnivore on earth, whose Latin name *Ursus maritimus* means “sea bear.” Polar bears are considered marine mammals because they spend most of their time in or around water, much the same as whales, dolphins, seals, sea lions, walrus, and sea otters. They hunt and breed on sea ice and would be poor candidates for survival if forced to live on land.

Polar Ice Caps: thick permanent covering of ice and snow at the North and South Poles.

Power Plant: energy-producing facility which uses either a turbine engine, water wheel, or other similar machine to drive a generator that converts mechanical or chemical energy to electricity.

Recycling: collecting and reprocessing materials so they can be used again. An example is collecting aluminum cans, melting them down, and using the aluminum to make new cans or other products.

Renewable Energy: energy obtained from non-depleting sources such as geothermal steam, wind, and the sun.

Seal: polar mammal that spends much of its time in the water. Ringed seals, which are the major food source for polar bears, thrive off Alaska’s coast and can survive in completely ice-covered waters.

Svante Arrhenius (1859-1927): Nobel Prize-winning Swedish physicist who first investigated the “greenhouse effect.” Arrhenius proposed in 1896 that doubling the amount of carbon dioxide in the atmosphere could raise the Earth’s surface temperature by 7-11 degrees Fahrenheit.

Thermostat: electrical device for regulating the flow of energy into and out of a heating and/or cooling system in order to automatically control interior temperatures.

Turbine: machine that converts the kinetic energy of a moving fluid (liquid or gas) to mechanical energy. Most of the electricity in the United States today is produced in steam turbines. Their food supply will be dangerously decreased if the Arctic ice melts and they are forced to spend all their time near the shore.

Walrus: large arctic mammal who dives from the ice sea to hunt for food on the ocean’s floor.

Weather: specific condition of the atmosphere at a particular place and time, measured in terms of wind, temperature, humidity, atmospheric pressure, cloudiness, and precipitation. In most places, weather can change hour-to-hour, day-to-day, and season-to-season.

Windmill: machine designed to convert wind energy into a more useful form by means of rotating blades. Modern windmills are more properly called “wind turbines” and are primarily used to generate electric power.

II. THE PRODUCTION

MEET THE PLAYWRIGHT

“I’m Richard Helleesen and I wish I could write music, but I write plays instead. Which I never planned to do; it just turned out that way. I grew up in the city of Orange, where I always liked doing plays in school. I wrote my first short play in third grade, and another in fifth grade. I really got involved in theatre in high school, and thanks to a particularly generous (and patient) drama teacher, I wrote and performed more short plays and my first long one. We also took field trips to a theatre called South Coast Repertory, which was a lot of fun, although I could never imagine actually working there. When I went to college at Cal State Fullerton, I studied Serious Things, but in my spare time found myself—guess what—acting and writing. Finally I realized I had to make a choice, and since Serious Things would always be there, I thought I’d give theatre a try for a while and see how it went. I’m still trying it. Now many years later, I’ve written several plays for adults produced at theatres across the country (including SCR). I’ve worked with many wonderful people and even won a few awards. In 1990, Michael Silversher and I began writing educational touring shows that are performed in schools, most recently last season’s *Bad Water Blues*.”

MEET THE COMPOSER

“I’m Michael Silversher, and I write songs, mostly. I also write music by itself, without words on occasion, but mostly I write songs with words. I’ve been writing songs from the time I was eight-years-old. I just always heard music in my head. I’d ask everyone I knew if they’d heard this piece of music before, and when they’d say, “No,” I figured I had written it. And I had! I’ve written a lot of songs with my partner, Patty Silversher, for Disney—mostly for television and video movies, like *Little Mermaid 2* and *Return of Jafar*, “Winnie-the-Pooh” specials and TV theme songs (“Gummi Bears” and “Tale Spin”). Also for Jim Henson and the Muppets, the TV series “Animal Jam” on the Learning Channel, “Muppet Classic Theatre,” and “Elmo in Grouchland.” THAT won a Grammy Award for Best Children’s Album with Music in 1999. We’ve also been nominated for three Emmy Awards for Best Individual Achievement in Songwriting for Television. I’m self-educated, although I did win a scholarship to Berklee School of Music in Boston way back in 1969 and attended classes there one summer. That’s the only real music education I’ve ever had. I have a great ear and an open attitude and I love every kind of music there is, so making music is like breathing to me.”

THE CREATIVE TEAM

Director: **John-David Keller** has directed more plays *for* children and more children *in* plays than anyone at South Coast Repertory. As the director of *A Christmas Carol* since it began 27 years ago, he gives lots of local youngsters their start in theatre. And as a director for almost all of the Educational Touring Productions, his work is featured annually in local schools throughout the Southland. In addition to his directing assignments, he appears regularly onstage both at SCR and throughout the region, most recently in *Bach at Leipzig* (Argyros Stage ’06-07) and *The Importance of Being Earnest* (Seegerstrom Stage ’07-08).

Set & Costume Designer: Romanian-born **Angela Balogh Calin** has designed many of SCR’s Theatre for Young Audiences productions, including most recently *James and the Giant Peach* and *The BFG*. She also designed costumes for SCR’s productions of *Dumb Show* (’06-07) and *Doubt* (’07-08), and she has designed sets and costumes for the Educational Touring Production since 2000.

III. EXPLORING THE THEME

WHAT IS THE GREENHOUSE EFFECT?

The Greenhouse Effect is a natural process occurring in the atmosphere which has been present since time began. It is a heat-trapping effect of the atmosphere which provides the Earth with a stable climate that allows life to flourish. Without it, the Earth would be too cold to sustain life. How this natural phenomenon works is well researched and understood.

The word "greenhouse" originated from a small glass house sometimes seen in mid to high latitudes where attempts were made to cultivate plants and trees from a warmer climate. As far back as Greek and Roman times, people made structures that created an indoor environment suited to growing plants throughout the year. With climate control, a gardener could provide fresh fruits and vegetables when needed. Today these structures are usually made of glass or plastic, but still allow us to maintain year-round greenery, and so, are called greenhouses.

The idea is that the short-wave radiation from the Sun goes into the house by penetrating the transparent glass, but it does not come out after reflection from the ground or any object in there and the heat energy is trapped inside. When the short-wave radiation is reflected from the ground inside the glass house, the wavelengths of reflected rays become longer and the penetrating power is reduced, accordingly, they do not fully escape the glass house. Due to the accumulating heat energy, the inside temperature rises naturally and tropical plants can grow.

As we are aware that our planet receives energy (solar radiation) continuously from the sun, it must get rid of this energy at the same rate by radiating it back out to space. Greenhouse gases (carbon dioxide, methane, nitrous oxide, water vapor, and chloro-fluoro-hydrocarbons) absorb some of this energy as it is being radiated out into space. In this way, the earth's surface has been provided with the required, regular supply of energy for life. If the concentrations of these gases increase, more heat will be trapped causing changes to the condition of the atmosphere and consequently to climate. It is being understood that these greenhouse gas concentrations are increasing and one probable result among others is a warming of the earth's surface (in the lower atmosphere), resulting in increasing temperature (global warming), climate changes, and subsequently associated sea level rises.

Concerns about the intensification of the Greenhouse Effect and its likely impacts on the climate system stem from disturbing findings by climate scientists who have studied this process over a period of time. They have demonstrated the close correlation between the rapid build up of concentrations of greenhouse gases in the atmosphere and the warming of the Earth's surface.

Rapid increases in greenhouse gas concentrations are due mainly to human activities such as burning of fossil fuels, deforestation, intensive agriculture, coal mining, rubbish dumps, and certain industrialized products. Since human activities bring about this increase in greenhouse gases, human responsibilities and actions should see to it that the trend should be reversed and, if possible, returned to safe levels.

Excerpted from an article published by the Department of Energy's ARM (Atmospheric Radiation Measurement) program. Read more online @ <http://education.arm.gov/teacherslounge/background/greenhouse.stm>

POLAR BEARS TREADING ON THIN ICE

Most of us wake up in the comfort of our own homes, knowing when our next meal will be. We normally know what to expect from the day. Most polar bears, on the other hand, aren't half as lucky.

To them, living is a deathly risk. Somewhere, in the middle of the Arctic Ocean, an exhausted polar bear frantically searches for an iceberg to save his life. He spots a chunk of ice about forty miles from his current, lost position. He doesn't know that by the time he reaches the ice chunk, his journey will be futile because the ice chunk will have melted to slush. The polar bear's name in Latin, *Ursus maritimus*, means "sea bear." Polar bears are entirely dependant on the sea ice for food.

During the summer, they roam the icy waters for large chunks of ice and drift for hundreds of miles finding mates, hunting for seals and penguins to fatten themselves before hibernation. However, global warming stands as the single, largest threat to polar bears' survival. Their natural habitat is melting away. A survey by the U.S. Mineral Management Service has recorded elevated numbers of polar bears drowning. Some have been found swimming far out in the warming Arctic sea, as the sea ice pulls back farther from land and the bears try to swim to shore. The polar bear, a strong swimmer and lone predator, is found on the arctic coasts and islands of the five countries around the North Pole: the United States (Alaska), Canada, Denmark (Greenland), Norway, and Russia.

It is the only species that still lives throughout its original range, with an estimated 20,000 living in the wild. Over the past three decades, more than one million square miles of sea ice - an area the size of Norway, Denmark and Sweden combined - has disappeared because of global warming. One of the reasons the loss of the planet's ice cover is accelerating is because, as the pole's bright white surface disappears, it changes the relationship of the Earth and the Sun.

Polar ice is so reflective that 90 percent of the sunlight that strikes it simply bounces back into space, taking its energy with it. Ocean water does just the opposite, absorbing 90 percent of the light and heat it receives, meaning that each mile of melting ice vanishes faster than the mile that preceded it. Scientists predict that, if the current rate of global warming continues, just about all of the bears' summer sea ice will be gone by 2100. Already, the ice on the southern edge of the polar bears' range is melting about three weeks earlier than in the past. As a result of early melting, there has been a 14 percent decline in the western Hudson Bay polar bear population over the past ten years. Polar bears native to the Hudson Bay are unique in the Arctic because they have a hibernation period of six to eight months, and winter hunting is essential for fat reservation.

The increasing scarcity of ice caps in the Arctic summer leaves them stranded onshore for unnaturally longer periods before they are able to replenish their reserves of fat by feeding on seal pups, which live on the ice. Polar bears are clumsy hunters on land and more time on land means loss of their critical fat reserves. This has negative impacts on reproduction as females aren't able to produce enough milk for their young. Lack of food has made some polar bears desperate enough to turn to cannibalism. In addition, a growing number of polar bears are drowning as they are forced to swim more often, and for longer distances, in search of ice caps. In May 2006, the threat of global warming to polar bears prompted the IUCN (World Conservation Union), one of the world's leading environmental bodies, to add the bears to its "Red List" of threatened wildlife. This is classified as "vulnerable," which is defined by the IUCN as a species facing a "high risk of extinction in the wild."

In 1973, Canada, the U.S. Denmark and Norway signed the International Agreement on the Conservation of Polar Bears and their Habitat. Its mission is to protect the bears' ecosystems, particularly their feeding areas and migration routes. The agreement also bans hunting from aircraft and powerboats. However, polar bears are still at risk of hunting and of disturbance to their habitat from oil exploration. In the far north of Russia, another United Nations agency [...] works with local communities to protect areas where polar bears live. People are involved in better management of the eco-systems that polar bears and other species depend on for their survival. The cold fact remains that polar bears are close to extinction. How much more can we stand to lose before we take action against the beginning of a crisis?"

Excerpted from an article by Nikita King in the Monday, January 8, 2007, issue of The Medium Online: The Voice of the University of Toronto

http://www.mediumonline.ca/news/index.php?option=com_content&task=view&id=622&Itemid=65

SCIENTISTS REPORT SEVERE RETREAT OF ARCTIC ICE

FAIRBANKS, Alaska, Sept. 20 — The cap of floating sea ice on the Arctic Ocean, which retreats under summer's warmth, this year shrank more than one million square miles — or six Californias — below the average minimum area reached in recent decades, scientists reported Thursday.

[...] While satellite tracking of polar sea ice has been done only since 1979, several ice experts who have studied Russian and Alaskan records going back many decades said the ice retreat this year was probably unmatched in the 20th century, including during a warm period in the 1930s. "I do not think that there was anything like we observe today" in the 1930s or 1940s, said Igor Polyakov, an ice expert at the University of Alaska, Fairbanks.

The ice retreat has been particularly striking this year. The Alaskan side of the Arctic Ocean has stretches of thousands of square miles of open water; the fabled Northwest Passage through the islands of northern Canada was free of ice for weeks; and the sea route between the Atlantic and Pacific Oceans north of Russia was nearly clear a week ago, with one small clot of ice around a group of Siberian islands.

Mark Serreze, a senior researcher at the snow and ice center, said it was increasingly clear that climate change from the buildup of greenhouse gases was playing a role in the Arctic warming, which is seen not only in the floating ice but also in melting terrestrial ice sheets, thawing tundra and warming seawater.

"We understand the physics behind what's going on," Dr. Serreze said. "You can always find some aspect of natural variability that can explain some things. But now it seems patterns that used to help you don't help as much anymore, and the ones that hurt you hurt you more. You can't dismiss this as natural variability," he said. "We're starting to see the system respond to global warming."

Excerpted from an article by Andrew C. Revkin which appeared in the September 21, 2007 edition of *The New York Times*.

POLAR BEARS' DAYS IN ALASKA ARE NUMBERED

Two-thirds of the world's polar bear population will be gone by 2050—including those in Alaska—because of thinning Arctic sea ice from global warming, government scientists said Friday.

Only in northern Canada and northwestern Greenland were polar bears expected to survive through the end of the century, said the U. S. Geological Survey, the scientific arm of the Interior Department.

The agency projected that over the next half century polar bears would lose 42% of the summer Arctic range they need in the Polar Basin to hunt and breed. Polar bears depend on sea ice as a platform for hunting seals, their primary food.

This uncredited Science in Brief article appeared in the September 8, 2007 edition of the *Los Angeles Times*.

WHAT YOU CAN DO TO HELP STOP GLOBAL WARMING

- Turn off the lights when you leave a room. Use fluorescent bulbs in your lamps and fixtures. Each fluorescent bulb will save 150 pounds of carbon dioxide a year over an incandescent bulb.
- Turn off your computer, TV, and other electronic devices when you're not using them. Unplug chargers when not in use to save thousands of pounds of carbon dioxide each year.
- Wait until you have a lot of clothes to wash before using the washing machine. And wash in cold or warm water instead of hot to save 500 pounds of carbon dioxide per year.
- Take shorter showers. Install low-flow showerheads. Turn off the water while brushing your teeth.
- Close the blinds on a hot day if the sun is shining in. Dress lightly instead of turning up the air conditioning. Or use a fan.
- Dress warmly when it's cold, instead of turning up the heat. And clean air filters regularly.
- Reduce, reuse, recycle. You can save 2,400 pounds of carbon dioxide per year by recycling half of your household waste.
- Don't ride in a car whenever you can walk, ride your bike, or take public transportation instead.
- Plant trees. A single tree will absorb one ton of carbon dioxide over its lifetime.



By Richard Helleesen
Music & Lyrics by Michael Silversher
Directed by John-David Keller

III. EDUCATION STATION

BEFORE THE SHOW

1. Think about the place you live, the people who live there with you, the food you eat, the clothes you wear, the animals you see everyday. Try to imagine how you would feel if you saw the life you're used to begin to change for the worse and you felt as if you could do nothing to stop it.
2. Does the weather ever get too hot where you live? How do you cool off?
3. Do you remember the first time you ever saw snow? When and where was it? Did you like it?
4. What does the word "responsible" mean to you? Do you consider yourself to be a responsible person?
5. Have you ever seen a polar bear in the zoo? What do you remember about it?
6. Knowing only the title of this play, what do you think it might be about?
7. Have you ever heard or read about global warming? Do you believe it has anything to do with you?
8. Read at least one book from the Bibliography in Part V: Resources.

DURING THE SHOW

Study the following questions and try to find the answers as you listen carefully to the dialogue:

1. Alex has to do a project on _____.
2. *Ursus maritimus*, the polar bears' scientific name, means _____.
3. Ursula the polar bear comes from 100 miles north of _____.
4. Her favorite food is _____.
5. She's in danger of _____ while trying to swim across water that used to be ice.
6. Twenty of the hottest twenty-one years on record have occurred since _____.
7. _____ is what's happening now; _____ is what happens over a long time.
8. Joseph Fourier discovered that the Earth's atmosphere works like a giant _____.
9. Svante Arrhenius first calculated that the Earth's temperature would go up drastically if the amount of _____ in the atmosphere doubled.
10. The drastic climate change predicted by Arrhenius will take less than ____ years.
11. Greenhouse gases are increasing at an alarming rate due mostly to _____ activity.
12. Carbon dioxide comes from anything humans do that burns _____ or _____.
13. Alex is part of the _____ Generation of kids determined to solve the problem of global warming.
14. One simple way to help is by using _____ light bulbs.

Answers: 1. global warming; 2. sea bear; 3. Alaska 4. seal; 5. drowning; 6. 1980; 7. weather, climate; 8. greenhouse; 9. carbon dioxide; 10. 100; 11. human; 12. coal, oil; 13. Green; 14. fluorescent.

AFTER THE SHOW

1. Using library and/or internet resources, find out more about polar bears and walrus.
2. Write five declarative sentences explaining why it is so important to take good care of our environment.
3. Locate these places on a world map: Alaska, Canada, Arctic Ocean, North Pole.
4. Pretend you are a news reporter interviewing Ursula the polar bear. Write five questions you'd like to ask her.
5. Recreate in your classroom Fourier's demonstration of the Greenhouse Effect from Scene 3 of the play.
6. Look up these vocabulary words and use each of them in a sentence: absolutely; abundant; alternative; apparently; astounding; authorized; baffled; calculation; catastrophe; complicated; creative; decade; definitely; disaster; efficient; figment; guaranteed; hibernate; incentive; inundate; mechanism; obviously; renewable; responsible; restricted; supposedly; temporary.
7. Using at least six words from the glossary in Part I of this study guide, write a descriptive paragraph about the dangers of climate change and what you can do to help.
8. Write letters (separately, please) to our Honorary Producers **The Boeing Company** and **The Capital Group Companies Charitable Trust Foundation**, thanking them for their generous support. Please send all letters to:

**SOUTH COAST REPERTORY, Education Department, Post Office Box 2197, Costa Mesa, Ca
92628-2197**

IV. CURRICULUM CONNECTION

FROM THE VISUAL AND PERFORMING ARTS FRAMEWORK

Education in the arts is essential for all students. California's public school system must provide a balanced curriculum, with the arts as part of the core for all students, kindergarten through grade twelve, no matter what the students' abilities, language capacities or special needs happen to be.

K-6 VISUAL & PERFORMING ARTS STRANDS

1. Artistic Perception
2. Creative Expression
3. Historical and Cultural Context
4. Aesthetic Valuing
5. Connections, Relationships, and Applications

KEY THEATRE CONTENT STANDARDS addressed by *You're Getting Warmer*

Kindergarten: 1.1, 2.2, 3.1

In theatre students learn the difference between an actor portraying an imaginary character and a real person. They learn that sense memory, which involves sight, smell, touch, taste, or hearing, is an important skill for actors to develop. [...] And by working together in dramatizations, they begin to understand what it means to be a member of the audience.

Grade One: 1.1, 2.1, 3.1

Acting through facial expression, gestures and movements alone helps students develop characters. Without prior rehearsing or scripting to improve their ability to improvise, students can create scenes. [...] In the process they identify the cultural and geographic origins of stories.

Grade Two: 1.1, 2.1, 4.1

Students perform in group improvisations and learn theatrical games to improve their skills. In the process they develop cooperative skills and concentration and learn the vocabulary of the theatre, such as *plot*, *scene*, *sets*, *conflict* and *script*. As students retell familiar stories and those from other cultures, they identify universal character types.

Grade Three: 1.1, 2.1, 3.1, 4.1

Students identify and describe important elements of theatre, such as *character*, *setting*, *conflict*, *motivation*, *props*, *stage areas* and *blocking*. When evaluating scripts and staging performances, they learn which criteria are appropriate. And if they like a scene in a play they are reading, they can explain how the playwright succeeded. By participating in theatrical experiences, they gain many opportunities to demonstrate their problem-solving and cooperative skills.

Grade Four: 2.3, 3.1, 4.2

Students increase their theatre vocabulary as they improve their acting skills by exploring how voice affects meaning and how costumes and makeup communicate information about character. They also learn that storytelling and theatrical traditions from many cultures are part of the history of California and that the entertainment industry has an important role in the state.

Grade Five: 1.1, 2.1, 3.3, 4.1

Students describe theatre experiences with an increased vocabulary. They identify more complex structural elements of plot in a script, discover universal themes in the theatrical literature they're studying, and recognize more fully how theatre, television and films play a part in their daily lives. Using appropriate criteria for critiquing theatrical performances, they can judge what they see and hear.

Grade Six: 1.1, 2.2, 2.3, 3.2, 4.1

Students use such terms as *vocal projection* and *subtext* as they describe their theatrical experiences. As they perform, they show effective vocal and facial expressions, gestures and timing. Now students can use and evaluate with more confidence the makeup, lighting, props and costumes employed in theatre.

See complete California State Standards <http://cde.ca.gov/be/st/ss/thmain.sp>

K-6 ENGLISH-LANGUAGE ARTS STRANDS addressed by *You're Getting Warmer*

Reading:

- 1.0 Word Analysis, Fluency, and Systematic Vocabulary Development
- 2.0 Reading Comprehension
- 3.0 Literary Response and Analysis

Writing:

- 1.0 Writing Strategies
- 2.0 Writing Applications

Listening and Speaking:

- 1.0 Listening and Speaking Strategies
- 2.0 Speaking Applications

K-6 SCIENCE CONTENT STANDARDS addressed by *You're Getting Warmer*

“Elementary school students respond positively to well-structured activities and expository reading materials that connect the world around them to the science content. Students raise questions, follow their curiosity, and learn to be analytical. They are encouraged to practice open and honest expression of ideas and observations; they learn to listen and to consider the ideas and observations of other students. Both teachers and students need to enjoy the adventure of science.

“Science, technology and societal issues are strongly connected to community health, population, natural resources, environmental quality, natural and human-induced hazards and other global challenges. The standards should be viewed as the foundation for understanding these issues.”

Kindergarten: Life Sciences 2 - Different types of plants and animals inhabit the earth. Earth Sciences 3 – Earth is composed of land, air, and water.

Grade One: Life Sciences 2 - Plants and animals meet their needs in different ways. Earth Science 3 – Weather can be observed, measured, and described.

Grade Two: Life Sciences 2 -Plants and animals have predictable life cycles. Earth Sciences 3 – Earth is made of materials that have distinct properties and provide resources for human activities.

Grade Three: Physical Sciences 1 – Energy and matter have multiple forms and can be changed from one form to another. Life Sciences 3 - Adaptations in physical structure or behavior may improve an organism’s chance for survival.

Grade Four: Physical Sciences 1 – Electricity and magnetism are related effects that have many useful applications in everyday life. Life Sciences 2 – All organisms need energy and matter to live and grow. Life Sciences 3 - Living organisms depend on one another and on their environment for survival. Earth Sciences 5 – Waves, wind, water and ice shape and reshape Earth’s land surface.

Grade Five: Life Sciences 2 - Plants and animals have structures for respiration, digestion, waste disposal and transport of materials. Earth Sciences 3 – Water on Earth moves between the oceans and land through the processes of evaporation and condensation. Earth Sciences 4 – Energy from the Sun heats Earth unevenly, causing air movements that result in changing weather patterns.

Grade Six: Heat (Thermal Energy) 3 – Heat moves in a predictable flow from warmer objects to cooler objects until all the objects are the same temperature. Energy in the Earth System 4 – Many phenomena on Earth’s surface are affected by the transfer of energy through radiation and convection currents. Ecology (Life Sciences) 5 – Organisms in ecosystems exchange energy and nutrients among themselves and the environment. Resources 6 – Sources of energy and materials differ in amounts, distribution, usefulness, and the time required for their formation.

V. RESOURCES

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BASIC THEATRE VOCABULARY

Acting The process by which a person uses the entire self—body, mind, voice and emotions—to interpret and perform the role of an imagined or assumed character.

Action The core of a theatre piece; the sense of forward movement created by the sequence of events and physical and psychological motivations of the characters.

Actor A person (either male or female) who performs a role in a play or other entertainment.

Ad-Lib To extemporize stage business or dialogue. To make it up as you go along.

Antagonist An adversarial person or situation, or the protagonist’s inner conflict.

Blocking The plan for the movement and stage business the actors perform.

Business Any action performed on stage.

Center stage The center of the acting area.

Character The fictional personality created by an actor through thought, action, dialogue, costume and makeup.

Climax The point of highest dramatic tension or major turning point in the action.

Comedy A play that is humorous in its treatment of theme and, generally, has a happy ending in which the protagonist is victorious.

Conflict The basic struggle underlying the plot of the play.

Costume The carefully selected clothing worn by the actor during a performance.

Critique Opinion and comment based on predetermined criteria to be used for self-evaluation or the evaluation of the actors or the entire production.

Cross The actor's movement from one stage location to another. For example the director might instruct (or **block**) the actor to "cross downstage."

Cue The last words or action of one actor immediately preceding the lines or business of another actor. For example, an actor may get a cue that his/her entrance, is next.

Dialogue The stage conversation between characters.

Directing (1) The art of bringing the elements of theatre together. (2) The process by which the **director** takes responsibility for the creative look, style and action of a theatrical production.

Downstage The part of the stage closest to the audience. At one time stages were raked, or sloped, with the lower ("downstage") part closest to the audience, and the higher ("upstage") part away from the audience.

Dramaturg A person who provides specific knowledge and literary resources to the director, producer, designers, actors and audience.

Exposition Detailed information revealing background information and the facts of a plot.

Flats Canvas or wood-covered frames that are used for the walls of a stage set.

Gesture The movement of a body part or combination of parts, with emphasis on the expressive aspects of the movement. Gesture includes all movements of the body not supporting weight.

Improvisation A spontaneous style of theatre in which scenes are created without advance rehearsing or a script.

In-The-Round A theatre set up with the stage in the middle of the audience, as an island.

Makeup Cosmetics and hairstyles worn by actors onstage.

Masks Coverings worn over the face or part of the face by an actor to emphasize or neutralize facial characteristics.

Mime An ancient art form based on pantomime in which conventionalized gestures are used to express ideas.

Monologue A solo speech. Often, this takes the form of a **Soliloquy**, in which the character reveals personal, innermost thoughts, when alone, or unaware of the presence of other characters.

Motivation A character's reason for his or her actions or dialogue in a play.

Musical theatre A type of staged entertainment featuring music and usually dance as integral parts of the action.

Objective A character's goal or intention.

Pacing The tempo of a theatrical work.

Pitch The highness or lowness of the voice.

Playwright A person who writes a play.

"Places" Direction given by the **Stage Manager** when it is time for the actors to be in their proper positions for the beginning of an act.

Plot That which happens in a story; the beginning, middle and end.

Project To speak loudly so the entire audience can hear you.

Props All the stage furnishings, including furniture, that are physically used by the actors.

Protagonist The main character of a play, with whom the audience identifies most strongly.

Rehearsal A practice session in which the actors and technicians prepare for performance.

Run Length of time the play will be presented.

Run-through A rehearsal moving from start to finish without stopping for correction.

Script The text of the play. Although the script may contain all the words of a play, it is considered in many ways an outline, or a starting point, for each individual production of a given play.

Set The scenery—walls, platforms, doors, etc.—which creates the physical world of the play.

Setting The locale of the action of a play.

Soliloquy A long monologue during which a character reveals innermost thoughts.

Stage crew The backstage workers responsible for changing scenery, hanging lights, setting props, etc.

Stage Left That part of the stage to the actor's left when the actor faces the audience.

Stage Manager The person who runs the show in production and calls the cues for the actors and the technicians.

Stage Right That part of the stage to the actor's right when the actor faces the audience.

Strike The dismantling of the set and the putting away of costumes and props at the end of the run of a show.

Style The specific manner in which a play is performed, often related to a historical period or dramatic genre.

Subtext Information, including actions and thoughts, implied by a character but not stated in dialogue.

Theme The central thought, idea or significance of the action.

Tragedy A play in which the protagonist is ultimately defeated, or dies.

Upstage The area of the stage farthest away from the audience and nearest to the backstage wall.

Wings Offstage areas out of sight of the audience on stage left and stage right that may be used for exits, entrances and set changes.