Skywatchers of Africa

Program Summary

For thousands of years, Africans have used their knowledge of the sky to build their societies, shape their spiritual lives, and meet their physical needs for survival. *Skywatchers of Africa* highlights the diversity of African astronomy, examines cultural uses of the sky that developed over thousands of years, and celebrates our shared human experience.

Skywatchers of Africa is an original production by the Adler Planetarium (Chicago, IL) and was adapted for fulldome by the Sudekum Planetarium at Adventure Science Center.

Tennessee Science Standards

1. Earth And Its Place In The Universe 7.0
2. Forces and Motion 11.0

Objectives

1. Name one significant star pattern used in several African cultures and why it was important.
2. Recount the Egyptian explanation for day and night
3. Describe how the North Star allows navigation at night.

Pre-Visit Activities

1. Locate Africa on a map or globe. Compare its location and size to the United States. Compare the size, population, and similar data of Egypt, Kenya, Zimbabwe, Madagascar, and other African countries to the United States.
2. Find Egypt and the River Nile on a map or globe. Compare the length of the Nile River to other rivers around the world: Mississippi, Amazon, etc. Discuss or explore the roles of rivers in everyday life and the expansion of civilization.
3. Have students investigate the size and extent of the Sahara desert. Explore the ecosystem, environment, flora, fauna, people, and importance of deserts. Compare and contrast living in or near a North African desert to Tennessee. Explore deserts in the United States? Identify other deserts around the world.

Post-Visit Activities

1. Download a monthly star chart from our website at SudekumPlanetarium.com. Have students locate any constellations or planets visible in the evening sky. Are Orion or the Big Dipper visible? The stars seen from Egypt are the same seen from Middle Tennessee.
2. Have students investigate other cultures' constellations and interpretations of the stars commonly known as Orion and the Big Dipper.
3. Have students model and discuss why we see different constellations in the evening sky at different times of year. Download star charts from different months to illustrate how the sky changes over time.
4. Invite students to explain and explore why Earth has seasons.
   a. Model how the tilt of Earth's axis affects the angle and amount of sunlight the surface receives as the Earth moves in its orbit.
   b. Investigate how much Earth's distance from the Sun changes in a year and when the Sun is closest and farthest from the Sun.
   c. Have students research how seasons are different based on your latitude

Vocabulary

Al-Hirab, the ship's keel
Amma
axis
burial chamber
Big Dipper
cardinal points
civilization
Dogon
foreleg of the Ox
granery
Great Pyramid
Isis
"imperishables"
Indian Ocean
Islam
Khufu
Madagascar
monsoons
morning star
mother Camel
Nabta
Namoratunga
Nile
North Star
Nut
orbit
Orion
Orion's belt
Osiris
Pharaoh
Pleiades
Polaris
resurrection
Sahara Desert
seasonal
Seth
Sirius
summer solstice
Swaziland
tally stick
Talmit
Tuareg
umbilical cord
Venus
Yoruba

north or south of the equator. How are seasons different in the southern hemisphere?

5. Have students investigate why Earth has a "north star", why this star maintains its position while all other stars appear to move around it, why the north star has changed since the time of the Pharaohs, and if there a "south star"?

Exhibit Connections

Space Chase – Solar System Survey

1. Visualize Earth's movement around the Sun in the Earth-Sun orrery.
2. Observe the Moon's movement around the Earth and the phases of the Moon seen from the surface of the Earth at the Earth-Moon orrery.
3. Caravans crossed the Sahara using the sky to navigate from oasis to oasis. Find the large Kharga Oasis (Latitude 25.44N, Longitude 30.55E) in modern Egypt at the Tilt-a-World exhibit table. Look in the western Sahara for the smaller Bilma Oasis at 18.68N, 12.9E. Tracks left in the rock floor of the desert near an oasis are visible at 21.8N, 24.8E.

Space Chase – Wonders of the Universe

Early civilizations saw the sky as a sphere with all stars at the same distance from Earth. Use the 3-D Starfield to see how stars lie at various distances in space and how our viewpoint on Earth causes us to see constellation patterns. Find Orion and the Big Dipper.

Sudekum Planetarium – ramp from 1st to 2nd floor

Like a modern Stonehenge, three of the windows along the Planetarium Ramp are aligned with outdoor markers that direct your view to the setting position of the Sun on the horizon at the equinox and solstices. This provides a basic calendar for tracking the passage of time.

Resources

Books

New Patterns in the Sky by Julius Staal

The Stars by H. A. Rey

Echoes of the Ancient Skies: The Astronomy of Lost Civilizations by Edwin C. Krupp

Dogon : Africa's People of the Cliffs by Walter E.A. Vanbeek

Websites

Monthly star charts and related articles
www.SudekumPlanetarium.com

A recounting of the Yoruba creation story:
http://www.gly.uga.edu/railsback/CS/CSGoldenChain.html

African creation stories:
http://dickinsg.intrasun.tcnj.edu/diaspora/creation.html

African people and culture
http://www.africaguide.com/culture

Many cultural stories about the stars, sky and constellations:
http://www.windows2universe.org/mythology/stars.html

The stones of Nabta
http://apod.nasa.gov/apod/ap980408.html

Ancient Navigation
http://www.pbs.org/wgbh/nova/longitude/secrets.html

African Mathematics:
http://www.historyforkids.org/learn/africa/science/numbers.htm

Animation of Earth going around the Sun:
http://www.onr.navy.mil/Focus/spacesciences/observingsky/motion4.htm

View of the Earth and the changing angle of sunlight as seen from a geostationary satellite:
http://www.classzone.com/books/earth_science/terc/content/visualizations/es1704/es1704page01.cfm

Want to tell time using the Big Dipper?
http://www.dmns.org/main/minisites/spaceodyssey/pdf/tellingTime.pdf

Make a star clock:
http://www.skyandtelescope.com/letsgo/familyfun/Make_a_Star_Clock.html

TN State Standards Grade Level Expectations (GLE)
Skywatchers of Africa

5th Grade

Science
Standard 6: The Universe
GLE 0507.6.2: Recognize that charts can be used to locate and identify star patterns.

Social Studies
Content Standard: 1.0
Culture encompasses similarities and differences among people including their beliefs, knowledge, changes, values, and traditions. Students will explore these elements of society to develop an appreciation and respect for the variety of human cultures.
Learning Expectations:
1.01 Understand the diversity of human cultures.
1.02 Discuss cultures and human patterns of places and regions of the world.
1.03 Recognize the contributions of individuals and people of various ethnic, racial, religious, and socioeconomic groups to the development of civilizations.
3.02 Recognize the interaction between human and physical systems around the world.

Geography
Content Standard: 3.0
Geography enables the students to see, understand and appreciate the web of relationships between people, places, and environments. Students will use the knowledge, skills, and understanding of concepts within the six essential elements of geography: world in spatial terms, places and regions, physical systems, human systems, environment and society, and the uses of geography.
Learning Expectations:
3.01 Understand how to use maps, globes, and other geographic representations, tools, and technologies to acquire, process and report information from a spatial perspective.
3.02 Recognize the interaction between human and physical systems around the world.
3.03 Demonstrate how to identify and locate major physical and political features on globes and maps.

6th Grade

Social Studies
Content Standard 1.0
Culture encompasses similarities and differences among people including their beliefs, knowledge, changes, values, and traditions. Students will explore these elements of society to develop an appreciation and respect for the variety of human cultures.
Learning Expectations:
1.01 Understand the nature and complexity of culture.
1.02 Recognize the role of major religions.
1.03 Appreciate the relationship between physical environments and culture.
1.04 Recognize how cultural and individual perceptions affect places and regions.
1.05 Understand the role that diverse cultures and historical experiences had on the development of the world.
1.06 Understand the influence of science and technology on the development of culture through time.

Geography
Content Standard: 3.0
Geography enables the students to see, understand and appreciate the web of relationships among people, places, and environments. Students will use the knowledge, skills, and understanding of concepts within the six essential elements of geography: world in spatial terms, places and regions, physical systems, human systems, environment and society, and the uses of geography.

Learning Expectations:
3.01 Understand the characteristics and uses of maps.
3.02 Know the location of places and geographic features, both physical and human.
3.03 Understand the characteristics and uses of spatial organization of Earth's surface.
3.04 Understand the physical and human characteristics of place.

TN State Standards Grade Level Expectations (GLE)
Skywatchers of Africa

7th Grade

Social Studies
Content Standard: 1.0
Culture encompasses similarities and differences among people including their beliefs, knowledge, changes, values, and traditions. Students will explore these elements of society to develop an appreciation and respect for the variety of human cultures.
Learning Expectations:
1.01 Understand the nature and complexity of culture.
1.04 Describe the influence of science and technology on the development of culture through time.

Content Standard: 3.0
Geography enables the students to see, understand and appreciate the web of relationships between people, places, and environments. Students will use the knowledge, skills, and understanding of concepts within the six essential elements of geography: world in spatial terms, places and regions, physical systems, human systems, environment and society, and the uses of geography.
Learning Expectations:
3.01 Understand the characteristics and uses of maps, globes, and other geographic tools and technologies.
3.02 Know the location of places and geographic features, both physical and human, locally, regionally and globally.
3.03 Understand the characteristics and uses of spatial organization of Earth's surface.
3.04 Understand the physical and human characteristics of place.
3.05 Understand that common physical and cultural characteristics create regions.
3.06 Understand how physical processes shape the Earth's natural landscapes and affect environments.
3.07 Understand how physical systems and the physical environment affect human systems.
3.08 Understand how human activities impact and modify the physical environment.

High School

Earth Science
CLE 3204.1.1 Explore theories for the origin and evolution of the universe.

Conceptual Physics / Physics
Embedded Inquiry
CLE 3237.Inq.1 / CLE 3231.Inq.1 Recognize that science is a progressive endeavor that reevaluates and extends what is already accepted.

Environmental Science
Water and Land Resources
CLE 3260.4.4 Evaluate the impact of human activities on natural resources.

World Geography
Course Description: In World Geography High School, students study people, places, and environments at local, regional, national, and international levels from the spatial and ecological perspectives of geography. The six social studies standards of essential content knowledge and four process skills are integrated for instructional purposes.
Standard Number: 1.0 Culture
Culture encompasses similarities and differences among people, including their beliefs, knowledge, changes, values, and tradition. Students will explore these elements of society to develop an appreciation of and respect for the variety of human cultures.
Learning Expectations:
1.1 Understand the complex nature of culture and how cultures influence the characteristics of places and regions.
1.2 Understand the relationship between physical environments and culture.
1.3 Understand how cultural perspective impacts perceptions of places and regions.