

SHADOW  
TRACKERS....  
Part II- Day & Night  
From Photography to  
Writing

**A fourth/fifth grade  
multidisciplinary  
unit for mild disabilities  
based on Principals of  
Universal Design and  
Differentiated Instruction**

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## Standards

What standards will be met through this unit?  
(Indiana State Standards)

### Science:

- 3.5.2 Construct tables and graphs to show how values of one quantity  
are related to values of another.
- 4.3.8 Explain that the rotation of the Earth on its axis every 24  
hours produces the night-and-day cycle.
- 4.3.9 Draw or correctly select drawings of shadows and their  
direction and length at different times  
of day.

### Math:

- 4.5.9 Add time intervals involving hours and minutes.

### Social Studies:

- 3.3.4 Explain basic Earth/sun relationships\*  
\*the rotation of the Earth on its axis, the revolution of  
the Earth around the sun, and the tilt of the Earth on its  
axis.
- 4.3.3 Explain the essential facts of Earth/sun relationships\*  
\*Cardinal directions: North, South, East, West  
\*Intermediate directions: Northeast, Southeast, North-  
west, and Southwest

### Language Arts:

- 3.1.7 Use a dictionary to learn the meaning and pronunciation of  
unknown words.
- 3.2.6 Locate appropriate and significant information from the  
text
- 3.4.3 Create single paragraphs with topic sentences and simple

supporting facts and details.

4.4.7 Use multiples reference materials and online information  
as aids to writing.

4.4.9 Use a computer to draft, revise, and publish writing,  
demonstrating basic keyboarding skills and  
familiarity with common computer technology.

Indiana Learning Standards

<http://www.doe.state.in.us/standards>Learner Activities

## Shadow Trackers II

What materials and resources will be useful for engaging students in meaningful learning activities?

To correspond with the investigations of Day and Night, we have collected a set of web sites which will show you live pictures of different places around the world. Although we cannot fly everyone to these sites, we can at least go there by way of the Internet.

- [Day/Night Globe](#). This is a picture of the whole Earth that you can click on to zoom in on. It is shaded according to which part of the world is having night and which is having day. You can also change your viewpoint from a plain world map to what the Earth looks like from the Sun or Moon. You can get weather features on the map as well as other features.
- [World Map](#). This is a site with a world map marked with red dots where there are live cameras.

Here are some selected sites:

*What time of day is it? What season is it? Where is it on the Earth?*

[Cambridge, England](#)

[Mt. Fuji, Japan](#)

[Sydney, Australia](#)

[Fairbanks, Alaska](#)

- [Around the World in 80 Clicks](#). A guided tour around the world through 80 live cameras.
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*Author/WebMaster Tania Ruiz  
Last updated January 22, 1999*

# Planning Pyramid Part II

## What should students know?

### Some students will know

- An arc shape can demonstrate the change in the shadows over time.
- How to incorporate digital photography into their published work.
- Why the shortest shadow around noon and why it points north.
- What would happen if the Earth did not rotate.

### Most students will know

- Data collected in an observation should be done at regular intervals and with the same recording method each time. Data collected can be graphed and compared.
- The Earth's "spin" time is different than "daylight" time.
- The passing of time can be demonstrated with shadows created by the sun's movement
- The sun is in the east in the morning, the south at noon, and in the west at day's end.

### All students will know

- The Earth spins on its axis, one complete rotation in 24 hours and that equals a day.
- The sun does not spin around the Earth.
- Part of the Earth is receiving daylight, while part remains in darkness.
- The length of shadows and positions do not change much day to day.

# Activity 1-4: Day and Night on the Spinning Globe

In the previous activity, students saw how shadows changed during a day. This activity uses a globe and indoor light source to create a classroom model showing day and night on a spinning Earth. (We would like to credit A. Lane and S. Nocelben for first showing us this activity.)

*This activity requires a darkened room.*

**Materials:** Earth globe with string attached to North Pole; strong focused light source (such as an overhead projector, a flashlight, or a slide projector); golf tees; small figurines; fun tack or similar material.

- 1. Hang the globe from the ceiling, low enough to be reached easily. Shine the light source directly at the globe from the side. The light source must be large enough to illuminate the entire Earth. If you use an overhead projector, you can cut out the "extra" light by placing a sheet of paper on the glass with a hole cut out of its center. While the Earth is actually tilted in its orbit, this is a complication which will not be dealt with until the next chapter on the seasons.
- 2. Attach a small figurine to the globe at your location with fun tack. Slowly turn the globe so that the figurine "sees" the Sun rise in the east and set in the west. Now attach a second figurine to another part of the globe. Does the Sun rise earlier or later in this new location? Are the figurines always both in light or both in darkness? Or can one be in light while the other is in darkness? What if the two figurines were on opposite sides of the Earth?
- 3. Attach a golf tee to the globe at your latitude. Again, slowly turn the globe eastward and notice the fan-like shadow pattern which the golf tee casts. Is it similar to the pattern cast by the shadow stick in the previous activities? Note that the shortest shadow points towards the North Pole.
- 4. Attach three golf tees to the globe at various latitudes along the same meridian of longitude. One should be on the equator, one should approximate your latitude, and one should be near the poles. Ask three students to each observe one of the golf tees. As the globe slowly spins, ask the students to call out their golf tee- "top", "middle", or "bottom"- as they cross the day-night boundary. Also, be sure to observe the midday shadows and to note in which direction

they point.

**Discussion:**

How do we know if we're spinning the globe in the right direction? Where does the Sun rise if we were standing on the globe? Where does it really rise? Set? What if we spun the globe in the other direction? Would this also match our observations? It is only by such comparisons with observations that we can verify our models. Are the golf tee shadows longer or shorter at the equator? What about at noon, when the Sun is highest in the sky? Is there any shadow at the equator? What about at your latitude? Where do all the shortest shadows point? Does the pattern made by the golf tee reasonably match that made by the shadow stick of the previous activities? Might a spinning earth, then, not be a reasonable model for the passage of day and night? What if the Earth didn't rotate? What if the North Pole were pointed towards the Sun? Where would it be day and night? Would all locations still have both day and night?

Can you think of any other ways to test this model of a spinning Earth? Maybe shadow stick patterns from schools at other latitudes could be compared to yours. Are they consistent with the differences seen on the spinning globe? Have the students observed any complications which our model does not account for? (More on these, such as the tilt of the Earth in the next chapter.)



## Assessment Part II

What materials and resources will be useful for assessing student knowledge and skills?

### Throughout the unit of study:

- Shadow Trackers Activity 4: Day and Night on the Spinning Globe
- Earth's Seasons and Cycles book
- Teacher-made short answer questions

### End of the unit of study:

- Don Johnston SOLO software: Read Outloud, Write Outloud, and Co-Writer 3-4 paragraphson what was learned based on short answer questions, discussions, and text reading (internet and book sources). Text and student's own writing can be read to them and a topic dictionary can be accessed. Assessment through a teacher-made rubric. See <http://rubistar.4teachers.org/> ID#1241577  
My rubric is available to preview on line
- **Student made book detailing their findings. Digital pictures included.**

**Name** \_\_\_\_\_

**Shadow Trackers**

**Activity 3: Spinning Earth**

**1. What if the Earth did not rotate?**

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**2. How did the spinning Earth show (model) the passage of day and night?**

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**Web Activities:**

**1. "Your Age on Other Worlds"**

**[www.exploratorium.edu/ronh/age](http://www.exploratorium.edu/ronh/age)**

**How do we define a day?**

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**How do we define a year?**

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2. [www.nsta.org/319](http://www.nsta.org/319)

3. <http://odyssey.mcas.k12.in.us>

**Quiz: The Moving Earth**

## Author's Note

I am currently a mild disabilities teacher at the elementary level. I have been teaching for 20 years at both the elementary and middle school level, in general education and special education.

This unit is designed for a group of my fourth and fifth grade mildly disabled students who receive direct service daily in reading and written language. The activities will cover several weeks of instruction, research, activities, and assessment. Taking all their results and information gained to a finished, word processed document, with digital pictures, will be the final step.

Contact:

[jthorne@mcas.k12.in.us](mailto:jthorne@mcas.k12.in.us)

## Teacher Library

What materials and resources will be useful for teachers?

<http://www.readinga-z.com/index.php>

"It's About Time" - Level K (Short nonfiction book and comprehension questions)

[http://hea-www.harvard.edu/ECT/the\\_book/index.html](http://hea-www.harvard.edu/ECT/the_book/index.html)

Eyes on the Sky: Feet on the Ground (hands on astronomy activities for kids)

<http://hea-www.harvard.edu/ECT/Hello/hello.html>

Lesson guide and background information for movement of the sun and rotation of the Earth activities

<http://livingearth.com/>

Live camera shots of places around the world.

<http://www.ajkids.com/index.asp?origin=0&meta=1>

Ask Jeeves for Kids

<http://www.donjohnston.com/downloads/downloads.htm>

Don Johnston SOLO software - download science and nature topic dictionaries for word prediction when word processing