TITLE: “BUILD A LIGHTHOUSE LAMP”

GRADE LEVEL**:** 4-5

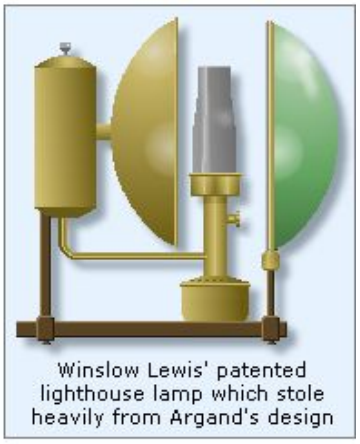
CONTENT AREA**:** Life Science

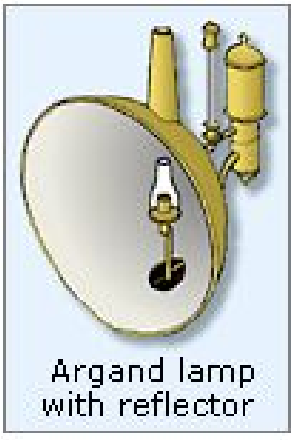
OBJECTIVE: To understand some of the properties and uses of light.
Light travels in a straight line unless it strikes an object.
Light can be reflected by a mirror, refracted by a lens, or absorbed by the object.

ACTIVITY: Students will understand how early lighthouse lamps in the United States used properties of light to make a brighter light to aid in navigation. Students will assist in making a model of an early lighthouse lamp using mirrors and lenses.

DEFINITONS:
Refraction occurs when light passes into a transparent material.
Refle**c**tion occurs when light bounces off an opaque material.

BACKGROUND:
Historical: A lighthouse’s light provides a mariner at sea with a fixed point of reference to aid his ability to navigate in the dark when the shore or an offshore hazard cannot be seen directly. The distance at which such a light can be seen depends on the height and intensity of the light At 82 feet, the St. Marks Lighthouse was tall enough to been about 15 miles away. The first lighthouse lamps, Lewis Patent Lamps, used both reflection and refraction to project light. In 1812 the U.S. Government purchased a patented "reflecting and magnifying lantern" from Winslow Lewis, a former ship captain. Lewis had adopted the design from Aimé Argand, a Swiss physicist and chemist. Each lighthouse contained multiple oil-burning lamps with each lamp having its own parabolic reflector and green glass or plano-convex lenses in front. American Lighthouses were illuminated by Lewis Patent Lamps for another 29 years (1823 to 1852). After that time, all Lighthouses in America were refitted with Fresnel Lenses.


Winslow Lewis' patented lighthouse lamp which stole heavily from Argand's design


Argand lamp with reflector

Science: There are THREE basic ways to control light:

1. Block it: this makes a shadow.

2. Reflect it: change its path with a mirror.

3. Bend it (Refraction): Change its direction by making it pass into another transparent material of different density, like glass, water or lens.

METHOD:

1. Use a small lamp with low-watt bulb. (Candles could be substituted)

2. Demonstrate that light can be blocked by placing hand or object next to the light and observing the shadow.

3. Demonstrate reflection by placing reflective object behind the light, mirror, metal foil, pie tin, etc. Does the light seem brighter? Point out that the Lewis lamps use a large reflector made of small polished tin plates.

4. Demonstrate refraction by placing a magnify glass in front of the lamp. Does the light seem brighter?

Summary: The Lewis lamps combined a reflector in the rear with a lens in the front to produce a stronger light.

FCAT STANDARDS

STANDARD	**FL.SS.A.1.2.**	**Time, Continuity, and Change [History]: The student understands historical chronology and the historical perspective.**	
BENCHMARK	**SS.A.1.2.1.**	**The student understands how individuals, ideas, decisions, and events can influence history.**	
STANDARD	**FL.SC.B.1.2.**	**Energy: The student recognizes that energy may be changed in form with varying efficiency.**	
BENCHMARK	**SC.B.1.2.2.**	**The student recognizes various forms of energy (e.g., heat, light, and electricity).**	
BENCHMARK	**SC.B.1.2.3.**	**The student knows that most things that emit light also emit heat.**	
BENCHMARK	**SC.H.3.3.5.**	**The student understands that contributions to the advancement of science, mathematics, and technology have been made by different kinds of people, in different cultures, at different times and are an intrinsic part of the development of human culture.**	**SC.B.1.2.3.1. The student knows that most objects that emit light also emit heat.**
	GRADE LEVEL EXPECTATION	**SC.H.3.3.5.1. The student knows that the advancement of science, mathematics, and technology is ongoing and influenced by a diverse population of scientists.**	