
IMH TEP'S

LEGACY ACADEMY

8.3 Making a Periscope

Grade 8 Activity Plan

Reviews and Updates

8.3 Making a Periscope

Objectives:

1. To explain the concept of reflection.
2. To understand the formation and differences between real and virtual images.
3. To actively demonstrate reflection with the use of a periscope.

Keywords/concepts: luminous objects, illuminated objects, reflection and law of reflection, incident and reflected rays, angles of incidence and reflection, speed of light, normal line, concave and convex mirrors, periscope.

Curriculum outcomes: 109-10, 111-3, 209-6, 210-11, 308-8, 308-9.

Take-home product: periscope

Segment	Details
African Proverb and Cultural Relevance (5 min.)	"The wind does not break a tree that bends". Sukuma, Tanzania.
Pre-test (10 min.)	Turn off all the lights in the room; get everyone to stand still and try to observe what is in the room. This demonstrates that darkness is the absence of light and light is very important for sight.
Background (10 min.)	Discuss the importance of light to sight. Discuss flat versus curved mirrors and how it affects the image we see. Use a spoon to demonstrate concave versus convex images. Describe reflection from bright and dark surfaces.
Activities (45 min.)	Illustrate the concept of reflection while making a periscope.
Follow-up (10 min.)	Use the periscope to view different objects such as around corners above tables etc.
Post-test (15 min.)	Word search with a twist. Upon finding the words in order, students should write a definition or words of association for the term.

Suggested interpretation of proverb: In life, one has to be accommodating to changes and able to adapt to different circumstances. If one is too rigid then life will be overwhelming and may lead to frustration.

Cultural Relevance

Dr. Jude Igwemezie was born in Nigeria. He is the Founder & President of ARRT - a railway consulting engineering and Research Company. He is an expert in structural mechanics, stress and failure analysis, design, testing and assessment of railway structures, and derailment investigations. He is also the Founder & President of The UniP Tie Co. Inc. UniP Tie Company Inc. (UniP) is a privately owned corporation that manufactures and supplies railway steel ties.

He is the inventor of the The UniP steel tie. This unique steel tie design won the Gold Medal in the 1996 Canadian Design Engineering Awards. Dr. Igwemezie is the Founder & President of NorfastInc - a company that manufactures functional, practical and cost effective rail-to-tie fastening systems. Dr. Igwemezie is the inventor of the patented Norfast Tie Plate and Clip Assembly products.

Education:

- PhD Engineering, McGill University
- Principal Researcher, CIGGT Queens University
- Adjunct Assistant Professor, Queens University

BACKGROUND INFORMATION

Three well-known light phenomena: reflection, refraction and scattering. Let's take a second to discuss each one.

Reflection: a light ray strikes a smooth surface, such as a [mirror](#), and bounces off. A reflected ray always comes off the surface of a material at an angle equal to the angle at which the incoming ray hit the surface. In physics, you'll hear this called the law of reflection.

Scattering: when light strikes a rough surface, incoming light rays reflect at all sorts of angles because the surface is uneven.

Refraction: occurs when a ray of light passes from one transparent medium (air, let's say) to a second transparent medium (water). When this happens, light changes speed and the light ray bends, either toward or away from what we call the normal line, an imaginary straight line that runs perpendicular to the surface of the object. The amount of bending, or angle of refraction, of the light wave depends on how much the material slows down the light.

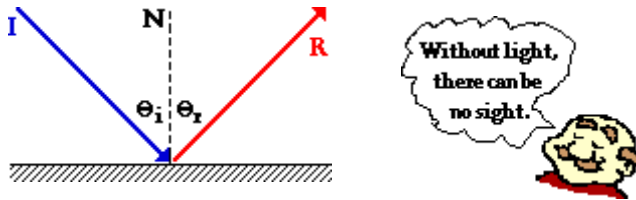
Lenses like those in a [telescope](#) or in a pair of glasses, take advantage of refraction. A lens is a piece of glass or other transparent substance with curved sides for concentrating or dispersing light rays. Lenses serve to refract light at each boundary. As a ray of light enters the transparent material, it is refracted. As the same ray exits, it's refracted again. The net effect of the refraction at these two boundaries is that the light ray has changed directions.

Periscope comes from two Greek words, peri, meaning "around," and scopus, "to look." A periscope lets you look around walls, corners, or other obstacles. A periscope includes two mirrors or reflecting prisms to change the direction of the light coming from the scene observed: the first deflects it down through a vertical tube; the second diverts it horizontally so that the scene can be viewed conveniently.

Activity 1: Spoon demo

Purpose: To explain the concept of reflection by demonstrating how light behaves when it comes in contact with concave and convex surfaces.

Suggested format: mentor should illustrate and allow students to watch.



Items	Quantity (for mentor)
Large table spoon	1
Flash light	1

Procedure:

1. Turn off the lights in the room.
Allow students observe that darkness is the absence of light.
2. Turn flashlight on and point it at something.
Allow students observe that sight is made possible when light is reflected off a subject.
3. Use the spoon and flashlight to demonstrate how light behaves when it hits a curved reflective surface.

Activity 2: Making a Periscope

Purpose: To actively demonstrate reflection with the use of a periscope.

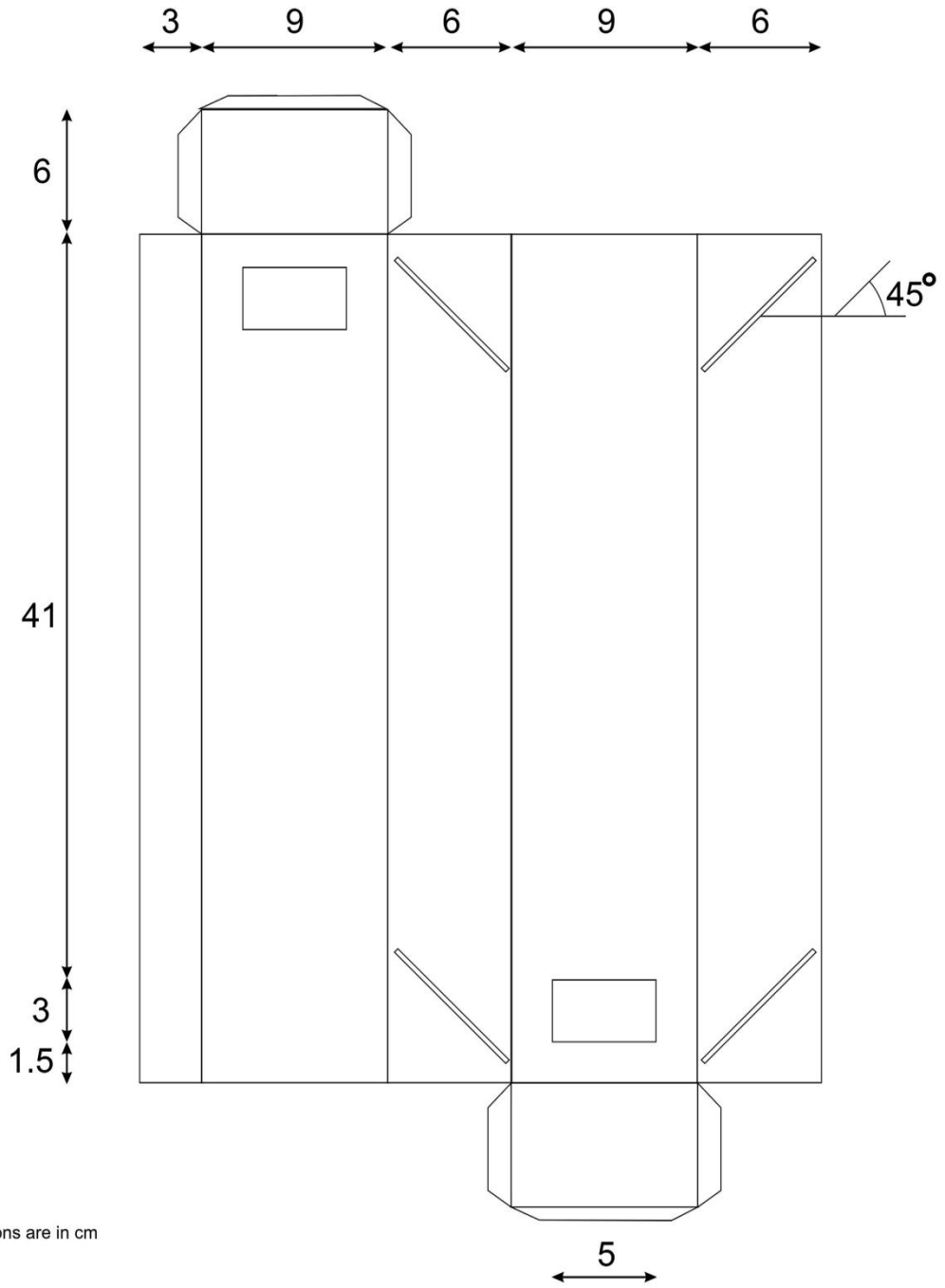
Suggested format: students should have their individual set-ups, but should be encouraged to work in groups.

Items	Quantity (for mentor and 10 students)
Black Bristol cards (60x32cm)	11
Flat mirrors (10x7.5cm)	22
Protractors	11
Masking tape	5rolls
Flashlight (with batteries)	1

Procedure:

1. Trace dimensions, as shown below, onto a piece of black Bristol board 60 cm x 35 cm.
2. Ensure that slits for mirrors are at **45° angles**. Use a protractor to help with these measurements.
3. Cut out the outline of the periscope
4. Fold the panels to make the tube. Fold and tuck in the flaps, and join the edges with adhesive tape.
5. Slide the mirrors through the angled slits so that they are **parallel and facing each other**. Use adhesive tape provided to put the mirrors in place.
6. Look through the hole at the bottom of the box while holding it upright and see what happens.

Milk containers can replace Bristol board. Cut off the top of the carton and proceed with cutting slits for the mirrors. If Bristol board is to be used, mentor should cut them prior to session. Also, mentor should endeavour take a sample periscope along.



All Dimensions are in cm

Post-Test

Have students try to look at different things with the periscope and say whether or not they can see them. Ask about how the periscope would work if the mirrors were at different angles. Demonstrate with the periscope.

Word Search with a twist. Find the word but in order to be credited, the student should say something about the word i.e. definition, function, importance.

Reflection of Light Word Search

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

ANGLE _____

BRAIN _____

CONCAVE _____

CONVEX _____

DARKNESS _____

EYES _____

ILLUMINATED OBJECTS _____

INCIDENT _____

LIGHT _____

LUMINOUS OBJECTS _____

MIRROR _____

MOON _____

PERISCOPE _____

REFLECTED RAY _____

REFLECTION _____

SUN _____