

# CLIL - A module of Physics in English

## TEACHER'S GUIDE

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Nell'esplicitare alla classe il contratto formativo specifico all'inizio dell'attività, le due docenti, al fine di ottenere i migliori risultati, cercheranno di:

- creare un clima propizio all'apprendimento;
- motivare gli alunni durante tutto il percorso;
- dialogare sui rispettivi ruoli docente-alunno.

### LEZIONE N. 1– FIRST ENGLISH LESSON (ONE HOUR)

#### a) Warm-up– discussion (10 minutes)

Ask students (in Italian, if appropriate) what they think about light. Ask them if they know some words related to light and write them on the blackboard. Be sure that among the words the following ones appear, otherwise add them to the students' list: LIGHT – SIGHT – LUMINOUS OBJECT – ILLUMINATED OBJECT – STREET LIGHT – PLANE MIRROR – RAY – IMAGE.

#### b) Reading comprehension (50 minutes)

Tell students they are going to read a text about LIGHT. Give students the texts previously adapted (see Text A and Text B – Modulo Operativo). While reading, students underline nouns, adjectives and verbs related to "light". Use three different colors: nouns – red; adjectives – green; verbs – blue.

At the end, students briefly discuss with the teachers their choices.

**At home:** students must copy the new words in their glossary, which is a "work in progress glossary" with their definitions and translations (Worksheet 1, Ex. 1 – text A; Worksheet 2, Ex. 1 – text B).

### LEZIONE N. 2 – PRIMA LEZIONE DI FISICA (DUE ORE)

#### Prima ora

Gli studenti eseguono l'esercizio 2 dei *Worksheets* 1 e 2 (relativi ai testi A e B); a seguire si correggono in classe sia l'esercizio 1 che l'esercizio 2 per ciascun testo (**30 minuti**). Agli studenti viene poi consegnato il Text C, che va letto in classe cercando le *key words* necessarie alla comprensione (**30 minuti**).

#### Seconda ora

La docente spiega l'argomento presentato dai testi possibilmente in inglese e inizia la discussione.

Viene poi consegnato il *Worksheet* 3 (giochi sul lessico per rafforzarlo e memorizzarlo, da svolgersi a piccoli gruppi).

**N.B.** I testi originali sono qui di seguito riportati, con evidenziati gli elementi derivanti dall'analisi lessicale, effettuata con il supporto della docente di lingua inglese. Tale analisi consente alla docente di Fisica di comprendere quali possano essere le difficoltà legate al lessico.

*In rosso sono evidenziati alcuni esempi di **chunks**; in arancione i **connettori testuali**; in blu alcune **frasi istituzionalizzate**; in lilla le **espressioni per strutturare il testo**.*

**Primo testo (Text A), tratto da:** <http://www.physicsclassroom.com/Class/refln/u13l1a.cfm>

### **Reflection and Its Importance. The Role of Light to Sight**

The bottom line is: without light, there would be no sight. The **visual ability** of humans and other animals is the result of the complex interaction of light, eyes and brain. We are able to see **because** light from an object can move through space and reach our eyes. **Once** light reaches our eyes, signals are sent to our brain, **and** our brain deciphers the information **in order to** detect the appearance, location and movement of the objects we are sighting at. The whole process, as complex as it is, would not be possible **if it were not for** the presence of light. Without light, there would be no sight.

**If** you were to turn off the room lights for a moment and **then** cover all the windows with black construction paper to prevent any entry of light into the room, **then** you would notice that nothing in the room would be visible. There would be objects present that were capable of being seen. There would be eyes present that would be capable of detecting light from those objects. There would be a brain present that would be capable of deciphering the information sent to it. **But** there would be no light! The room and everything in it would look black. The appearance of black is merely a sign of the absence of light. **When** a room full of objects (or a table, a shirt or a sky) looks black, **then** the objects are not generating nor reflecting light to your eyes. **And** without light, there would be no sight.

The objects that we see can be placed into one of two categories: **luminous objects** and **illuminated objects**. **Luminous objects** are objects that generate their own light. **Illuminated objects** are objects that are capable of reflecting light to our eyes. The sun is an example of a luminous object, while the moon is an illuminated object. During the day, the sun generates sufficient light to illuminate objects on Earth. The **blue skies**, the **white clouds**, the **green grass**, the colored leaves of fall, the neighbor's house, **and** the car approaching the intersection are all seen as a result of light from the sun (the **luminous object**) reflecting off the **illuminated objects** and traveling to our eyes. Without the light from the **luminous objects**, these **illuminated objects** would not be seen. During the evening **when** the Earth has rotated to a position where the light from the sun can **no longer** reach our part of the Earth (**due to** its inability to bend around the spherical shape of the Earth), objects on Earth appear black (**or at least** so dark that we could say they are nearly black). In the absence of a porch light or **a street light**, the neighbor's house can no longer be seen; the grass is no longer green, **but** rather black; the leaves on the trees are dark; **and were it not for** the headlights of the car, it would not be seen approaching the intersection. Without **luminous objects** generating light that propagates through space to illuminate **non-luminous objects**, those **non-luminous objects** cannot be seen. Without light, there would be no sight.

A common Physics demonstration involves the directing of a **laser beam** across the room. With the room lights off, the laser is turned on and its beam is directed towards a **plane mirror**. The presence of the **light beam** cannot be detected as it travels towards the mirror. **Furthermore**, the **light beam** cannot be detected after reflecting off the mirror and traveling through the air towards a wall in the room. The only locations where the presence of the **light beam** can be detected are at the location where the **light beam** strikes the mirror **and** at the location where the **light beam** strikes a wall. At these two locations, a portion of the light in the beam is reflecting off the objects (the mirror and the wall) and traveling towards the students' eyes. **And since** the detection of objects is **dependent upon** light traveling from that object to the eye, these are the only two locations where one can detect the **light beam**. **But** in between the laser and the mirror, the **light beam** cannot be detected. There is nothing present in the region between the laser and the mirror that is **capable of** reflecting the light of the beam to students' eyes.

**But then** the phenomenal occurred (**as it often does** in a Physics class). A mister is used to spray water into the air in the region where the **light beam** is moving. Small **suspended droplets of water** are capable of reflecting light from the beam to your eye. **It is only due to** the presence of the **suspended water droplets** that the light path from the laser to the mirror could be detected.

**When** light from the laser (a **luminous object**) strikes the **suspended water droplets** (the **illuminated object**), the light is reflected to students' eyes. The path of the **light beam** can now be seen. With light, there can be sight. **But** without light, there would be no sight.

None of us generate light in the visible region of the **electromagnetic spectrum**. We are not brilliant objects (please take no offense) like the sun; rather, we are **illuminated objects** like the moon. We make our presence visibly known by reflecting light to the eyes of those who look our way. **It is only by** reflection that we, **as well as** most of the other objects in our physical world, can be seen. **And if** reflected light is so essential to sight, **then** the very nature of light reflection is a worthy topic of study among students of physics. **And** in this lesson and the several that follow, we will undertake a study of the way light reflects off objects **and** travels to our eyes **in order to** allow us to view them.

**Secondo testo (Text B), tratto da:** <http://www.physicsclassroom.com/Class/refln/U13l1b.cfm>

### The Line of Sight

A **luminous object** emits light in a variety of directions; **and** an **illuminated object** reflects light in a variety of directions. **Although** this light diverges from the object in a variety of directions, your eye only sees the very small **diverging cone** of rays that is coming towards it. **If** your eye were located at a different location, **then** you would see a different cone of rays. **Regardless of** the eye location, you will still need to sight along a line in a specific direction **in order to** view the object.

**While** simple, this concept of the line of sight is **also** profound! This very principle of the **line of sight** will assist us in understanding the formation of images (reflection).

**The manner in which** light travels to your eye as you view the image of an object in a mirror can be summarized as follows.

To view the image of an object in a mirror, you must sight along a line at the image. **One of** the many rays of light from the object will approach the mirror and reflect along your line of sight to your eye. This ray of light is known as the **incident ray** - the light ray approaching the mirror. The **incident ray** intersects the mirror at the same location where your line of sight intersects the mirror.

The light ray **then** reflects off the mirror **and** travels to your eye (**as represented by** the red ray in the diagram below); this ray of light is known as the **reflected ray**.

Observe in the diagram above that the image is positioned directly across the mirror along a line that runs perpendicular to the mirror. The distance from the mirror to the object (known as the **object distance**) is equal to the distance from the mirror to the image (known as the **image distance**). For all **plane mirrors**, this equality holds true:

$$\text{Object distance} = \text{Image distance}$$

## LEZIONE N. 3 – SECOND ENGLISH LESSON (ONE HOUR) AFTER THE FIRST PHYSICS LESSON

First of all students brainstorm ideas in pairs or small groups (to be sure they have understood and memorized the new specific vocabulary) (**10 minutes**). Then students are given Worksheet 4 and work on it in class (**15 minutes**). Then they are asked to categorise the new words using the table from Worksheet 5, exercise 1. Feedback students' ideas by completing the table. If there is serious disagreement between groups as to which category a concept should be put in, ask for a show of hands (**10 minutes**). Check the exercises in class (**15 minutes**).

## LEZIONE N. 4 – THIRD ENGLISH LESSON (ONE HOUR)

### *Writing*

Briefly explain the activity. Students must work individually. Set a word limit for their production (120-150 words) and ask them to use the scheme from Worksheet 5, exercise 2. Students should concentrate on accuracy and lexis, making sure to use the new words related to the topic (**50 minutes**). Students can't use the dictionary. At the end of the lesson the teacher collects the papers.

At home, when marking the stories, make a list of student errors to put on the board in the next lesson. Students then have to correct each other's errors.

## LEZIONE N. 5 – SECONDA LEZIONE DI FISICA (UN'ORA)

Da svolgersi nel laboratorio informatico.

### **Group work per la realizzazione di una presentazione in Power Point (1 ora e 10 minuti)**

La classe (ipotizzata di circa 25 allievi) viene suddivisa in 6 gruppi formati dalla docente. Ogni gruppo deve comprendere ragazzi "bravi" e ragazzi meno impegnati, risultando quindi disomogeneo. La docente assegna un ruolo a ciascun membro del gruppo (ad es. *leader, speaker, web surfer, designer*), a seconda delle capacità e delle attitudini dei singoli e in modo funzionale al task proposto.

A ciascun gruppo viene consegnata una scheda di lavoro con il *task* da svolgere e i suggerimenti ritenuti utili.

GROUP 1	Title and Map
GROUP 2	The Role of Light to Sight
GROUP 3	The line of Sight
GROUP 4	The characteristics of the image created by a plane mirror
GROUP 5	The reflection from a plane mirror
GROUP 6	Plane Diffusion

L'obiettivo finale è la realizzazione di un'unica presentazione in Power Point, creata con i contributi specifici di ciascun gruppo. Poiché tra i prerequisiti trasversali dell'unità di apprendimento si richiede che gli studenti conoscano e sappiano usare programmi per la creazione di presentazioni Power Point, tale lavoro non dovrebbe creare particolari difficoltà legate all'utilizzo del computer. Questo *task* permette agli allievi di utilizzare la nuova terminologia specifica, di trasferire in contesti diversi dal libro di testo i concetti scientifici appresi e di migliorare la propria competenza digitale.

Nel frattempo, viene restituito il lavoro svolto con il *Worksheet 5* e i singoli vengono chiamati dalla docente per la spiegazione degli errori, mentre il resto della classe lavora al nuovo *task*.

## LEZIONE N. 6 – TERZA LEZIONE DI FISICA (UN'ORA)

Da svolgersi nel laboratorio informatico

Gli studenti continuano e concludono il lavoro delle *slides* e le inviano alla docente, che le assemblerà a casa. Al termine del percorso CLIL, in un'ora di fisica o di inglese a scelta, verrà proiettato il PPT realizzato e verrà comunicata la valutazione finale del percorso di apprendimento, valutazione elaborata congiuntamente dalle due docenti.

## LEZIONE N. 7 – FOURTH ENGLISH LESSON (ONE HOUR)

Do some **word games** in order to memorize the new vocabulary. The ones presented have been constructed using the website [www.discoveryeducation.com](http://www.discoveryeducation.com). They work in pair (**20 minutes**). Check students answers (**10 minutes**). Ask each group to create one or two word games. Vote the best one(s) (**20 minutes**).

## LEZIONE N. 8 – QUARTA LEZIONE DI FISICA (DUE ORE)

**Verifica**

**Esercizi di produzione scritta**

**Comprensione scritta**

# SOLUTIONS

## LEZIONE 1

### Worksheets 1 – 2

**Esercizio 1.** *Esempi:* light – sight – luminous object – illuminated object – torch light – Street light – plane mirror.

## LEZIONE 2

### Worksheet 3

**Activity 1.** mirror, reflection, virtual, image, glass, light, reverse, invert, ray, real.

**Activity 2.** The hidden sentence is: “Without light no sight”.

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

### Activity 3

image / virtual  
mirror / plane  
light / white, reflected  
ray / reflected  
object / luminous

## LEZIONE 3

### Worksheet 4

#### Exercise 1

1. A luminous object is an object that emits light.
2. They are the same.
3. It's an upright image that has the same size and the same distance as the object. It's laterally inverted and it's a virtual image.

#### Exercise 2

1. True, 2. False, 3. False, 4. True, 5. False, 6. False.

#### Exercise 3

2. A non-luminous object can be seen because it reflects light.
3. A shiny surface reflects all the rays in the same direction.
5. A reflected ray is created by a plane mirror.
6. The angle of incident is always equal to the angle of reflection.

## LEZIONE 7

### Activity 1

The hidden sentence is: "Without light there would be no sight".

N	W	S	S	E	I	K	S	W	I
T	I	H	C	D	O	U	T	H	L
I	G	A	H	I	U	T	T	I	H
S	S	A	R	G	S	O	E	T	P
R	E	W	O	B	U	Y	L	E	L
A	B	S	E	N	C	E	H	C	A
L	U	M	I	N	O	U	S	P	N
W	I	N	D	O	W	S	L	D	E
B	E	N	R	O	R	R	I	M	O
S	I	G	G	R	E	E	N	H	T

### Activity 2. Double puzzle

we see – because – light – from – an object – moves – through – space – and – reach – our eyes:  
LUMINOUS OBJECTS

### Activity 3. Letter tile puzzle

A L-UMI-NOU-S O-BJE-CT – EMI-TS –LIG-HT –IN – A V-ARI-ETY- OF- DI-REC-TIO-NS =  
A LUMINOUS OBJECT EMITS LIGHT IN A VARIETY OF DIRECTIONS

### Activity 4. Criss-cross puzzle

Across

3. MIRROR

5. IMAGE

7. DISTANCE

Down

1. SIGHT

2. REVERSE

4. REFLECT

6. RAY

## LEZIONE 8 FINAL TEST

### Exercise 1

- FALSE:** The human visual ability is the result of the interaction of light, eyes and **brain**.
- FALSE:** An illuminated object **doesn't** emit light in a variety of directions.
- TRUE**
- FALSE:** Eyes situated in different locations **doesn't** see the same cone of rays coming from the same object.
- TRUE**
- FALSE:** The angle of incident is always equal to the angle of reflection.
- FALSE:** The image created by plane mirror is upright and it is laterally inverted.

### Exercise 3: reading comprehension

- formulated – Newton – most – theories – light – particles – waves – explained – resolve – spherical – uniform – advance – speed – shining – spreads – line
- A 2; B 1; C 3.