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Академічний ліцей «Європейський» Лубенської міської ради Лубенського району Полтавської області
Посада
Заступник директора з НВР з іноземних мов
Номінація
Іноземні мови

Theme	
Application of Optics in Various Professional Spheres	
Objectives	
This detailed lesson plan aims to seamlessly integrate physics content with English language practice (CLIL), enhancing students' understanding of optics while reinforcing their language skills.	
Grade	Lesson type
11	Content language integrated lesson
Digital tools	Terms and vocabulary
Zoom platform; Kahoot game-based learning platform; You Tube video hosting; GPT chat / Wikipedia; Digital board Padlet; Puzzel.org web app.	Optics, convex and concave lenses, magnification, beam splitter, fibre optic cable, perspective, transparent, monochromatic, refraction, reflection, collimator, wavelength
Key competences	
<p style="text-align: center;">Linguistic Competence</p> <p>Expanding vocabulary on the topic of optics in English, improving reading, listening, and speaking skills related to specialized topics, using subject-specific terminology in oral and written communication.</p> <p style="text-align: center;">Mathematical and Scientific Competence</p> <p>Understanding physical phenomena related to optics (refraction, reflection, the functioning of telescopes and microscopes, basics of aerodynamics, etc).</p> <p style="text-align: center;">Digital Competence</p> <p>Working with online platforms, apps, digital boards and media resources.</p> <p style="text-align: center;">Learning to Learn</p> <p>Fostering critical thinking while discussing modern applications of optics in technology.</p> <p style="text-align: center;">Social and Civic Competence</p> <p>Collaborating in groups and engaging in teamwork during tasks, discussing the role of scientific discoveries in historical and modern contexts.</p>	

Procedure

Introduction

Hello, students. Today we are going to learn some Physics by means of English and some English by means of Physics. So, let's not waste any minute and start our adventure called "Application of Optics to Various Professional Spheres"

At our English lesson we will find out some more facts, deepen our understanding of optical devices, learn some history and carry out experiments. Let's get started.

There is a number of professions and spheres connected with optics. You face some aspects of this field of physics a lot more often than you imagine. Our acquaintance with it will be arranged through professions, which might help you come up with your own as you are finishing school this year.

Main part

To begin with, let's discuss **astronomy and astronomers**.

This is quite a rare occupation, but in order to get to know more about the history of a telescope and somebody who is called the father of modern science we will talk about astronomers.



There is a great educational video on YouTube, which I want you to watch right now.



Please, be sure to take notes individually or in groups. After watching we will take a **Kahoot quiz** based on information from the video.

<https://create.kahoot.it/details/d9a31e0a-24d3-471f-9154-549332e6b97c>



Now log on to **Kahoot.it**, enter the code and let's have a quiz.

1 - Quiz
The telescope is a complex system of...

- iron and silver
- human knowledge and advanced technology
- lenses and curved mirrors 😊
- I'm not sure I know much about this topic.

3 - Quiz
According to the first description of the telescope, the device was used ...

- "For multiplying numbers"
- "For detailed examination of space objects"
- "For seeing things far away as if they were nearby" 😊
- "For understanding the principles of optics"

6 - Quiz
What subject did Galilei NOT teach in Padua?

- geometry
- physics 😊
- astronomy
- mathematics

2 - Quiz
The earliest existing record about the telescopes was made in ...

- 1806
- 1608 😊
- I'm completely confused!
- 1086


5 - True or false
Galileo Galilei was born in Pisa ...

- Tak 😊
- Hi


7 - Quiz
Galileo states that he solved the problem of a telescope in a ...

- week
- day
- hour
- night 😊


8 - Quiz
Galileo's telescopes magnified the objects but ...

- the image was blurred
- the refraction was multiple
- they produced a flipped over image 
- they were of low productivity

9 - Quiz
What was the value of Galileo's telescope magnification?

- 2x
- 23x 
- 3x
- 32x

10 - Quiz
The term "telescope" comes from the Greek:

- "tele" vision and "skopein" sun
- "tele" go and "skopein" stare
- "tele" across and "skopein" sky
- "tele" far and "skopein" look 

The next sphere we are going to immerse into is **biology and microbiology**. What piece of equipment do you associate biologists with? The microscope.



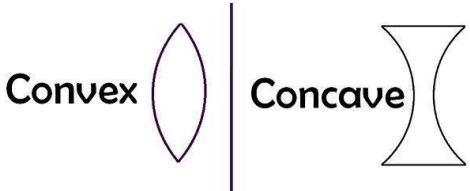
This time we will learn about it from the text which needs to be composed. Each of you will randomly get a set of sentence parts of only one colour, however, only by working together we will see the whole thing. Your task will be to predict the next phrase based on the meaning and grammar. Look at the beginning and say whose part goes next. I will share my screen so that you could see my **PPT presentation**.

During the 1st century AD, glass had been invented and the Romans were looking through the glass and testing it. They experimented with glass in different shapes and eventually found that different thickness of glass could produce magnification by holding one of these "lenses" over an object.

Someone also discovered that you can focus the rays of the sun with one of these special "glasses" and start a fire. These early lenses were called magnifiers or burning glasses. These lenses were not used much until the end of the 13th century when eyeglass makers were producing lenses to be worn as glasses.

The early simple "microscopes" which were really only magnifying glasses had one power, usually about 10x. People found fleas interesting to look at and these early microscopes were frequently used to view insects. In the 1660s in Holland, Antonie van Leeuwenhoek also started playing with lenses. He realized that he could polish lenses so they would have curves on the edges to produce greater magnification. His rounded lenses allowed his microscope to magnify up to 270x!

Because Leeuwenhoek's microscope was able to magnify greater than what the naked eye could see, he opened up a world that included being able to view tiny animals swimming in water, blood cells, and even bacteria. Leeuwenhoek is often called the father of microscopy due to his discoveries and he is often given credit for inventing the microscope as well as convex and concave lenses.



Now that you know more about microscopes you are most welcome to use them. Each one will get one sample photo made by me using school microscopes and my camera. Please, explain what you see and make a guess what this might be.

Peacock feather, blood of the human, rabbit hair, a fruit fly



Useful phrases:

1. This image reminds me of ...
2. Judging from the image I can say that...
3. It's difficult to tell from the pattern, but I assume ...
4. I might be wrong, but ...
5. By the colours and texture this resembles ...
6. My final guess is that it is ...

You were rather enthusiastic about the task. Imagine how thrilling it is to see the samples through an electronic microscope! Our biology teachers will happily demonstrate the samples to you when you come to school and attend their lessons. Now let's move on. While some of you are completely uncertain about your future careers, the others have already made their choices. I am speaking about your classmate Yaroslav Pidtoptany, who is currently attending our school from abroad. He is in Slovakia and started his professional path there. His dream is to become a pilot. **Aircraft engineering** is one more sphere where optics is widely used. I asked Yaroslav

to share his knowledge of optics in the field he is currently studying. Here is a QR code to a short video he sent me back.

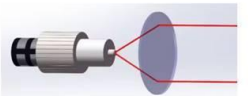
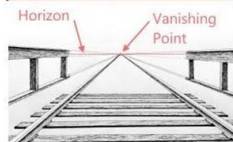


Yaroslav uses quite professional vocabulary in his video, so this time we're going to work with some terms. Download the **PDF file**. It is a chart filled in with 12



Three non-mentioned words

magnification	transparent	projector
optics	data	collimator
perspective	glass	beam splitter
monochromatic light	refraction	wavelength



expressions. Please, skim through them in a couple of seconds and then while watching the video cross out the mentioned ones. In the end, you will have to name **three words** that were not said by Yaroslav. Use any app aimed at working with and editing images to have access to an electronic pen. I can recommend **Scissors** on computer or **Photo Edit** on telephone.

A new term for you here is a collimator. Use **GPT chat or Wiki** to define the word. Let's share findings in our Zoom chat.

In order to remember terms let's play a "Where do I go" vocabulary game.

(Students look thoroughly at the words and their order on the chart "Three non-mentioned words". Then they close their eyes and put their heads on the arms. The teacher starts with any previously chosen word in the middle and asks a "Where do I go?" question. One student gives directions: up, down, left, right and the rest have to try to visualize the chart and name the word which is in that place. The game continues until most words are named. This game develops memory, visualization and boosts immense brain work)

ChatGPT

A collimator is a device that narrows a beam of particles or waves. It often has an arrangement of lenses, mirrors, or slits that direct or shape light, radiation, or other forms of energy into a parallel or narrowly focused beam. Collimators are commonly used in fields like physics, medicine, and astronomy.

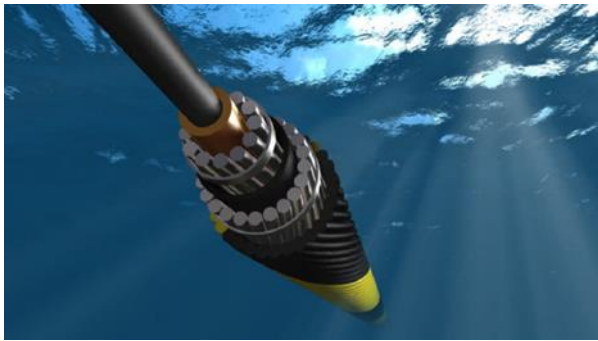
WIKIPEDIA

Collimator

Article Talk

This article needs additional citations for verification. (June 2017)

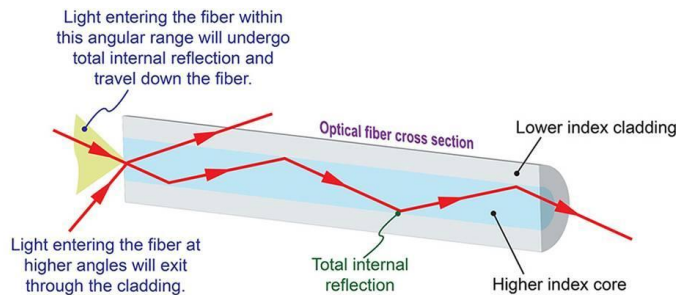
A **collimator** is a device which narrows a beam of particles or waves. To narrow can mean either to cause the directions of motion to become more aligned in a specific direction (i.e., make **collimated light** or **parallel rays**), or to cause the **spatial cross section** of the beam to become smaller (**beam limiting device**).



It's time we moved to **IT sphere**. Look at the picture and guess what you see here.

This is actually **fiber optic cable**. From the name of it you can guess that it has a direct connection with optics. The whole planet is literally dressed in those cables. What do they provide? (*the Internet*)

Basic Operation of an Optical Fiber



Light travels down a fiber optic cable **by bouncing off the walls** of the cable repeatedly.

Here is the principle of how light travels inside the cable by bouncing off the walls repeatedly. Due to continuous reflection the signal can be easily and quickly transmitted from point A to point B.

Let's read about 4 out of many spheres where fiber optic cables are used. We will split into group and work in 4 **different rooms in Zoom**. The idea is to read a couple of

sentences and choose a correct variant from multiple options. After finishing we will discuss what you have come up with. Be ready to explain your choice.

Room #1

#1 Remote Sensing

- Fiber optic cables **use/are used/have used** sensors to measure temperature and pressure. Using fiber optic cables in remote sensing is convenient **due to / because / because of** it doesn't require any electricity in a remote location.

Room #2

#2 Medicine

- Fiber optic cables are **general /generalization/ generally** used in endoscopy (non-intrusive surgical methods). In **such a/such/so** procedure, a small, bright light is used to light up the surgery area inside the body.

Room #3

#3 Decorations and Lighting

- Fiber optics are used for lighting decorations and illuminating Christmas trees. They are an easy, attractive, and **economic/economical/economy** solution **for/to/of** lighting projects.

Room #4

#4 Military and Space Applications

- Fiber optic cables are the perfect solution to **transmitting/transporting/transferring** high-security **data/data/datas** for military and aerospace applications.

Let's leave the rooms and discuss grammar/vocabulary structures and share information.

And the last field we are going to discuss today is **photography**. It also deals with the principles of optics. You were given the task to take pictures which will illustrate different optical processes that we can witness during our everyday life, a **mini photo projects** when you were experimenting with optical illusions and light.



The pictures are on **Padlet** and now I invite you to tell us what exactly your photos illustrate and probably what principles of physics we can observe on them. You can leave questions or commentaries under the photos your classmates have posted.

Summing-up

Well-done! To sum it up and memorize vocabulary let's do a final revision and systematization of terms.

Match the words with their meanings. **Scan the code** and play online.

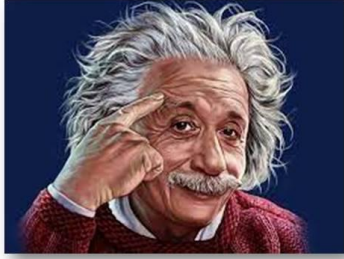


https://puzel.org/en/matching-pairs/play?p=-OB_le_N1TwMa27Xrwev

- | | |
|-------------------------|--|
| <i>a. transparent</i> | 1. an adjective meaning that you can see through some substance clearly |
| <i>b. collimator</i> | 2. the phenomenon when light ray is caused to change direction |
| <i>c. perspective</i> | 3. the distance between two waves |
| <i>d. monochromatic</i> | 4. a device which narrows a beam of particles or waves |
| <i>e. refraction</i> | 5. an image that you can see in a mirror, glass, or water |
| <i>f. wavelength</i> | 6. a set of qualities in a substance or material |
| <i>g. properties</i> | 7. light consisting of only one specific wavelength |
| <i>h. reflection</i> | 8. a distant view |
| <i>i. refraction</i> | 9. cables that are made of a thin strand of glass or plastic and carry data signals in the form of light waves |

And as an overarching summary we will finish with a saying of an outstanding physicist Albert Einstein who said ↓

To cup it all, I must say that today you were highly motivated and engaged. You definitely had the will to gain knowledge of two subjects. And all of us together



managed to do this in a form of a distant lesson which was possible due to many of the things and processes we had been analyzing for the previous 45 minutes. Thank you!

References

“Where there is a will there is a way”

Albert Einstein

1. URL:<https://youtu.be/mzVwLIs6zRY> (date of access: 15.11.2024).
2. URL:<https://www.microscopeworld.com/t-history-of-the-microscope.aspx> (date of access: 15.11.2024).
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5. URL:<https://www.tevelec.com/10-uses-of-fiber-optic-cables/> (date of access: 15.11.2024).