SCENARIO	
Title	**Refraction of light.**
Summery	The student will become familiar with the concept of refraction. Thanks to practical action (experience) he will be able to indicate the relationship between the angle of incidence and the angle of refraction. He will make a schematic drawing for the experiment.
Author/s	Jarosław Szczęsny — Date: 19/01/2020

Didactic objectives
General objectives:
- Introduction of the concept of refraction.
- Experimental demonstration of the relationship between the angle of incidence and the angle of refraction.
Specific lesson objectives:
Students will be able to:
- Indicate examples of refraction in the surrounding reality,
- Design an experiment illustrating the phenomenon of refraction (changes in the angle of refraction when the angle of incidence changes
- describe the course and result of the experiment carried out, explain the role of the instruments used
- make a schematic drawing illustrating the experimental system,
- describe the course of rays at the transition of light from a thinner medium to an optically thicker medium and vice versa, using the concept of refraction angle.
Physics☒   Mathematics☐   Information Technology☐   Robotics☐   Programming☐
Education Level: 10-12 years☐   12-14 years ☒
Problem Statement
-What is the phenomenon of refraction?
-When does the phenomenon of refraction occur?

„InnoExperiment – Innovative Approach to Teaching through Experiment"
Project Leader: Zespół Szkolno – Przedszkolny w Goniądzu (ZSP)

aiju Technological Institute for children's products & leisure

RCK
REGIONALNE CENTRUM KOMPETENCJI

BOM (Bill Of Materials needed)
- computer station
- SCRATCH environment or Internet access installed
- instruments for optics experiments.
Activity description
Lesson flow:

1. Organizational and organizational activities
2. Introduction to the topic - a reminder of messages regarding the propagation of light in homogeneous media
3. Demonstration of an experiment showing refraction of light.
4. Demonstration of an experiment showing refraction at the border of two centers.
   - Explanation of the phenomenon of refraction based on observation of experiments.
5. Demonstration of the difference in refraction of light depending on the centers on which the light falls.
   - Explanation of the dependence angle of refraction on the type of medium.
   - Explanation of the relationship between the angle of incidence and the angle of refraction.
6. Experience demonstration - the passage of laser light through the prism
7. Simulation in the SCRATCH environment of refraction at the border of two centers.

```
when [flag] clicked
set size to 30 %
go to x: -227 y: 61
clear
set L to 0
set n1 to 0
set n2 to 0
set B to 0
set limiting_angle to 0
set V1[m/s] to 0
set V2[m/s] to 0
ask Enter the absolute refractive index n1 and wait
set n1 to answer
ask Enter the absolute refractive index n2 and wait
set n2 to answer
ask Enter the value of the angle of incidence and wait
set L to answer
set V1[m/s] to round 300000000 / n1
set V2[m/s] to round 300000000 / n2
set B to round asin of sin of L / n2 / n1
broadcast komunikat1
set limiting_angle to asin of n2 / n1
say join The angle of refraction is B for 10 secs
```
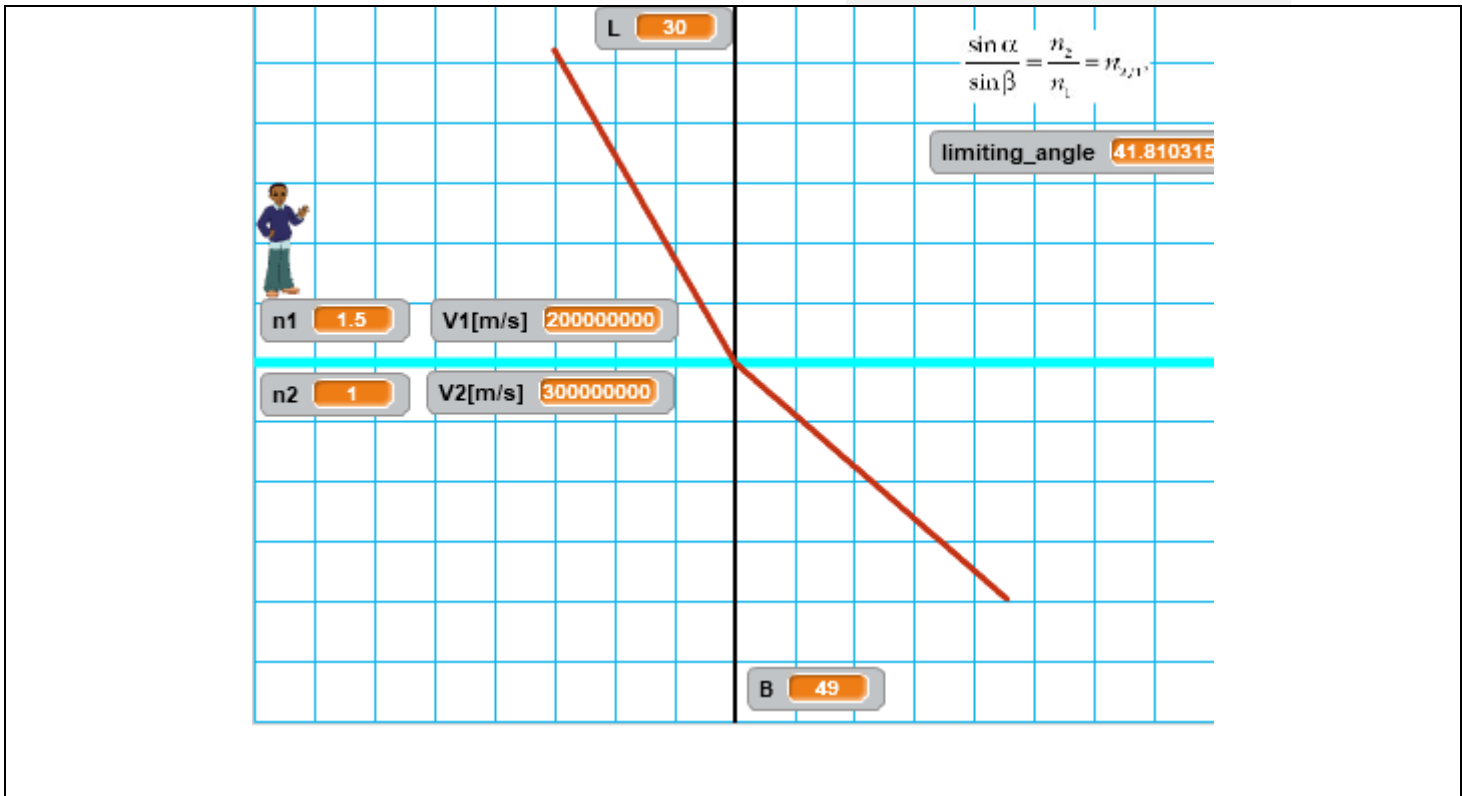
```
kiedy kliknięto [flag]
ukryj
wyczyść
idź do x: 0 y: 0
ustaw rozmiar na 30 %
na wierzch

kiedy otrzymam komunikat1
ustaw kierunek na 0
obróć o L stopni
przesuń o 180 kroków
przyłóż pisak
ustaw rozmiar pisaka na 3
ustaw kolor pisaka na [red]
leć przez 2 s do x: 0 y: 0
ustaw kierunek na 180
obróć o B stopni
powtórz 90 razy
    przesuń o 2 kroków
podnieś pisak
```

8. Summary and end of the lesson.

Resources
- computer stadion - SCRATCH environment installed or Internet Access

„InnoExperiment – Innovative Approach to Teaching through Experiment”
Project Leader: Zespół Szkolno – Przedszkolny w Goniądzu (ZSP)

aiju Technological Institute for children's products & leisure

RCK REGIONALNE CENTRUM KOMPETENCJI

$$\frac{\sin\alpha}{\sin\beta} = \frac{n_2}{n_1} = n_{2,1}$$

L 30

limiting_angle 41.810315

n1 1.5   V1[m/s] 200000000

n2 1   V2[m/s] 300000000

B 49

Students' Evaluation
The student will be assessed for commitment and proper performance of experiments.

Bibliography
Spotkania z fizyką - Podręcznik do fizyki dla klasy ósmej szkoły podstawowej Authors: Grażyna Francuz-Ornat, Teresa Kulawik, Maria Nowotny-Różańska https://scratch.mit.edu

Scalability
Script modification and improvement.

More information
Solving tasks using the program.