SCENARIO		
Title	**Receiving images using lenses.**	
Summery	During the course, students will be able to recall basic information about the phenomenon of light refraction. They will be acquainted with the types of lenses and the experimental obtaining of images created with the help of a focusing lens. They will learn the equation of the lens and use it to determine the position of the image.	
Author/s	Jarosław Szczęsny	Date: 07/01/2020

Didacticobjectives
General objectives: -To familiarize students with the types of lenses. -Experimental receiving images using lenses. - Discussion of the structure of the human eye and the most common vision defects and ways of correcting them. **Specific lesson objectives:** Students will be able to: -plan the experience related to testing the course of rays passing through the border of two optical centers, -replace and distinguish types of lenses, -describe the course of rays passing through the focusing or distracting lenses, using the concepts of focus, focal length and focusing ability of the lens, - create a sharp image of the object on the screen using the focusing lens, - select experimentally the position of the lens and the object, -make a schematic drawing illustrating the formation of the image obtained using the focusing lens, -draw structurally images created by the focusing lens, -distinguish between images: real, apparent, simple, inverted, enlarged, reduced, -describe the creation of images in the human eye, explain the meaning of the concepts of myopia and farsightedness, -explain the role of lenses in correcting these vision defects.

Physics ☒	Mathematics ☐	Information Technology ☐	Robotics ☐	Programming ☐
Education Level:	10-12 years ☐	12-14 years ☒		

Problem Statement

How can you construct images created with concave and convex lenses?

What are the features of the images formed in the lenses?

How and where can be the lenses used?

BOM (Bill Of Materials needed)

- a computer
- SCRATCH environment installed or Internet Access
- instruments for experiments: focusing and diffusing lenses, with different focal lengths, laser pointers, candle, cardboard.

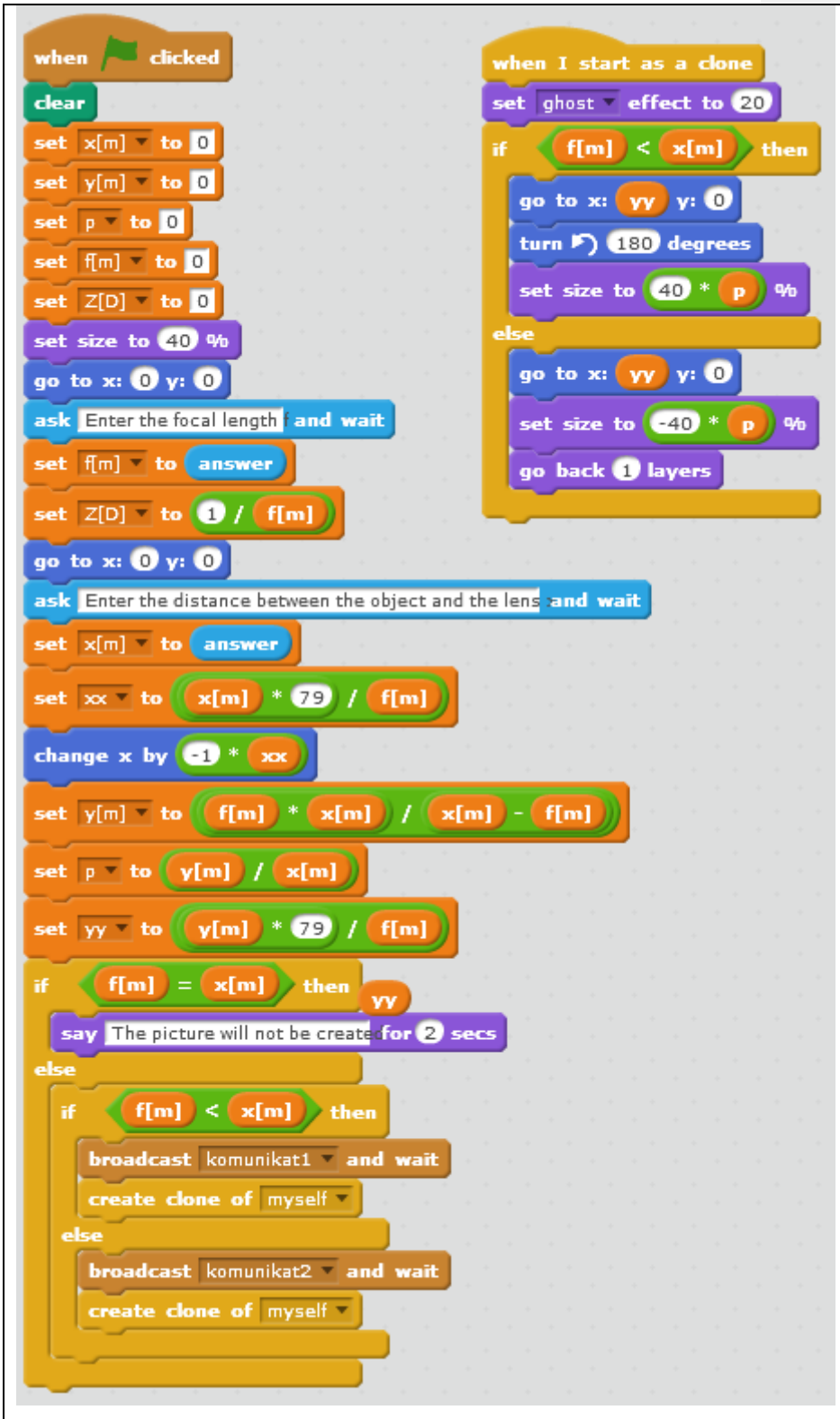
Activity description

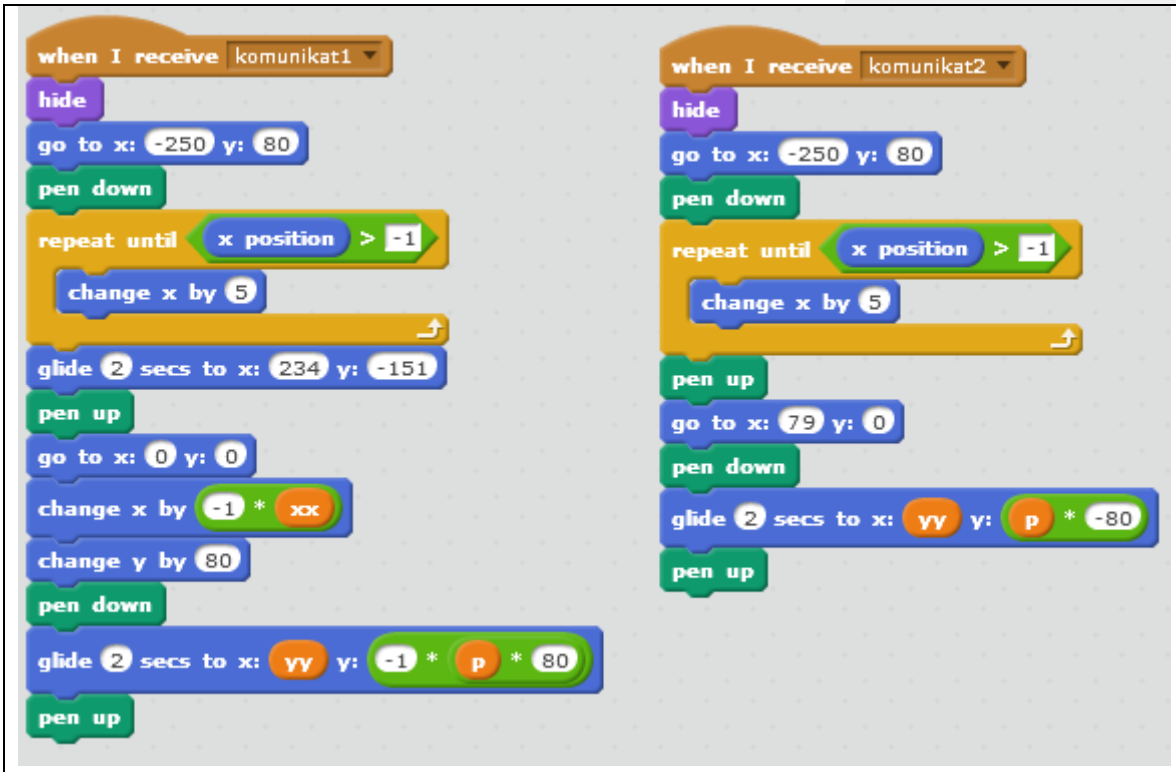
Lesson course:

1. Organizational activities
2. Introduction to the topic - a reminder of news about the phenomenon of refraction.
   - What are the lenses for?
   - An explanation of what a lens is.
   - Overview of lens types.
3. Experiment demonstration - the passage of a parallel light beam through focusing and diffusing lenses.
   - Discussion of the phenomena of beam focusing and scattering as it passes through the lens.
   - Introduction of the concepts: focuses - for the focusing lens, virtual focus - for the diffusing lens.
4. Demonstration of an experiment showing the passage of parallel rays through the lenses with different focusing abilities.
   - Introduction of the concepts of focal length and focusing ability.
5. Plan and demonstrate by students the experience of studying the course of rays passing through the focusing lens and determining its focal length.
   - Implementation by students (in groups) of an experiment: creating a sharp image of an object on

the screen using a focusing lens.

6. Introduction of concepts related to the construction of images.
    - Creating the structure of images obtained with the help of focusing lenses, discussing the features of these images.
7. Simulation in the SCRATCH environment of the formation of images obtained using the focusing lens.

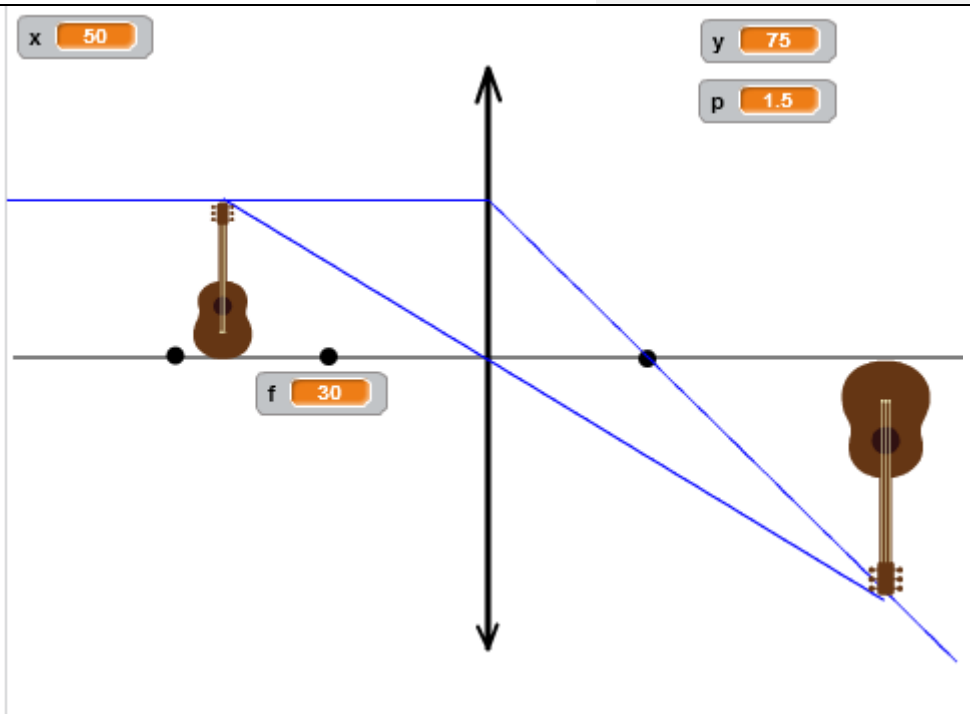

when clicked
clear
set x[m] to 0
set y[m] to 0
set p to 0
set f[m] to 0
set Z[D] to 0
set size to 40 %
go to x: 0 y: 0
ask Enter the focal length and wait
set f[m] to answer
set Z[D] to 1 / f[m]
go to x: 0 y: 0
ask Enter the distance between the object and the lens and wait
set x[m] to answer
set xx to x[m] * 79 / f[m]
change x by -1 * xx
set y[m] to f[m] * x[m] / x[m] - f[m]
set p to y[m] / x[m]
set yy to y[m] * 79 / f[m]
if f[m] = x[m] then
yy
say The picture will not be create for 2 secs
else
if f[m] < x[m] then
broadcast komunikat1 and wait
create clone of myself
else
broadcast komunikat2 and wait
create clone of myself
when I start as a clone
set ghost effect to 20
if f[m] < x[m] then
go to x: yy y: 0
turn 180 degrees
set size to 40 * p %
else
go to x: yy y: 0
set size to -40 * p %
go back 1 layers



8. Discussion of the structure and operation of the human eye.
9. Discussion of ways to correct vision defects.
10. Solving problems related to lenses.
11. Summary and end of the lesson.

Resources

- computer stadion
- SCRATCH environment installed or Internet Access



Students' Evaluation

The student will be marked for commitment and a proper performance of experiments.

Bibliography

Spotkania z fizyką - Podręcznik do fizyki dla klasy siódmej szkoły podstawowej
Authors: Grażyna Francuz-Ornat, Teresa Kulawik, Maria Nowotny-Różańska

https://scratch.mit.edu

Scalability

Script modification and improvement.

Moreinformation
Solving tasks using the program.