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USING PPT¹ AND LG² TO CREATE OPTICS CONCEPTS FOR HIGHSCHOOL STUDENTS

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Abstract

Learning concepts related to specific phenomena becomes easier and more effective when learners are allowed to experiment them with their own senses. Optics, basic phenomena can be perceived by seeing, although sight is also involved through images and text.

Therefore a learning tool which involves the sense of seeing should be welcomed, specially if it is easy to implement .The see tool presented here is based on the open-source software Looking Glass(LG). Nevertheless, the fact that Looking Glass is available on the web, free of charge, makes it an ideal choice for implementing this see tool. In this experiment the PowerPoint and Looking Glass software are used to teach optics in high schools .In this way the photos from nature and images from LG software can gather and we can plan the lessons by students more attractive .The students are interested in this method ,because the usage of these software are easy to learn. Specially, when the Optics lab comes to help us for learning Optics .Many learning activities can be devised using this software application with using camera and PPT (PowerPoint software) and real laboratory experiments.

1. Introduction

Physics is about concepts and real events around us. A coherent instructional standard may be “to engage students in understanding the physical world by constructing and using scientific models to describe, explain, predict, and control physical phenomena.

These goals of Physics education can be considered by using PowerPoint and Looking Glass software to teach optics in high schools. Although science classrooms are filled with the voices of teacher and students, it is clear that communication and learning in the classroom are achieved by more than just linguistic tools. There are various proposals for teaching approaches and variety of multimedia tools. The natural languages of science is synergistic integration of words ,diagrams ,pictures , graphs ,maps ,equations ,tables ,charts ,movies ,simulations and other forms of virtual and mathematical expression. In this plan, the photos from nature and images and movies from LG software and the diagrams and charts are created by PPT and movies form lab and nature can be gathered. In addition the concepts are created by students and it is more attractive .They plan their ideas about nature and express them in the virtual space, this individual activity make them to construct rather than receive.

1.1. Observation

At the first step the students are invited to see and find optical phenomena in the nature ,the propagation of light ,reflection and refraction .This observation help them to be ready for the next step of learning optics .

1.2. Photography

Different optics phenomena, including a reflection from plate or spherical mirrors, can be photographed by students. Pictures are presented immediately and the results should be understood by examining the model representation. The students take photos of interested images in mirrors and they can explain the differences between images.

1.3. Real laboratory experiments

The laboratory will be a journey of exploration of the mysterious nature of light. And with experiments we study the straight propagation of light, the laws of reflection, refraction and the formation of images in the eye and the perception of distance. Most of Optical instruments for high school concepts are simple. The students try these simple experiments and suggest the relationship between distances of objects and images.

1.4. Using Looking Glass software

LG (Looking Glass™) is a geometric optics construction set that allows students to create and explore situations involving several objects, lenses, mirrors and images. This software takes an interactive, visual approach to physics. Looking Glass™ will help students develop an intuition for the effect of lenses and mirrors on light rays. Students will gain a better understanding of the Optics behind the images. By creating and exploring their own lenses and mirrors with Looking Glass™, students encounter many of the core concepts in optics. The students can change kinds of mirrors and distances and see the produced images, also they can check their answers for several kinds of images, depends on object distance from mirror, and also find the relation between p , q , f in spherical mirrors.

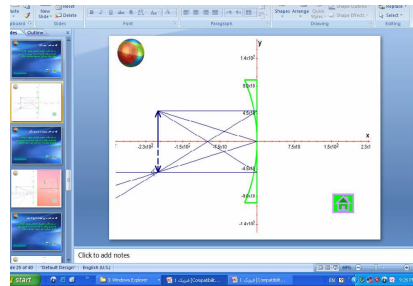


Figure 1:a print screen of LG on a PPT slide

1.5. Planning and solving numerical optics problems

In this step students plan and solve problems of mirrors .In this way they can gain their abilities to organize concepts about Images in mirrors and its formula, how to use it to calculate q and predict the kind of image.

1.6. Comparing the results of solution with Looking Glass geometrical results

Many of image places in spherical mirrors can be predicted by this equation;

$$1/p+1/q=1/f \quad (1)$$

Mathematics is the strong device to find the relation between optical quantities. So in Optics' problems students use this equation .It helps students to understand the behavior of the light through using LG they can compare the mathematical results of solution and the modeling results of light and mirrors in this software. After that they can recognize their mistakes in solution. This is a self- teaching method.

1.7. Using Power Point software

PPT(PowerPoint) is a software with these abilities :Slide transition and animation , adding clip art to the presentation, adding sound to the presentation ,adding movies to the presentation, adding Internet images to the presentation, adding Internet or document links to the presentation, using action buttons, showing the presentation. A complexion of all resources (is created by LG) and presenting it (by PPT), is the scientific way to use all of these languages in meaningful and appropriate ways, to be able to functionally integrate them in the conduct of scientific activity. There are strong commonalities in how individuals appear to think about the natural world.

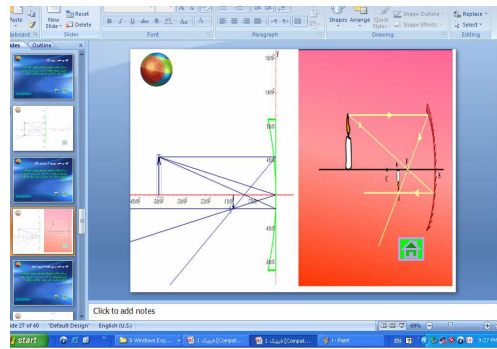


Figure 2:painting and a photo from LG on a PPT slide

1.8. Presenting to other classmates

The idea that learning occurs as discrete concepts are formed and then linked into more complex conceptual structures has largely given way to a view that concepts are part of larger relational structures from the start. Learning scientific knowledge involves a passage from social to personal planes and the process of learning is consequent upon individual sense-making by the learner, learning is mediated by various semiotic resources, the most important of which is language, graphics, pictures, photos, movies, simulations. They practice concepts by talking to others”, and they use it in talking to them in talking to their selves.

This method can Help teachers to teach optics using contents and scenes from LG movies, allow convenient use in ordinary Physics classes, produce moving picture files by capturing scenes from LG. and they can motivate and help students understand Optics principles by collecting documents from LG, scanning materials, using cameras to capture images, capturing and using digital video from nature and lab work, saving LG to media, saving information,.... And they can make students take part in the learning activities, and present their PPT in class.

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