



KIDSPACE
A CHILDREN'S EXPLORATION CENTER

Educator Viewing Guide



Seeing: A Photon's Journey Across Space, Time, and Mind (2017)
22 minutes

Based on a 1-hour PBS documentary, *Seeing!* uses hemispheric 2D and 3D animations and video to explore the fascinating processes of the cosmos, from astrophysics to the biology of the eye and brain. Imagery from all over the world including humanity, landscapes, skyscapes, wildlife and of space are the backdrop for photo-realistic animations, which are used to create a story of a photon's journey through the eye and its conversion to an electro-chemical impulse that then travels the neuro-pathways of the brain to the various centers that create the image the brain sees.

Topics covered:

Astrophysics, biology of sight

Interdisciplinary connections: biology, health sciences

Key Terms and Concepts:

Atmosphere, Big Bang, Cornea, Density, Iris, Lens, Nebula, Optic Nerve, Photoreceptors, Protons, Pupil, Refraction, Retina, Speed of Light, Telescope

Combine with these KidSpace Activities:

Ballistics Lab

Take aim with space-themed ball blasters, jump, and climb while exploring science concepts: forces, gravity, resistance, energy, and more.

Magnetic Lab

Investigate the push and pull forces of magnetism while guiding the unique material, Ferrofluid, a nanometer-sized particle that acts like a magnetic solid and liquid.

PlaySpace!

Science begins with imagination. The space-themed playground offers many opportunities for space-themed play, space-related discoveries, and demonstrations of science concepts: gravity, friction, force, laws of motion, and more.



Learning Resource and Activities:

Create learning units designed around a visit to KidSpace! These web resources and activities are designed to illustrate concepts and ideas presented in the show. Many of these can be adapted to various age groups.

Seeing Educational Materials/Workbook; Koenig Films

This site contains worksheets designed to reinforce the concepts in the show. Includes diagrams and definitions.

https://www.eso.org/public/archives/education/pdfsm/edu_0073.pdf

Investigating Eyesight; The Surfing Scientist, Australian Broadcasting Company

This resource contains description, overview, learning objectives and full instructions to complete activities designed to explore the sense of sight.

http://www.abc.net.au/science/surfingscientist/pdf/lesson_3_eyesight.pdf

Do You See What I See (Light, Sight, & Natural Selection); Project Neuron; University of Illinois

This resource includes seven lessons that explore optical illusions, color perception, color-blindness, and diversity of vision across species. Lessons include *What do I see*, *How does biology affect perception*, *How does the environment affect perception*, *What are color and light*, *What is a fish's favorite color*, *Why do guppies have favorite colors*, and *What do you see*.

<https://neuron.illinois.edu/units/do-you-see-what-i-see>

NASA Space Place: Classroom Activities; NASA

This resource contains several space-related activities for the classroom. Must scroll down to find link to downloadable PDF of activity. Related activities include: *Make a Pinhole Camera*, *Taking Apart the Light*, *Blinded by the Light*, *Be Glad You're Not a Cyclops* and more.

<https://spaceplace.nasa.gov/classroom-activities/en/>

Exploring the Universe: Pack a Space Telescope; NISE Network

This resource contains all downloads needed for participants to design, build, pack, and deploy their own model space telescopes (Spanish and English available). Includes learning goals and how-to videos.

<http://www.nisenet.org/catalog/exploring-universe-pack-space-telescope-2018>

Eye Opening Discoveries; PBS Learning Media (must create free account)

This site provides complete lesson plan to encourage learners to explore the process of invention through studying Charlie Kelman, the inventor of cataract surgery.

https://rmpbs.pbslearningmedia.org/resource/kel10.sci.lv.ls.eye/eye-opening-discoveries/#.WwBYuC_Mz_Q



Comprehension Questions:

Help learners process the concepts and ideas presented in the show with these questions.

1. Why does the light we see from stars seem to twinkle?
2. What processes explain the different colors we see in nebula?
3. Do all photons that make it to the Earth's atmosphere make it all the way through to the telescope?
4. What are some of the suggestions given for taking care of our sight as we grow older?
5. Why is the eye called the "window to the soul?"

Further Research and Discussion

Learners can conduct further research about what type of diet helps maintain good eyesight. What effect do green and orange vegetables have on maintaining eyesight and overall health?

This show covers content that addresses Colorado Academic Standard in Science (Physical Science and Earth Systems Science). See [Planetarium Show Academic Standard Chart](#) for details by grade.