Alternative Assessment

1. Interview an optometrist, optician, or ophthalmologist. Find out what equipment and tools each uses. What kinds of eye problems is each able to correct? What training is necessary for each career?
2. Obtain permission to use a microscope and slides from your school's biology teacher. Identify the optical components (lenses, mirror, object, and light source) and knobs. Find out how they function at different magnifications and what adjustments must be made to obtain a clear image. Sketch a ray diagram for the microscope's image formation. Estimate the size of the images you see, and calculate the approximate size of the actual cells or microorganisms you observe. How closely do your estimates match the magnification indicated on the microscope?
3. Construct your own telescope with mailing tubes (one small enough to slide inside the other), two lenses, cardboard disks for mounting the lenses, glue, and masking tape. Test your instrument at night. Try to combine different lenses and explore ways to improve your telescope's performance. Keep records of your results to make a brochure documenting the development of your telescope.
4. Study the history of the camera. Possible topics include the following. How did the camera obscura work? What discovery made the first permanent photograph possible? How do instant cameras work? How do modern digital cameras differ from film cameras? Give a short presentation to the class to share the information.
5. Create a pinhole camera with simple household materials. Find instructions for constructing a pinhole camera on the Internet, and follow them to make your own pinhole camera. Partner with a photography student to develop the pictures in your school's darkroom. Create a visual presentation to share your photographs with the class.
6. Research how phone, television, and radio signals are transmitted over long distances through fiber-optic devices. Obtain information from companies that provide telephone or cable television service. What materials are fiber-optic cables made of? What are their most important properties? Are there limits on the kind of light that travels in these cables? What are the advantages of fiber-optic technology over broadcast transmission? Produce a brochure or informational video to explain this technology to consumers.
7. When the Indian physicist Venkata Raman first saw the Mediterranean Sea, he proposed that its blue color was due to the structure of water molecules rather than to the scattering of light from suspended particles. Later, he won the Nobel Prize for work relating to the implications of this hypothesis. Research Raman's life and work. Find out about his background and the challenges and opportunities he met on his way to becoming a physicist. Create a presentation about him in the form of a report, poster, short video, or computer presentation.
8. Choose a radio telescope to research. Possibilities include the Very Large Array in New Mexico, the Arecibo telescope in Puerto Rico, or the Green Bank Telescope in West Virginia. Use the Internet to learn about observations that have been made with the telescope. How long has the telescope been operating? How large is the telescope? What discoveries have been made with it? Has the telescope been used for any SETI *(Search for Extra-Terrestrial Intelligence)* investigations? After your research is complete, write a list of questions that you still have about the telescope. If possible, call the observatory and interview a member of the staff. Write a magazine article with the results of your research.