

Creating opportunities in astronomy: Communication for people who are blind or visually impaired

Noreen Grice

You Can Do Astronomy LLC¹ (Noreen@youcandoastronomy.com)

Abstract

Astronomy is such a visually rich field that you may wonder if access is possible for a person who is blind or visually impaired. The good news is that with creative strategies and available resources, students who are blind need not be excluded. Braille text, tactile illustrations, hands-on models, and descriptive narration can remove many barriers.

Introduction

According to the American Foundation for the Blind² and the National Federation of the Blind³, there are approximately 10 million blind or visually impaired people in the United States. Unfortunately, only 45% of students in the US with severe visual impairment or blindness complete high school studies, compared with the 80% success rate of their sighted peers. And only about 32% of legally blind working-age Americans are employed.

It is critical that educators devise new ways to make science, technology, engineering and mathematics topics accessible to students with visual impairments. The following strategies will benefit all students by presenting information for a variety of learning styles.

1) Listening: In addition to students listening to the instructor, it is important that the instructor pays close attention to the needs of students. If a student cannot comprehend a topic, consider alternative, non-visual, approaches.

2) Seeing: To “see” does not always mean to see only with your eyes. A person can see with their “mind’s eye” by touching an object or listening to a very descriptive explanation.

3) Doing: Many visually impaired students are not given equal opportunities to participate in laboratory experiences because the subject is deemed too visual or assumed to be inaccessible. Almost anything can be made accessible through alternative approaches and/or assistive technology. Talking calculators, Braille rulers or software that can speak the words on the computer screen are but a few of the ways visually impaired students can fully participate.

¹ www.youcandoastronomy.com

² www.afb.org

³ www.nfb.org



Figure 1 – Students explore puff paint constellations inside a tactile planetarium tent.

4) Discussing: Pictorial description brings subjects to life! Books on tape are a great example of the power of descriptive narration for both sighted and blind listeners. By using this technique, everyone will experience a higher quality and more productive learning environment.

5) Touching: Students exploring topics such as graphs or abstract images benefit greatly from the use of a hands-on model or tactile pictures. Use tactile materials whenever possible for all students.

Resources and strategies

Here are some specific ways to make educational materials more accessible to people who are blind or visually impaired.

- Use Quick Draw paper from the American Printing House for the Blind⁴ to make quick and simple tactile graphics. Quick Draw paper is sponge-like so when the user draws on it with a water-based marker, it swells instantly. Do not use this paper in places with high humidity!
- Push brass fasteners through a piece of dark cardboard to create instant constellations. Brass fasteners are very inexpensive and available at most office supply stores.

⁴ www.aph.org



Figure 2 – Students compare a variety of sport ball planets in a scaled model of the Solar System.

- Attach string to pushpins to make tactile graphs. Students who are blind or visually impaired can create these tactile graphs with Braille graph paper. The instructor can also create tactile graphs to share with the entire class.
- Apply puff (also called fabric) paint onto a piece of cardboard or foam paper. Puff paint is inexpensive and sold at most art and craft supply stores. The paint comes in a variety of colours and in small bottles. Allow at least 24 hours for the puff paint to dry before use in the classroom. A science teacher (Ben Wentworth) took puff paint to the next level. He and his students at the Colorado School for the Blind used puff paint to map constellations inside portable tents to create unique tactile planetariums.
- Fasten foam stickers to foam paper to create simple tactile star patterns or other astronomical images. Foam stickers are very popular and inexpensive items at your local craft supply store. Add in some fuzzy pipe cleaners and you can create a 3-dimensional surface of the Sun, with dynamic prominences and solar flares.
- Tape two hula hoops together to create a hands-on explanation for the Moon's path about the Earth and why we don't experience an eclipse each month.
- Compare differently sized sport balls in a scaled-diameter model of the planets. Or create a distance-scaled model of the Solar System by attaching jingle bells at pre-measured locations.

The following processes require specific equipment and machines to create or use tactile graphics.

1. Thermoform machines (also called heat vacuum machines) can duplicate tactile pictures onto plastic paper called Braillon. You make a “master copy” by carving an aluminium sheet with tools from the American Printing House for the Blind or by gluing different textures to cardboard. Creating the master copy can be a time consuming process and is not recommended if you only need a small number of copies or have a limited amount of time. It may be possible, however, to work with a Braille printing house or tactile artist to create the master and duplicate a large quantity of copies.
2. The swell form machine (also called a swell touch or thermal expansion machine) is one of the easiest ways to make tactile graphics. You can design your image (it must be a black image on a white background) in a graphics program like Adobe Photoshop or Illustrator or even draw a picture by hand. Use a photocopy machine to transfer the image onto the swell touch paper, and then run the copy through the swell form machine. Swell form paper has a special coating on it so anything that is black will “puff up” and become tactile.

If you have access to a swell form machine, you can make telescopic views at a star party accessible to visually impaired or blind participants. Capture an astronomical image as a JPG file and invert the image (in Photoshop or other software) so that space is white and the object is black. If you have your computer, printer, photocopy machine and swell form machine close by, you should be able to print out tactile versions of telescopic views quickly and have them available in a few minutes. I did this at the 2007 National Federation of the Blind Youth Slam at Johns Hopkins University and it worked out great! In fact, the local college students who happened to stop by thought that tactile images must be a usual part of any star party because the pictures were interesting for everyone!

3. The Talking Tactile Tablet (TTT) is an electronic device that allows a thermoform or other tactile page to dynamically interact with the user. The TTT is connected to a computer, and you can program it to respond with narration or sounds when a person presses different areas of the tactile picture.

It is important to remember that we all have special needs. When we make materials accessible to people who are blind or visually impaired, we are also making them accessible to many other people with different learning styles.

References

- American Thermoform Corporation, www.americanthermoform.com
- Grice, N. (2006), Resources for Making Astronomy More Accessible for Blind and Visually Impaired Students, *Astronomy Education Review*, Volume 5, Issue 1
- National Federation of the Blind Science Web Portal, www.blindscience.org.