Working with students who are visually impaired in large introductory science classes – a case study in Environmental Science

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Abstract and Introduction:

Over the past year, five students who are visually-impaired took the Blue Planet (ENVS 101) class. In order to provide the environment for these students to succeed, we hired a sighted tutor, developed text-only materials for lecture notes, provided descriptions of images in the text, and provided in-class activities and exercises in formats that could be used by the students during class. Working with Accessibility Services, we were also able to translate images into textured figures (PIAFs), and the sighted tutor was able to explain many of the concepts using these figures. Our tutor also used tactile objects such as food, to enhance the students' understanding of concepts. Though much more could have been done, and may be developed for the future, the students were able to successfully complete this course.

What we did:

- Early communication with students and counselors at Accessibility Services.
- Hired a sighted tutor
- Translated PowerPoint slides to text format
- Translated textbook figures to text format
- Converted important figures to PIAFs (Pictures In A Flash – available through Accessibility Services).
- Used large-format images for one student.
- Tutor used tactile props to clarify some concepts.
- Provided in-class exercises on flash-drives or in large-print format, allowed students to email answers.
- Continued communication throughout semester.
- Text-only exams and descriptive answers to questions.

What helped student success:

- Images (large print or PIAF), and text versions of images and PowerPoint slides
- Tutoring sessions (though one-on-one would have been better)
- Continual communication
- Flexibility with limited time and preparation.

What hindered student success:

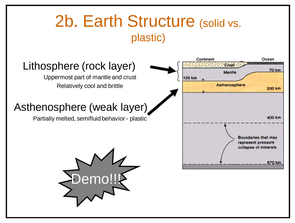
- Lack of preparation time on part of tutor and professor
- Accommodating different visual impairments and preferences of learning style throughout the semester.
- Scheduling conflicts between multiple students, tutor, and professor of help sessions. Additionally one-on-one tutoring would have been better.

A Braille notebook used by students in class. Students can follow text lecture notes using this device. Also, we were able to transfer in-class exercises to the students using USB flash drives, and students could hand back answers on the flash drive.

Examples of Materials Used

Conversion of PowerPoint slides to text:

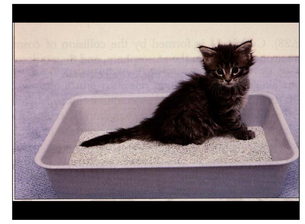
I use PowerPoint slides in all lectures to organize concepts and provide tangible notes to students (these are released to all students on Vista). Many of the concepts in the Blue Planet are very visual, therefore we had to translate these visual slides to text. Students could then follow the lecture on their Braille notebook or other specialized laptop computers. This was the most time-consuming activity for the professor and tutor. When 'funny' visuals are used, these MUST be described so students don't feel left out (see kitten example below).



Slide 24:

- Earth Structure:
  - •Lithosphere (rock layer)
    - •Uppermost part of mantle and crust
    - •Relatively cool and brittle
  - •Asthenosphere (weak layer)
    - •Partially melted, semi-fluid behavior to plastic
- Demo: silly putty will be passed around to show how asthenosphere acts.
- Image on slide shows distribution of lithosphere, asthenosphere:
  - •Lithosphere – crust and upper mantle: down to ~ 125 km below surface under continents, 70km under oceans.
  - •Asthenosphere – down to 200km below the surface.

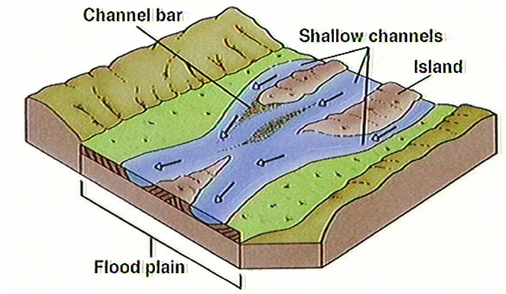
The visual image of Earth's structure is relatively easy for sighted students to grasp. This must be described to students with visual impairments but it is relatively straight-forward to do.



Slide 9: A picture of a kitten in a litter box…everyone will probably go "Awwww…"

When teaching about minerals, I use an example of bentonite clay (used in kitty litter) as one of the mineral images (prior to this slide, I present several examples of beautiful mineral specimens). This is the slide the class sees, along with the text description given to the students with visual impairment.

Creation of PIAFs or large-formats for some images and graphs:



PIAF example here

Tactile props to aid student understanding of some concepts:

- Play dough and blocks to show plate tectonic and magma movement
- Toothpicks and marshmallows to show molecular structure
- Tactile contour maps
- Pineapple rings for domes and basins
- Ribbons of different sizes and textures used to show relative time concepts
- See other examples!

Faculty time/effort involved

Some additional faculty time is required in order to convert slides and images to text format, provide exams that are useable by these students, re-draw images for PIAF conversion if they are too complex, and coordinate efforts of tutor with the students. However, a good tutor can help with much of this workload. In the semester when these students took the Blue Planet, I was extremely busy with a large research project and did not have large amounts of time to spend on preparing special materials. I often fell behind on providing text versions of slides and figures in the textbook, and on several occasions I did not communicate well with the students and the tutor about progress. I spent about 3-5 hours per week, at most, developing special materials. Similarly, Brittany (the tutor) was extremely busy and arranging meeting times was often challenging. Even with these limitations, because we set up communications early and were eventually able to provide students with text and tactile materials, they were able to follow and learn materials in this strongly visual class. Of course we could do a better job in providing materials to the students, but even with the minimal time available to the professor, we were able to successfully provide a positive learning environment for these students. Additionally, we now have materials available for students in future classes.