Accessibility & Distance-learning in Geography

General Best Practices Report

ABSTRACT

Most geography instructors believe that providing the combination of text and images provides a powerful learning experience for students to enhance their geographic awareness. Most human geography courses help students to improve their skills to analyze complex phenomena using images juxtaposed with text. However, the tendency to design geography courses on the basis of a primarily visual pedagogy undermines the accessibility of course content to visually impaired students. In this study, we address the challenges faced by visually impaired students and their instructors in utilizing maps and mapping applications, photo images, videos, infographics, and histograms in geography teaching.

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Project Background

Distance Learning department and Disabilities services expressed their concerns with the content of most geography courses, which are designed with a heavy use of visual component, such as maps and images, and are difficult to describe with text. With the approval of deans and department chair, a study group formed to meet regularly once a week. In the beginning of the study, we developed a survey to gather data on what tools and content are being used in our geography courses. As soon as we received the feedback from the SAC, we started working on the project. The initial report from the survey results indicate that most of our instructors use different sort of visuals in their courses.

Introduction

A recent survey conducted in support of this study indicated that most geography courses at PCC heavily utilize visual learning along with comprehensive integrated text. Geography has traditionally been a very visual subject, with geography courses making widespread use of maps, photo images, videos, histograms, and infograms/infographics. But the science of geography is most importantly a *spatial science*, and an awareness of the world of spatial relationships is in no way limited to those who can see. According to blind members of this study group, individuals who lost their sight later in life often still have a visual frame of reference that can manifest in the form of a visual mental map, and this can make interacting with a sighted geography instructor easier for both parties. But, despite the timing of a person's visual disability, all human beings gather spatial knowledge and are capable of learning and applying the principles of geography.

For blind students, the world exists primarily in contact with the other senses: touch, hearing, smell, and taste. We learned that there are several techniques that can be used to make geography courses more accessible to visually impaired students and distance learning department and disabilities services have resources to channel to faculty to design courses keeping blind students in mind.

Like any discipline, one of the primary challenges of teaching geography is keeping course materials and information up to date. It is important that instructors have at least a basic understanding of what goes into creating blind-accessible materials, such as tactile maps, and histograms/infograms, so that they can be proactive in adapting any new materials to these formats.

Our aim in this study is to mediate the experience and knowledge that we learned, providing it to our colleagues who might have to teach a blind or partially sighted student in their classroom. Below are some recommendations the geography study area group put together to guide geography instructors in designing courses which keep visually impaired students in mind.

Map Identification

The **desired outcome** when teaching map identification to any student is **increased** spatial awareness and intelligence.

- Map identification tends to use thematic presentations (e.g., national boundaries, generalized mountain ranges, etc.) to teach local, regional, and global geographic patterns. These maps are used in concert with instructor explanations of geographic theory which seeks to explain *why* many of these apparent patterns exist, as well as *how* the various components of geography interact to create landscapes.

- Students are expected to commit geographic relationships to memory in order that they can find the major thematic elements (specific countries, rivers, regions) consistently on test maps without referring to supplemental materials.

Specific issues related to instruction of map identification to distance-learning students who are blind include, but are not limited to:

- Prevalence of visually-oriented maps, in both paper and digital formats, that exclude blind student access.
- Limitation of using *audio description* to provide accessibility due to the requirement to teach spatial awareness (geographic relationships of places), and not just geographic knowledge attributed to those places.
- Difficulty of *re-creating* flat thematic maps as tactile (for paper maps) or haptically-enabled (for digital maps) on short notice between when a blind student signs up for the course and the beginning of the term. This also includes the difficulty of providing distance-learning students with existing tactile materials via postal delivery.
- Lack of cartographic understanding of the necessary differences in map generalization between visually-accessible maps and blind-accessible maps (which need to display information in a significantly coarser form than visually-oriented maps)

Recommendations for some of these issues include:

- Instructors should examine the maps used for map identification exercises to assess whether or not they can be easily replaced with tactile map sets housed in the PCC library system.
- For more esoteric maps, an instructor is urged to contact the director of PCC's Geographic Information Systems certificate program to request help creating a map document that can be printed through Disability Services Alternative Media Formats section (usually in the Scalable Vector Graphics (.svg) file format). **See the excellent Tactile Imagery Illustrated for a breakdown and examples of tactile document creation.**

Map analysis

As with map id, the **desired outcome** from teaching map analysis is also **increased** spatial awareness and intelligence.

- Map analysis utilizes the thematic maps studied during map identification as base maps overlaid with specific data (e.g., population, rainfall, conflict, etc.) in the form of representations via individual symbols or patterns of symbols.
- Students are expected to make geographically educated associations between the base map information and the data being presented; these associations will most often take the form of essays about a geographic region, or as theory-based hypotheses used as the foundation for a project.

Specific issues related to instruction of map analysis to distance-learning students who are blind include, but are not limited to:

- Besides the aforementioned cartographic issues related to the re-creation or construction of base maps for map identification, visually-oriented map analysis often relies on complex symbology to present multivariate information on a map. This reduces the ability to easily compare different data side-by-side in the same medium.

Recommendations for some of these issues include:

- As discussed in the previous section, blind-accessible maps need to present all information in a coarser form, perhaps using different or simpler classification of data than might be common in a visually-structured map (e.g., two or three classifications of population density instead of five or more). While this may seem at first glance to deprive a blind student of functionality available to a sighted student, attention to map simplicity can be valuable for all new geographers, as map complexity can be a hindrance to developing early map-reading skills)
- Tools such as the Livescribe $_{tm}$ pen can be used to enhance a physical tactile map with audio-accessible information. These "smart pens" play pre-recorded audio tracks when the pen tip touches an adhesive sticker placed in strategic locations on the map.
- Finally, techniques for converting existing visual documents through a variety of technologies is being studied, and may be useful to instructors who wish to continue using existing teaching materials that do not lend themselves to reformatting. One example of this research may be found here: Haptic Access to Conventional 2D Maps for the Visually Impaired.

Photo Analysis

The desired outcome when using photo images is to stimulate students' critical thinking and help students to associate images with the text they evaluate.

- Photos are possibly the most ubiquitous media resource used in geographic teaching
- Students are expected to apply available textual information, as well as critical thinking, to analyze and interpret the geographic implications found in any particular photograph

Specific issues related to use of photos with distance-learning students who are blind include, but are not limited to:

- Photography is a purely visual medium, with no attributes that are easily adapted into a tactile format
- Verbal description of an individual photograph usually carries with it a greatly increased time commitment, both for the instructor and the students
- Finally, verbal description of a photo may inadvertently shift the interpretive responsibility onto the describer of the photo rather than the student, limiting the student's ability to apply independent critical analysis.

Recommendations for some of these issues include:

- To make photo images accessible to visually impaired students, instructors need to describe the images with a *short* anecdote. These short descriptions add meaning to the images for blind students to understand the significance of it, while minimizing the time investment as much as is reasonable.

- There are different ways to describe an image. Alternative text (ALT text) is the most commonly used among instructors. ALT text will make images accessible to screen reader users.
- Describing an image can be very complex. Instructors need to be very clear about the content depicted within the image to convey the necessary meaning to the blind person. For more information in making complex images accessible, refer to Complex Image Accessibility.

Videos

Similar to photo analysis, the **desired outcome** when using video imagery is also to stimulate students' critical thinking and help students to associate images with the text they evaluate.

- Video is a powerful visual tool geographer uses in their teaching to make learning process interactive, and are one way to retain students' in-class interest over longer periods.
- Video presentations help instructors to convey geographic information to students in an enjoyable way that classroom notes and text cannot fully present.

Specific issues related to use of videos with distance-learning students who are blind include, but are not limited to:

- Video production relies heavily on its visual component to impart information, and also to drive the narrative, which can severely limit blind accessibility to the media.
- While video description service exists in some aspects of major broadcast media production, it is often non-existent in the variety of free sources many instructors turn to (e.g. YouTube).

Recommendations for some of these issues include:

- The primary way to make videos accessible to visually impaired students is to use audio description, wherein the speaker can pause the production and read over the titles, names, and describe the visual information for the blind students. For more information on making videos accessible, refer to Audio & Video Accessibility.
- One resource specifically useful for adding audio description to YouTube videos is YouDescribe.

Histograms & Infographics

The **desired outcome** when using histograms and infographics is similar to maps, in that they help stimulate students' critical thinking and assimilation of complex data related to geography.

- Histograms and infographics are widely used in geography teaching to show the distribution of a variety of data in graphic format.
- Histograms give quick visual summary and comparison of the large amount of data that is difficult to read in spreadsheet form.

Specific issues related to histograms and infographics with distance-learning students who are blind include, but are not limited to:

- Like maps, histograms and infographics tend to rely on visual accessibility
- They also tend to use symbology that may not lend itself readily to tactile reconstruction

Recommendations for some of these issues include:

- One way to make histograms accessible to visually impaired students is to develop a table or spreadsheet with following the WEB accessibility guidelines at Accessibility for Online Course Content
- Another way the geography study area group experimented with is to create a tactile document for the image and use braille to help blind students to read the data on the image. Tactile and braille representation of the data help blind students to feel the difference with a quick touch, if the necessary information is provided with the visuals, such as texts that explain the phenomena.

Geographic Information Systems

The **desired outcome** from teaching Geographic Information Systems (GIS) to any student is to allow access to what is now an integral tool in the geographic/spatial sciences, used for creating, managing, and visualizing geospatial data.

- Significantly, much of the employment and earning potential of a geography degree is directly related to a graduate's familiarity and skill with GIS.
- The primary GIS program in use by PCC is ESRI's ArcGIS.

Specific issues related to instruction of GIS to distance-learning students who are blind include, but are not limited to:

- Unfortunately, GIS has been developed as a primarily visual application; as of this study, none of the existing applications were directly adaptable to the needs of blind users.
- When the user interface (UI) was tested using common screen-reading utilities, it became obvious that a great majority of the UI remained inaccessible without adequate vision and a mouse (blind computer-users tend to use the keyboard as their primary interface). Study participants could find no third-party tools or apps that directly improved this situation.
- Also, while spatial analysis results may be delivered in the form of numeric or text data, one of the most powerful products from GIS analysis is a visual map.

Recommendations for some of these issues include:

- Paradoxically, the general lack of accessibility of the UI does not exclude blind users from accessing most of the more advanced functions of a GIS, which tend to be easily manipulated through scripting tools such as Python or Visual Basic. The resulting spatial analysis data can then be outputted in tabular format (e.g., Excel, OpenOffice, etc.), which is easily read using existing accessibility tools.
- If a visually-impaired student is to gain access to the potential of GIS software, it is imperative that they are partnered with an assistant who is already versed in the basics of the GIS software that will be used.

Further Resources

Please see the excellent and comprehensive Accessibility Survival Guide for Instructors highlights and report for more information oriented toward Computer Information Sciences (CIS).

See also Accessibility for Online Course Content for in-depth instructions pertaining to adaptation of sight-focused materials into accessible formats, as well as the Tactile Imagery Illustrated for a breakdown and examples of tactile document creation.

**Note: proceed with caution when dealing with publisher-based content. It should be carefully vetted for accessibility. Contact a representative from Instructional Support Services to help you evaluate publisher content for accessibility. **

Accessible Maps for the Visually Impaired (PDF) -- Zeng & Weber

Essentials of Geography -- Geography as a spatial science

3D Maps for the Blind (GIS Lounge)

Image Description Guidelines (Diagram Center)

Instructional Strategies for Teaching Geography and Social Studies

SCIPS (Strategies for Creating Inclusive Programmes of Study)

Specific Guidelines – Maps (Diagram Center)

Tactile Graphics Image Library

The Princeton Braillists

Why are tactiles important to be included in educational text materials?

World at Your Fingers by AbleData

YouDescribe - Audio Description for YouTube Videos