BACKGROUND

Geodemography traditionally focuses on processes with respect to form - meaning students need to have a facility with spatial relationships if they are to develop an understanding of how shape, orientation, and geographic distribution of landforms is related to the processes that sculpt them. The challenge as an instructor is to strengthen spatial visualization of students with varying degree of experience and skill (Gerson et al. 2001; Kall et al. 1997; Larkin and Brick 2002; McGehee 1979; Orion et al. 1997; Schofield and Kirby 1994).

Previous research (Burnett and Lane 1980; Eley 1993; and Uital 2000) suggests that spatial visualization is not a fixed cognitive skill and that academic instruction can impact visualization skills (Shepard and Metzler 1977; Burnett and Lane 1980; Eley 1993; and Schofield and Kirby 1994). These studies suggest that continued exposure and application of spatial skills leads to improved spatial ability.

METHODOLOGY

Students make use of traditional paper topographic maps and aerial photographs during a lab session prior to the digital exploration of landform visualization. They are required to answer questions about topography (e.g. - relief, aspect, curvature, etc.), length and gradient of streams, landform identification and descriptions, expected shapes of pre-selected cross-sectional lines, and describing potential processes responsible for landforms and landscapes.

During the next lab session they are asked to interpret the same maps and aerial photos, only in digital form within a geographic information system (GIS). They are asked to answer similar questions and perform similar task. They initially work with ArcGIS and make use of digital elevation models (DEM), digital rasters (DRG - USGS topo quads), and digital orthophoto quadrangles (DOQ's - aerial photographs) (Figure 1). They are able to measure elevation and distance using the GIS rather than traditional techniques. They are then asked to make use of ArcScene, an extension for ArcGIS that allows them to extrude topographic maps and aerial photos and create three-dimensional landscapes (Figure 2). It is within this environment that they are asked, prior to extrusion, to make predictions and sketch how they "read" the topography.

LEARNING GOALS FOR MAP & PHOTO LAB

(1). Develop a spatial facility with topographic maps and aerial photos
(2). Develop skills using a stereoscope to identify and interpret surfacial features
(3). Learn to identify landforms and associated processes at local and regional scales
(4). Measure slope, aspect, gradient, etc, using traditional paper / photo techniques

LEARNING GOALS FOR GIS-BASED LAB

(1). Facilitate traditional topographic map and aerial photography interpretation via digital media
(2). Challenge students to make predictions about topographic relationships
(3). Evaluate these predictions within a three-dimensional environment
(4). Provide a means to "visualize" the morphology of various landforms and landscapes that don't exist in their geographic region.

CHALLENGES

In addition to interacting with students of differing spatial abilities, there are a number of other issues with utilizing this type of learning environment:

(1). Introducing a new software package (technology) that many students don't have experience with.
(2). Building an appreciation for technology, but still developing fundamental map / photo interpretation skills.
(3). Using similar datasets for both paper and digital assignments.
(4). Quantitative assessment for the same assignments.
(5). Inability to address variety of reasons for lack of spatial clarity.

STUDENT FEEDBACK

Qualitative feedback from students suggests virtual exploration and the ability to extrude landscapes provided a better model for illustrating what contour lines on topographic maps and shading values on aerial photos actually represent. However, my general impression is that they would rather focus exclusively on learning how to use technology to interpret landscapes rather than using their own spatial skills.

FUTURE WORK

Scovel et al. 1965 produced a classic book on terrain analysis titled "Atlas of Landforms." This text is a wonderful resource for undergraduate and graduate students interested in improving their map and photo interpretation skills. This text is no longer in print and I hope to develop an updated version of this resource that covers both the traditional and digital techniques for landscape-scale analyses.

REFERENCES