

Chapter 72

Colorado 14ers, Pixel by Pixel

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ABSTRACT

This document describes a capstone learning exercise designed for undergraduates enrolled in an introductory geospatial tools course. The overarching theme of the exercise, Colorado 14ers, Pixel by Pixel, is mountain geography. While immersed in a digital mountainous landscape, students explore topics of geomorphology and geomorphometry and discover how it is possible for a summit that rises well above 14,000 feet not to qualify as a true Colorado '14er'. To address these topics, students examine freely-available digital elevation models (DEMs) using common geospatial analysis tools. The exercise was developed with five purposes in mind: (1) students should be introduced gently to geospatial software; (2) students should enter upper-level geography courses armed with basic computer skills and a diverse geospatial toolkit; (3) students should internalize the fact that invariably digital geographic explorations are influenced by scale; (4) students of geography should be able to identify natural and anthropogenic impacts to a landscape, and; (5) to help students conceptualize what geographers do, learning exercises should include local and interesting case studies. As an exercise intended to synthesize geographic concepts covered throughout a course, the learning objectives range from grasping broad theoretical concepts related to scale and measurement to learning specific computer skills related to directory structures and file naming conventions. Deliverables of the exercise include posting four maps and answers to nine questions to a website. The outcome of the exercise is a confident, geospatial tool-savvy student who is eager to further investigate the field of geography.

INTRODUCTION¹

Colorado 14ers, Pixel by Pixel is a stand-alone, computer-based exercise that concludes Digital Earth, an undergraduate University of Colorado at Colorado Springs (UCCS) Geography and Envi-

ronmental Studies (GES) geospatial tools course. Digital Earth introduces geographic information systems (GIS), global positioning systems (GPS), geovisualization, remote sensing, geomorphometry, virtual globes, and web design. The course seeks to prepare students for the digital worlds they will encounter in upper-level geography courses

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and exposes students, in exciting and interactive ways, to the breadth and depth of geography. The course, which is required for all GES majors, focuses on eight computer-based exercises (labs). As examples, in one lab, students use the virtual globe *'SkylineGlobe'* to compare and contrast fashion by 'surfing' crosswalk cameras in large cities across the globe. In another lab, students manipulate 3D models in a GIS to investigate controls of geology on settlement patterns in and around Durango, Colorado. Asking students to solve imaginative problems using interactive and exploratory approaches inspires interest in geospatial tools and their practical applications. Digital Earth has been well received by students at UCCS as measured by higher than expected enrollment numbers and strong course evaluations.

Colorado 14ers, pixel by pixel is the capstone exercise of Digital Earth and as such represents a summary of many of the concepts and tools encountered during the semester. Set in a virtual mountainous Colorado landscape, the exercise requires students to explore issues related to physical geography, map scale, spatial resolution, and digital measurement. The exercise asks students to demonstrate through various mappings how it is possible that one peak in a group of three 14,000 foot + peaks does not qualify as a *true* 14er. A '14er' is one of 54 iconic peaks in Colorado (e.g., Pikes Peak, Longs Peak, Mount of the Holy Cross) that reaches or exceeds an altitude of 14,000 feet (Blake, 2002).

PURPOSE STATEMENT

The intent of the exercise is to focus student interest on an interesting geographic problem that requires a suite of geospatial tools to solve. To address this intent and the specific learning expectations of the exercise (described in the 'Learning Objectives' section below), five general purposes were developed:

- **Minimize intimidation:** Students of geography should learn to apply powerful and complex tools for geospatial analysis in non-intimidating and exciting ways. Negative or frustrating first encounters with geospatial tools such as ArcMap GIS can intimidate and dissuade students. Similarly, the datasets explored are often difficult to view, edit, and manage in these software environments. Avoiding intimidation is addressed in the exercise by providing students with data and a step-by-step, cookbook style set of instructions, many with screen-shot examples.
- **Colorado 14ers, Pixel by Pixel:** is a capstone exercise for a course that serves as a prerequisite for all upper-level geospatial tools courses including GIS, remote sensing, image processing, and internet GIS. A student familiar with geospatial terminology (e.g. raster, vector, interpolation, DEM, TIGER) who possesses some general computer skills (e.g., copying folders, transferring files to a web server) and is armed with a diverse geospatial toolkit (e.g., GIS, geovisualization, geomorphometry) is positioned to enter upper-level courses with heightened confidence.
- **Scale is king:** With most geographers relying at some point on GIS, remote sensing, digital cartography, digital measurements, and raster and/or vector data analysis, it is important at early stages in a student's academic trajectory to recognize that all-things-digital are influenced by scale.
- **Human impacts:** Geologic and atmospheric hazards, sustainability, climate change, and political stability are topics currently being addressed by geographers. To elucidate the connectedness between humans and environment in these contexts, students should interact with geographic data face-to-face to visualize tangible ex-

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