Teaching Python Scripting to the Next Generation of Geoscientists

Joe Martin and Amanda Schmidt

EarthCube’s mission, enabling the creation of a community-driven dynamic cyberinfrastructure for the earth sciences, is enhanced by computer-literate earth scientists on a variety of levels. Having computer literate earth scientists is beneficial during the development of infrastructure, as they can better collaborate with their computer and information scientists partners. Similarly, stronger and more effective partnerships are also important for the successful governance of this effort. Computer literate earth scientists will also be able to make more effective use of resulting cyberinfrastructure projects.

However, many people, especially undergraduate students with limited or no experience with computer programming, are intimidated by the idea of learning to program. Many people perceive themselves with an inherent inability to use computers in new and complex ways. In the fall semester of 2016, a series of exercises using the Python package for ArcGIS were introduced into the Applied GIS course at Oberlin College to help students develop these skills. Seven exercises were created which moved the students from making minor edits to existing scripts to creating their own scripts. At the end of the class, we found that students who had little to no confidence in their ability to learn Python beforehand were happy to be exposed, and left the class interested in continuing to learn computer programming and with confidence in their ability to create Python scripts on their own.

The students in the class had a range of backgrounds, from some who had no prior exposure to computer programming to those who had previously taken computer science classes using Python. In an effort to avoid overwhelming students who felt that computer programming was the domain of computer scientists, the exercises were primarily practical and avoided concepts relating to the elements of programming languages. Although all the students were happy to be exposed to Python, and left the class with their confidence increased, many students felt that more time and depth should have been given to these concepts. Ideas like environments, variables, and data had been deemphasized to avoid intimidation, leaving students unable to make the conceptual leaps necessary to begin creating their own scripts.

Even students without prior exposure to computer programming and with limited confidence in their own ability to learn left the class with a view of scripting as a skill that was not only valuable but also attainable. No student thought the Python should be removed from the class, and many thought the focus on Python should be increased. The development of basic scripting skills is the first step in creating earth scientists who can more effectively be involved in the creation, governance of use of cyberinfrastructure for earth science. Introducing these skills can and should start at the undergraduate level, and while our experience shows the necessity of giving students a conceptual base robust enough to build upon, much can be accomplished without new classes or new requirements, just thoughtful modifications to existing curriculums.