



Geo-Python: An open online introduction to programming in Python for geoscientists

David Whipp, Henrikki Tenkanen, and Vuokko Heikinheimo

Department of Geosciences and Geography, University of Helsinki, Finland (david.whipp@helsinki.fi)

As geology and geography become more quantitative, basic programming skills are an increasingly important asset for geoscientists. These skills provide the ability to acquire, manipulate, and visualize growing digital datasets, and simple programs can expand or even replace expensive commercial software packages. Here we introduce the Geo-Python course, which we have been developing for the past several years for undergraduate and post-graduate geology and geography students at the University of Helsinki, Finland. The course aims to provide students with essential programming skills in Python using a unique combination of free web-based applications and materials. These include an easily navigable course website, interactive discussion channels for the course lessons and exercises, an accessible cloud computing environment for writing and testing programs, and management of the course assignments using GitHub Classroom.

Building on existing online Python programming courses including those offered by the Software Carpentry organization (<https://software-carpentry.org>), we have tailored the course for geology and geography students by focusing lessons and exercises on real-world datasets that appeal to both groups, such as climate data. This provides students not only with hands-on experience working with data available in online databases, but also provides this diverse group with common interests and incentive to learn from students with varying backgrounds. Through our experience of teaching the course we have identified a number of factors that affect the depth of understanding students attain and the likelihood that they continue using Python after the course has concluded. The most significant factor we have observed in students that continue using the course content outside of the classroom is installation of the Python software on their personal computers. Previous experience with cloud computing offered the advantage of a uniform computing environment for the course participants, but connecting to cloud computers instead of using personal computers resulted in a lower likelihood to continue use of Python. In addition, providing video screencasts of the lessons online after each class has allowed students to re-watch sections of the lesson that may have been complicated or confusing. Lastly, we found that improving the ease of navigation of the course website resulted in students revisiting past lessons more often and completing assignments with less frustration. Combined, this course design has been well received by course participants and resulted in a large number of students continuing to use and further develop their Python skills.

The course (<https://geo-python.github.io>) is open to any interested persons and all course materials are freely available on GitHub.com.