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Introducing Python Coding to Petroleum Engineering Undergraduates: Excerpts from a Teaching Experience

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Abstract

The post-Covid world is witnessing a rise in automation and remote work models. Oilfield operations are becoming increasingly innovation-driven with advances such as digitalization technologies, smart fields and intelligent wells. Proliferation of data is extending career frontiers in data analytics, machine learning and artificial intelligence. Human competence in computer programming is a key enabler of these trends. As a contribution to the Nigerian oil/gas human resources development, the petroleum engineering program at Covenant University recently developed and is implementing a course module on Python programing with oil/gas applications. This

paper documents the philosophy, pedagogy, and prospects of this initiative and provides a guide for its implementation across the Nigerian educational space.

The module opens with a seminar on the emerging oil/gas opportunities in data science – to stimulate students' interest. Thereafter, a gentle introduction to computer programming is taught. At its core, the module teaches basics of Python programming language – input/output, objects (values, variables, keywords), conditional and repetitive structures, *functions, lists, tuples* and *dictionaries*. The module is enriched with applications in reservoir volumetrics, material balance equation, PVT properties, reservoir discretization and simulation. Hands-on experience is enhanced with class demos and take-home programming assignments featuring simple algorithms. Also, the course features a training on the use of distributed version control (*GitHub*) for collaboration between students and instructors. All course materials are available on an open-access *GitHub* repository, with hyperlinks embedded in lecture notes. Ultimately, the course assesses students' skills with exams set in the context of quasi-real-life projects. The future prospects targeted in this initiative includes a follow-up module on petroleum data analytics and machine learning, incorporation of Python coding into other modules, and a short-course for industry professionals.

Keywords:
upstream oil & gas, geologist, clojure, united states government, educational technology, programming language, python, cobol, rock type, machine learning
Subjects:
Fluid Characterization, Professionalism, Training, and Education, Information Management and Systems, Phase behavior and PVT measurements, Artificial intelligence

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