A Qualitative Study of Computational Geology and its Use in the Undergraduate Curriculum

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Introduction

GLY 4866, “Computational Geology,” is a Quantitative (capital-Q) Literacy course that has been offered annually to undergraduate geology majors at the University of South Florida in Tampa since 1996. The course, which has had a Calculus-1 prerequisite, focuses on problem solving in a geologic context, with a goal of improving student comfort with numeracy (numbers, graphs, and calculations), quantitative literacy (verbal and graphic communication), and quantitative reasoning (habits of mind). Recent meetings and surveys (e.g., the Summits on the Future of Undergraduate Geoscience Education1) have identified similar skills and habits of mind as being vital for geology undergraduates to learn. In “Alumni Narratives on Computational Geology,” (Spring 1997 – Fall 2012) (Ricchezza 2016), ten professionally successful course and program alumni, who took the course between spring 1997 and fall 2013, were given anonymity and interviewed about their memories of the course, how they have used the material since graduating, and what they now would suggest students should learn. This presentation collects our findings and material since graduating, and what they now would suggest students should learn. We have focused primarily on the use of the course material in these narratives on Computational Geology. The study indicates that for this (admittedly limited and purposefully selected) sample group, the skills are still present in their professional function. The habits of mind desired as outcomes include critical thinking and understanding why to use some problem solving methods over others. Further proposed studies include USF alumni and national survey(s) to determine how programs prepare students with the quantitative skills they need for career success.

Results

Are there anything from the course that you used professionally or personally since graduating?

John Doe, M.S., Consultant, Fall 2012

“I definitely use a lot of Excel, so the little tips and tricks, when it comes to solving problems with Excel, was definitely useful and [1] continue to gain knowledge in Excel every day, so, especially when it comes to solving problems with Excel that are important for that task.”

Sam, B.S., Regulator, Fall 2011

“It was really a matter of a basic understanding of how to use Excel, how to use the different functions in Excel, how to set up equations...one thing that was really helpful was knowing how to manipulate entire columns of data. That’s something I definitely learned in that class.”

Arya, M.S., Academic, Fall 2011

“I take such classes literally...we have to do weighted averages and they have trouble with Excel. And I say I can give you something to help you with that and I give them these tutorial modules or something like that to help them.”

Sunshine, M.S., Academic, Fall 2006

“Last week I made an Excel spreadsheet for one of my students who was going to fail...she just needed some figuring, this was her second time taking the lab...and I knew there were things going on. So I gave her a W and I...created an Excel spreadsheet of the lab she has turned in, the quizzes she has turned in...and I color-coded for the ones she could manipulate to see what she would need to get on the lab and the quizzes to get that grade that she wanted at the bottom. So at the bottom I had a ‘W’, and the spreadsheet is where it would change whether she took it or not.”

“I felt like it gave me a little bit more of a starting point because... I was not very strong in statistics, so with not having a strong statistical background and doing a [MS thesis] that’s just highly related to statistics... I was able to go back and use my notes.”

“Gilda, B.S., Consultant, Fall 2008

“You, I think I have probably used every single Excel function in the Dr. Vacher course and...the only thing I used was the...the ‘what?’ and then the ‘how?’ of the use of the course material in these alumni’s subsequent professional careers.

In this presentation we have focused primarily on the response to the specific question, there is anything from the course that you have used professionally or personally since graduating? We have further narrowed that focus to the professional uses these alumni discussed and direct statements they made regarding the impact the course had on their careers.

Common themes in the interviews included the use of spreadsheets/Excel to solve problems and manage large data sets, correct conversion of units, effective communication about numbers and quantities, thinking logically, and learning to be empowered by the tools provided by mathematics rather than being fearful of them.

Conclusions

Medusa pleaded the most important questions geared from the course as “so what?” and “who cares?” and we have applied those to this project. We came away with the following answer – this course has produced graduates who are quantitatively literate within a variety of geologically oriented professions. Although the list of professions chosen was not exhaustive, the spread of such careers clearly demonstrates that the skills, competencies, and habits of mind that are the desired student learning outcomes of the Computational Geology course not only show retention after a long span of time, but are also not specific to a single job. The competencies or skills that are taught in this course include the ability to perform calculations, solve problems, communicate numerical results, and to use Excel proficiently to accomplish these goals. The data generated in this study indicates that for this (admittedly limited and purposefully selected) sample group, the skills are still present in their professional function. The habits of mind desired as outcomes include critical thinking and understanding why to use some problem solving methods over others.

Further proposed studies include USF alumni and national survey(s) to determine how programs prepare students with the quantitative skills they need for career success.

Selected References

Pugh, Jon. 1945. How to Solve It.

Ricchezza, Victor J. 2016. “Alumni Narratives on Computational Geology” (Spring 1997 – Fall 2012). University of South Florida School of Geosciences


URL: http://www.usfca.edu/events/theses-of-geoscience-undergraduate-education/

URL: http://www.usfca.edu/events/theses/Lee/SF report.pdf

Further information

This poster includes information from the primary author’s MS thesis (2010). For more information on this project, on the author’s other work, scan the QR code or visit http://victorjricchezza.com.html

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