Software Carpentry and the Research Bazaar as a solution to the cyber-skills gap

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Keywords: software carpentry, research bazaar, cyberinfrastructure, research computing.

As computationally-enabled approaches to research become more prevalent across all disciplines, the gap between what students and researchers know, and what they need to know to leverage these new approaches, widens. By now it is a huge gulf, with cyberinfrastructures and computer scientists on one side and most of our potential users and collaborators on the other. The gap seems to be at its widest within the humanities and social science communities, where most geographers reside.

Curricula cannot evolve fast enough to close such gaps, and are always hampered by local politics and the equally-important expansion of knowledge in a multitude of other directions within any given research domain. Trying to change the curriculum can also take years, by which time the needs themselves may have changed.

An alternative approach is to up-skill researchers outside of the curriculum, and one advantage of doing so is that the teaching and learning can focus on practical and useful knowledge, skills and practices, without the additional need to meet the rigors of a college syllabus with an academic focus on what is often a very practical need. However, creating an environment where researchers choose to take on additional work that is not for credit is also a huge challenge. How might it be tackled?

At the Centre for eResearch here in Auckland, New Zealand, we have been facing the challenge of equipping researchers to avail themselves of cyber-technologies for several years. Our response has usually been to provide practical help and expert consulting where it is needed, with some regular workshops on specific topics. But this approach is very difficult to scale across a large and demanding research community.

Over the last year we have taken a radically different approach, inspired by the work of the Software Sustainability Institute¹ and specifically Software Carpentry² and the Research Bazaar³ or ResBaz. The aim is to up-skill the community at large, and to empower and encourage individual researchers to form a supportive community to help each other. In short, nothing less than a complete culture change.

In the book The Cathedral and the Bazaar, Raymond (1999) contrasts two competing approaches to creating useful software: by a monolithic institution or a loose confederacy of engaged and empowered individuals. The book describes how the highly-successful Linux operating system emerged from the nascent open-source community and the principles that allowed it to do so. In a similar way, there is huge potential for researchers to help other researchers in a way that builds into an effective, sustaining community, over time.

Our new approach took the following form:

1. We began by conducting a research computing (cyber) needs assessment. Two separate focus groups were convened to identify specific and key digital literacy skills for research. The first focus group had 10 attendees representing researchers and research support staff across the university. The second focus group was attended by more than 20 delegates at a national eScience conference, who

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¹ http://www.software.ac.uk/about
² http://software-carpentry.org/scf/
³ https://feb2016.resbaz.com/
faced similar challenges at their home institutions. High priority needs included: high performance computing, basic scripting and programming, using code repositories, sharing and publishing.

2. With the needs identified and prioritized, it immediately became clear that they aligned well with existing earning materials created by the Software and Data Carpentry\(^4\) movements. The New Zealand eScience Infrastructure (NeSI)\(^5\) arranged a program of Software Carpentry instructor training to help create a national team of engaged, knowledgeable and qualified instructors (all would-be instructors have to pass an evaluation before qualifying).

3. In January, 2016 we ran our first Resbaz event to provide 3 days of intensive training on the use of modern cyber technologies for research with 20 instructors and helpers, and 60 participants—mostly younger faculty and research students. The event was a huge success, you can see the *storify* highlights reported here: [https://storify.com/cammerschooner/resbazakl](https://storify.com/cammerschooner/resbazakl) with most participants committing to help out at the next event, which can then be bigger.

4. Each week we host an event called HackyHour\(^6\), run in a public location, currently a cafe, which provides an opportunity for researchers to come along with open ended questions relating to digital literacy, research software or working with data. The participants help each other, with us facilitating and providing more help if needed.

As a direct result of these changes, participation in ongoing events is high, and there is now a growing, researcher-led demand for additional workshops and not-for-credit classes on Python programming. We are now exploring how to train more instructors in time for the next event, enabling researchers to help each other, and to build over time into a sustainable and nurturing community.

During Software Carpentry, participants practice their skills directly as they learn. They post pink or green sticky notes on their computers to show if they are following along or if they need help.

**References**


\(^4\) [http://www.datacarpentry.org/](http://www.datacarpentry.org/)
\(^5\) [https://www.nesi.org.nz/](https://www.nesi.org.nz/)
\(^6\) [https://uoa-eresearch.github.io/HackyHour/](https://uoa-eresearch.github.io/HackyHour/)