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Reflections from Transitioning Carpentries Workshops Online

Ben B. Chiewphasa[1] and Anna K. Moeller[2,3]

[1]University of Notre Dame, Notre Dame, IN, USA
[2]University of Montana, Missoula, MT, USA
[3]Oklahoma State University, Stillwater, OK, USA

Abstract

Objectives: As certified Carpentries instructors, the authors organized and co-taught the University of Montana's first in-person Carpentries workshop focused on the R programming language during early 2020. Due to the COVID-19 pandemic, a repeated workshop was postponed to the fall of 2020 and was adapted for a fully online setting. The authors share their Carpentries journey from in-person to online instruction, hoping to inspire those interested in organizing Carpentries at their institution for the first time and those interested in improving their existing Carpentries presence.

Methods: The authors reflected on their experience facilitating the same Carpentries workshop in-person and online. They used this unique opportunity to compare the effectiveness of a face-to-face environment versus a virtual modality for delivering an interactive workshop.

Correspondence: Ben B. Chiewphasa: bchiewph@nd.edu

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Abstract Continued

Results: When teaching in the online setting, the authors learned to emphasize the basics, create many opportunities for feedback using formative assessments, reduce the amount of material presented, and include helpers who are familiar with technology and troubleshooting.

Conclusions: Although the online environment came with challenges (i.e., Zoom logistics and challenges, the need to further condense curricula, etc.), the instructors were surprised at the many advantages of hosting an online workshop. With some adaptations, Carpentries workshops work well in online delivery.

Introduction

As digital scholarship and research data services become more common in academic libraries, there is a growing interest in The Carpentries for streamlining data literacy instruction efforts. The Carpentries is a worldwide community centered around creating open-access curricula and delivering hands-on workshops to increase data literacy and computational skills (The Carpentries n.d.). The Carpentries relies on evidence-based pedagogy techniques and a "train-the-trainer" approach.

Each Carpentries workshop is based on established lessons consisting of a number of episodes. Workshops are taught by volunteer instructors who are certified through the Carpentries Instructor Training program. During Carpentries workshops, instructors demonstrate new concepts in real time using live-coding. Learners then have dedicated time to practice concepts and learn with each other. One of the strengths of The Carpentries is its emphasis on never teaching alone; instructional teams typically include a host, two or more instructors, and at least one helper. The in-person modality has been the standard setup because helpers can easily monitor a room, observe learners' screens, detect those who may need help or troubleshooting, and jump from person to person on the fly (The Carpentries 2021).

Carpentries workshops are highly interactive, using two-way feedback between learners and instructors. The Carpentries emphasizes formative assessment, and instructors solicit feedback often. Instructors use feedback to tailor their pace and delivery to the learners' needs in real time. Pre- and post-workshop surveys help instructors prepare for a particular audience and self-reflect after the workshop.

Although all institutions that adopt The Carpentries operate under unifying principles, how Carpentries "plays out" differs depending on context and level of investment or buy-in. For example, the University of Oklahoma pays for annual Carpentries membership and, as a benefit, is able to train up to 10 instructors per year (Pugachev 2019, 212). Other institutions do not have the resources to acquire institutional membership, so potential instructors are waitlisted for instructor training. Furthermore, different institutions centralize Carpentries administration differently. For example, many Carpentries workshops are organized by academic libraries, but other institutions "house" Carpentries in different departments (with a specific domain focus) or research-oriented units (e.g., Office of Research). Despite the differences and some added hurdles for small universities, we believe that any sized institution from R1 to R3 can successfully get involved with The Carpentries.

Implementing The Carpentries

A 2018 environmental scan of research data workflows showed that University of Montana graduate students were generally aware of available tools and approaches to help streamline data management, manipulation, analysis, and

visualization, but students lacked opportunities to actually learn these data skills and apply them to their own research (Chiewphasa 2020). For example, students who were familiar with the existence of the R programming language identified it as an important skill in particular disciplines, but they felt intimidated to take the time to learn.

The Carpentries curricula and teaching ethos, which favor the practical and specific over the theoretical and general, appeared to be a good solution for the data literacy needs of the graduate students at the University of Montana. We, a Government Information Librarian and Wildlife Biology Ph.D. student, became certified Carpentries instructors and teamed up to link core instructional concepts with an understanding of domain-specific research cultures.

After we became certified Carpentries instructors, we had planned two R programming language Carpentries workshops in-person in February and September, 2020 at the University of Montana. We orchestrated our first workshop in-person in February but postponed our second workshop and pivoted to remote delivery due to the COVID-19 pandemic. We took this unique opportunity to compare how the workshop functioned online versus in-person.

We wanted to share our Carpentries journey, specifically related to lessons learned during the abrupt shift from in-person to online instruction due to the COVID-19 pandemic. We hope our experience offers inspiration to those interested in organizing Carpentries at their institution for the first time and those interested in improving their existing Carpentries presence.

Facilitating an in-person session

Our first Carpentries workshop, "Beginning R for Ecologists: Data Manipulation and Visualization," introduced beginners to coding in R and working with data, using examples designed for ecologists. To prepare, we configured a large room with power outlets at every seat. We taught five of the six workshop episodes over one eight-hour day, with sponsored snack breaks every two hours. A helper supported learners one-on-one with troubleshooting, installing software, explaining concepts, etc.

Following the Carpentries model, our goals were to (1) create an inclusive and encouraging learning atmosphere, (2) impart introductory skills in R, and (3) connect learners with online and local resources for continued learning. First, we followed the Carpentries emphasis on community building by beginning the day with icebreakers and exercises that encouraged learners to collaborate with their neighbors. Second, to effectively teach new R skills, we relied on frequent feedback and formative assessment. Following the Carpentries model, we handed out sticky notes in two different colors, which learners placed on their laptop backs to indicate "yes" and "no" responses throughout the day. Finally, at the end of the day, we connected learners to online and library resources to facilitate continued self-learning. We also fostered an informal community of practice by encouraging

participants to swap emails to help each other problem-solve after the workshop. We used feedback from learners and self-reflection to determine how effectively we met our stated goals.

Then COVID-19 hit...

Due to the onset of COVID-19, we postponed our second Carpentries workshop and transitioned it to online delivery. The highly interactive nature of Carpentries workshops and the general understanding that online workshops should be led by experienced instructors made the transition daunting, but our position as relatively new instructors enabled us to try new approaches without sacrificing deeply rooted habits.

Transitioning online: lessons learned

Our second workshop followed the same curriculum as the first over an eight-hour day, with similar participant backgrounds. Post-workshop surveys and anecdotal feedback from the first workshop indicated our learners were most excited about data manipulation and visualization, which were the last two lessons in our first workshop and cut short due to time. In response, we streamlined introductory materials and reorganized lessons to teach these skills first in the second workshop.

We maintained the same workshop goals and structure in our second workshop; instructors live-coded, learners practiced skills and worked with other learners to reinforce concepts, helpers and instructors provided one-on-on troubleshooting, and we solicited feedback often.

When moving the workshop online, we worried about losing cues and feedback when learners were feeling overwhelmed, burned out, or simply uninterested. To combat these possibilities, we relied even more heavily on formative assessments and encouraged frequent feedback through chat and the use of the Yes/No buttons on Zoom. We established the norm of turning on video cameras, while remaining sensitive to those who did not have a camera or chose not to use one (for personal reasons, the heavy bandwidth toll, etc.). We reduced the number of participants to increase time to interact with each learner. To combat burnout, we deliberately slowed our pace, which resulted in covering less material. Furthermore, we delivered materials in fifty-minute sessions with ten-minute breaks interspersed.

We found some surprising advantages of the online workshop format. First, we discovered that Zoom has useful built-in tools for formative assessment, like the Yes/No buttons, which functioned like the in-person sticky notes. Second, some logistics were simpler. We did not need to locate a room of appropriate size and technological capabilities, nor did we cater snack breaks. Instead, our pre-workshop tasks focused on learning the capabilities of Zoom and practicing the necessary functionalities, like assigning break-out rooms and moving between them.

Although we did not choose to shift to online delivery, doing so resulted in takeaways relevant to general delivery of Carpentries' curricula. First, the online workshop reinforced the importance of prioritizing the basics. We can and should teach much less material in order to best meet learning outcomes. Second, concern about losing our audience led us to invest heavily in creating opportunities for feedback, performing formative assessments, and lowering our expectations on content amount. Although we would not have made this extreme change to our pace and formative assessment without moving online, learner feedback indicated it was advantageous and not overboard. We believe these lessons translate well to in-person teaching, and we will implement these adjustments to pace and content amount going forward.

We were surprised that the role of the instructor's helper changed between the in-person and virtual workshops. During the in-person workshop, the helper mainly assisted learners with concepts and exercises. During the virtual workshop, the helper's role was more logistical, assisting learners with faulty internet, outdated software, etc. We recommend future Carpentries instructors prepare for the helper(s) to have technological troubleshooting skills for online workshops and more familiarity with the curriculum materials during in-person workshops.

Overall, we found that Carpentries workshops can be adapted and taught successfully in very different formats. The biggest differences between online and in-person workshops were the logistical preparation, pace and content amount, and helper's role.

The Future of Carpentries

The onslaught of COVID-19 forced instructors around the globe to experiment with remote instruction. Many argue that the crisis will transform assumptions about how people learn (Cowell 2021). Indeed, online education enables people to learn from anywhere in the world with reliable internet access. However, the pandemic amplified the existing digital divide and the inequities that come with it; some families do not have internet access and rely on their children's schools for access to technology. In states like Montana that are highly rural, internet affordability is only one component; available internet must also meet the bandwidth requirements of online learning. Carpentries workshops can be very demanding because participants must juggle multiple applications alongside Zoom's lofty data and bandwidth requirements when taking into account video and audio. We recommend that Carpentries instructors or hosts determine what is and isn't necessary (e.g., turning on cameras) to run successful workshops that uniquely address their audience's needs.

The Carpentries community came together to share tips and suggested practices for teaching online (The Carpentries 2020a) and also created and shared an evolving list of recommendations (The Carpentries 2020b). If The Carpentries decides to fully embrace the online modality post-pandemic, it will need to continue to reassess and reconfigure the elements that define The Carpentries. For

example, interactions between learners, instructors, and helpers are fundamental to the Carpentries model but are much harder to foster in an online delivery. Furthermore, how will The Carpentries set itself apart from other online data training opportunities (like Udemy)? We believe that The Carpentries does a better job of facilitating continued learning compared to its peers, but we urge the organization and its member institutions to ponder these questions, especially when working in university ecosystems that offer students many choices to achieve similar goals.

Conclusion

Because the COVID-19 pandemic turned the world upside-down, it offered us an invaluable learning opportunity to run Carpentries workshops remotely. We found teaching online was doable and surprisingly rewarding, but it takes different planning, more thought, and a greater willingness to pivot tools and approaches. The main lessons we learned were:

- Emphasize the basics
- Create many opportunities for feedback using formative assessments
- Lower expectations for the amount of material presented
- When teaching online workshops, include helpers who are familiar with technology and troubleshooting

Our Carpentries experience helped shape our teaching praxis that we have taken to new positions in other learning environments. We hope that our story inspires new members to get trained, pursue new partnerships to make Carpentries possible at their respective organizations, or organize their first online workshop.

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