

## Workshop Overview

Software Carpentry workshops introduce the computational skills needed for basic research computing. Instructors provide a user-friendly and fun environment in which to learn skills for performing version control, automating research tasks, and producing reproducible analyses. We assumed no prior computational experience for this workshop, which was open to WSU students and staff in addition to non-WSU participants.

We hosted the [Software Carpentry workshop](#) in April of 2019. Participants were taught how to use the Unix shell, perform version control with Git and GitHub, and work with data structures and plotting in R and Python. This offering of Software Carpentry was unique in that we ran concurrent breakout groups for R and Python languages, instead of offering only one language during the workshop. The workshop syllabus can be found in Appendix B.

The workshop was team taught between five instructors with the assistance of eight helpers. The helpers have previous experience with the software being taught and were present to troubleshoot participants' problems as they arose. The workshops are generally composed of tutorials that include hands-on exercises with live coding demonstrations. Challenge questions interspersed throughout each tutorial allow participants to practice throughout the workshop and gain confidence in their ability to apply the techniques being taught. We also provided many of the scripts in a format that would be accessible online to the participants after the workshop, allowing them to revisit the same material afterwards.

We had a total of 40 registrants in this workshop, with a higher proportion of female attendees than male. Most registrants were graduate students, although faculty, postdoctoral researchers, university staff, undergraduates, and industry workers were also represented. Members from 14 departments registered for the workshop (Table 1). For participants by college, see Table A1. Thirty-two registrants attended day one, and 24 attended day two.

*Table 1. Summary of Software Carpentry Workshop Demographics*

<b>Number of:</b>	
Registrants	40
Male	11
Female	15
Graduate student	26
Faculty	1
Staff	4
Postdoc	5
Undergraduate student	3
Other positions	1
Depts represented	14
Colleges represented	6
WSU campuses represented	1

*Participant totals may not sum to 40 if not all participants responded to demographic questions. These data are provided through a combination of WSU and Carpentries surveys.*

## Summary of Participant Feedback

### Survey Results

Links to confidential surveys were sent to the workshop participants immediately before and after the workshop. The surveys were created by The Carpentries to assess the effectiveness of their workshops by measuring participant responses before and after participating in Software Carpentry. Pre-workshop survey response rates were higher than post-workshop (65% vs. 40%). An overview of survey findings is given in Table 2.

Almost 75% of respondents had some previous experience with a programming language. However, 52% had never used a statistical analysis program with a graphical user interface. Post-workshop survey results indicated that 47% of participants felt they gained immediately applicable knowledge from the workshop. On average, participants said post-workshop that they were likely (78%) to recommend the workshop to a friend or colleague. Additionally, participants appreciated that the helpers and instructors were attentive and knowledgeable.

Table 2. Overview of survey responses

	Pre-survey response rates (65%) were higher than post-survey response rates (40%)
	Software carpentry participants came into the workshop with some previous experience programming, and a plurality left feeling that they had gained immediately usable knowledge.
	A significant portion of the participants did not have prior experience with a statistical analysis program.
	Awareness of Software Carpentry came primarily from emails or flyers, followed by advisors, and then friends or colleagues.
	Participants provided very positive feedback on the instructors' and helpers' performance.
	Participants noted that there was a wide range of difficulty in the material, from very basic to some material that might have been challenging to newcomers.
	Contrary to our fall 2018 Data Carpentry feedback, participants with less programming experience did not request greater focus on foundational concepts for R and Python.

## Appendices

### Appendix A. Table

Table A1. Participants by College

College	Count
Carson College of Business	2
College of Agricultural, Human and Natural Resources	12
College of Arts & Sciences	15
College of Education	1
College of Veterinary Medicine	2
Non-WSU	2
Voiland College of Engineering and Architecture	6
<b>Grand Total</b>	<b>40</b>

## **Appendix B. Workshop syllabus**

### **The Unix Shell**

- Files and directories
- History and tab completion
- Pipes and redirection
- Looping over files
- Creating and running shell scripts
- Finding things

### **Version Control with Git**

- Creating a repository
- Recording changes to files: add, commit, ...
- Viewing changes: status, diff, ...
- Ignoring files
- Working on the web: clone, pull, push, ...
- Resolving conflicts

### **Programming in Python**

- Python interface
- Defining variables
- Data types
- Built-in functions
- Using libraries
- Reading data
- Pandas DataFrames
- Plotting
- Lists
- Loops and conditionals
- Creating and using functions

### **Programming in R**

- R interface
- Getting help with R
- Data structures
- Data frames
- Subsetting data
- Loops and conditionals
- Base plotting
- Creating and using functions