

# **Promoting Data Literacy Across Campus with Carpentries: The Experience of Three Librarians**

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Edmon Low Library  
Oklahoma State University



# Outline

## **1. How The Carpentries improve data literacy**

- a. What is data literacy?
- b. Why do students need data literacy?
- c. Learning through The Carpentries
- d. Exploring The Carpentries

## **2. History of the OSU Carpentries**

- a. HPCC Launches the Carpentries
- b. How Carpentries came to OSU Libraries
- c. Current state of Carpentries at OSU

## **3. Future growth of the OSU Carpentries**

- a. Improving instructor recruitment
- b. Diversifying lesson materials
- c. Encouraging Carpentry skills beyond Carpentry workshops

## **4. Summary**



Kay K Bjornen, PhD  
Research Data Initiatives Librarian  
Visiting Assistant Professor

# **HOW THE CARPENTRIES IMPROVE DATA LITERACY**



# What is Data Literacy?

“...knowledge and skills involved in collecting, processing, managing, evaluating, and using data for scientific inquiry.”

<https://nnlm.gov/data/thesaurus/data-literacy>



# Mark Twain and Disraeli had it right!



*Drawn by Peter Newell.*

*Illustration by Peter Newell from COSMOPOLITAN,  
August 1898*

Figures often beguile me, particularly when I have the arranging of them myself; in which case the remark attributed to Disraeli would often apply with justice and force: "There are three kinds of lies: lies, damned lies and statistics."

*- Mark Twain's Own  
Autobiography: The Chapters  
from the North American  
Review*

<http://www.twainquotes.com/Statistics.html>



# Why do Students Need Data Literacy?

- 1) To become competent data consumers

*"...the number of abstracts in the database in 1957 was 2,232,688 and grew to 17,627,459 in 1997, a 690% jump. However, the growth slowed down in the last two years. The number of abstracts in 1999 was 19,029,012 and 19,754,012 in 2000, a growth of only 3.81%."*



# Why do Students Need Data Literacy?

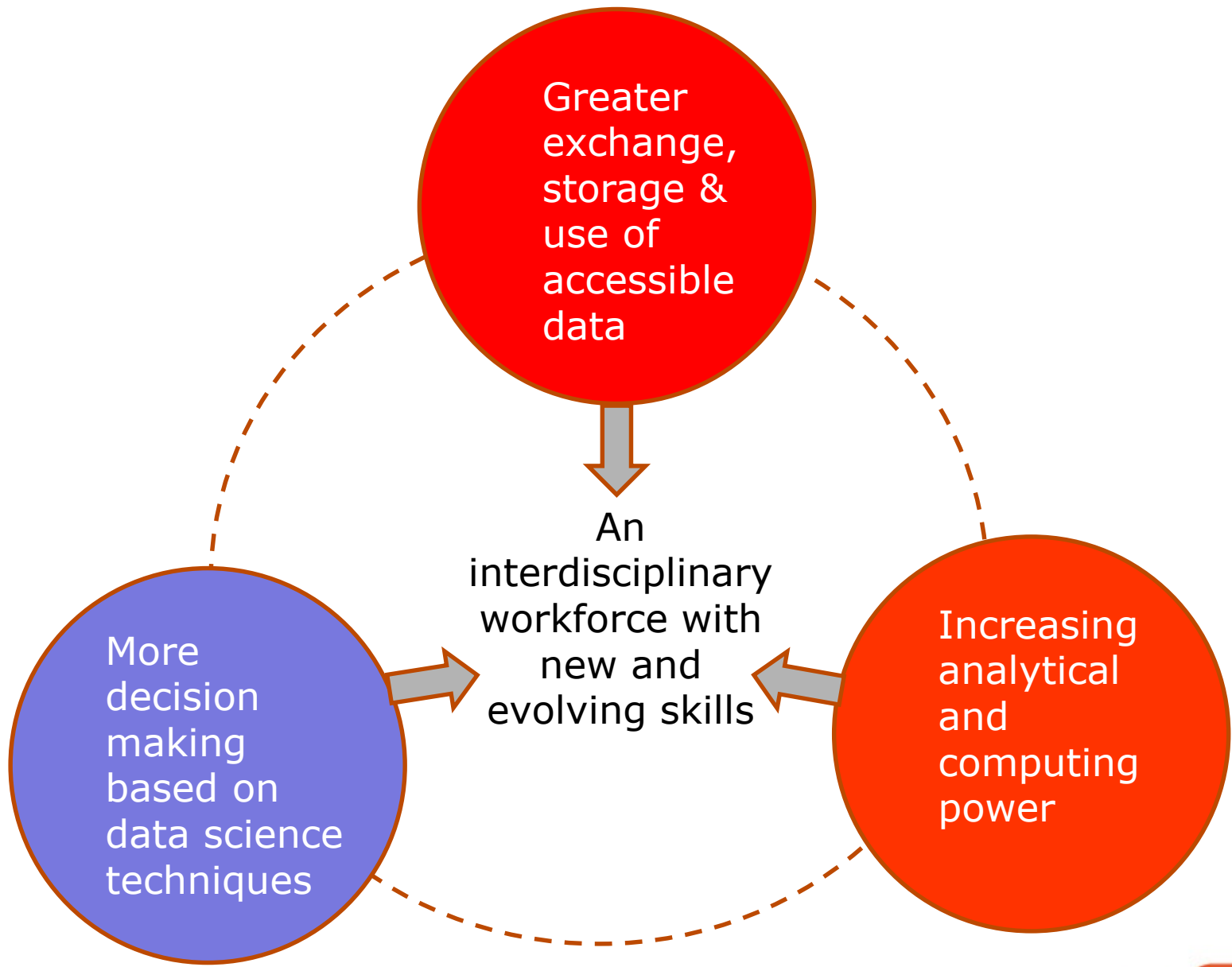
2) To enhance their job skills and employability

From a Forbes blog post: “Why All Employees Need Data Skills in 2019 (And Beyond)”

*“Data isn’t used in a vacuum: it touches many other roles, and those employees need the literacy to handle it effectively.”*

<https://www.forbes.com/sites/laurencebradford/2018/10/11/why-all-employees-need-data-skills-in-2019-and-beyond/#5d3d7f21510f>







# Why do Students Need Data Literacy?

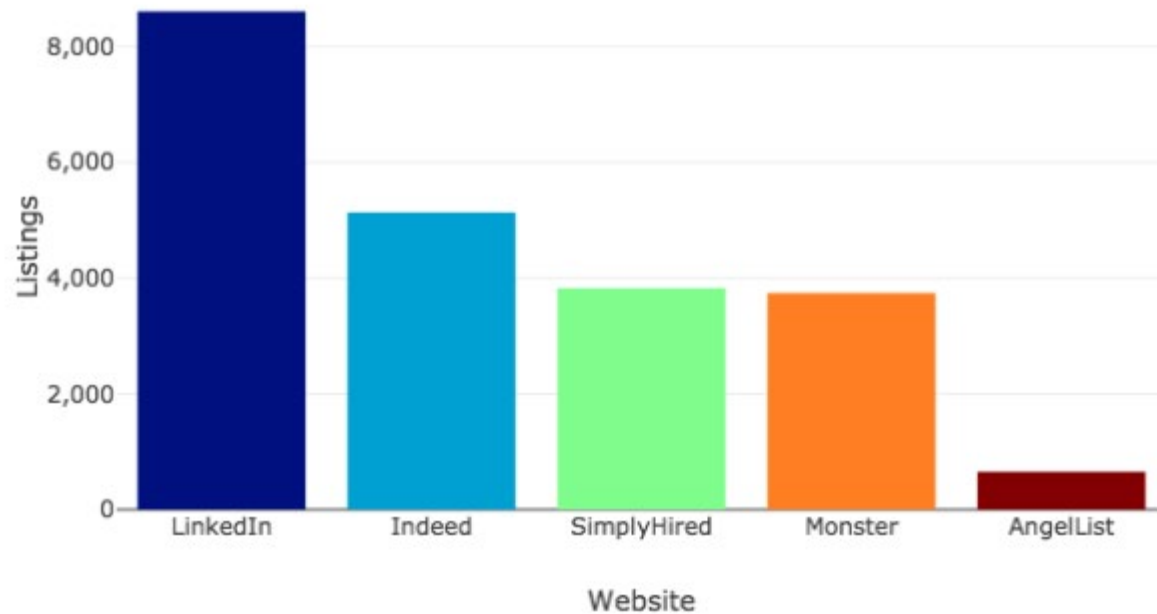
3) More advanced skills are needed for research & graduate education:

- Documentation and metadata
- Version control
- Software for data analysis, cleaning & visualization
- Data preservation



# One Day's Snapshot of Data Science Job Listings - October 10, 2018

Data Scientist Job Listings



<https://towardsdatascience.com/the-most-in-demand-skills-for-data-scientists-4a4a8db896db>



# Dynamics of Data Science Skills: How Can All Sectors Benefit from Data Science Talent?

*-A 2019 Report from The Royal Society*

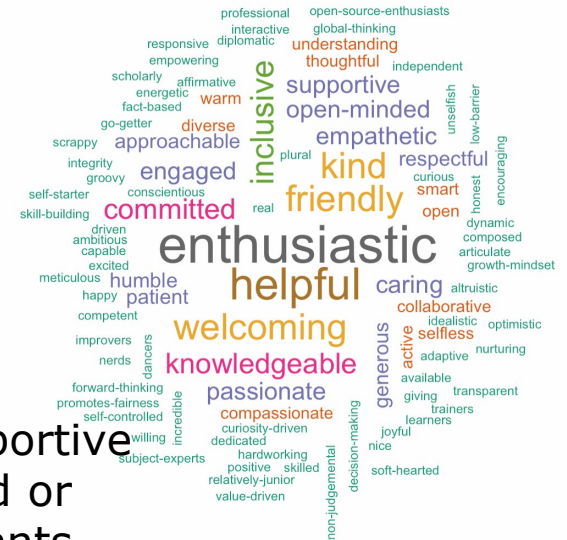
“In higher education further consideration is needed about how universities can teach data science effectively, and integrate it into university curricula as a developing and interdisciplinary set of skills and methodologies”







THE  
CARPENTRIES



## The Carpentries Code of Conduct

We are dedicated to providing a welcoming and supportive environment for all people, regardless of background or identity. By participating in this community, participants accept to abide by The Carpentries' Code of Conduct and accept the procedures by which any Code of Conduct incidents are resolved. Any form or behaviour to exclude, intimidate, or cause discomfort is a violation of the Code of Conduct. In order to foster a positive and professional learning environment we encourage the following kinds of behaviours in all platforms and events:

- Use welcoming and inclusive language
- Be respectful of different viewpoints and experiences
- Gracefully accept constructive criticism
- Focus on what is best for the community
- Show courtesy and respect towards other community members



# Learning through The Carpentries

- ✓ Data Cleaning – OpenRefine
- ✓ Data Organization – Using Spreadsheets
- ✓ Data Management - SQL
- ✓ Data Analysis and Visualization - Python and R
- ✓ Versioning - Git
- ✓ Automation - Unix Shell



<https://carpentries.org/testimonials/>

“Data Carpentry opened up a whole new world for me. I was doing Biology during my undergraduate studies, which didn’t include any formal training in computational skills. Suddenly, I was drowning in big data during my postgrad and had no clue how to work with this type of data. Since attending my first Carpentry workshop, I have learned most of the tools taught by The Carpentries, qualified as an instructor, and have taught at five Data Carpentry workshops, as well as three one-day R workshops. Obviously, I am now very passionate about teaching these tools to researchers who find themselves in the same situation I did. I also feel confident and competent to analyze various types of data, which helped gain me a post-doctoral fellowship in Pharmaceuticals.”

**Bianca Peterson** is conducting kinetic analyses of extemporaneously compounded medicines at the Centre of Excellence for Pharmaceutical Sciences (Pharmacem), North-West University, South Africa.



# Explore the Carpentries

- ✓ <https://carpentries.org>
- ✓ Attend a workshop
- ✓ Become an instructor
- ✓ Organize workshops at your institution
- ✓ Contribute through the Carpentries organization.





Phillip Doehle, MS  
Digital Services Librarian  
Assistant Professor

# **HISTORY OF THE OSU CARPENTRIES**



## Software Carpentry Comes to the OSU Library



- ✓ May 2015—Software Carpentry comes to OSU
- ✓ March 2016—First self-hosted workshop
- ✓ May 2016—Second self-hosted workshop



## Data Carpentry Comes to the OSU Library



- ✓ July 2017—Host our inaugural Data Carpentry Workshop using Python Curriculum
- ✓ October 2017—Two-part R workshop
- ✓ August 2018—Carpentries Inspired Workshop



## **OSU Libraries' Participation Since 2015**

How has it gone?

- ✓ OSU has self-hosted 23 workshops (24<sup>th</sup> is happening today)
- ✓ Run in multiple formats to accommodate demand
- ✓ 5<sup>th</sup>-year anniversary



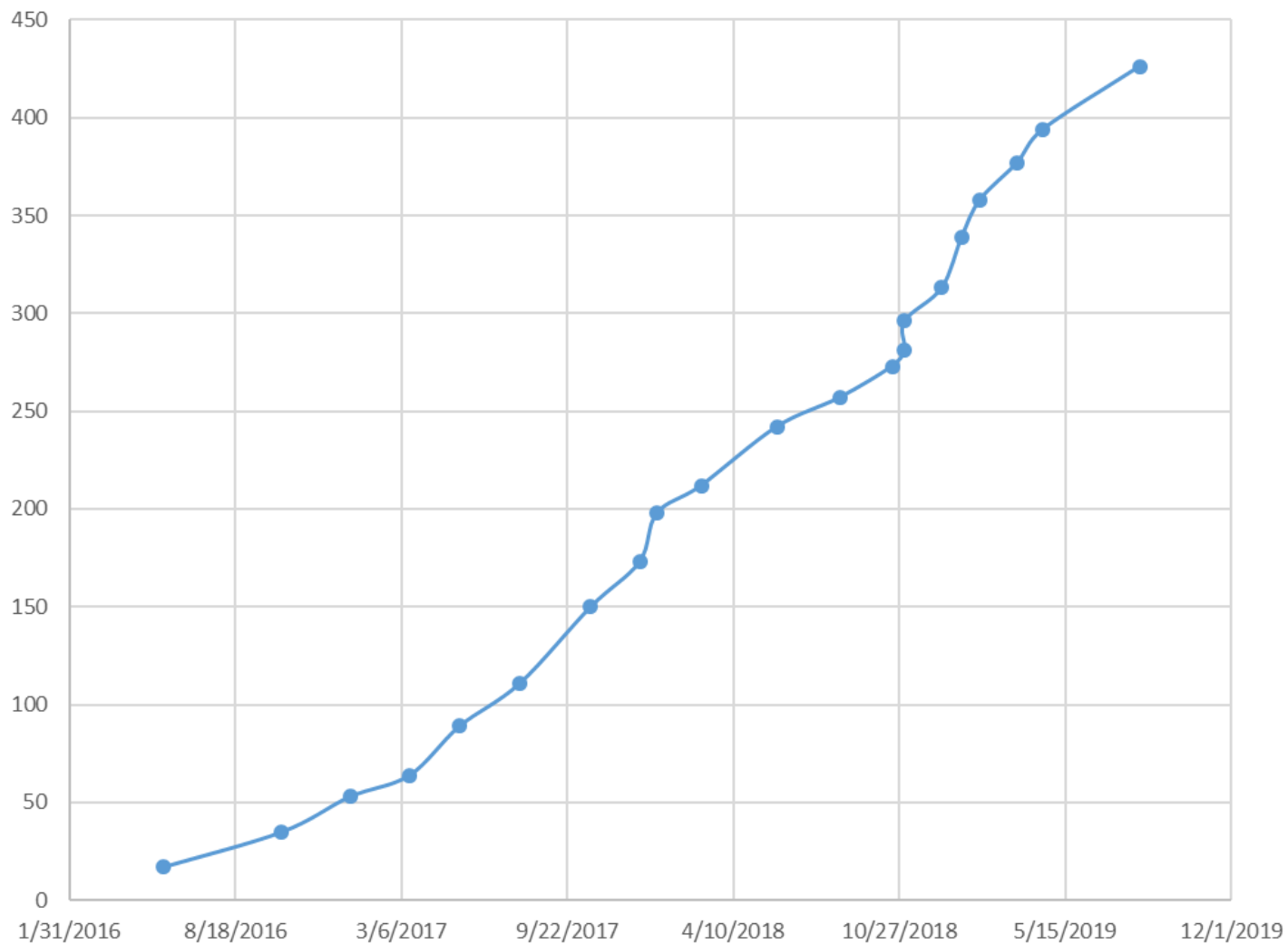
## **Carpentries was a Natural Fit at OSU Libraries**

OSU Library's involvement with the Carpentries

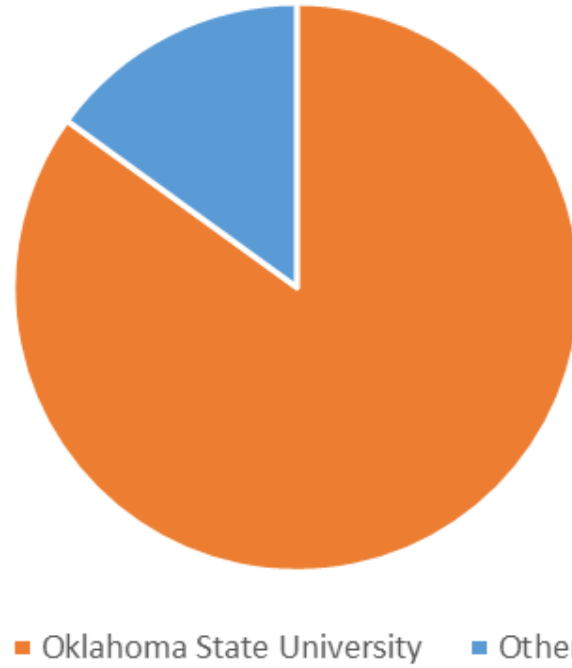
- ✓ The library has provided facilities
- ✓ Enthusiastic response from library staff and strong support from administration was vital
- ✓ The library acted as a central hub



# Total Attendees



## Participants by Organization



# Other Institutions

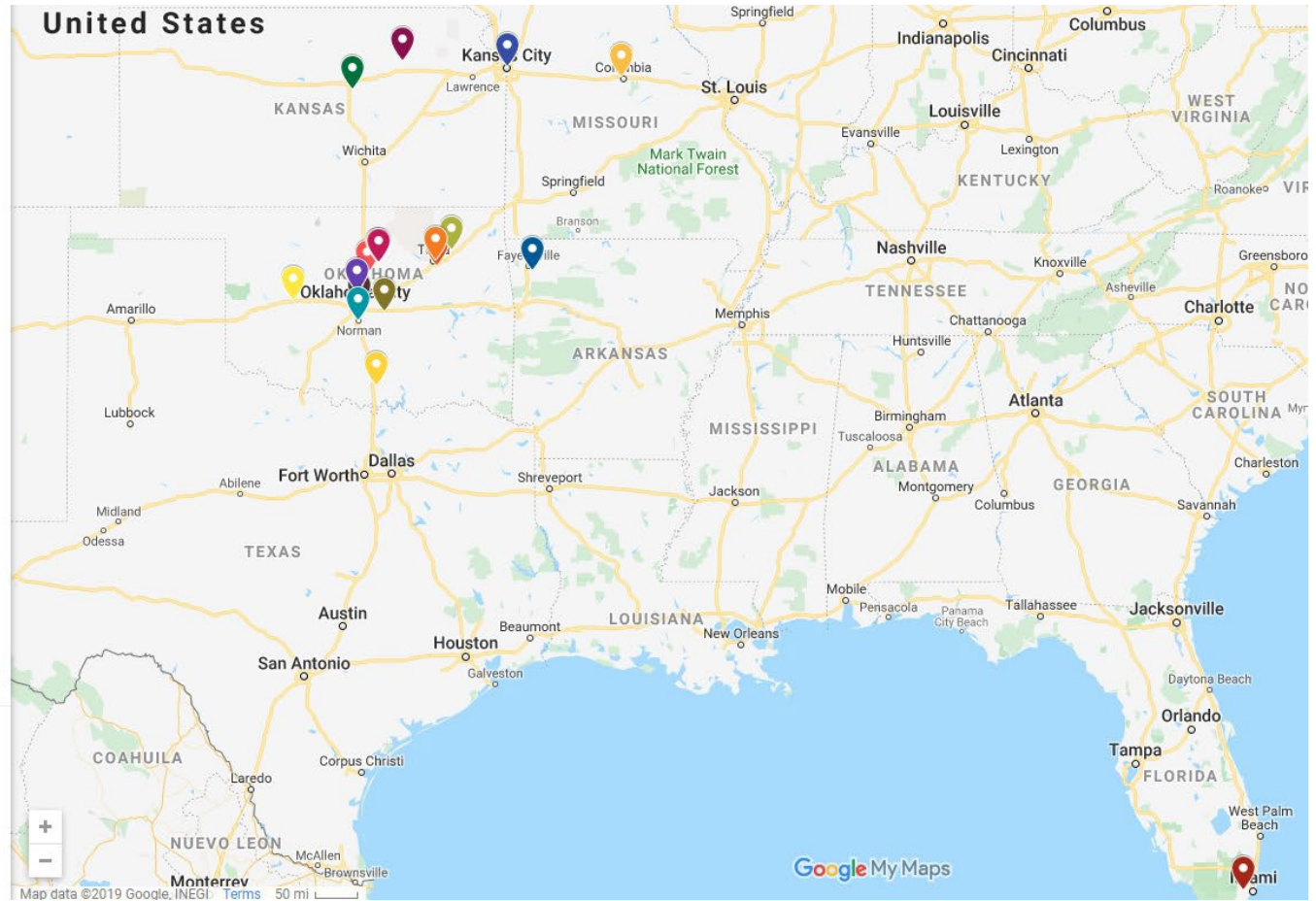
- ✓ University of Central Oklahoma
- ✓ Military
- ✓ Kansas State University
- ✓ Langston University
- ✓ Southwestern Oklahoma State University
- ✓ University of Oklahoma
- ✓ Laureate Institute for Brain Research
- ✓ University of Tulsa
- ✓ Florida International University
- ✓ Great Plains Network
- ✓ Kansas City University of Medicine and Biosciences
- ✓ Noble Research Center
- ✓ Oklahoma Baptist University
- ✓ Oklahoma Department of Career Teach
- ✓ Rogers State University
- ✓ The Land Institute
- ✓ University of Arkansas





# Other Institutions

- Florida International University
- Great Plains Network
- Kansas City University of Medicine and Bio...
- Kansas State University
- Langston University
- Laureate Institute for Brain Research
- Noble Research Center
- Oklahoma Baptist University
- Oklahoma Department of Career Tech
- Oklahoma State University
- Rogers State University
- Southwestern Oklahoma State University
- The Land Institute
- Tinker Air Force Base
- University of Arkansas
- University of Central Oklahoma
- University of Oklahoma
- University of Tulsa



Made with Google My Maps

Google My Maps



Madison Chartier, MLS  
Metadata Librarian  
Assistant Professor

# **FUTURE GROWTH OF THE OSU CARPENTRIES**



# Growing OSU Carpentries

## Successes

- ✓ Library's support
- ✓ Established administrative team
- ✓ Active volunteers
- ✓ Regular workshop schedule
  - ✓ Monthly workshops
  - ✓ Data & Software Carpentries

## Improvements

- ✓ Instructors
  - ✓ See more instructors certified
  - ✓ Increase available instructors
- ✓ Campus-wide impact
  - ✓ Draw more participants from across the university
  - ✓ Use lesson plans to more disciplines

**How do we sustain what we've built?**  
**How do we enhance what we've built?**



# The Bedrock of OSU Carpentries

## 1. Solid lesson plans

- ✓ Live-coding examples
- ✓ Real-life datasets
- ✓ Demonstrable application to multiple disciplines

## 2. Active instructor team

- ✓ Lead workshops
- ✓ Review and maintain lesson materials
- ✓ Regularly recruit and train new instructors

**Fresh, diverse perspectives bring new insights and lesson updates.**



# Our Future Goals

## 1) Improve instructor recruitment

- ✓ Help more volunteers complete training
- ✓ See new instructors lead more workshops
- ✓ Increase engagement

## 2) Diversify lesson material

- ✓ Target more disciplines
- ✓ Attract broader range of volunteers
- ✓ Increase campus-wide involvement

***... 3) Create post-workshop support***

***Sustain our team by growing our team.***



1)

# **IMPROVE INSTRUCTOR RECRUITMENT**



# Why Internal Recruitment Matters

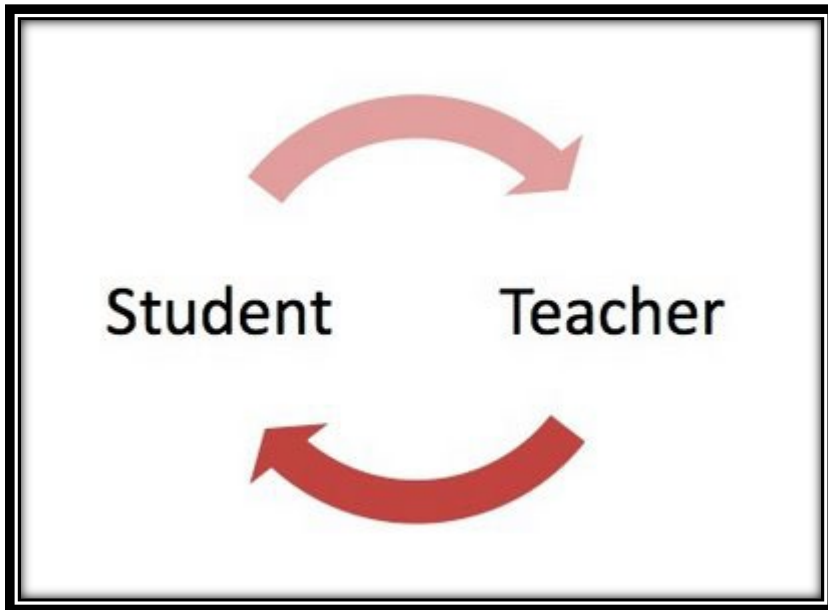


Image retrieved from: "Science of Education: Student—Teacher." [Blog post]. (5 Nov. 2013). Retrieved from: <https://kkcd.wordpress.com/2013/11/05/science-of-education-2/>

- ✓ **Workshop participants are the future!**
  - ✓ Firsthand experience of curriculum structure
  - ✓ Reflect on learning experience
    - ✓ **What worked well?**
    - ✓ **When did I struggle?**
    - ✓ **Why?**
  - ✓ Apply student experience to instructor role

**Learn <-> Comprehend <-> Apply**



# Instructor Requirements

## 1) Participate in a workshop

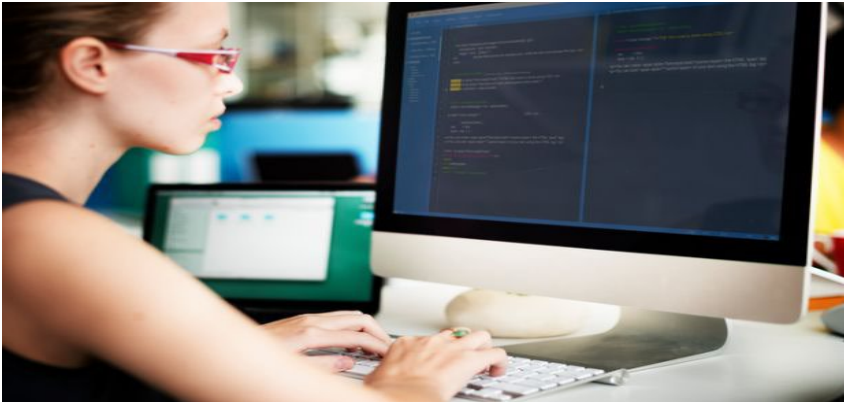


Image retrieved from: Minsky, C. (9 Dec. 2016). "Best universities in the world for learning to code." Times Higher Education. Retrieved from: <https://www.timeshighereducation.com/student/news/best-universities-world-learning-code>

## 2) Assist in a workshop



Image retrieved from: Ramsdell, D. (10 April 2019). "Why college peer tutoring works." [Blog post]. Retrieved from: <https://www.joinknack.com/blog/2019/04/10/why-college-peer-tutoring-works/>

## A comfortable transition...





# Certified Instructor Training

1. 2-Day Workshop
2. 3 Follow-Up Tasks
  - ✓ Lesson Recommendation
  - ✓ Community Discussion
  - ✓ Live Demo
3. Lead First Workshop

**3 months to complete follow-up tasks.  
Teach first workshop within a year.**



# Our Problem...

**...not everyone  
completes  
their training.**

**How to motivate  
volunteers to  
complete their  
certification?**



Image retrieved from: TNN. (13 May 2019). "Would you ask for an extension of deadline? This is the right answer." Times of India. Retrieved from: <https://timesofindia.indiatimes.com/lifestyle/health-fitness/de-stress/should-you-ask-for-an-extension-of-a-deadline-this-is-the-right-answer/articleshow/69308114.cms>



# Our Solution...

## To complete 3 tasks:

1. *Establish consistent communication*

- ✓ Track progress
- ✓ Deadline reminders
- ✓ Answer questions

2. *Hold practice sessions for live demo*

## To lead 1<sup>st</sup> workshop:

*Give newly certified instructors teaching priority*

- ✓ First consideration
- ✓ Immediate involvement
- ✓ Community incorporation

**Create a system of support.**  
**Create a positive environment.**



2)

**DIVERSIFY LESSON  
MATERIAL**



# Lesson Material Already Available!

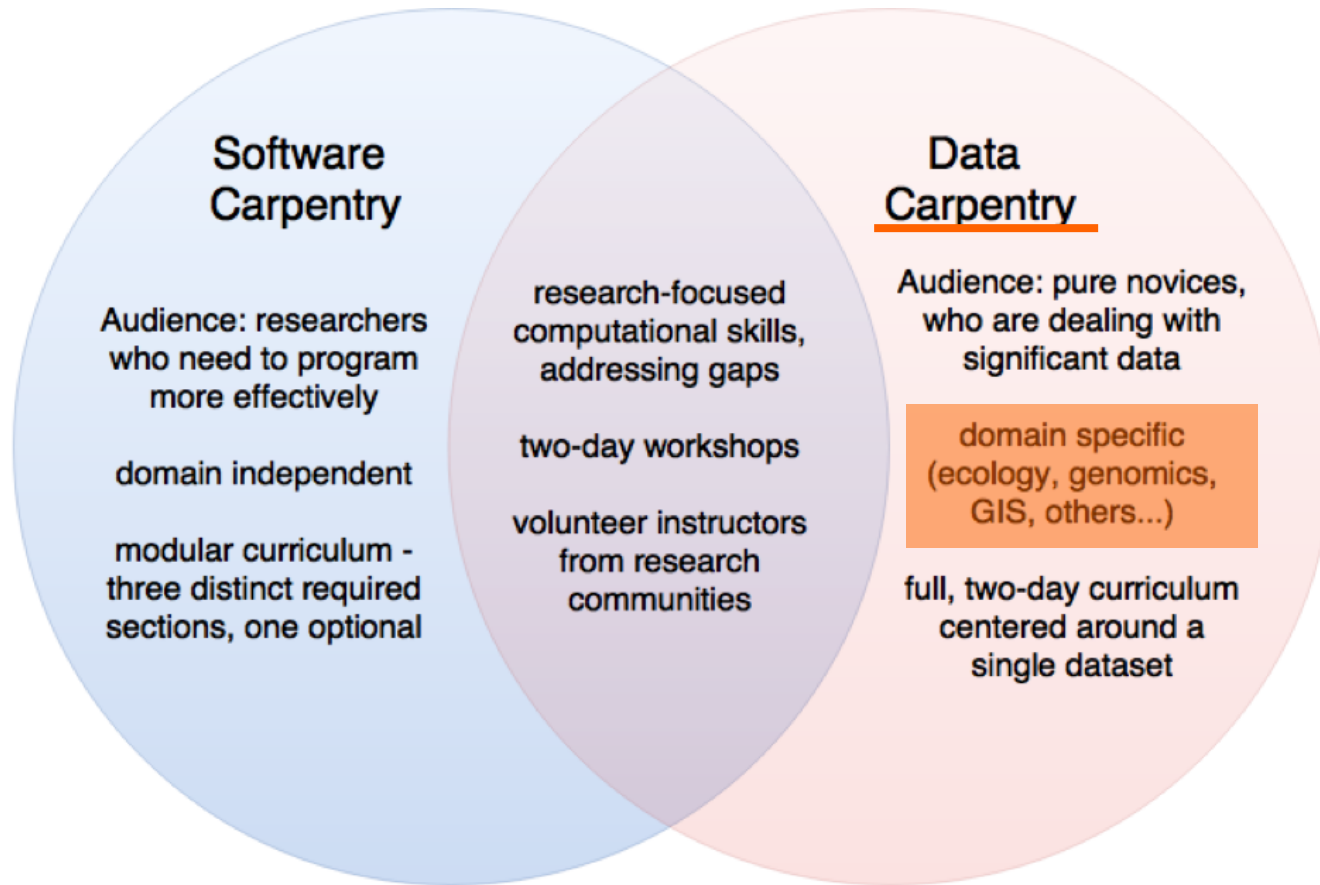


Image retrieved from: van Gelder, C. (n.d.). "Software and data carpentry." Dutch Techcentre for Life Sciences. Retrieved from: <https://www.dtls.nl/training-and-education/software-data-carpentry/>

**Explore more domains → Expand our appeal**



# Explore and Experiment

- ✓ Spring 2020, initiating genomics workshop
- ✓ Inaugural trial
  - ✓ Measure student reaction and interest
  - ✓ See disciplines represented
  - ✓ Compare to ecology workshops
- ✓ Explore further expansion



Image retrieved from: Baron, J. (22 Oct. 2018). "Don't believe the headline hype when it comes to genomic research." Forbes. Retrieved from: <https://www.forbes.com/sites/jessicabaron/2018/10/22/dont-believe-the-headline-hype-when-it-comes-to-genomics-research/#622176486e5c>

**Nothing tried, nothing gained.**



3)

**CREATE POST-WORKSHOP  
SUPPORT**



# Encourage Carpentry Skills...

Image retrieved from: "Little Lake Health Center Continues Tradition of Brown Bag Lunches." (Jan. 2015). MCHC Health Centers. Retrieved from: <https://www.mchcinc.org/news/whats-happening/little-lake-health-center-brown-bag-lunches/>



**...BEYOND Carpentry Workshops!**





# Collateral Impact

## Present reality

- ✓ Low attendance
- ✓ Few instructors available
- ✓ Not all instructors can answer certain questions

## Future hope

- ✓ Appeal to more disciplines
- ✓ Hold Brown Bags more regularly
- ✓ Have more instructors, more experience, more answers

**Create resonating impacts with targeted improvements.**



# Summary

- ✓ OSU Carpentries is a continued work in progress.
  - ✓ We had a need: Data literacy
  - ✓ We established a foundation: OSU Libraries
  - ✓ We keep growing and exploring.
    - ✓ More instructors
    - ✓ Broader discipline appeal
- ✓ Keep answering campus needs by spreading campus impact
- ✓ Discover new ways to spread data literacy

**Create a solution; leave a legacy.**



Are there any questions?

**THANK YOU!**

