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Are we using the right tools?

Mistaken Identifiers: Gene name errors can be introduced inadvertently when using Excel in bioinformatics

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What are the right tools?

With growing rate of data accumulation, there is an acute need for all researchers to learn about:

- Repeating common tasks
- Cleaning/reading/processing data
- Sharing code for common tools and methods
- Collaborating with code
Departure point

Research organization leaders seek to build sustained capacity

Researchers need to build and expand on data skills
Technical consulting doesn't scale
Online training and MOOCS can leave people frustrated, without a community to help them.
Our approach is to build community

and capacity through peer instruction
Software Carpentry

- Stemmed from consulting overload
- Greg Wilson and Brent Gorda at Los Alamos National Laboratory, 1997
- Five full days
- Online lessons
Reboot in 2012

- Hacker Within community (U of Wisconsin)
- peer instruction with instructor training
- helpers + type-along pedagogy
- instructional material openly licensed (CC-BY)
- fun and dynamic community of instructors
Instructor training

- We train scientists how to teach technology skills with more impact:
  - various pedagogical approaches
  - take into account learner's background
  - reduce cognitive load
  - give and receive constructive feedback
Jugyokenkyu - lesson study

- Coordinated collaboration, testing and continuous improvement of lessons.
- Collaboration on lessons, conversation about teaching of lessons
- Instructor community that discusses the ongoing improvement of a lessons
- Kaizen of teaching
Preparing the unconscious

• N.R.F. Maier's two cords experiment
• Problem solving skills can be inaccessible to the conscious mind
• Hack our unconscious to work on problems when we're not thinking about them?
• Experiment and play to seed the unconscious mind
• Training is more than just the things you teach
The path from novice to expert

• prepare the unconscious mind to solve problems
• mentorship
• play, tinkering
• community support
Teaching as performance art

- Excitement
- Engagement
- Passion for the topic
- Improv
- Lessons are a loosely sketched script
Our Workshops

- 2-days, max
- team taught (at least two instructors)
- sticky notes
- challenges
- helpers
- feedback
About Software Carpentry

- Unix Shell
- A programming language, Python, R, or Matlab
- Version control (Git, Svn or Mercurial)

<table>
<thead>
<tr>
<th>Schedule</th>
<th>Day 1</th>
<th>Day 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arrival</td>
<td>Pre-workshop Survey</td>
<td>09:00  Programming with Python</td>
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<tr>
<td>09:00</td>
<td>Automating tasks with the Unix shell</td>
<td>10:30 Coffee</td>
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<tr>
<td>10:30</td>
<td>Coffee</td>
<td>12:00 Lunch break</td>
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<tr>
<td>12:00</td>
<td>Lunch break</td>
<td>14:30 Coffee</td>
</tr>
<tr>
<td>13:00</td>
<td>Version control with Git</td>
<td>16:30 Wrap-up</td>
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<tr>
<td>14:30</td>
<td>Coffee</td>
<td>Dismissal</td>
</tr>
<tr>
<td>16:30</td>
<td>Wrap-up</td>
<td>Post-workshop Survey</td>
</tr>
</tbody>
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About Data Carpentry

• Focused on data scientist skills necessary for research
• Lessons for discipline-specific needs
• Not as much about creating code:
  • scripting existing code
  • using tools that leave reproducibility artifacts
• Best practices in data management
Thank You!

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