Teaching data management in a lab environment

IASSIST 2014     |     Toronto, CA     |     Wednesday, 6/4/14

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IUPUI University Library Center for Digital Scholarship
What I'm going to talk about

- Background
- The lab experience
- Evidence-based teaching
- DM Lab - The Early Days
- The Future of the DM Lab
Background

- IUPUI
- Data Services Program
- Data Management Lab
- Why IASSIST, why now?
Data management training

No

Data management training
The Laboratory Experience

Procedural skills

Critical thinking skills

Metacognitive skills

Reflective Journal

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Below Average</th>
<th>Average</th>
<th>Above Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observations and insights</td>
<td>Simple observations; provides little or no insight, comment or analysis; more descriptive than reflective</td>
<td>Adequate degree of observations; some insight and analysis; reflective and outcomes considered but lack depth</td>
<td>Sophisticated and thoughtful observations; high degree of insight and analysis; evidence that outcomes have been processed and reflected upon</td>
</tr>
<tr>
<td>Language and structure</td>
<td>Not well organised; pre-dominantly descriptive; little interpretation or reflection; poor vocabulary and grammar; numerous errors</td>
<td>Better structure with a logical progression; use of varied interpretation and reflection; competent vocabulary and grammar; occasional errors</td>
<td>Excellent coherence and progression; ideas and observations are well structured, effective and accurate use of vocabulary and grammar, very few errors</td>
</tr>
<tr>
<td>Comments and discussion</td>
<td>Rarely engages with other group members on the pertinent issues and discussion</td>
<td>Engages with other group members on the pertinent issues and discussion; supports the group members' arguments with relevant evidence and analysis</td>
<td>Actively engages with other group members on pertinent issues and discussion; convincingly questions or supports the group members' arguments with relevant evidence; introduces new perspectives</td>
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<tr>
<td>Maximum Mark</td>
<td>15</td>
<td>11</td>
<td>12-15</td>
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What is the lab experience?
“...it is vital to isolate and define goals for which laboratory work could make a unique and significant contribution to the teaching and learning of science.”

–Hofstein & Lunetta, 2004
Faculty identified goals for the lab experience

- Critical thinking skills & experimental design
- Lab skills & techniques
- Engaging in science
- Teamwork skills
- Written communication skills
- Connecting lab & lecture

Bruck et al, 2010
Goals for the data management lab experience

• Critical thinking skills & project design
• Data management skills & techniques
• Engaging in data management activities
• Team science skills
• Project documentation skills
• Connecting data management to the research process
Evidence-Based Teaching

I FACILITATE THINKING.
I ENGAGE MINDS.
I LISTEN TO QUESTIONS.
I ENCOURAGE RISK.
I SUPPORT STRUGGLE.
I CULTIVATE DREAMS.
I LEARN EVERY DAY.

I TEACH.
• Start with the end in mind
• Keep it brief (15-20 minutes)
• Use multiple channels for communicating the message
Effective examples

• Enable learners to integrate new information into a coherent structure (e.g., mental model)

• Provide worked and partially worked examples to facilitate procedural learning

• Provide feedback appropriate for each learner's level of experience

\[
\sigma_x^2 = \frac{\sum_{i=1}^{N} (X_i - \mu_x)^2}{N} \\
\sigma_x^2 = \frac{(2 - 6.8)^2 + (15 - 6.8)^2 + \ldots + (2 - 6.8)^2}{5} \\
= \frac{(-4.8)^2 + (8.2)^2 + \ldots + (-4.8)^2}{5} \\
= \frac{23.04 + 67.24 + \ldots + 23.04}{5} \\
= \frac{114.8}{5} \\
= 22.96
\]
Relevant exercises

- Meaningful
- Contextualized
- Designed to teach the targeted skill NOT following instructions or getting the right answer
- Provide opportunities to apply the targeted skill or procedure or strategy
- Provide opportunities to practice self-regulation of learning skills
Fostering discussion

- Activity-based
- Encourage reflection
- An important part of formative assessment
- Provide opportunities to practice self-regulation of learning skills
Data Management Lab

Pilot: January 2014

Modular Series: March - April 2014

Data Management Lab v2.0 materials available at: http://www.slideshare.net/goldenphizzwizards
Intro to RDM

DM Planning

Organize Data & Files

QA/QC

Collection

Entry & Coding

Screen & Clean

Automate

Protection & Security

Rights & Access

Attribution & Citation

Ethical & Legal Obligations
Measure Twice, Thrice, Many Times, Cut Once

- Define expected outcomes and quality standards for data
- Identify your legal obligations as they affect data management and protection and ethical obligations for ensuring data confidentiality, privacy, and security
- Choose tools, formats, and standards wisely
- Plan & implement a sound storage & backup plan, including use of data locks or master files
- Outline planned project and data documentation to enable effective reporting
- Use best practices for data collection, entry, coding
- point to docs on Slideshare
  www.slideshare.com/goldenphizzwizards

Ask for help
An actionable data management plan

• Draft it during the planning phase
• Update it during start-up
• Correct & maintain it during the active phases
• Enhance it during processing, analysis, & write-up
Defining success

- If you can't measure it, you can't manage it
- Anticipate problems to prevent them
- Information needed to communicate the process and explain products to colleagues (e.g., thesis/dissertation, manuscripts)
- Enabling extension, secondary use/reuse, and replication/reproducibility
Linking data quality standards to process
Failing upwards

- Choose best course format possible
- Teach fewer topics, dive deeper
- Incorporate meta cognitive skills to promote self-regulation of learning
- Structure & support activities better
- Formative assessment of data management plans & documentation
- Evidence of behavior change, implementation
Thanks for your attention!
Images

- Rocky path: https://www.flickr.com/photos/13448066@N04/3255009670/
- Hikers on rocky path: https://www.flickr.com/photos/devonaire/6071209350/
- Old Lab: https://www.flickr.com/photos/sludgeulper/3230950117/
- Enid & Betty in the lab: https://www.flickr.com/photos/28853433@N02/4679198690/
- Microarray chip: https://www.flickr.com/photos/47353092@N00/2034113679/
- Lecturer: https://www.flickr.com/photos/39213312@N07/3722413559/
- I teach: https://www.flickr.com/photos/28430474@N05/6902965047/
- Calculate SD example: http://ci.columbia.edu/ci/premba_test/c0331/s7/s7_3.html
- Discussion group: https://www.flickr.com/photos/47423741@N08/8733059592/
- Success baby: https://www.flickr.com/photos/91633309@N08/8827619102/
- Lab notebooks: https://www.flickr.com/photos/89975702@N00/5878993041/
- Data steward logo: http://www.trilliumsoftware.com/images/360_01.jpg
- Data quality graphic: http://library.ahima.org/xpedio/groups/public/documents/graphic/bok1_049652.jpg
Resources


