A PROPOSED SCAFFOLDING FOR DATA MANAGEMENT SKILLS

From undergraduate education through post graduate training and beyond
What if we graduated data literate students?
WE CURRENTLY DON'T

THE CURRENT STATE OF DATA LITERACY ON MATRICULATION

• Industrial Advisory Boards and Recruiters
  • They retrain just graduated students from scratch on data management (Van Tuyl & Whitmire, 2016)

• Research Faculty
  • Graduate students are unprepared to manage data at the beginning of graduate school. (Carlson et al.2011; Carlson and Stowell-Bracke, 2013)

• Post Docs and Early Career Faculty
  • Self report gaps in data management knowledge (Sapp-Nelson, 2015; Weller & Monroe-Gulick, 2015; McLure et al, 2014)

Created by Spicy Icons from Noun Project
WHAT WOULD WE NEED AS A PROFESSION?

THE TOOLS OF THE TRADE

• An end goal for what a data literate graduate looks like
• A road map to get a typical student to that end goal
• A variety of instructional tools to move students along the road map.

Images courtesy Noun Project.
WHAT WE HAVE AT OUR DISPOSAL

EXISTING COMPETENCIES AND CURRICULA

At least five competency lists:
Qin & D'Ignazio 2010
Carlson et al. 2011
Piorun et al. 2012
Calzada Prado & Marzal Miguel 2013
Schneider 2013

Many individual courses
(Carlson & Stowell Bracke 2015)
(Whitmire 2015)
(Wright & Andrews 2014)
(Johnston & Jeffryes 2013)
(Mandinach & Gummer 2013)
(Qin & D'Ignazio 2010)
(Hogenboom Phillips Hensley 2011)
(Athanases & Bennet 2013)

AND MANY, MANY MORE...

New England Collaborative Data Management Curriculum

DataONE Educational Modules

MANTRA Research Data Management Training
WHAT ARE WE MISSING?

GAP ANALYSIS TIME

• Three gaps identified
  • **Systematic approach**
    • Tracks across the growth of the individual throughout career
    • Measurable, Observable behaviors
  • **Communication tool**
    • Who has been taught what, by whom?
    • To what level has that individual been exposed to that concept?
  • **Assessment tool**
    • Are we meeting our goal of graduating an individual who is data literate?
    • What is the evidence?

Created by Arthur Shlain from Noun Project
WE WERE MISSING THE ROAD MAP

PROJECT IN RESPONSE TO PROFESSION’S NEEDS

Icon Courtesy of NounProject.com “Map” by factor[e] design initiative
PILOT COMPETENCY MATRIX SCAFFOLDING FOR DATA EDUCATION

A FRAMEWORK TO BUILD COMPREHENSIVE DATA EDUCATION

What It Is
A structure to discuss who has taught what to whom
A way to combine existing curricula into a structured whole, if desired
A way to articulate learning goals to learners, colleges within university and ourselves
A way to assess whether we are successful in our teaching and programs

What It Is Not
A data education program (until someone turns it into one)
Immutable
Comprehensive

Created by Anna Sher from Noun Project
SCAFFOLDING TO MOVE LEARNERS ACROSS DOMAINS

MOVING TO MASTERY OF GREATER SKILLS/RESPONSIBILITY

Each step of scaffold represent attempt to equip learners for a specific domain

<table>
<thead>
<tr>
<th>Domain</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Domain</td>
<td>Lifelong Learning</td>
</tr>
<tr>
<td></td>
<td>Personal Data Management</td>
</tr>
<tr>
<td>Team Domain</td>
<td>Knowledge Building Industry</td>
</tr>
<tr>
<td></td>
<td>Team Data Management</td>
</tr>
<tr>
<td>Research Enterprise Domain</td>
<td>“The Buck Stops Here”</td>
</tr>
<tr>
<td></td>
<td>Responsibility</td>
</tr>
<tr>
<td></td>
<td>Directive Data Management</td>
</tr>
</tbody>
</table>

Research
Enterprise
Team
Personal
SELECTED SAMPLE COMPETENCY

EXCERPTED FROM SCAFFOLDING

Bloom’s Levels Indicated

<table>
<thead>
<tr>
<th>Level and Number</th>
<th>Cognitive</th>
<th>Psychomotor</th>
<th>Affective</th>
</tr>
</thead>
<tbody>
<tr>
<td>U25</td>
<td>Schedule regular backups for personal files and follow through on performing the backups.</td>
<td>Initiate multiple backups in multiple locations to ensure preservation of personal files.</td>
<td>Appreciate the importance of backups for the mitigation of file loss through theft or accident.</td>
</tr>
</tbody>
</table>

Bloom’s Levels Indicated

<table>
<thead>
<tr>
<th>Level and Number</th>
<th>Cognitive</th>
<th>Psychomotor</th>
<th>Affective</th>
</tr>
</thead>
<tbody>
<tr>
<td>G25</td>
<td>Set up backups, loss prevention, version control, etc in a logical and routine manner integrated within the research plan.</td>
<td>Mix preservation methods logically in order to create a comprehensive preservation plan.</td>
<td>Relate the function of a preservation technique and describes how the technique adds a layer of added security.</td>
</tr>
</tbody>
</table>
SELECTED SAMPLE COMPETENCY

EXERPTED FROM SCAFFOLDING

U25 Learners integrate regular backups and Lots of Copies Keeps Stuff Safe (LOCKSS) to preserve personal files.²⁵,²⁶

S25 Learners integrate backups, loss prevention, version control, periodic migrations, media-based preservation solution, and other preservation best practices as appropriate to their research project and discipline.

<table>
<thead>
<tr>
<th>Oversee implementation of backups, loss prevention, migration, etc in a routine manner integrated in workflow.</th>
<th>Adopt preservation best practices and implement logically in order to address preservation</th>
<th>Instruct research personnel on preservation techniques and verify that preservation initiatives are being carried out effectively.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set up backups, loss prevention, version control, etc in a logical and routine manner integrated within the research</td>
<td>Mix preservation methods logically in order to create a comprehensive preservation plan.</td>
<td>Relate the function of a preservation technique and describes how the technique adds a layer of added security.</td>
</tr>
</tbody>
</table>

Purdue University Libraries
WHY CALL IT A SCAFFOLDING?

TYING THE NEW COMPETENCIES TO OUR PREVIOUS WORK

As learners move from one phase to another, scaffolding must be applied to build on their existing skills in order to move them to the next domain.

Scaffolding includes:
- Learning objects such as tutorials, modules, etc.
- Activities
- In person/online instruction

We have been building these learning artifacts (courses, tutorials) without the underlying structure. This is an opportunity to circle back and to slot these objects into a systematic approach to education.
STATS ABOUT THE PILOT

WHAT IT CONTAINS

• Started from Carlson, Fosmire, Miller, Sapp-Nelson 2011.
• Ended with 35 competencies in the scaffolding.
• All competencies have the Undergraduate, Graduate, and Data Steward levels built in, as well as descriptive learning objectives
  Bloom’s Cognitive, Psychomotor, Affective
• Competencies reference additional articles or resources that inspired or directly influenced the competency as written.
• Reference list is attached to the matrix.
• Additionally, each level (U, G, S) is packaged separately for convenience.

12 Competencies

<table>
<thead>
<tr>
<th>Competency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Databases and Data Formats</td>
</tr>
<tr>
<td>Discovery and Acquisition of Data</td>
</tr>
<tr>
<td>Data Management and Organization</td>
</tr>
<tr>
<td>Data Conversion and Interoperability</td>
</tr>
<tr>
<td>Quality Assurance</td>
</tr>
<tr>
<td>Metadata</td>
</tr>
<tr>
<td>Data Curation and Re-use</td>
</tr>
<tr>
<td>Cultures of Practice</td>
</tr>
<tr>
<td>Data Preservation</td>
</tr>
<tr>
<td>Data Analysis</td>
</tr>
<tr>
<td>Data Visualization</td>
</tr>
<tr>
<td>Ethics, including citation of data</td>
</tr>
</tbody>
</table>
WHAT’S NEXT?

WHAT IF WE GRADUATED DATA LITERATE STUDENTS?

• Conversation
• Customization for Purdue
• Dreaming:
  • Pilot systematic approach to graduate education first
  • Then approach liaisons with undergraduate competencies as well.

Created by Richard Schumann from Noun Project
PILOT SCAFFOLDING IS AVAILABLE FOR DOWNLOAD

PILOT VERSION

Available for reading/sharing, but not editable at this time.

URL:  http://docs.lib.purdue.edu/lib.fsdocs/136/
Or  http://bit.ly/1Tw1teb

Editable version will go up in July 2016 on purr.purdue.edu.

Watch twitter @sappnelson for more information.
REFERENCES: BACKGROUND ON TRAINING NEEDS

IF YOU WANT TO KNOW MORE


REFERENCES: PUBLISHED COMPETENCY LISTS

IF YOU WANT TO KNOW MORE


REFERENCES: DIL COURSES ALREADY DEVELOPED

FOR MORE INFORMATION


Any Questions?