Beyond Statistical Literacy: Open Data for Teaching, Collaboration, and Profit

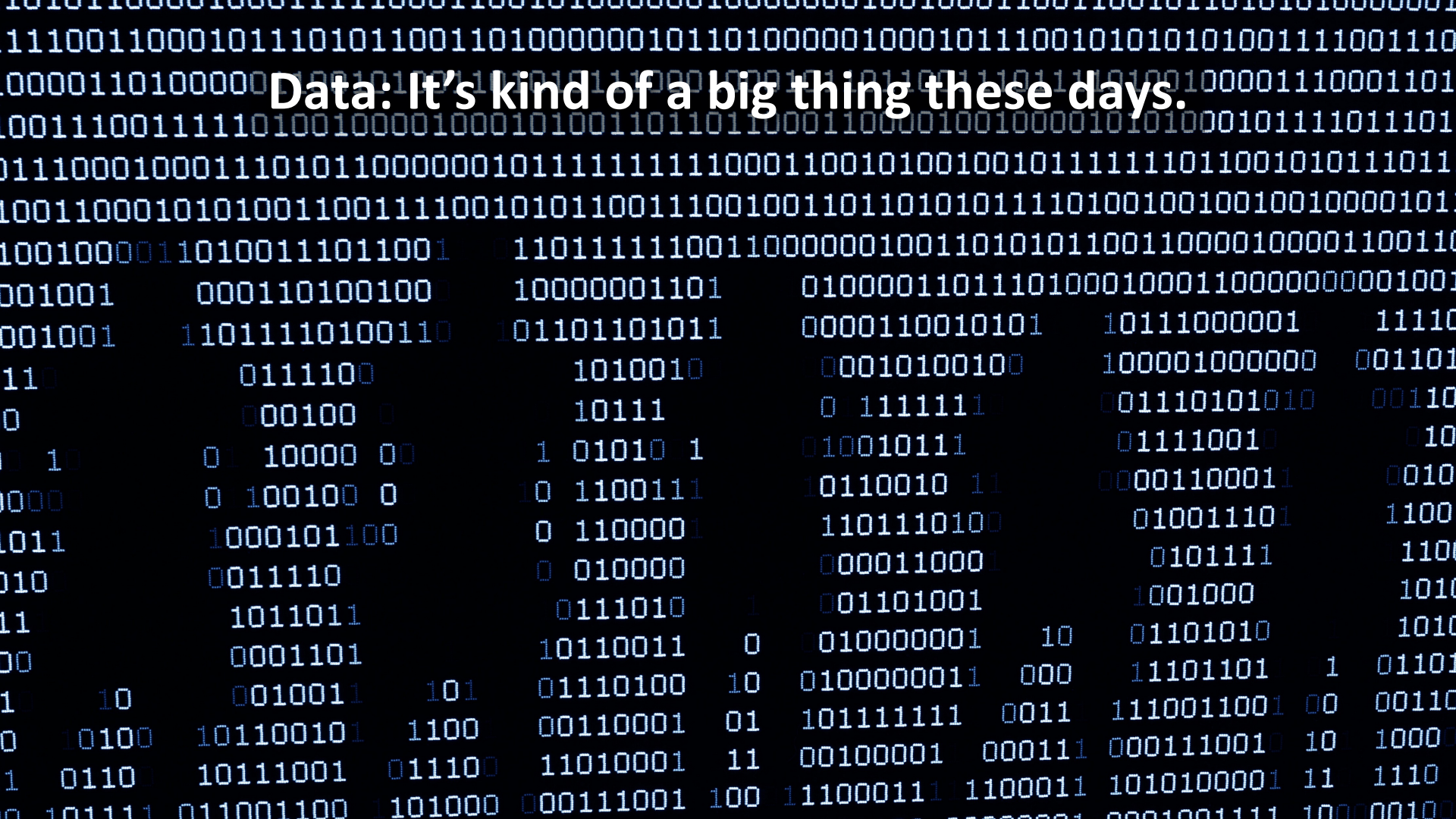
Mike Smit

School of Information Management

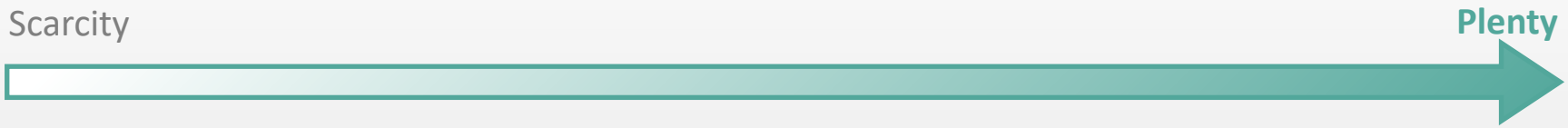
Faculty of Management

@michael_smit

DALHOUSIE UNIVERSITY


Data: It’s kind of a big thing these days.

Transition from data scarcity to data plenty

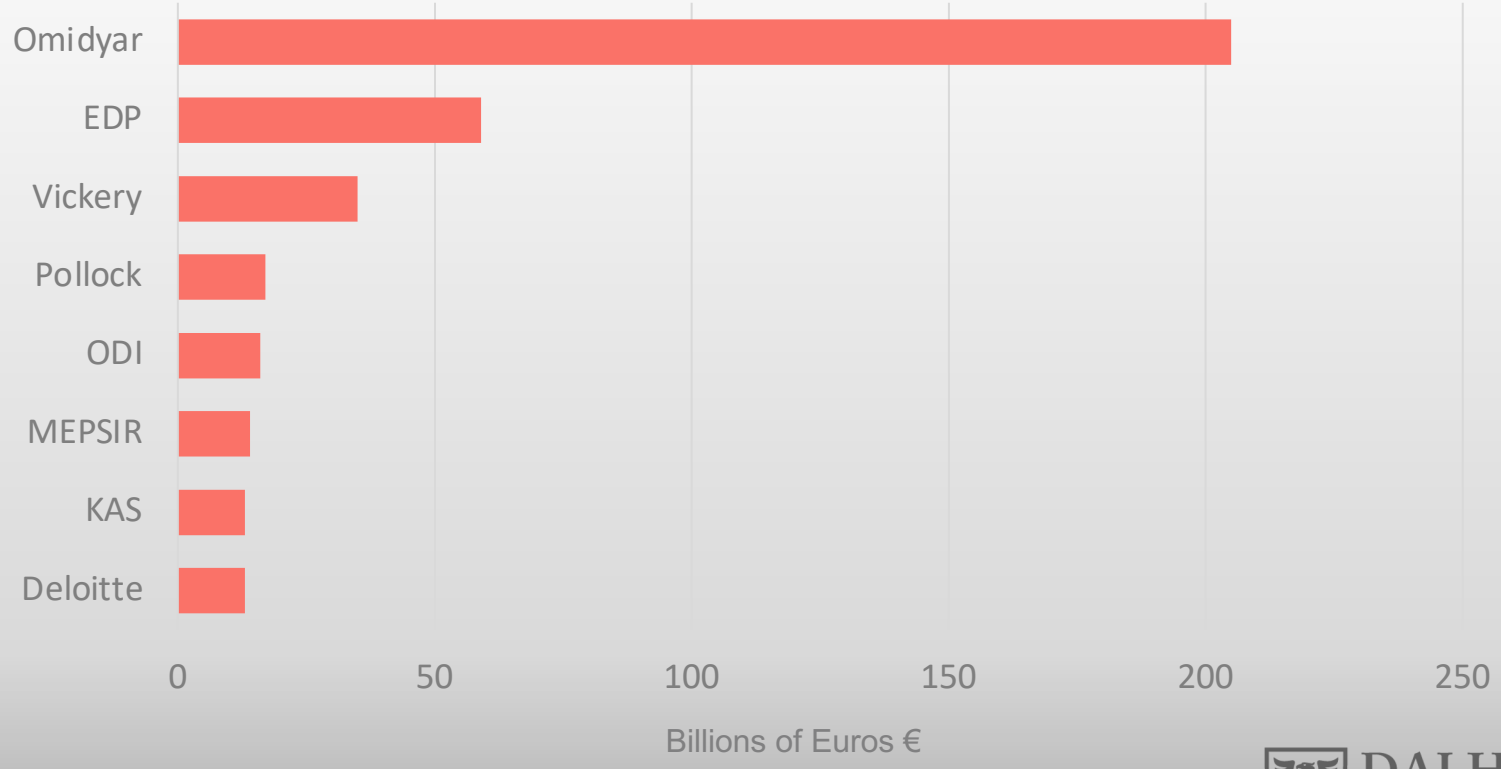


- Data is an asset & must be protected
- Challenge is accessing the data you need
- Mostly competition
- Short-term gain
- Key issue: data hoarding

- Relationships are an asset, data is a networking tool
- Challenge is finding the data you need
- Mostly cooperation
- Long-term gain
- Key issue: data waste

DALHOUSIE UNIVERSITY

Various estimates for the value of open data to EU

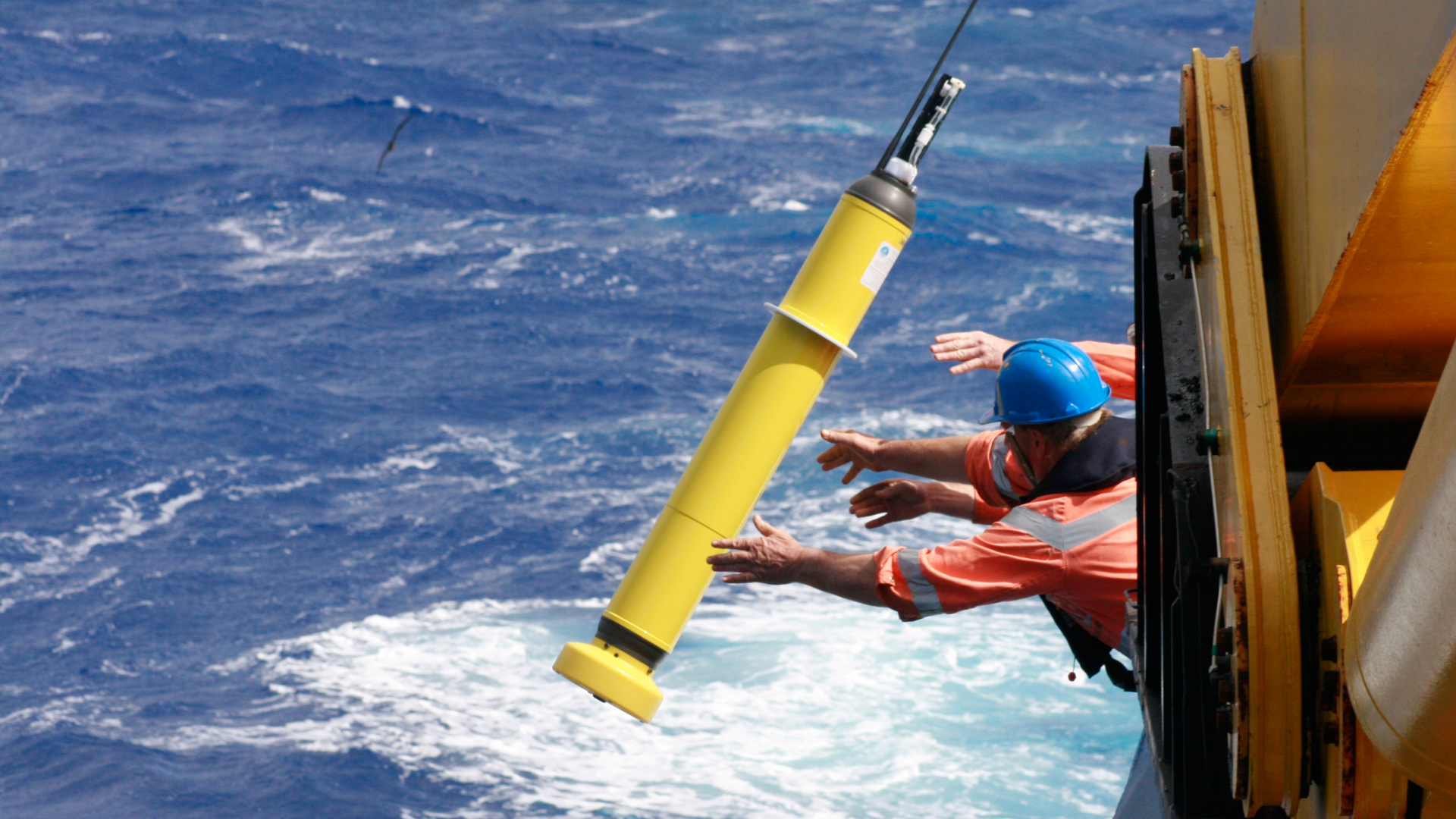


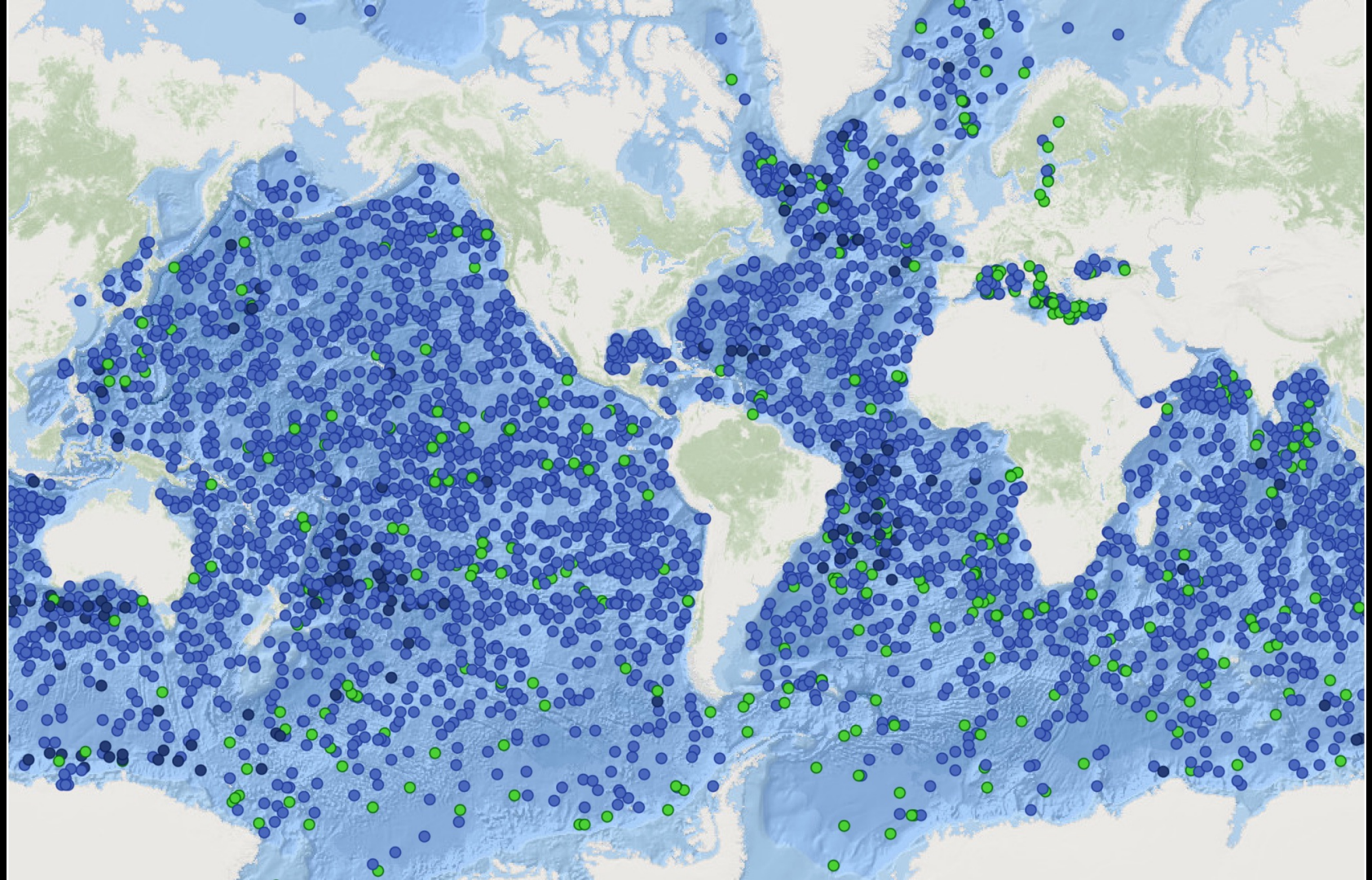
Compiled by: European Data Portal. (2017). Analytical Report 9: The Economic Benefits of Open Data.

DALHOUSIE UNIVERSITY

Schrödinger’s Data: open data is worthless and priceless at the same time

DALHOUSIE UNIVERSITY





So how do we equip society to unlock this value?

- Some thoughts, based on five main categories of information

DALHOUSIE UNIVERSITY

Strategies and Best Practices for Data Literacy Education

- SSHRC Knowledge Synthesis
- The transdisciplinary Team:

Chantel Ridsdale MLIS graduate student	**James Rothwell** MLIS/MPA graduate student	**Hossam Ali-Hassan** Business (MIS)
Michael Bliemel Business (MIS)	**Dean Irvine** English	**Daniel Kelley** Oceanography
Stan Matwin Computer Science	**Mike Smit** Information Management	**Brad Wuetherick** Centre for Learning & Teaching

Social Sciences and Humanities Research Council of Canada
Conseil de recherches en sciences humaines du Canada
Canada

Strategies and Best Practices for Data Literacy Education

Knowledge Synthesis Report

Chantel Ridsdale, James Rothwell, Mike Smit,
Hossam Ali-Hassan, Michael Bliemel, Dean Irvine,
Daniel Kelley, Stan Matwin, and Brad Wuetherick

Databilities®

A data literacy competency framework

[PDF] **Strategies** and **best practices** for **data literacy** education: Knowledge synthesis report

C Ridsdale, J Rothwell, M Smit, H Ali-Hassan… - 2015 - dalspace.library.dal.ca

BACKGROUND: We begin with a definition, synthesized from existing literature and refined based on expert input: **Data literacy** is the ability to collect, manage, evaluate, and apply **data**, in a critical manner. It is an essential ability required in the global knowledge---based …

☆ Cited by 121 Related articles All 6 versions »

Chantel Ridsdale, Adrienne Colborne, and Michael Smit
Dalhousie University

Proficient Use of Open Data Requires These Core Information Skills: An Open Data Community Perspective

Abstract:

Expanding access to open data, such as government data and research data, requires that we consider how citizens and stakeholders can best access the value these data hold. Should individuals rely on an intermediary to create information products from the data, or should they dive in and work with raw data? Building on previous work defining a core set of data literacy skills, we convened a workshop with 34 open data professionals to define the core set of skills for working with open data: "open data literacy". Analysis of their perspectives reveals a focus on non-technical skills, like creativity, curiosity, and critical thinking, as a priority over technical skills like coding and visualization. We describe their perspective in

CIOOS
CANADIAN INTEGRATED OCEAN OBSERVING SYSTEM

SIOOC
SYSTÈME INTÉGRÉ D'OBSERVATION DES OCÉANS DU CANADA

Data access for Canada's future

- Ocean Health
- Ocean People
- Ocean Economy

Nova Scotia Government

DALHOUSIE UNIVERSITY

Bachelor of Management
MGMT 2605
Working with Data
Fall 2020

RECOGNITION OF MI'KMAQ TERRITORY

Dalhousie University is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq. We are all Treaty people.

The Elders in Residence program provides students with access to First Nations Elders for guidance, counsel and support. Visit the office in the Indigenous Student Centre, 1321 Edward Street, or email Elders@dal.ca.

Instructor:	Colin Conrad
Pronouns:	he/him
Office:	Kenneth C. Rowe Management Building, 4020
Telephone:	(902) 494-8378
E-mail	colin.conrad@dal.ca

About Your Instructor:

Colin Conrad, Ph.D., Assistant Professor
School of Information Management, Dalhousie University

dal.ca/execed/big-data

DATA LITERACY & BUSINESS ANALYTICS WORKSHOP

data literacy: The ability to create, comprehend, and communicate data.

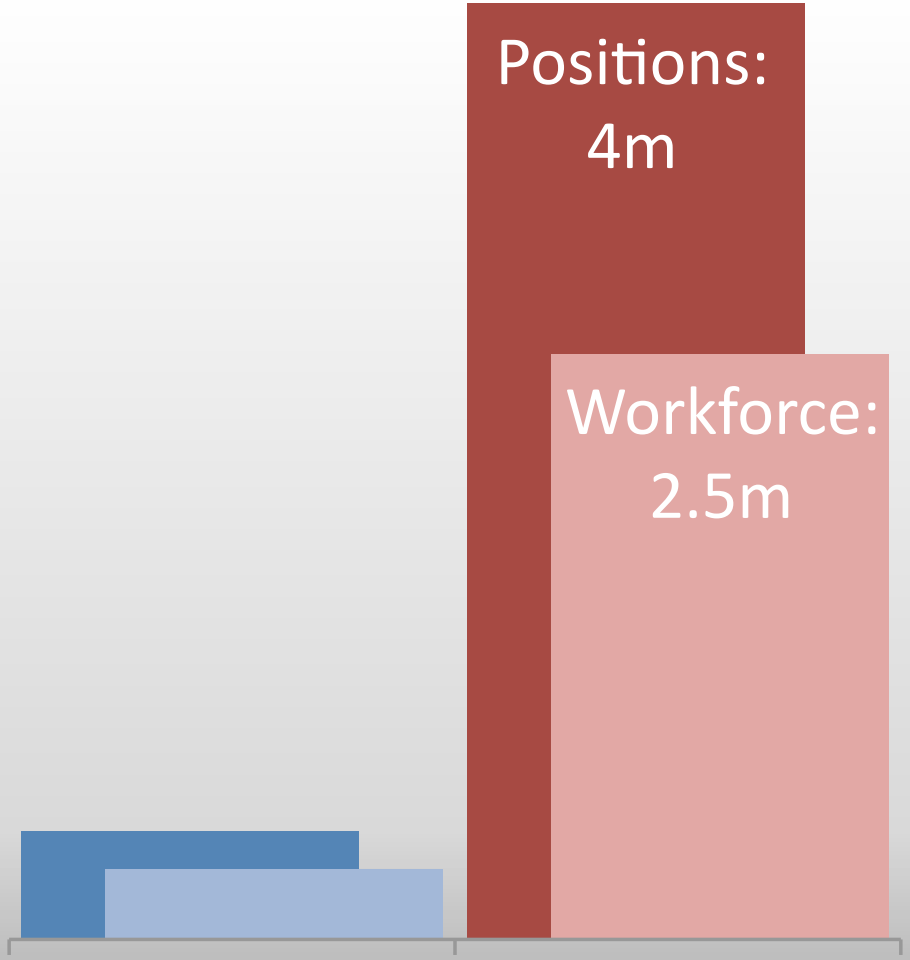
The ability to collect, manage, evaluate, and apply data, in a critical manner.

“By 2018, the United States alone could face a shortage of 140,000 to 190,000 people with deep analytical skills…”

McKinsey Global Institute

Skills Gap

- Predicted for US in 2018 by McKinsey Global Institute



DALHOUSIE UNIVERSITY

Closing Canada's
Big Data Talent Gap

Canada's Big Data Consortium
October 2015

We would like to thank the following organizations for their leadership and in-kind contributions to Canada's Big Data Consortium, Canada's Big Data Talent Gap Study, and to this paper, "*Closing Canada's Big Data Talent Gap.*"

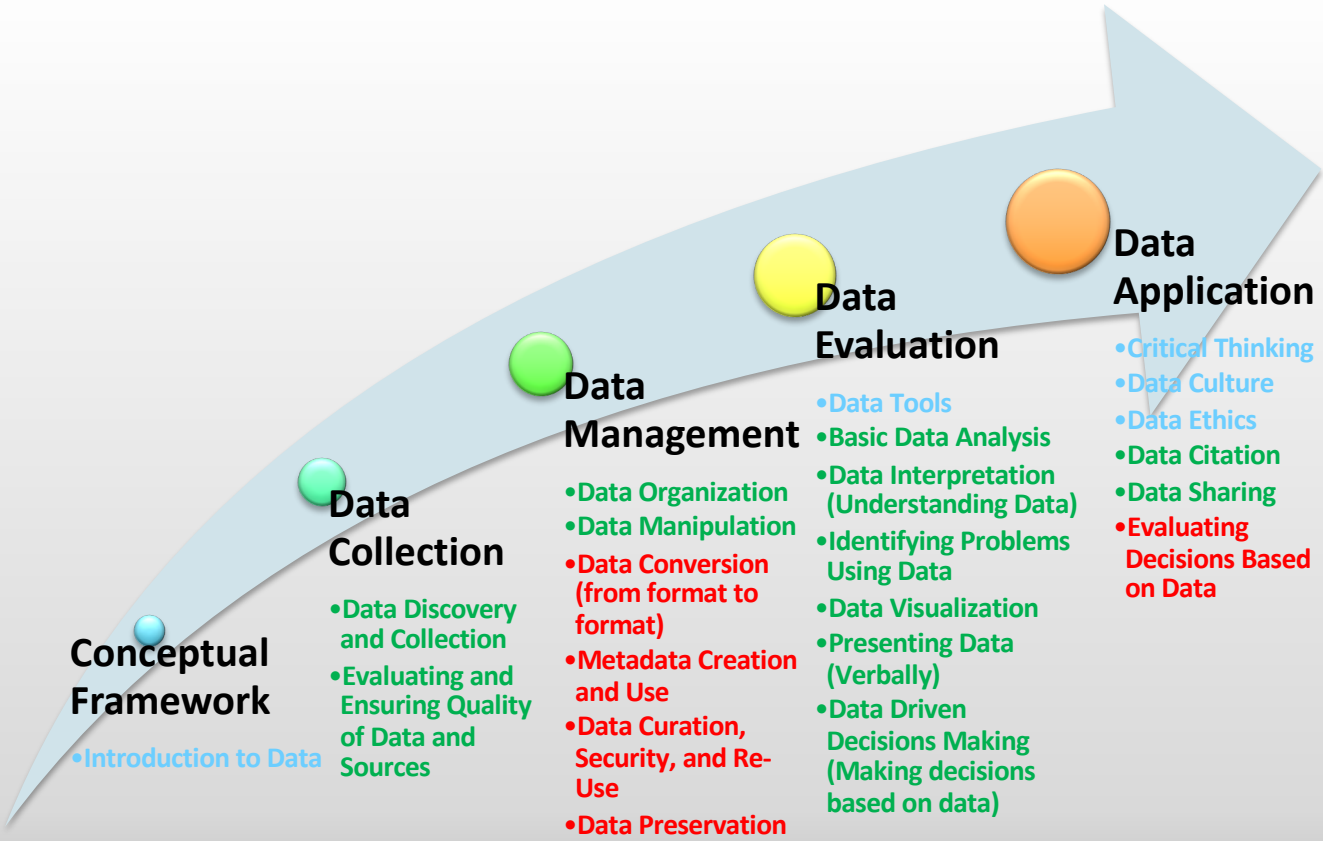
Ryerson University · Dalhousie University Inspiring Minds · Concordia University · SFU Simon Fraser University Engaging the World · Government of Canada / Gouvernement du Canada

Deloitte. · ITAC · ACTI · CIO Association of Canada · TMX · SAS

21st Century Literacies

- Data Literacy can be understood as part of a broader suite of literacies
- Information literacy
- Technological/digital literacy
- Statistical/numerical literacy
- Visual literacy
- Scientific literacy
- Cultural literacy
- Metaliteracy/transliteracy

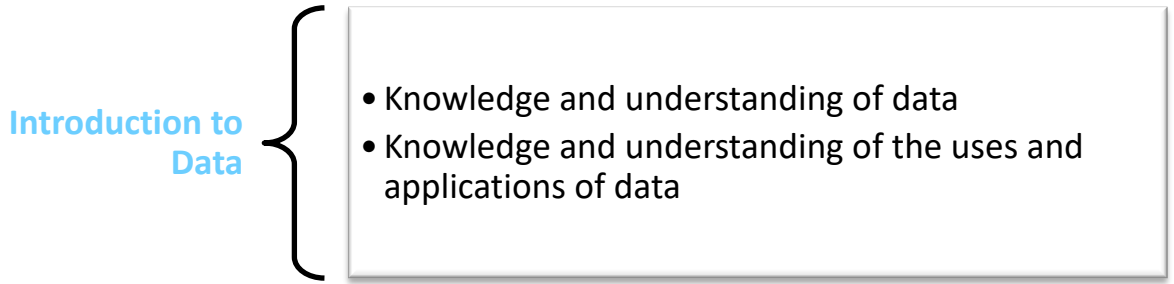
DALHOUSIE UNIVERSITY



Conceptual Competencies
Core Competencies
Advanced Competencies

DALHOUSIE UNIVERSITY

Conceptual Framework



Conceptual Competencies
Core Competencies
Advanced Competencies
- Knowledge/Tasks

Data Collection

Data Discovery and Collection

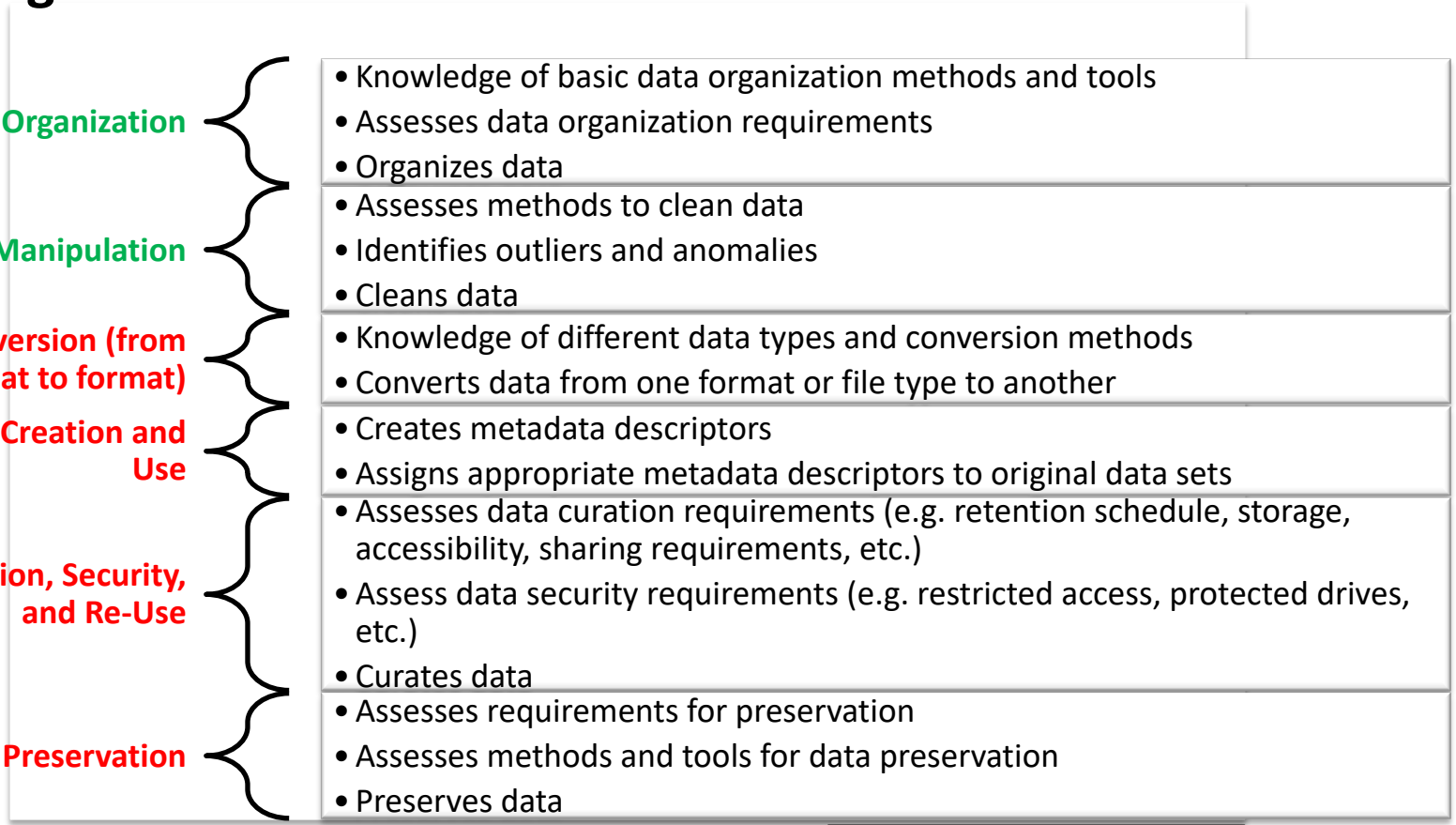
- Performs data exploration
- Identifies useful data
- Collects data

Evaluating and Ensuring Quality of Data and Sources

- Critically assesses sources of data for trustworthiness
- Critically evaluates quality of datasets for errors or problems

Conceptual Competencies
Core Competencies
Advanced Competencies
- Knowledge/Tasks

Data Management

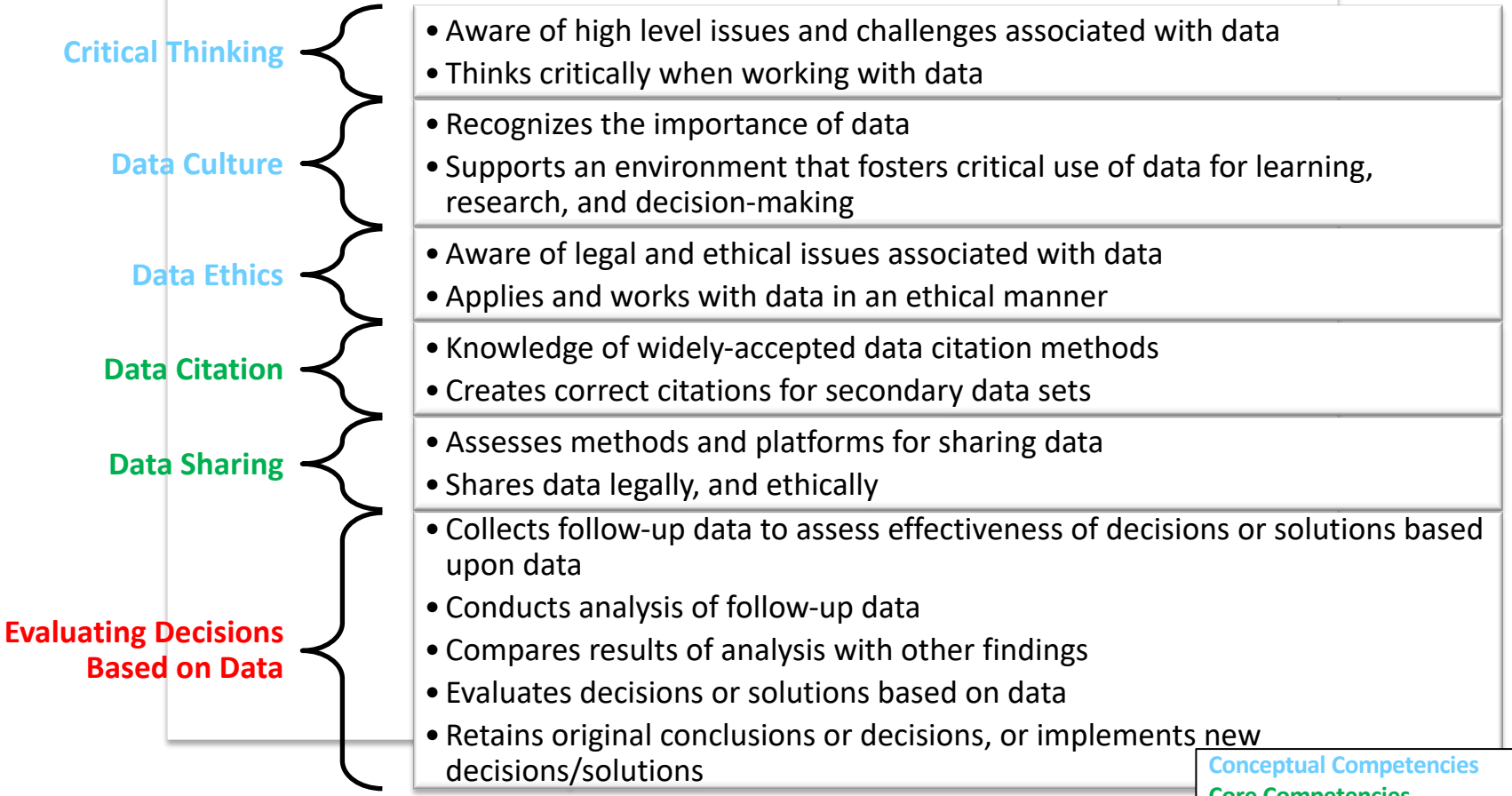


Data Evaluation

Conceptual Competencies
Core Competencies
Advanced Competencies
- Knowledge/Tasks

Data Tools	•Knowledge of data analysis tools and techniques •Selects appropriate data analysis tool or technique •Applies data analysis tools and techniques
Basic Data Analysis	•Develops analysis plans •Applies analysis methods and tools •Conducts exploratory analysis •Evaluates results of analysis •Compares results of analysis with other findings
Data Interpretation (Understanding Data)	•Reads and understands charts, tables, and graphs •Identifies key take-away points, and integrates this with other important information •Identifies discrepancies within the data
Identifying Problems Using Data	•Uses data to identify problems in practical situations (e.g. workplace efficiency) •Uses data to identify higher level problems (e.g. policy, environment, scientific experimentation, marketing, economics, etc.)
Data Visualization	•Creates meaningful tables to organize and visually present data •Creates meaningful graphical representations of data •Evaluates effectiveness of graphical representations •Critically assesses graphical representations for accuracy and misrepresentation of data
Presenting Data (Verbally)	•Assesses the desired outcome(s) for presenting the data •Assesses audience needs and familiarity with subject(s) •Plans the appropriate meeting or presentation type •Utilizes meaningful tables and visualizations to communicate data •Presents arguments and/or outcomes clearly and coherently
Data Driven Decisions Making (Making decisions based on data)	•Prioritizes information garnered from data •Converts data into actionable information •Weighs the merit and impacts of possible solutions/decisions •Implements decisions/solutions

Data Application



Skill	Votes
Basic statistics & math	19
Pattern Recognition	17
Basic computer literacy	16
Ability to judge sources; where is the data coming from	15
Skepticism	13
Communication Skills	13
Data Visualization	11
Patience & Focus	10
Curiosity	10
Awareness of bias	10

The top individual skills required to work directly with open data, as identified by a panel of experts.

DALHOUSIE UNIVERSITY

Skill Area	Number of Skills	Total Votes
Critical Thinking	5	47
Numeracy	5	41
Awareness	7	38
Analysis	7	35
Communication	5	34
Attitude	7	32
Computer Knowledge	6	27
TOTAL	**42**	**254**

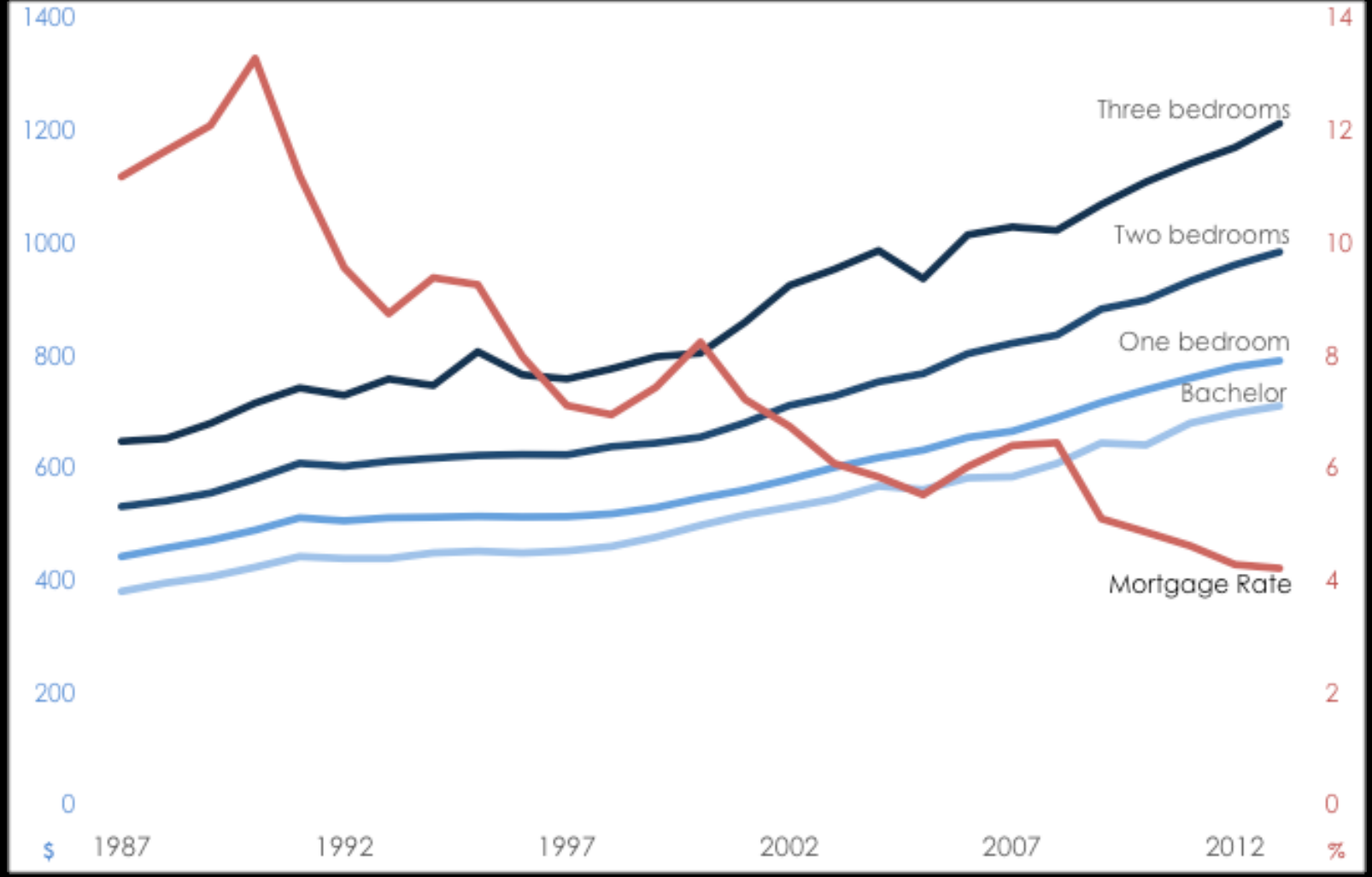
How do we produce more data-literate graduates?

- We have data literacy expertise
- We teach elements of data literacy every day
- Many graduates are data literate without knowing it!

- No systematic, cross-discipline best practices
- No universal standard
- Not always taught as transferable skill

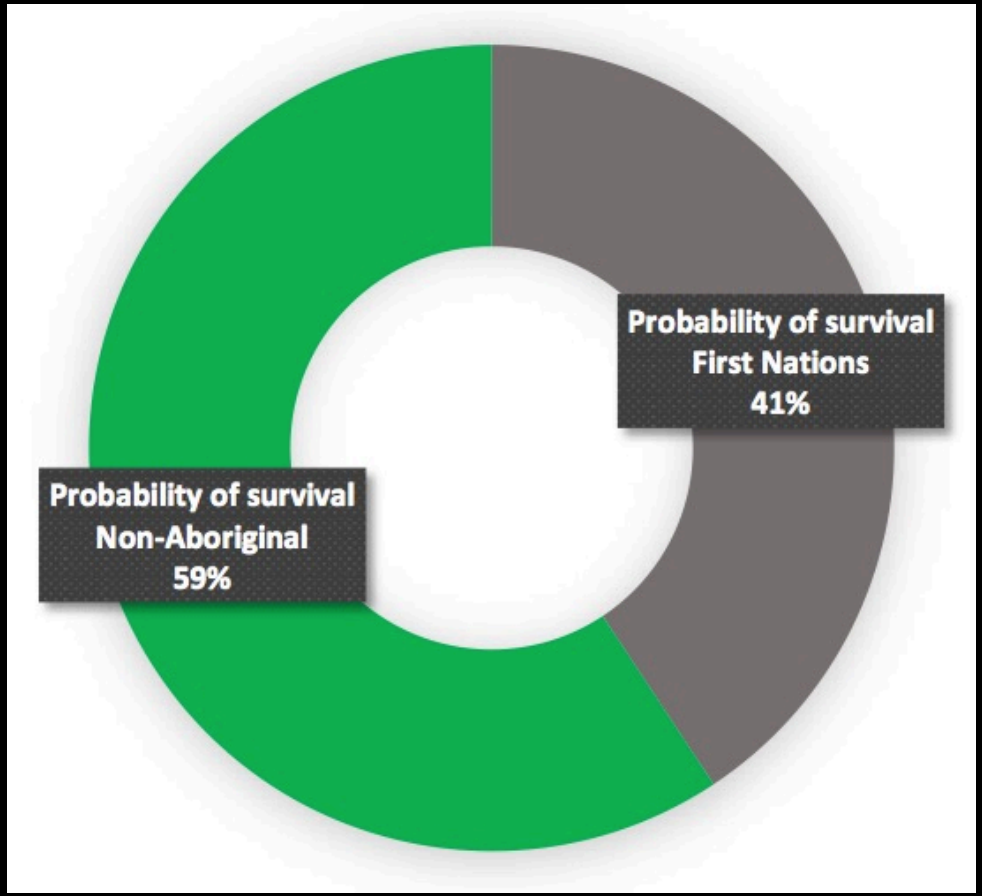
1. Project-based learning with some choice

- Projects that include a wide range of investigation and have real-world applicability will solidify the connection between process/theory and practice. The project will allow evaluators the chance to assess skills practically, instead of formally.
- Projects should offer students the opportunity to go further than you expect.
- We love to use open data for this!



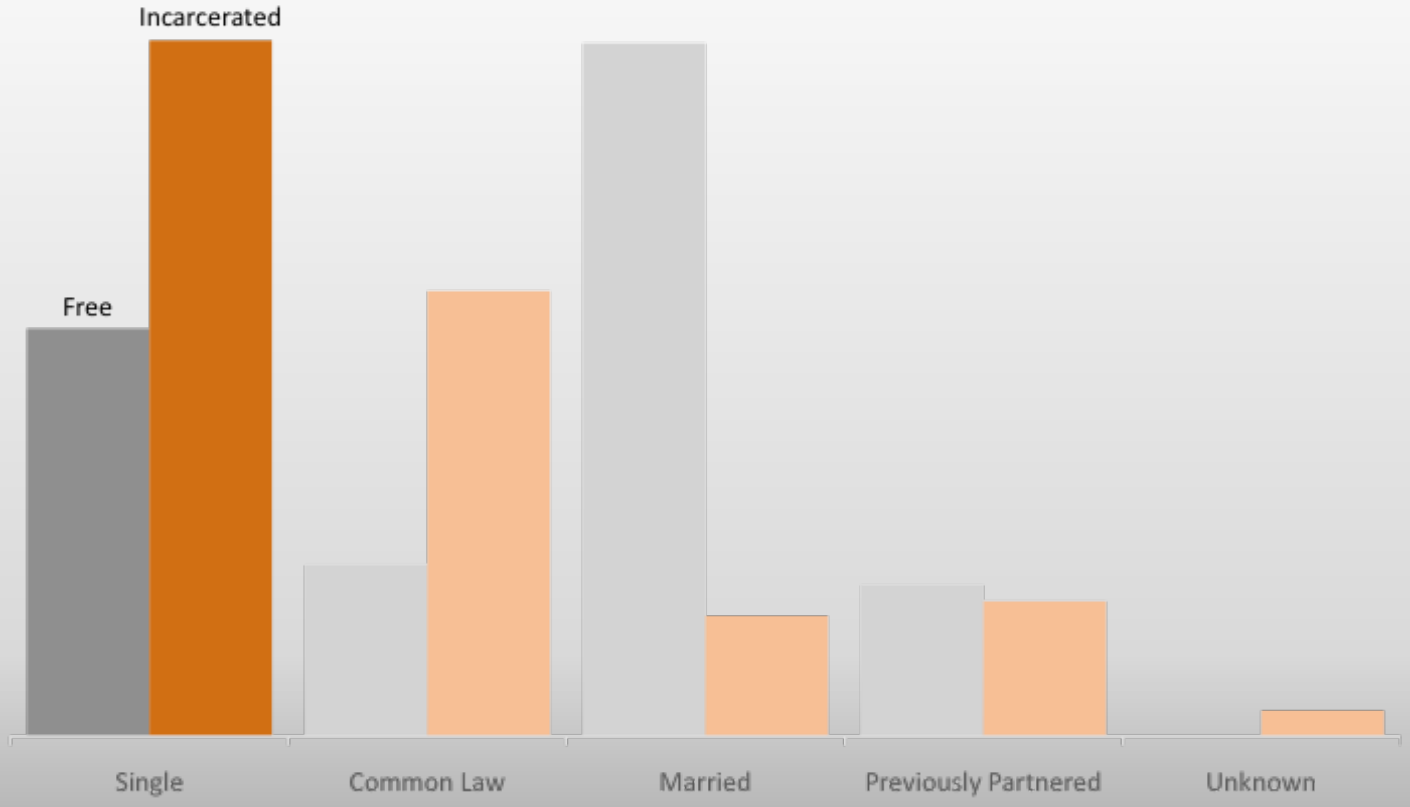
Carlisle Kent, MLIS /MREM 2016

Probability of Women Surviving 80 Years



Ray MacLeod, MLIS

Canada's Most Eligible Bachelors:
Marital Status for Incarcerated Men vs. Canadian Men Over 18



Keriann Dowling, MLIS

2. Link training to things that matter to students

- The benefits of data, and data skills, must be clearly stated from the beginning. This is particularly true for mid-career learners, who will be more willing to invest their limited time and effort if they see the opportunity to help their community, industry, family, or others.
- The motivation should be intrinsic for students

VIRTUAL REALITY OCEAN CHALLENGE

JANUARY 17 & FEBRUARY 6
SHIFTKEY LABS

SHIFTKEY LABS

SURGE
Science Unleashed

3. Modular, just-in-time learning (as possible)

- The “learn this now because you’ll need it later” has always been a stretch, and now even more so
- Making training available in the moment when it is needed for things that matter intrinsically to students
- Integrated into other courses in a program / curriculum
- Related to the concept of learning / tutoring centres and similar

4. Hands-on learning, and make mistakes okay

- Hands-on learning in workshops and labs provides students with the necessary practical experience needed to fully understand a technical skill; students need the chance to figure out processes and methods on their own and make mistakes to readjust their own understanding. Mechanics are very important in data literacy; practice is required. Making mistakes can be frustrating, but will encourage critical thinking and problem solving.

5. Laddering / iterative learning

- Allows students to build upon previously learned skills, encouraging process over memorization or following rigid instructions, and ultimately making learning an unfamiliar concept more manageable. Beginning small and working up to the more complicated tasks allows students to have confidence in their abilities.

When?

- Before post-secondary?


iPad

System Barriers to Effective Data Literacy Instruction

- **Lack of support/conditions** for innovative learning, e.g. creativity, risk-taking (Johnson, Adams Becker, Estrada, & Freeman, 2015).
- **Lack of university faculty trust** in benefits of data literacy (Ikemoto & Marsh, 2008; Johnson, et al 2015).
- **Mixed support** for different data literacy competencies, e.g. teaching some aspects of data literacy, but not others (Carlson, Johnston, Westra, & Nichols, 2013)
- **Abstract nature and perceived complexity** of data literacy and related concepts (Qin & D'Ignazio, 2010; Twidale, Blake, & Grant, 2013).
- **Misconception** that the Net Generation/Digital Natives are inherently **more knowledgeable technically** than past students (Thompson, 2012).

Operational Barriers to Effective Data Literacy Instruction

- Modifying existing curriculum to include **room for course(s**) on data literacy (Hunt, 2004; Teal, Cranston, Lapp, White, Wilson, Ram, & Pawik, 2015)
- Not enough skilled professors, or not enough time to **learn the required skills to effectively teach a data literacy** course (Boyles, 2012; Carlson, et al, 2013; Teal, et al, 2015)
- Poor communication regarding student learning goals, as well as a **lack of communication/collaboration between professors** relating to what has been covered in courses, and what should be developed for future courses (Cowan, Alencar, & McGarry, 2014 ; Teal, et al,, 2015)
- Differing levels of **comfort and experience with technology and/or data**, differing levels of education (graduate vs. undergraduate), and age/generational differences between students (Jones, Ramanau, Cross, & Healing, 2009; Shorish, 2015)

DALHOUSIE UNIVERSITY

Questions / Discussion Welcome!

- Mike.Smit@dal.ca
- @michael_smit

DALHOUSIE UNIVERSITY

References

- Full references are available in the KS report at http://dalspace.library.dal.ca/handle/10222/64578

.

DALHOUSIE UNIVERSITY