Science Literacy

- National Science Education Standards
  - Science literacy entails being able to read with understanding articles about science in the popular press and to engage in social conversation about the validity of the conclusions

- Literature
  - Science literacy has been broadly defined as the ability to understand how science is practiced, how science knowledge is gained, and how science is distinguished from other kinds of knowledge
Information Literacy Components

Learning Outcomes

- Understand the definition of primary literature in order to distinguish it from other types of literature (secondary and tertiary)
- Recognize how to locate appropriate sources using library resources
- Demonstrate how to use appropriate attribution in order to be an ethical user of information (avoiding plagiarism by citing sources as part of constructing an argument and presenting information)
Worcester Polytechnic Institute (WPI)

WPI

- STEM Focused University
- Seven week terms
- No prerequisites / required order of courses

Biology Department

- For majors classes vs non majors
- Basic science requirement
- Major Qualifying Project/ Capstone
BB1045 Biodiversity

General Information

- For majors course
- 75-100 students
- In-class and out of class work (5 modules on primary literature)
- Term project (final project)

Timeline and Type on Inclusion

- Students work through Module 1 (including completing the HW for Module 1)
- Librarian visits the class
- Integrated follow up post in class site
- Module Quiz 1 (with IL questions and answers provided by librarian)
- Attend final presentations
Teaching Outcomes

- Students asked more advanced questions during the in-class discussion
- Students referenced more varied and advanced sources during the in-class discussion
- Students asked citation questions throughout the term regarding proper formatting
Supplemental Information

Literature Categories (as defined for this class)

Primary: is the publication of information that is original research or, the first (or primary) place this information is available to readers [peer-reviewed articles, research article, monograph, government document, or notebook]

Secondary: any form of literature that condenses, synthesizes, or draws upon primary literature [books, review articles, and newspaper or magazine articles]

Tertiary: a form of literature that compiles lists or facts from primary or secondary sources [dictionaries, encyclopedias, handbooks, and fact sheets]
References

Thank you!

Q&A
Supplementary Materials
LIBRARY INSTRUCTION PREPARATION FORM

Requestor: Marja Backermans
Course Name & ID: Biodiversity
Room: Classroom Lower Fuller
Time/Date: Thursday, January 26, 2017
# of participants: 64
Student Type: FY-SR UGrads
Librarians: Rebecca Ziino Plotke

Important Background Information:
Syllabus (Marja Bakermans BB1045) Overall Learning Outcomes: Describe the mechanisms of evolution and evaluate the need for biodiversity. Quantify, analyze, and interpret ecological data. Apply the principles of biodiversity conservation to current ecological issues. Demonstrate knowledge and skills developed in the area of expertise of your project. Think critically about complex ecological issues.

Teaching and Learning Outcomes:
By the end of the session, students will be able to:

- Understand the definition of primary literature in order to distinguish it from other types of literature (secondary and tertiary)
- Recognize how to locate appropriate sources using library resources
- Demonstrate how to use appropriate attribution in order to be an ethical user of information (avoiding plagiarism by citing sources as part of constructing an argument and presenting information)

Final Group Project
- Select 1 concept from the term (hint: look through your book and see what interests your group the most). Submit a 1 paragraph proposal of the concept you will explore with your team AND the journal article you will present to the class.
- Final Project: Your team will link content from lecture with information from the primary literature modules in a presentation of a scientific article to the class. More information will follow.

Class Outline:
Teaching (~20mins)

Introduction (2 minutes)
- Welcome and introduction
  - Provide a breakdown of the objectives for the hour (provide the why!) – relate back to the syllabus [understanding primary literature final project]
  - Find out if there are any questions regarding Module 1 (library module)

Part I: Using Scholarly Peer-Reviewed Research: (~15 mins)

Peer-Review Literature
Discussion/Talking Points:
- Ask for the definition of primary literature from the module
- Secondary & Tertiary
- Discuss identifying elements of a scholarly resources (transition by explaining we are going to look at some of these elements together and how to use components of a scholarly source to advance your research)

Summon & Databases
Overview: This portion of the class is a lot of modeling searching and talking through sources

Sample keywords/topic: Jellyfish; climate; biodiversity; trophic cascade
- Navigate to the library homepage (http://web.wpi.edu/academics/library/) [remind students that navigating the library home page and general search was part of module 1 – ask again if there are any questions]
• Model: search Summon with keywords (ALL tab on library home page)
  o talk through crafting a search strategy with keywords and how this broad database provides you with insight into the scope of the topic, and gives additional keywords and concepts for taking next steps in more tailored databases
• Model: search Scopus, ScieneDirect, BioOne
  o Choose an article/resources from each database
  o Compare results and any additional/different features
  o Highlight range of journals, types of sources, and how to access (full-text direct vs full-text finder/ILL)
  o Highlight how to find additional resources using a scholarly article
    ▪ References
    ▪ Journal Search
    ▪ Citation/Cited by

Part II: Plagiarism, Copyright, Citation

Discussion & Resources
• Reiterate the importance of both in-text and end of document citation (look again at scholarly article)
• Talk about the safe assign and academic honesty
• Highlight resources:
  o Citing Sources Libguide http://libguides.wpi.edu/content.php?pid=120054
  o CSE Handbook University of Wisconsin http://writing.wisc.edu/Handbook/DocCSE_NameYear.html

Wrap Up
• Re-cap top points (primary literature elements of an article)
• Request an appointment: https://www.wpi.edu/academics/library/help/request-consultation.html or walk in office hours 8:00am-5:00pm Mon-Fri
• Email rziino@wpi.edu
Module 1 slides are a portion of curriculum developed by:
  Marja Bakermans, Ph.D. Assistant Teaching Professor Biology and Biotechnology
  Worcester Polytechnic Institute
  Input on library content from Rebecca Ziino Plotke, Research and Instruction Librarian

Course: BB1045 Biodiversity

Contact: Rebecca Ziino Plotke rziino@wpi.edu
Finding primary literature and other sources

How do you identify whether a source is primary, secondary, or tertiary?

Fortunately for you, the WPI Gordon Library has key steps in place on their search engines to help you distinguish between these types of sources. You can use different search engines, filters, and quick links to narrow down your searches and identify the type of document you found.

I recommend 2 strategies to search for primary literature: 1) starting with the Summon search engine and using filters (see Figures 2 and 3), and 2) going directly to a database (see Figure 4).

WPI & The Gordon Library
Finding and distinguishing primary, secondary, and tertiary literature

Part A: Start Searching
Begin by navigating to the Gordon Library website (http://www.wpi.edu/academics/library.html). Here you will be able to access subject specific databases, journals, and the library's discovery search tool Summon.

1. Summon
   a. Search Summon by using keywords (example: wildlife AND conservation AND climate)
   b. To narrow your results down to primary literature and distinguish between types of sources you will need to apply filters (see figure 2)

2. Quick Links
   a. Also available is the ability to search directly in the library's databases that hold collections of the journals containing primary, secondary, and tertiary literature (more detail will be provided in Part B)

Figure 2: Strategies for finding sources can be found through searching on Summon (highlighted in blue) or in Databases (highlighted in green) from the Gordon Library homepage. The ‘AND’ terms were added to join the different concepts together.
Figure 2. Strategies for finding sources can be found through searching on Summon (highlighted in blue) or in Databases (highlighted in green) from the Gordon Library homepage. The ‘AND’ terms were added to join the different concepts together.

Figure 3. The next step (Part B) in Strategy 1 is to use filters to limit the types of sources included in your search.

When you search directly in a Database on the WPI library website, you will see you have many database options to choose from but ScienceDirect, Scopus, and Web of Science are your best options in the ecology and biodiversity research. See Figure 2 for the Quick Link to get to databases.
Remember research requires using a variety of the databases to find scholarly peer-reviewed literature.
What are in-text citations and why do authors use them?

When an author supports their claim on a topic they must reference the sources/authors where they found that information by providing an in-text citation. In part, this demonstrates ethical use of information by explaining to the reader who produced the original information or idea. In addition, it allows the reader to go to those sources and verify your claims. Furthermore, a reader may want to go to those sources and learn more (on background, methods, results, etc.) of that particular study or track the progression of information or ideas through time. The only way a reader can do any of these steps is for the author to clearly cite any information they used in the process of their research along the way.

For example, in the Introduction of an article on predicted loss of large mammals in Europe by Rondinini and Visconti (2015) they wrote,

> Habitat destruction is the most pervasive threat to animal species in general (Hoffman et al. 2010) and mammals in particular (Schipper et al. 2008), and large mammals are expected to be particularly sensitive to this threat due to their area requirements. Body size is indeed correlated with extinction risk in mammals (Cardillo et al. 2005; Davidson et al. 2009), and one large mammal in 3 is threatened with extinction (Schipper et al. 2008), a figure that has increased substantially in the past 40 years in response to anthropogenic pressures (Di Marco et al. 2014).

The authors clearly and ethically support their claims by sending the reader directly to the sources that generated that information (like body size is related to extinction risk). Notice that 5 sources were used in just 2 sentences and 1 of those sources was used twice. This use of multiple sources demonstrates that the authors researched the topic extensively. These sources then must also be listed at the end of the document in the Literature Cited section.

When does an author *NOT* need to cite information? Any information that is common knowledge does not need to be cited. This is information that is so well known that we cannot attribute any person to the generation of that information. Examples of common knowledge include widely known historical facts (e.g., George Washington was the first president of the United States) or scientific facts (e.g., the molecular structure of water - $\text{H}_2\text{O}$). If you have to look up the information, you got it from somewhere and it should be cited. If you are not sure if something is common knowledge or not, err on the side of caution and use an in-text citation.

For more information on the Importance of Citation, see Dr. Judy Hunter’s page at: [http://web.grinnell.edu/Dean/Tutorial/EUS/IC.pdf](http://web.grinnell.edu/Dean/Tutorial/EUS/IC.pdf)
How do I cite a source?

For the journal articles we will be reading in this class, most of them use a version of the Name-Year style of the CSE (Council for Science Editors) format for both in-text and end of text references. For more information on this style go to http://www.scientificstyleandformat.org/Home.html. The citation Quick Guide is a nice resource for students. http://www.scientificstyleandformat.org/Tools/SSF-Citation-Quick-Guide.html.

For example, for the article mentioned above on loss of large mammals, the full end-of-document citation would be as follows:

The pieces of information in this citation can be viewed as a formula:

Author(s) name(s), Year. Title of article. Abbreviated journal title. Volume(Issue):page numbers.

In addition, when you have an in-text citation and there are more than 2 authors for a publication, you use the abbreviation et. al which means ‘and others’. For example, above I quoted an article and it used the in-text citation of ‘Hoffman et al. 2010’. This means this journal article had at least 3 authors. Furthermore, according to the CSE guidelines you are following this term, when you are including information in the Literature Cited section you include up to 10 authors before writing ‘et. al.’.

Remember, see the Quick Guide, linked to above, for formatting journal articles, books, dissertations and theses, newspapers, and other sources for both in-text and end of text (i.e., Literature Cited section) citations.
Module 1 Homework
Using the ScienceDirect online database available through the Gordon Library, find one recent example of primary literature on biodiversity. Using the online catalog through Gordon Library, find one current example of secondary literature on biodiversity. Using an online catalog through Gordon Library, find one example of tertiary literature on biodiversity. Try to find examples from each of these that relate to the same subtopic of biodiversity (e.g., agriculture and biodiversity). Examine the three examples and write a 1 page summary (anything beyond 1 page will NOT be read) of your observations of similarities and differences in content and formatting of the three sources. Provide a citation (in CSE format) for each one. In addition, explain two (2) connections of how the subtopic you picked to research relates to you (e.g., any related to you personally, socially, or professionally). Supplemental information (like the citations) can be placed on the second page.
Module 1 Quiz Questions

Question 1

"What piece of information is missing from the following citation for a scientific journal article? Malik A, Fensholt R, Mertz O. 2015. Mangrove exploitation effects on biodiversity and ecosystem services. Biodiversity and Conservation. 24(14)."

- Journal Name
- Page Numbers
- Journal Volume
- Author
- Date
Question 2

What is the purpose of peer review?

- to guard against flawed science being published
- to promote a shift in information available
- to analyze data collected in an experiment
- to repeat an experiment in order to verify the results

Question 3

“What piece of information is missing from the following citation for a scientific journal article? Rocha-Ortega M, Castano-Meneses G. 2015. Effects of urbanization on the diversity of ant assemblages in tropical dry forests, Mexico. 18(4):1373-1388”

- Page Numbers
- Author
- Date
- Journal Name
- Journal Volume
Question 4

What piece of information is missing from the following citation for a scientific journal article? Jim CY. Zhang H. Urbanization effects on spatial-temporal differentiation of tree communities in high-density residential areas. Urban Ecosystems 18(4):1081-1101.

- Page Numbers
- Author
- Journal Name
- Journal Volume
- Date

Question 5

Find the false statement. In-text citations are evidence of _________________.

- common knowledge not attributable to one source
- sending the reading directly to a source
- support for the author's claims
- in-depth research on a topic
- ethical use of information