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The Information Literacy User's Guide: An Open, Online Textbook

Allison Hosier

University at Albany, State University of New York

Daryl Bullis

University at Albany, State University of New York

Deborah Bernard,

University at Albany, State University of New York

Greg Bobish

University at Albany, State University of New York

Irina Holden

University at Albany, State University of New York

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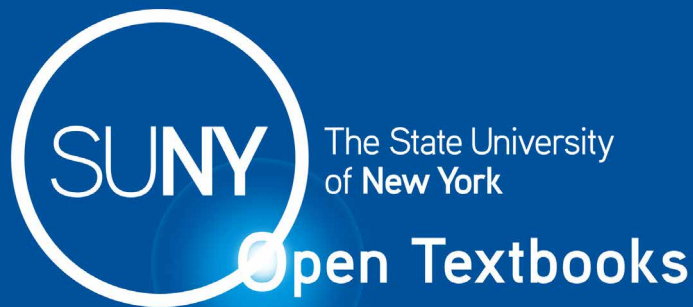
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Authors

Allison Hosier; Daryl Bullis; Deborah Bernard,; Greg Bobish; Irina Holden; Jenna Hecker; Tor Loney; and Trudi Jacobson



The Information Literacy User's Guide

Edited by
Greg Bobish and Trudi Jacobson

Deborah Bernnard, Greg Bobish, Jenna
Hecker, Irina Holden,
Allison Hosier, Trudi Jacobson,
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Trudi Jacobson, Tor Loney, and Daryl Bullis

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About this Textbook

Good researchers have a host of tools at their disposal that make navigating today's complex information ecosystem much more manageable. Gaining the knowledge, abilities, and self-reflection necessary to be a good researcher helps not only in academic settings, but is invaluable in any career, and throughout one's life. *The Information Literacy User's Guide* will start you on this route to success.

The Information Literacy User's Guide is based on two current models in information literacy: The 2011 version of The Seven Pillars Model, developed by the Society of College, National and University Libraries in the United Kingdom¹ and the conception of information literacy as a metaliteracy, a model developed by one of this book's authors in conjunction with Thomas Mackey, Dean of the Center for Distance Learning at SUNY Empire State College.² These core foundations ensure that the material will be relevant to today's students.

The Information Literacy User's Guide introduces students to critical concepts of information literacy as defined for the information-infused and technology-rich environment in which they find themselves. This book helps students examine their roles as information creators and sharers and enables them to more effectively deploy related skills. This textbook includes relatable case studies and scenarios, many hands-on exercises, and interactive quizzes.

About the Authors

Deborah Bernard is Head of the Dewey Graduate Library at the University at Albany, State University of New York. She is also a veteran information literacy instructor. She was a member of the committee that created UNL 205, Information Literacy, a one-credit undergraduate course, taught by University at Albany librarians since 2000. She also teaches a graduate course; Information Literacy Instruction: Theory and Technique. She has authored several book chapters and articles on information literacy topics.

Greg Bobish is an Associate Librarian at the University at Albany, State University of New York. He has taught credit-bearing information literacy courses since 2000 and enjoys experimenting with new educational technologies and new pedagogical approaches as he tries to convey the relevance of information literacy to his students' lives. He has received the Chancellor's and the President's awards for Excellence in Librarianship.

Daryl Bullis is the Lead Instruction Librarian at Babson College. He received his BA in Classics and Russian from the University of New Hampshire, an MA in Russian and an MLS from the University at Albany, State University of New York. He has taught credit

¹ https://www.sconul.ac.uk/groups/information_literacy/publications/coremodel.pdf

² <http://crl.acrl.org/content/72/1/62.full.pdf>

courses in Information Literacy and is currently researching best practices for adapting TBL methods to bibliographic instruction sessions.

Jenna Hecker is an instructional developer for the University at Albany, State University of New York and teaches Information Literacy in both face-to-face and online formats. She received her MLIS from the University of Rhode Island.

Irina Holden teaches Information Literacy in the Sciences and works as an Information Literacy and Science Outreach Librarian in the Science Library at the University at Albany, State University of New York. Her research interests include science literacy, reference and instruction in both traditional and virtual environments, sustainability and first year experience courses. Ms. Holden is a native of Ukraine.

Allison Hosier earned her MSIS from the University at Albany, State University of New York in 2011. She is currently an Information Literacy Librarian at Coastal Carolina University.

Trudi Jacobson is the Head of the Information Literacy Department at the University at Albany, State University of New York. She and Thomas Mackey developed the concept of metaliteracy, which has infused her teaching and her research. She loves the challenge and excitement of effective new teaching methods, and is currently involved in the development of a metaliteracy badging system. She was the recipient of the Miriam Dudley Instruction Librarian of the Year award in 2009. She is honored to have taught or mentored all but one of the co-authors of this book when they were graduate students.

Tor Loney is a Youth Services Librarian at Albany Public Library, concentrating on teen engagement with a focus on creative arts and emerging technologies. He previously worked as an Information Literacy Librarian and Instructor at the University at Albany, State University of New York, where he earned his MLIS.

Reviewer's Notes

The Information Literacy User's Guide: An Open, Online Textbook is written for teaching-librarians and faculty who conduct instruction either online or face-to-face. It is a contemporary take on what the information literate learner should know in the 21st century. Using the 7 Pillars of Information Literacy as the framework, the textbook is a hands-on step by step guide that can be incorporated in for-credit courses, embedded librarian projects and also one-shot instruction sessions.

The question many librarians and academics struggle with today is what does it mean to be information literate in the 21st century? Oftentimes we look at the technological innovations that has changed the very nature of information as the catalyst for this disruption, but this textbook challenges us to think about the information cycle from the base levels (what is a book, what is an article etc.) to the broader and deeper questions about information,

like what ownership means in in our participatory culture. It transcends the basic pretense that technology has changed the meaning of information literacy and delves deeper into looking at networks, both physical and virtual and the information gathering and creation inside those networks.

The book examines information literacy as it relates to the liberal arts, as well as the hard sciences, and is layered with excellent classroom examples that can be incorporated in classes with a research component. The textbook is ideal for undergraduate level work and could be used as a companion piece to a discipline-focused class, like Anthropology or Chemistry, or could be used as the base text to an information literacy course.

Mark McBride, Monroe Community College

Mark McBride is the Director of Library Services at Monroe Community College. Mark received holds an AS from Erie Community College, BA in Media Study from the University at Buffalo and received his MLS from the University of Buffalo, as well. His background is in information literacy & metaliteracy instruction. He has ample experience planning and designing learning spaces (both formal and informal). He is an Open Education advocate and believes in the unfettered access to content for all learners.

About Open SUNY Textbooks

Open SUNY Textbooks is an open access textbook publishing initiative established by State University of New York libraries and supported by SUNY Innovative Instruction Technology Grants. This initiative publishes high-quality, cost-effective course resources by engaging faculty as authors and peer-reviewers, and libraries as publishing infrastructure.

The pilot launched in 2012, providing an editorial framework and service to authors, students and faculty, and establishing a community of practice among libraries. The first pilot is publishing 15 titles in 2013-2014, with a second pilot to follow that will add more textbooks and participating libraries.

Participating libraries in the 2012-2013 pilot include SUNY Geneseo, College at Brockport, College of Environmental Science and Forestry, SUNY Fredonia, Upstate Medical University, and University at Buffalo, with support from other SUNY libraries and SUNY Press.

For more information, please see <http://opensuny.org>.

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Introduction

You may be using this book for any one of a variety of reasons. It may have been assigned by a professor, in whole or in part. You may be using it to enhance your research techniques for your classes. Or you may see the importance of being savvy about information use and production, and have decided to learn more on your own. After all, our world is defined by our easy access to information. In fact, as is often said, we are drowning in information. Some is valuable. Some is worthless. And some is just fun, in its proper context. As you know, information comes in many different formats and sometimes, depending on the content, information in one format can be in any of these categories. For example, a tweet could be valuable (maybe an expert on a topic has just announced something groundbreaking), worthless (“Going shopping. Looking for socks that don’t fall down.”), or fun (I’ll let you decide what that message might be). So it seems that information content, context, and quality matter more than what kind of package or format the information takes. You will have a chance to read more about this later in the book. And accessing information is just one component; there is also your role as an information producer. We’ll get to that, too. You will learn a number of ways to enhance your abilities to work with the information that surrounds you.

So let’s start at the beginning. This book is entitled *The Information Literacy User’s Guide*. If you are information literate, you are adept at working with information. But a user’s guide can still be of assistance, since there are so many components to information. You, the authors, and just about everyone is better versed in working with some aspects of information than with others. While you will find elements in this book that you are totally up to speed on, there will be others that you have less familiarity with. Hence, the value of a user’s guide.

While this textbook refers to information literacy throughout, there are a variety of different models and subsets of information literacy: visual literacy, science literacy, digital literacy, information fluency, media literacy, and many more. Let’s highlight just one: metaliteracy. The originators of this model think of it as information literacy for today’s open, networked, collaborative information environment. It also places an emphasis on metacognition, or thinking about your own thinking. Being able to find and use information well means realizing what you know, what you don’t, and what you need to learn, and thinking about these categories throughout the process. It means being aware of how one is interacting with information, and not just reverting to long-standing habits only because they are familiar. There is a list of learning objectives for metaliterate learners at the end of this chapter, but we continue to identify occasional small changes to the objectives. The most current version can be found at <http://metaliteracy.org>.

You might think of the learning objectives as one of those headlines you see on magazine covers while waiting in a grocery store checkout lane:¹

- 6 Symptoms You Shouldn't Ignore
- 50 People Who Make Your Life Better
- Get 30% Richer This Year: Very Smart Money Tips
- 4 Panza-Blasting Moves for a Tighter Bod

Maybe there should be some catchy, motivational title for these learning objectives. (If you have a good idea, send it to one of the authors.) But, in seriousness, being aware of your own thought processes and working towards becoming more proficient in the areas included in the metaliteracy learning objectives will help you in your academic endeavors and in your everyday life. When you finish reading this introduction, take a look at the list. Are there items that you do well? Are there others that you just need to remember to follow through on? Possibly some will be less familiar to you. Recognize that they are empowering behaviors and attributes that will advance your abilities in school, the workplace, and in daily life. Knowing this may well provide the motivation to follow through with the readings and exercises in the upcoming chapters.

This book is arranged using a model called the SCONUL Seven Pillars of Information Literacy (<http://www.sconul.ac.uk/sites/default/files/documents/coremodel.pdf>). The model was developed in the United Kingdom, and revised in 2011, to reflect today's information world. As you would expect, its visual representation shows pillars, each one labeled with a one-word access point to a larger concept. The pillars, with short explanatory descriptions, are

Identify (understanding your information need)

Scope (knowing what is available)

Plan (developing research strategies)

Gather (finding what you need)

Evaluate (assessing your research process and findings)

Manage (organizing information effectively and ethically)

Present (sharing what you've learned)

The authors of this book have added two additional chapters to engage you in important areas not specifically represented by the pillars:

¹ The first two story headlines appeared on the cover of *AARP*, January/February 2013, the second was on *Marie Claire*, February 2013, and the last was on *Cosmopolitan*, Spring 2013.

Visual Literacy (applying information literacy to visual materials)

Science Literacy (information literacy in the sciences)

The developers of the Seven Pillars model explain that an individual can be more expert in some areas than others, and has the ability to increase their expertise. But interestingly, they also mention that people can become less expert in the areas designated by the pillars. How might that be? If you learned something, and then learned more, you become more adept, right? They make the point, however, that because the information environment shifts all the time, it is possible people won't keep up, and thus become less proficient. So just as someone can climb one of the pillars, so too can he or she slip down.

Each of the seven areas incorporates both abilities and understandings. The abilities include what an individual can do. The understandings cover both attitude and behaviors. For example, someone might be aware that they should carefully evaluate the information they find and know how to go about it, yet not care enough to actually do it. Abilities and understandings work together to enable information literacy. Near the beginning of each chapter, you will find pertinent abilities and understandings lists taken from the Seven Pillars model.

As mentioned earlier, you are likely skilled at some of the elements the book will be discussing, less so at others. In other words, you will have ascended some of the pillars more than others. This is true of the authors themselves. We teach information literacy and call ourselves experts. But we can still learn from our colleagues' chapters on various facets of the nine areas covered in this book. We hope you will also find this to be the case.

This introductory chapter is intended to be short, and will end with an important recommendation: As you learn from this textbook, remember to reflect on your new knowledge, skills, and attitudes. What are you doing differently? Did you find particular new approaches to locating or sharing information that work better? Why? Are you evaluating information more consistently? Differently? Do you feel more comfortable as an information producer? If you continue to ask yourself questions like these, and follow through based on your responses, your proficiency with information will last far beyond your memory of reading this textbook.

Note

If you encounter terms in this book whose meanings are not clear to you, start your investigation by looking at these two sites. The first provides definitions, while the second is a multilingual glossary that provides corresponding terms in six languages:

Definitions

<http://www.ala.org/acrl/sites/ala.org.acrl/files/content/aboutacrl/directoryofleadership/sections/is/iswebsite/projpubs/idpdefinitions.pdf>

Glossary of terms, with English, Chinese, Korean, Japanese, French, Spanish, and Arabic
<http://www.ala.org/acrl/sites/ala.org.acrl/files/content/aboutacrl/directoryofleadership/sections/is/iswebsite/projpubs/idplanguagetable.pdf>

Appendix

Developing Metaliterate Learners

Metaliteracy learning falls into four domains: **behavioral** (what students should be able to do upon successful completion of learning activities—skills, competencies), **cognitive** (what students should know upon successful completion of learning activities—comprehension, organization, application, evaluation), **affective** (changes in learners' emotions or attitudes through engagement with learning activities), and **metacognitive** (what learners think about their own thinking—a reflective understanding of how and why they learn, what they do and do not know, their preconceptions, and how to continue to learn). Each aspect of the main metaliteracy learning goals presented below applies to one or more of these categories, and is labeled as such (B for behavioral, C for cognitive, A for affective, M for metacognitive).

The learning objectives recognize that metaliterate “learners,” as they are called here, must learn continually, given the constantly and rapidly evolving information landscape. Instructors and learners can meet these objectives in a variety of ways, depending on the learning context, choosing from a menu of learning activities. The objectives are conceived broadly, so as to remain scalable, reproducible, and accessible in a range of contexts.

Goal 1: Evaluate content critically, including dynamic, online content that changes and evolves, such as article preprints, blogs, and wikis.

1. Place an information source in its context (for example, author's purpose, format of information, and delivery mode) in order to ascertain the value of the material for that particular situation. (B, C)
2. Distinguish between editorial commentary and information presented from a more research-based perspective, recognizing that values and beliefs are embedded in all information. (C)
3. Determine the value of formal and informal information from various networked sources (scholarly, user-generated, OERs, etc.). (C)
4. Evaluate user response as an active researcher; understand the differing natures of feedback mechanisms and context in traditional and social media platforms. (B, C)
5. Appreciate the importance of assessing content from different sources, including dynamic content from social media, critically. (A)

Goal 2: Understand personal privacy, information ethics, and intellectual property issues in changing technology environments.

1. Differentiate between the production of original information and remixing or re-purposing open resources. (C)
2. Distinguish the kinds of information appropriate to reproduce and share publicly, and private information disseminated in more restricted/discreet environments. (C)
3. Use technology to build a positive web presence. (B)
4. Apply copyright and Creative Commons licensing as appropriate to the creation of original or repurposed information. (B)
5. Recognize the ethical considerations of sharing information. (A)

Goal 3: Share information and collaborate in a variety of participatory environments.

1. Participate conscientiously in collaborative environments. (B)
2. Take responsibility for participation in collaborative environments. (A)
3. Compare the unique attributes of different information formats (e.g., scholarly article, blog, wiki, online community), and have the ability to use these effectively and to cite information for the development of original content. (B)
4. Describe the potential impact of online resources for sharing information (text, images, video, and other media) in collaboration with others. (A)
5. Demonstrate the ability to translate information presented in one manner to another in order to best meet the needs of particular audiences; integrate information from multiple sources into coherent new forms. (M, C)
6. Effectively communicate personal and professional experiences to inform and assist others; and recognize that learners can also be teachers. (A, B)
7. Produce original content appropriate to specific needs in multiple media formats; transfer knowledge gained to new formats in unpredictable and evolving environments. (B)
8. Value user-generated content and critically evaluate contributions made by others: see self as a producer, as well as consumer, of information. (A)
9. Be open to global perspectives; use communication with others in a global context to encourage deep learning. (A)

Goal 4: Demonstrate ability to connect learning and research strategies with lifelong learning processes and personal, academic, and professional goals.

1. Determine scope of the question or task required to meet one's needs. (C)
2. Reevaluate needs and next steps throughout the process. (C)
3. Demonstrate the importance of matching information needs and search strategies to appropriate search tools. (C)
4. Use self-reflection to assess one's own learning and knowledge of the learning process. (M)
5. Demonstrate the ability to think critically in context and to transfer critical thinking to new learning. (M)
6. Value persistence, adaptability, and flexibility. (M)
7. Communicate effectively with collaborators in shared spaces and learn from multiple points of view. (M)
8. Recognize that learning is a process and that reflecting on errors or mistakes leads to new insights and discoveries. (M)
9. Engage in informed, self-directed learning that encourages a broader worldview through the global reach of today's information technology. (M)
10. Demonstrate self-empowerment through interaction and the presentation of ideas; gain the ability to see what is transferable, translatable, and teachable (learners are both students and teachers). (M)
11. Conclude that metaliteracy is a lifelong value and practice. (M)

Developed by participants involved in the SUNY Innovative Instruction Technology Grant, Developing a SUNY-wide Transliteracy Learning Collaborative to Promote Information and Technology Competencies for the 21st Century, based on objectives in Mackey and Jacobson, *Reframing Information Literacy as a Metaliteracy, C & RL, 72.1* January 2011 <http://cr.l.acrl.org/content/72/1/62.full.pdf+html>

Contributors: Michele Forte, Tom Mackey, Kathleen Stone (Empire State College); Trudi Jacobson, Richard Fogarty, Emer O'Keeffe (University at Albany); Brian Morgan and Kim Davies-Hoffman (SUNY Geneseo); Jennifer Ashton, Logan Rath (SUNY Brockport); Carleen Huxley (Jefferson Community College)

The most up to date version can be found at <http://metaliteracy.org>

Identify

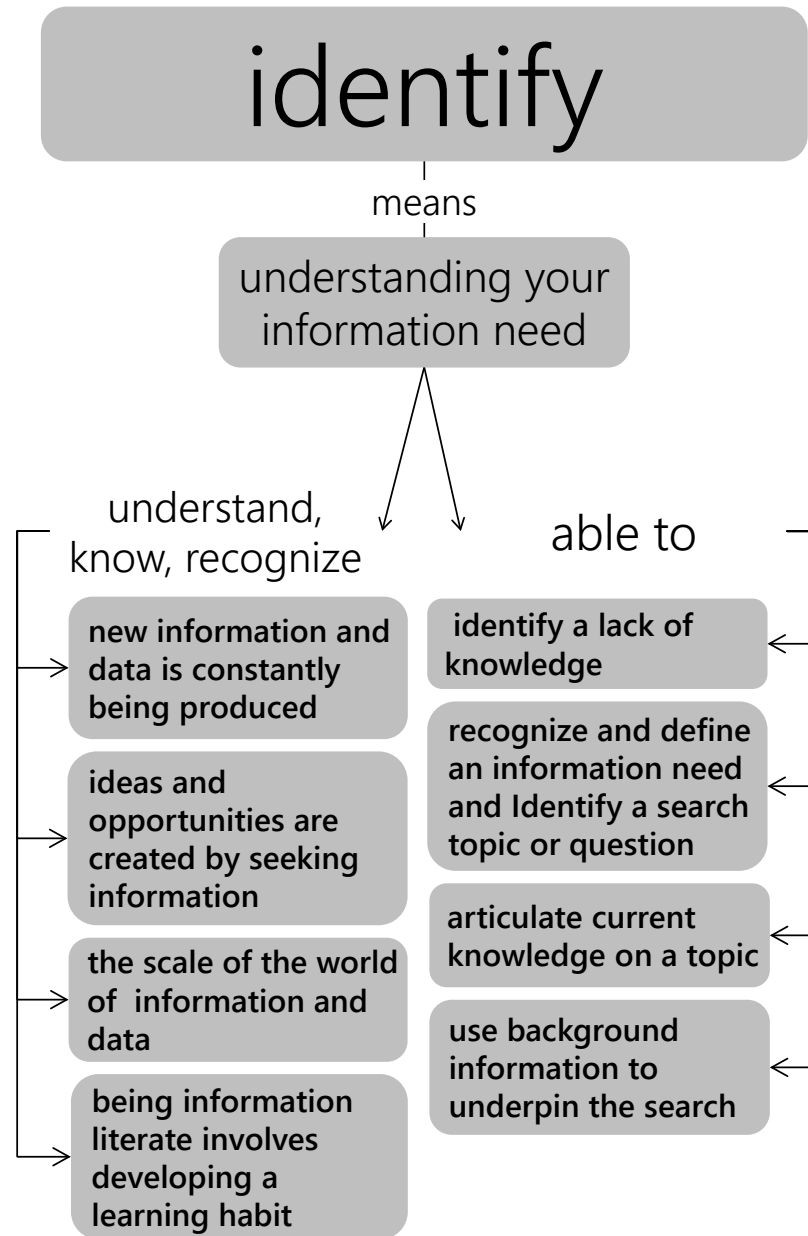
In this chapter, you will learn about the first pillar of information literacy. While the pillars are normally presented in a certain order, it is important to remember that they are not intended to be a step-by-step guide to be followed in a strict order. In most research projects, you will find that you move back and forth between the different pillars as you discover more information and come up with more questions about your topic. In this chapter you will learn how to identify your information need so that you can begin your research, but it is likely that you will also revisit some of the ideas in this chapter to make sure you are actually meeting that need with your research findings.

A person proficient in the Identify pillar is expected to be able to identify a personal need for information. They understand

- That new information and data is constantly being produced and that there is always more to learn
- That being information literate involves developing a learning habit so new information is being actively sought all the time
- That ideas and opportunities are created by investigating/seeking information
- The scale of the world of published and unpublished information and data

They are able to

- Identify a lack of knowledge in a subject area
- Identify a search topic/question and define it using simple terminology
- Articulate current knowledge on a topic
- Recognize a need for information and data to achieve a specific end and define limits to the information need
- Use background information to underpin the search
- Take personal responsibility for an information search
- Manage time effectively to complete a search



Proficiencies in the Identify pillar

Scenario

Norm Allknow was having trouble. He had been using computers since he was five years old and thought he knew all there was to know about them. So, when he was given an assignment to write about the impact of the Internet on society, he thought it would be a breeze. He would just write what he knew, and in no time the paper would be finished. In fact, Norm thought the paper would probably be much longer than the required ten pages. He spent a few minutes imagining how impressed his teacher was going to be, and then sat down to start writing.

He wrote about how the Internet had helped him to play online games with his friends, and to keep in touch with distant relatives, and even to do some homework once in a while. Soon he leaned back in his chair and looked over what he had written. It was just half a page long and he was out of ideas.

Identifying a Personal Need for Information

One of the first things you need to do when beginning any information-based project is to identify your personal need for information. This may seem obvious, but it is something many of us take for granted. We may mistakenly assume, as Norm did in the above example, that we already know enough to proceed. Such an assumption can lead us to waste valuable time working with incomplete or outdated information. Information literacy addresses a number of abilities and concepts that can help us to determine exactly what our information needs are in various circumstances. These are discussed below, and are followed by exercises to help develop your fluency in this area.

Understanding the Context of an Information Need

When you realize that you have an information need it may be because you thought you knew more than you actually do, or it may be that there is simply new information you were not aware of. One of the most important things you can do when starting to research a topic is to scan the existing information landscape to find out what is already out there. We'll get into more specific strategies for accessing different types of information later in the book, particularly in the [Gather](#) chapter, but for now it pays to think more broadly about the information environment in which you are operating.

For instance, any topic you need information about is constantly evolving as new information is added to what is known about the topic. Trained experts, informed amateurs, and opinionated laypeople are publishing in traditional and emerging formats; there is always something new to find out. The scale of information available varies according to topic, but in general it's safe to say that there is more information accessible now than ever before.

Due to the extensive amount of information available, part of becoming more information literate is developing habits of mind and of practice that enable you to continually seek new information and to adapt your understanding of topics according to what you find.

Because of the widely varying quality of new information, evaluation is also a key element of information literacy, and will be addressed in the [Evaluate](#) chapter of this book.

Finally, while you are busy searching for information on your current topic, be sure to keep your mind open for new avenues or angles of research that you haven't yet considered. Often the information you found for your initial need will turn out to be the pathway to a rich vein of information that can serve as raw material for many subsequent projects.

When you understand the information environment where your information need is situated, you can begin to define the topic more clearly and you can begin to understand where your research fits in with related work that precedes it. Your information literacy skills will develop against this changing background as you use the same underlying principles to do research on a variety of topics.

From Information Need to Research Question

Norm was abruptly confronted by his lack of knowledge when he realized that he had nothing left to say on his topic after writing half a page. Now that he is aware of that shortcoming, he can take steps to rectify it.

Your own lack of knowledge may become apparent in other ways. When reading an article or textbook, you may notice that something the author refers to is completely new to you. You might realize while out walking that you can't identify any of the trees around your house. You may be assigned a topic you have never heard of.

Exercise: Identifying What You Don't Know

Wherever you are, look around you. Find one thing in your immediate field of view that you can't explain.

What is it that you don't understand about that thing?

What is it that you need to find out so that you can understand it?

How can you express what you need to find out?

For example: You can't explain why your coat repels water. You know that it's plastic, and that it's designed to repel water, but can't explain why this happens. You need to find out what kind of plastic the coat is made of and the chemistry or physics of that plastic and of water that makes the water run off instead of soaking through. (The terminology in your first explanation would get more specific once you did some research.)

All of us lack knowledge in countless areas, but this isn't a bad thing. Once we step back and acknowledge that we don't know something, it opens up the possibility that we can find out all sorts of interesting things, and that's when the searching begins.

Taking your lack of knowledge and turning it into a search topic or research question starts with being able to state what your lack of knowledge is. Part of this is to state what you already know. It's rare that you'll start a search from absolute zero. Most of the time you've at least heard something about the topic, even if it is just a brief reference in a lecture or reading. Taking stock of what you already know can help you to identify any erroneous assumptions you might be making based on incomplete or biased information. If you think you know something, make sure you find at least a couple of reliable sources to confirm that knowledge before taking it for granted. Use the following exercise to see if there is anything that needs to be supported with background research before proceeding.

Exercise: Taking Stock of What You Already Know

As discussed above, part of identifying your own information need is giving yourself credit for what you already know about your topic. Construct a chart using the following format to list whatever you already know about the topic.

Name your topic at the top.

In the first column, list what you know about your topic.

In the second column, briefly explain how you know this (heard it from the professor, read it in the textbook, saw it on a blog, etc.).

In the last column, rate your confidence in that knowledge. Are you 100% sure of this bit of knowledge, or did you just hear it somewhere and assume it was right?

When you've looked at everything you think you know about the topic and why, step back and look at the chart as a whole. How much do you know about the topic, and how confident are you about it? You may be surprised at how little or how much you already know, but either way you will be aware of your own background on the topic. This self-awareness is key to becoming more information literate.

This exercise gives you a simple way to gauge your starting point, and may help you identify specific gaps in your knowledge of your topic that you will need to fill as you proceed with your research. It can also be useful to revisit the chart as you work on your project to see how far you've progressed, as well as to double check that you haven't forgotten an area of weakness.

What do you know?	How do you know it?	How confident are you in this knowledge?

Once you've clearly stated what you do know, it should be easier to state what you don't know. Keep in mind that you are not attempting to state *everything* you don't know. You are only stating what you don't know in terms of your current information need. This is where you define the limits of what you are searching for. These limits enable you to meet both size requirements and time deadlines for a project. If you state them clearly, they can help to keep you on track as you proceed with your research. You can learn more about this in the [Scope](#) chapter of this book.

One useful way to keep your research on track is with a "KWHL" chart. This type of chart enables you to state both what you know and what you want to know, as well as providing space where you can track your planning, searching and evaluation progress. For now, just fill out the first column, but start thinking about the gaps in your knowledge and how they might inform your research questions. You will learn more about developing these questions and the research activities that follow from them as you work through this book.

What do you already know about your topic?	What do you Want to know about your topic?	How will you find information on your topic?	What have you Learned about your topic?

Defining a research question can be more difficult than it seems. Your initial questions may be too broad or too narrow. You may not be familiar with specialized terminology used in the field you are researching. You may not know if your question is worth investigating at all.

These problems can often be solved by a preliminary investigation of existing published information on the topic. As previously discussed, gaining a general understanding of the information environment helps you to situate your information need in the relevant context and can also make you aware of possible alternative directions for your research. On a more practical note, however, reading through some of the existing information can also provide you with commonly used terminology, which you can then use to state your own research question, as well as in searches for additional information. Don't try to reinvent the wheel, but rely on the experts who have laid the groundwork for you to build upon.

Once you have identified your own lack of knowledge, investigated the existing information on the topic, and set some limits on your research based on your current information need, write out your research question or state your thesis. The next exercise will help you transform the question you have into an actual thesis statement. You'll find that it's not uncommon to revise your question or thesis statement several times in the course of a research project. As you become more and more knowledgeable about the topic, you will be able to state your ideas more clearly and precisely, until they almost perfectly reflect the information you have found.

Exercise: Research Question/Thesis Statement/Search Terms

Since this chapter is all about determining and expressing your information need, let's follow up on thinking about that with a practical exercise. Follow these steps to get a better grasp of exactly what you are trying to find out, and to identify some initial search terms to get you started.

1. Whatever project you are currently working on, there should be some question you are trying to answer. Write your current version of that question here.
2. Now write your proposed answer to your question. This may be the first draft of your thesis statement which you will attempt to support with your research, or in some cases, the first draft of a hypothesis that you will go on to test experimentally. It doesn't have to be perfect at this point, but based on your current understanding of your topic and what you expect or hope to find is the answer to the question you asked.
3. Look at your question and your thesis/hypothesis, and make a list of the terms common to both lists (excluding "the", "and", "a", etc.). These common terms are likely the important concepts that you will need to research to support your thesis/hypothesis. They may be the most useful search terms overall or they may only be a starting point.

If none of the terms from your question and thesis/hypothesis lists overlap at all, you might want to take a closer look and see if your thesis/hypothesis really answers your research question. If not, you may have arrived at your first opportunity for revision. Does your question really ask what you're trying to find out? Does your proposed answer really answer that question? You may find that you need to change one or both, or to add something to one or both to really get at what you're interested in. This is part of the process, and you will likely discover that as you gather more information about your topic, you will find other ways that you want to change your question or thesis to align with the facts, even if they are different from what you hoped.

A Wider View

While the identification of an information need is presented in this chapter as the first step in the research process, many times the information need you initially identified will change as you discover new information and connections. Other chapters in this book deal with finding, evaluating, and managing information in a variety of ways and formats. As you become more skilled in using different information resources, you will likely find that the line between the various information literacy skills becomes increasingly blurred, and that you will revisit your initial ideas about your topic in response to both the information you're finding and what you're doing with what that information.

Continually think about your relationship to the information you find. Why are you doing things the way you are? Is it really the best way for your current situation? What other options are there? Keeping an open mind about your use of information will help you to ensure that you take responsibility for the results of that use, and will help you to be more successful in any information-intensive endeavor.

Scope

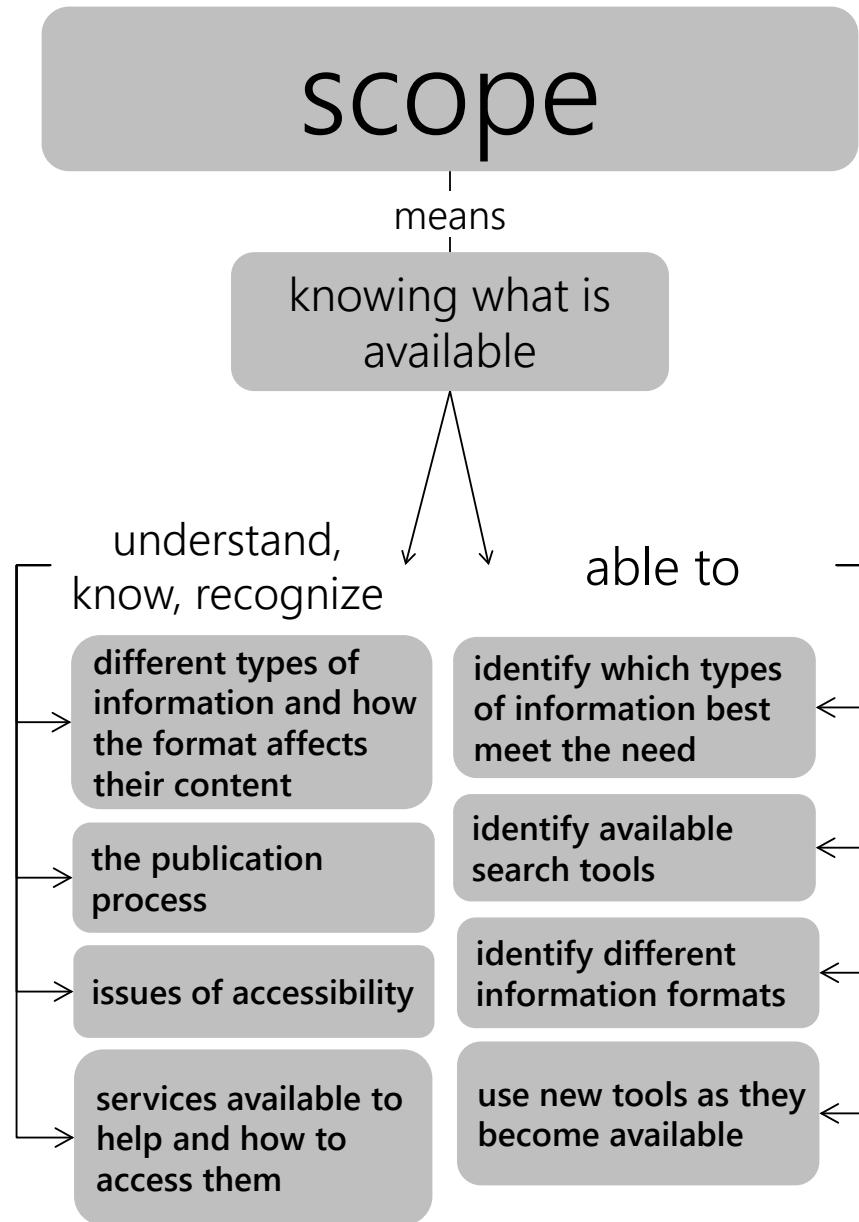
A person who is information literate in the Scope pillar is able to assess current knowledge and identify gaps.

The above statement is from the Seven Pillars of Information Literacy, the model of information literacy presented in the Introduction of this book. The following list, from the creators of the Seven Pillars model, provides more detail about the Scope pillar. Components include:

- “Know what you don’t know” to identify any information gaps
- Identify which types of information will best meet the need
- Identify the available search tools, such as general and subject specific resources at different levels
- Identify different formats in which information may be provided
- Demonstrate the ability to use new tools as they become available

Additionally the information literate person in the Scope pillar understands

- What types of information are available
- The characteristics of the different types of information source available to them and how they may be affected by the format (digital, print)
- The publication process in terms of why individuals publish and the currency of information
- Issues of accessibility
- What services are available to help and how to access them



Proficiencies in the Scope pillar

Now let's examine these concepts.

Scenario

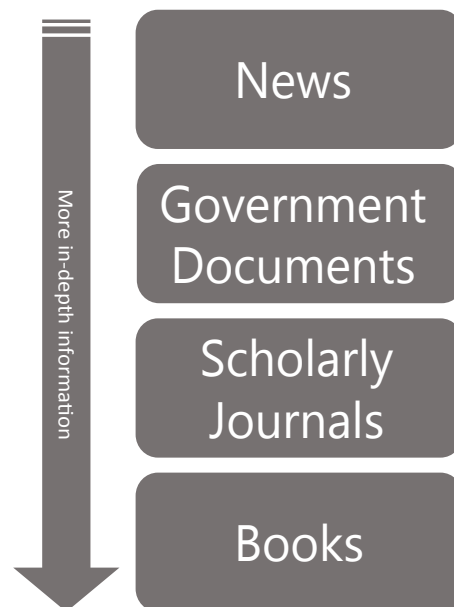
Harry and Sally Dennis have lived in central New York State for 25 years. They work as teachers in the Cortland City School District. Lately, they have been closely following the debate about hydraulic fracturing or fracking in New York State and are concerned about their ability to influence the course of fracking in the future. Although they don't own much land, they are worried about the possible adverse effect on drinking water, disruption to their environment, and the influx of people that fracking-related jobs will bring into their city. Sally Dennis is considering running for public office in her town to have a more

powerful voice in the fracking debate. To receive the backing of her local political party, Sally needs to present some persuasive arguments against hydraulic fracking that are well thought out and scientifically sound. She needs to engage in substantial research on this issue so that she can present herself as an expert.

At this point, all that Sally really knows about fracking is what she has heard from neighbors and news shows. How will she proceed with her research? Sally's intentions are laudable and she knows she will have to fill in the information gaps in her fracking issue knowledge before she can be taken seriously as a candidate for city office. Knowing that you don't have sufficient information to solve an information need is one important aspect of information literacy. It enables you to obtain that missing information.

Different Information Formats and Their Characteristics

In addition to knowing that you are missing essential information, another component of information literacy is understanding that the information you seek may be available in different formats such as books, journal articles, government documents, blog postings, and news items. Each format has a unique value. The graphic below represents a common process of information dissemination. When an event happens, we usually hear about it from news sources—broadcast, web, and print. More in-depth exploration and analysis of the event often comes from government studies and scholarly journal articles. Deeper exploration, as well as an overview of much of the information available about the event, is often published in book format.



Information sources from less in-depth to more in-depth

Sally realizes that she needs to obtain an overview of the whole fracking debate. She needs to determine how severe the consequences of fracking could be and what is actually involved in the fracking process. Where can she find such an overview and how can she trust that the overview is accurate and complete?

Sally believes that she can find this information online and uses Google to search the World Wide Web. She quickly finds that there is an overwhelming amount of online information about fracking. Her search has resulted in more than 11,000,000 sites. Sally knows that she doesn't have to peruse all of these resources, but those that she does examine do not provide a comprehensive overview of the issues. She also notices that many of the sites are obviously advocating their own point of view.

A better first step is to identify a library that contains academic resources so that Sally will have access to more scholarly treatments of the subject. Sally can use the SUNY union catalog or Worldcat.org (that will allow her to search numerous academic libraries at once).

Library Catalogs

A library catalog is a database that contains all of the items located in a library as well as all of the items to which the library has access. It allows you to search for items by title, author, subject, and keyword. A keyword is a word that is found anywhere within the record of an item in the catalog. A catalog record displays information that is pertinent to one item, which could be a book, a journal, a government document, or a video or audio recording.

If you search by subject in an academic library catalog you can take advantage of the controlled vocabulary created by the Library of Congress. Controlled vocabulary consists of terms or phrases that have been selected to describe a concept. For example, the Library of Congress has selected the phrase "Motion Picture" to represent films and movies. So, if you are looking for books about movies, you would enter the phrase "Motion Picture" into the search box. Controlled vocabulary is important because it helps pull together all of the items about one topic. In this example, you would not have to conduct individual searches for movies, then motion pictures, then film; you could just search once for motion pictures and retrieve all the items on movies and film. You can discover subject terms in item catalog records.

Many libraries provide catalog discovery interfaces that provide cues to help refine a search. This makes it easier to find items on specific topics. For example, if Sally enters the search terms "Hydraulic Fracturing" into a catalog with a discovery interface, the results page will include suggestions for refinements including several different aspects of the topic. Sally can click on any of these suggested refinements to focus her search.

Using this method, Sally finds several good resources on her topic, now she needs to locate them. The SUNY catalog will provide a list of the institutions that own the book she wants

to read. She can then link to the institution's own library catalog to find out more information on the location and status of the item.

Why should Sally choose books instead of another format? Books can provide an overview of a broad topic. Often, the author has gathered the information from multiple sources and created an easy to understand overview. Sally can later look for corroborating evidence in government documents and journal articles. Books are a good information resource for this stage of her research.

Once Sally starts to locate useful information resources, she realizes that there are further gaps in her knowledge. How does she decide which books to use? She needs the most current information, because she certainly doesn't want to get caught spouting outdated information.

Looking at publication date will help her to choose the most recent items.

How can she get these books? She is not a SUNY student or faculty member.

Interlibrary loan services at her public library will allow her to access books from an academic library or the college in her area may allow community members to borrow materials. There is a wealth of knowledge contained in the resources of academic and public libraries throughout the United States. Single libraries can't hope to collect all of the resources available on a topic. Fortunately, libraries are happy to share their resources and they do this through interlibrary loan. Interlibrary loan allows you to borrow books and other information resources regardless of where they are located. If you know that a book exists, ask your library to request it through their interlibrary loan program. This service is available at both academic and most public libraries.

Checking for Further Knowledge Gaps

Sally has had a chance to review the books that she chose and although her understanding of the issues associated with fracking has improved, she still needs more specific information from the point of view of the energy industry, the government, and the scientific community. Sally knows that if she doesn't investigate all points of view, she will not be able to speak intelligently about the issues involved in the fracking debate. Where will she get this information? Because this information should be as current as possible, much of it will not be available in book format. Sally will need to look for scholarly journal articles and government documents. It is not likely that the public library will have the depth and scope of information that Sally now needs. Fortunately, Sally has just enrolled in a class at her local SUNY school and is able to use the resources at this academic library. However, when Sally visits the library, she finds that the amount of information available is overwhelming. There are many databases that will help Sally find journal articles on almost any topic. There are also many kinds of government information, some in article format, some as documents,

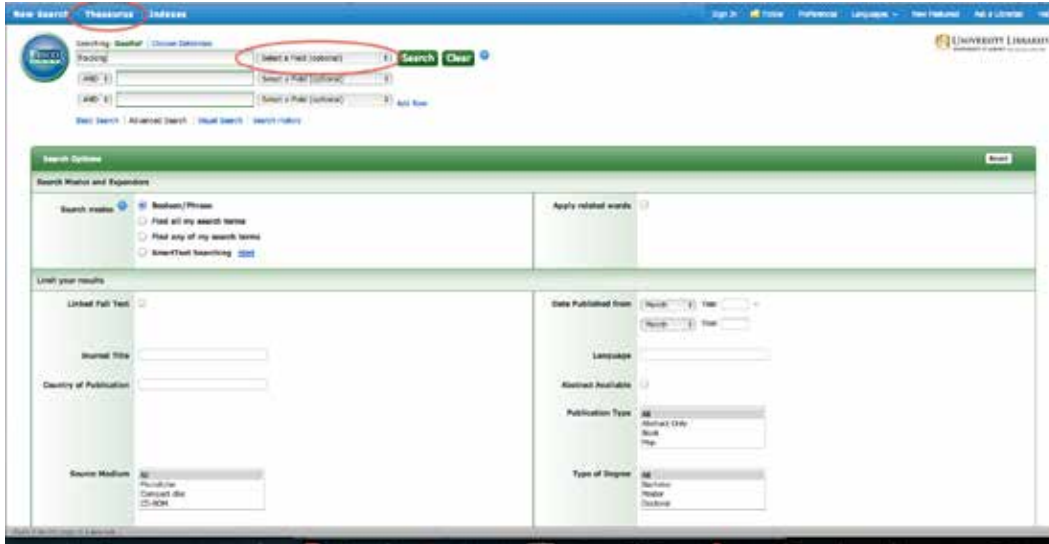
and some as published rules and regulations. Sally suddenly feels out of her element and doesn't have any idea of where to start her research.

Databases

Sally should start her search for journal articles with research databases. Research databases contain records of journal articles, documents, book chapters, and other resources. Online library catalogs differ from other research databases in that they contain only the items available through a particular library or library system. Research databases are often either broad or comprehensive collections and are not tied to the physical items available at any one library. Many databases provide the full-text of articles and can be searched by subject, author, or title. Another type of database provides just the information about articles and may provide tools for you to find the full text in another database. The databases that contain resources for a vast array of subjects are referred to as general or multidisciplinary databases. Other databases are devoted to a single subject, and are known as subject-specific databases. Databases are made up of:

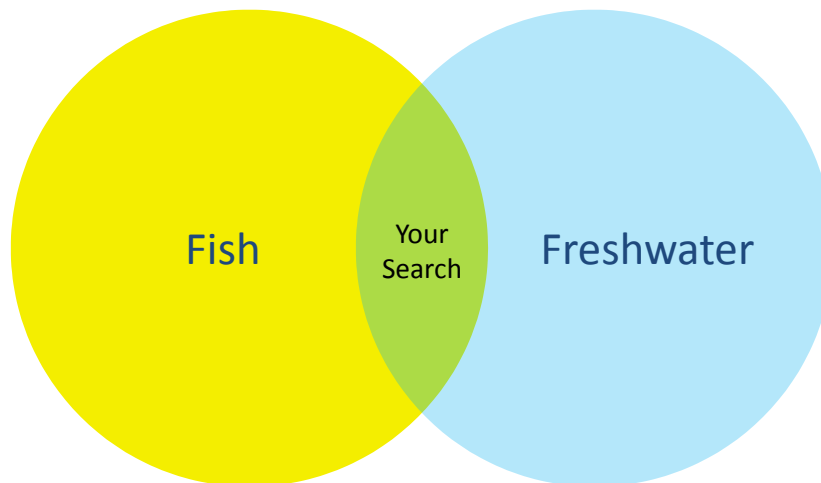
- **Records:** A record contains descriptive information that is pertinent to one item which may be a book, a chapter, an article, a document, or other information unit.
- **Fields:** These are part of the record and they contain information that pertains to one aspect of an item such as the title, author, publication date, and subject.
- The subject field can sometimes be labeled subject heading or descriptor. This is the field that contains controlled vocabulary. Controlled vocabulary in a database is similar to controlled vocabulary in a Library Catalog, but each database usually has a unique controlled vocabulary unrelated to Library of Congress classifications. Many databases will make their controlled vocabulary available in a thesaurus. If the database you are searching does not have a thesaurus, use the subject field in a record to find relevant subject terms.

Below is the first screen of a subject specific database called GEORef. This database covers technical literature on geology and geophysics. The thesaurus is circled. Clicking on the thesaurus allows you to find controlled vocabulary that will focus your search. In this search, Sally has typed the word "fracking" in the search box and only retrieved 23 records. When Sally uses the controlled vocabulary phrase "hydraulic fracturing," she is able to increase her search results. In fact, she has retrieved too many records. Now she wants to limit her search, but she still wants to obtain the most relevant articles available.



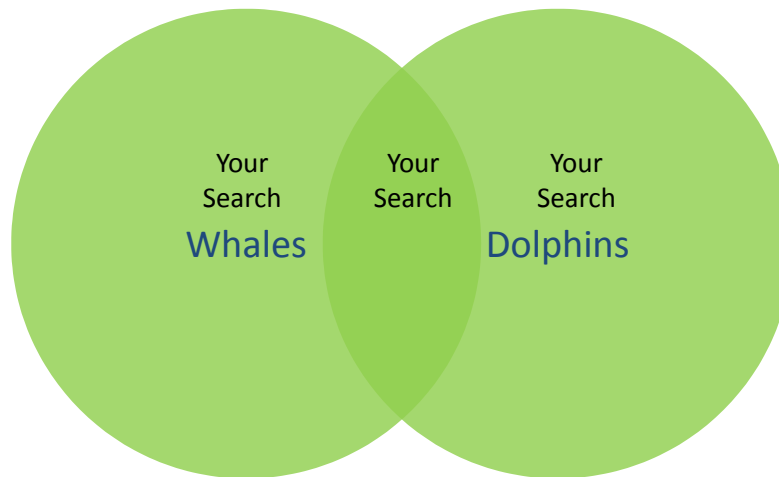
Boolean Operators

One way to limit a database search is to use Boolean operators; words you can add to a search to narrow or broaden your search results. They are *and*, *or*, and *not*. You can usually find these words in the advanced search query area of a database. *And* will narrow your search. For example, if you are interested in fresh water fishing you would enter the terms “*fish and freshwater*.” Your results would then include records that only contained both of these words.



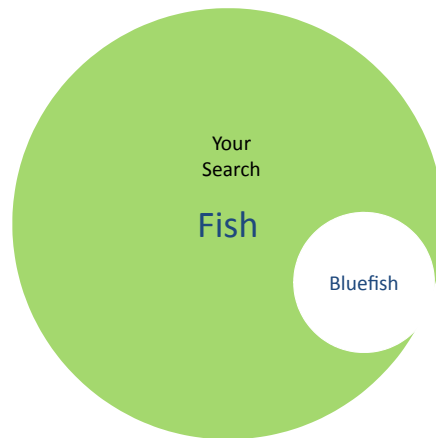
The green overlapping area in the diagram above represents the results from the “*fish and freshwater*” search.

Or will broaden your search and is usually used with synonyms. If you are interested in finding information on mammals found in the Atlantic Ocean, you could enter the terms “*whales or dolphins*”.



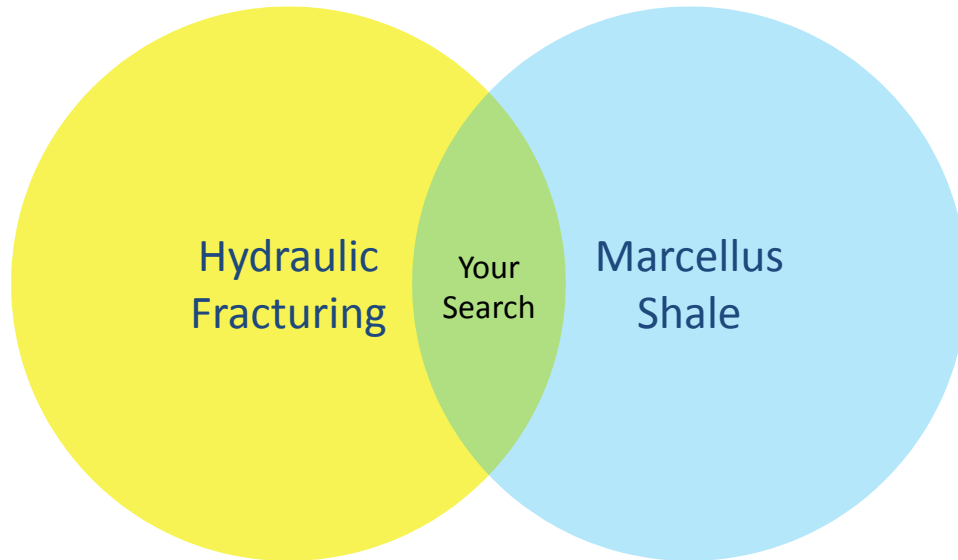
The circles above represent the *or* search. All of the records that contain one or another, or both of your search terms will be in your results list.

Not will eliminate a term from your results. If you were looking for information on all Atlantic Ocean fish except Bluefish, you would enter “*fish not bluefish*.”



The larger green circle represents the results that you would retrieve with this search.

Let's go back to Sally's search of the GEORef database. If you remember, she searched the controlled vocabulary term, “*hydraulic fracturing*.” She can use *and* with the phrase “*Marcellus Shale*” to focus and limit her results. Sally's search query is now “*hydraulic fracturing and Marcellus Shale*.” You can see this represented below. The overlapping area represents the records this search will retrieve.



More information on [Boolean Operators](#) can be found in the [Plan](#) chapter.

Database searching can seem confusing at first, but the more you use databases, the easier it gets and most of the time, the results you are able to retrieve are superior to the results that you will get from a simple internet search.

Other Information Sources

After taking some time to think about her goal, which is to present a persuasive argument on why she would be a good candidate for public office, Sally decides to concentrate on obtaining relevant government information. After all, she hopes to become part of the government, so she should have some knowledge of the government's role in the fracking issue.

Government information consists of any information produced by local, state, national, or international governments and is usually available at no cost. However, sometimes it is reproduced by a commercial entity with added value. Look for websites that are created by official government entities, such as the U.S. Department of the Interior at <http://www.doi.gov/index.cfm> and Thomas, the congressional website at Thomas.loc.gov. New York State's website can be found at www.ny.gov. It contains information from all New York State government branches. As Sally will discover, you can usually find a wealth of reliable information in government sources.

Even though she has narrowed the scope of her search for information resources, Sally is still confronted with a myriad of information formats. With help from a reference librarian,

Sally discovers a research guide on government information available in the library. She notices that there is a section for New York State that she can explore.

She breathes a sigh of relief when she sees a whole section on the environment that includes a link to the New York State Department of Environmental Conservation's website, which has many documents and regulations on the topic of Hydraulic Fracturing. The reference librarian continues to assist Sally to find the most useful information as she navigates through the site. Since this information is freely available to the public, Sally is able to access the site from home and spends many hours reading the documents.

Conclusion

Sally has demonstrated that she is competent in the Scope information literacy pillar. She was able to determine that there were gaps in her knowledge and she formulated a plan to locate information to close those gaps. Sally became aware that information was available in many different formats and she was able to choose the formats that were most relevant to her needs: books and government information. In addition, she was able to navigate a complex information environment—the New York State Department of Environmental Conservation—to identify the information that was most useful for her purpose. She did encounter some barriers:

- The information she found using Google was not useful because there was too much and it was biased.
- She had to determine which information formats would best serve her needs.
- Her public library didn't have the required information.
- She was overwhelmed by the resources available at the academic library.

Sally was able to overcome all of these common research pitfalls. Consulting a reference librarian was a good way for her to obtain information that she might otherwise have not thought to use.

Exercise: Searching in Databases

1. Search both the SUNY connect catalog and Worldcat.org to identify possible books that will provide the information that Sally is seeking. Choose a few resources based on information provided in catalog record and explain why these resources will help Sally solve her knowledge gap.
2. Using an online catalog, identify both a print resource and an online resource on one specific topic. Compare these resources in terms of content and currency. Which resource would be most useful for obtaining an in depth understanding of the topic? Which would be more useful for gaining a broad overview of the topic?

3. Use a newspaper database, such as Proquest Historical Newspapers to find a newspaper article written shortly after a well-known news event such as the immediate results of the election for the President of the United States in 2000. Compare that information with the information that we now have on that contested Presidential Election. What is missing from the newspaper account? What are some possible information sources that would provide the missing information from the early reports?

3

Plan

Scenario

Sarah's art history professor just assigned the course project and Sarah is delighted that it isn't the typical research paper. Rather, it involves putting together a website to help readers understand a topic. It will certainly help Sarah get a grasp on the topic herself! Learning by attempting to teach others, she agrees, might be a good idea. The professor wants the website to be written for people who are interested in the topic and with backgrounds similar to the students in the course. Sarah likes that a target audience is defined, and since she has a good idea of what her friends might understand and what they would need more help with, she thinks it will be easier to know what to include in her site. Well, at least easier than writing a paper for an expert like her professor.

An interesting feature of this course is that the professor has formed the students into teams. Sarah wasn't sure she liked this idea at the beginning, but it seems to be working out okay. Sarah's team has decided that their topic for this website will be 19th century women painters. But her teammate Chris seems concerned, "Isn't that an awfully big topic?" The team checks with the professor, who agrees they would be taking on far more than they could successfully explain on their website. He suggests they develop a draft thesis statement to help them focus, and after several false starts, they come up with:

The involvement of women painters in the Impressionist movement had an effect upon the subjects portrayed.

They decide this sounds more manageable. Because Sarah doesn't feel comfortable on the technical aspects of setting up the website, she offers to start locating resources that will help them to develop the site's content.

Before we learn more about what happens with Sarah and her team, let's look at the components of the Plan pillar. The overall ability is: "Can construct strategies for locating

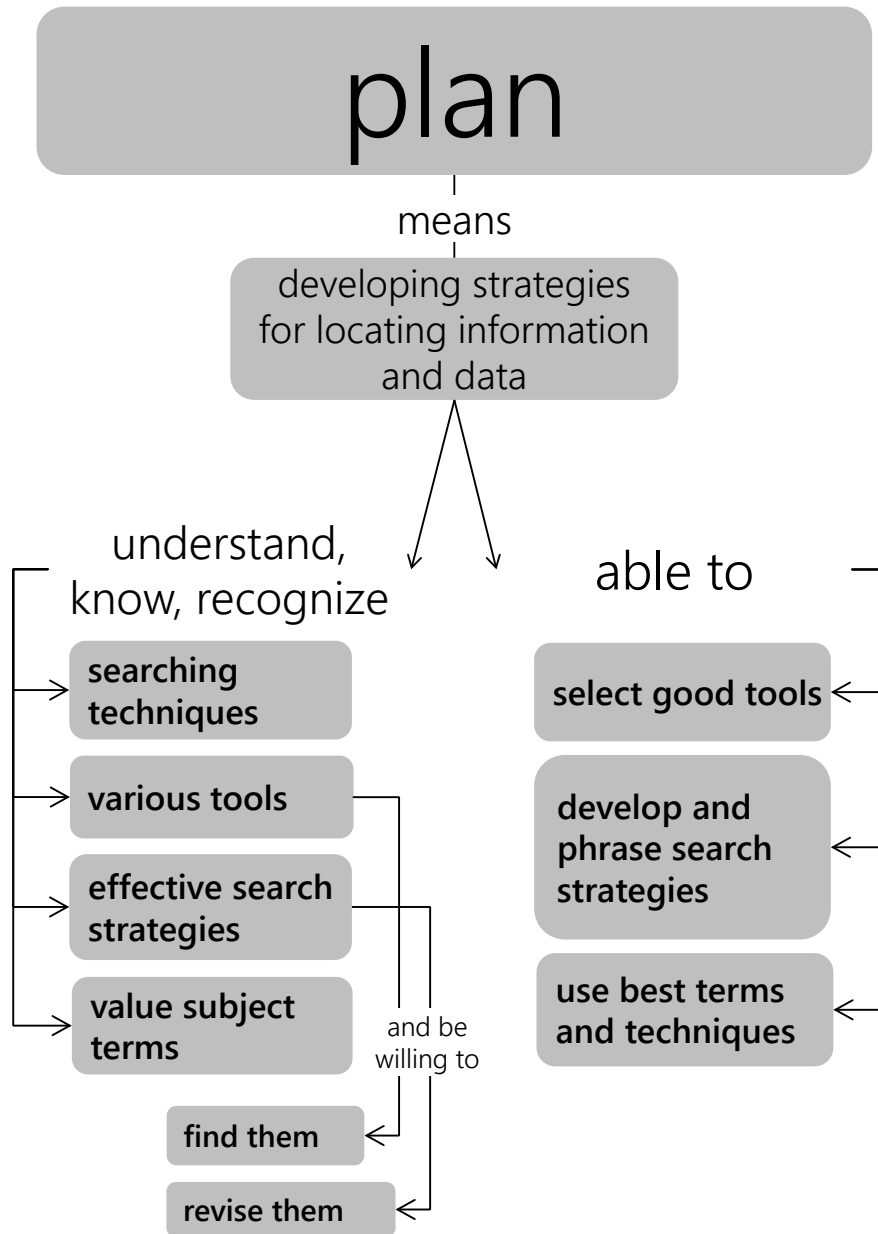
information and data.” That is a fairly short sentence, but a great deal is packed into it. It includes

- Understanding a range of searching techniques
- Understanding the various tools and how they differ
- Knowing how to create effective search strategies
- Being open to searching out the most appropriate tools
- Understanding that revising your search as you proceed is important
- Recognizing that subject terms are of value

And these are just the items to understand! There are also the things you need to be able to do:

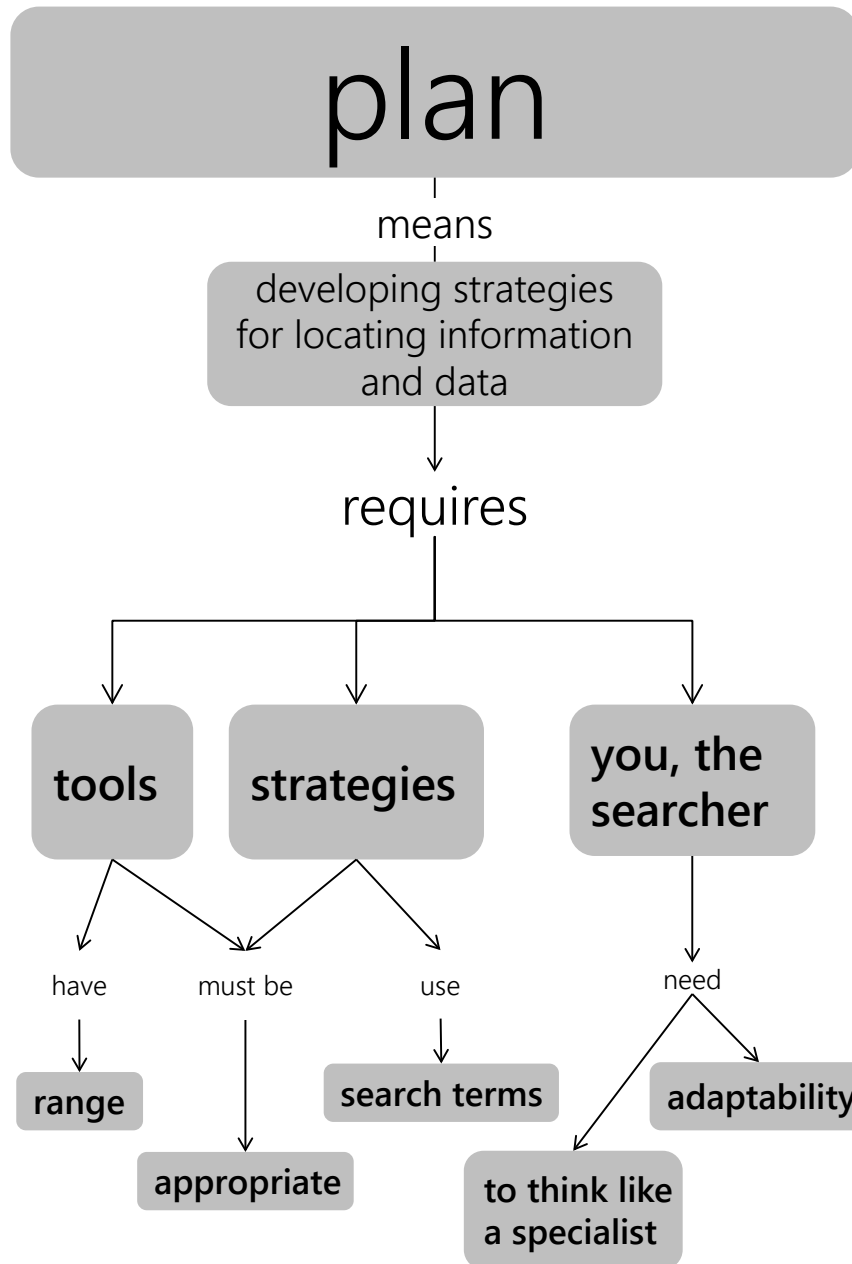
- Clearly phrase your search question.
- Develop an appropriate search strategy, using key techniques.
- Selecting good search tools, including specialized ones.
- Use the terms and techniques that are best suited to your search.

Here is a visual representation of these components:



Proficiencies in the Plan pillar

Now, take a look at the essence of these items condensed into another concept map:



Proficiencies in the Plan pillar simplified

The second concept map is simplified. The focus is on the key elements: the tools and strategies that you use and the mindset that will help you as you plan your research. This may seem a bit daunting, so let's see how Sarah tackles the project. She sometimes falters, but that happens even to experienced researchers. As you read through Sarah's quest for good information, think about the range and appropriateness of the strategies she uses. What would you do differently? What approaches seem to be good ones? (While there is some mention of particular research tools and resources in this chapter, they will be discussed in depth in the [Gather](#) chapter, and also in the [Scope](#) chapter.)

As you read about Sarah's quest for information, and reflect on your own information searches in the past, remember particularly the bullet within the Plan pillar that emphasizes the need to revise your search as you work. It is very important to do this, and to build time into the process so you are able to revise. As you learn more about your topic, or the terms used in conjunction with its concepts, or key scholars in the field, it is only natural that you will need to shift focus, and, perhaps, change course. This is a natural part of the research process and indicates that your efforts are bearing fruit. Let's return to Sarah...

The next time the class meets, Sarah tells her teammates what she has done so far:

"I thought I'd start with some scholarly sources, since they should be helpful, right? I put a search into the online catalog for the library, but nothing came up! The library should have books on this topic, shouldn't it? I typed the search in exactly as we have it in our thesis statement. That was so frustrating. Since that didn't work, I tried Google, and put in the search. I got over 8 million results, but when I looked over the ones on the first page, they didn't seem very useful. One was about the feminist art movement in the 1960s, not during the Impressionist period. The results all seemed to have the words I typed highlighted, but most really weren't useful. I am sorry I don't have much to show you. Do you think we should change our topic?"

Alisha suggests that Sarah talk with a reference librarian. She mentions that a librarian came to talk to another of her classes about doing research, and it was really helpful. Alisha thinks that maybe Sarah shouldn't have entered the entire thesis statement as the search, and maybe she should have tried databases to find articles. The team decides to brainstorm all the search tools and resources they can think of.

Here's what they came up with:

Search Tools and Resources
Wikipedia
Professor
Google search
JSTOR database

Based on your experience, do you see anything you would add?

Sarah and her team think that their list is pretty good. They decide to take it further and list the advantages and limitations of each search tool, at least as far as they can determine.

Search Tools and Resources		
Search Tool	Advantages	Limitations
Wikipedia	Easy access, list of references	Professors don't seem to like it, possibly misinformation
Professor	The expert!	Not sure we can get to office hours; we want to appear self-directed
Google search	Lots of results	We need a better search term
JSTOR database	Authoritative, scholarly articles	None that we know of

Alisha suggests that Sarah should show the worksheet to a librarian and volunteers to go with her. The librarian, Mr. Harrison, says they have made a really good start, but he can fill them in on some other search strategies that will help them to focus on their topic. Would Sarah and Alisha like to learn more?

Let's step back from this case study again, and think about the elements that someone doing research should plan before starting to enter search terms in Google, Wikipedia, or even a scholarly database. There is some preparation you can do to make things go much more smoothly than they have for Sarah.

Self-Reflection

As you work through your own research quests, it is very important to be self-reflective. The first couple of items in this list have been considered in the [Identify](#) chapter:

- What do you really need to find?
- Do you need to learn more about the general subject before you can identify

the focus of your search?

- How thoroughly did you develop your search strategy?
- Did you spend enough time finding the best tools to search?
- What is going really well, so well that you'll want to remember to do it in the future?

Another term for what you are doing is metacognition, or thinking about your thinking. Reflect on what Sarah is going through as you read this chapter. Does some of it sound familiar based on your own experiences? You may already know some of the strategies presented here. Do you do them the same way? How does it work? What pieces are new to you? When might you follow this advice? Don't just let the words flow over you, rather think carefully about the explanation of the process. You may disagree with some of what you read. If you do, follow though and test both methods to see which provides better results.

Selecting Search Tools

After you have thought the planning process through more thoroughly, start to think about where you can look for information. Part of planning to do research is determining which search tools will be the best ones to use. This applies whether you are doing scholarly research or trying to answer a question in your everyday life, such as what would be the best place to go on vacation. "Search tools" might be a bit misleading, since a person might be the source of the information you need. Or it might be a web search engine, a specialized database, an association—the possibilities are endless. Often people automatically search Google first, regardless of what they are looking for. Choosing the wrong search tool may just waste your time and provide only mediocre information, whereas other sources might provide really spot-on information and quickly, too. In some cases, a carefully constructed search on Google, particularly using the advanced search option, will provide the necessary information, but other times it won't. This is true of all sources: make an informed choice about which ones to use for a specific need.

So, how do you identify search tools? Let's begin with a first-rate method. For academic research, talking with a librarian or your professor is a great start. They will direct you to those specialized tools that will provide access to what you need. If you ask a librarian for help, she or he may also show you some tips about searching in the resources. This chapter will cover some of the generic strategies that will work in many search tools, but a librarian can show you very specific ways to focus your search and retrieve the most useful items.

If neither your professor nor a librarian is available when you need help, check your school's library website to see what guidance is provided. There will often be subject-related guides or lists of the best resources to assist researchers. There may be a directory of the databases the library subscribes to and the subjects they cover. Take advantage of the expertise of

librarians by using such guides. Novice researchers usually don't think of looking for this type of help, and, as a consequence, often waste time.

When you are looking for non-academic material, consider who cares about this type of information. Who works with it? Who produces it or help guides for it? Some sources are really obvious, and you are already using them—for example, if you need information about the weather in London three days from now, you might check Weather.com for London's forecast. You don't go to a library (in person or online), and you don't do a research database search. For other information you need, think the same way. Are you looking for anecdotal information on old railroads? Find out if there is an organization of railroad buffs. You can search on the web for this kind of information, or, if you know about and have access to it, you could check the Encyclopedia of Associations. This source provides entries for all U.S. membership organizations, which can quickly lead you to a potentially wonderful source of information. Librarians can point you to tools like these.

As you consider the information presented in this chapter, keep the scope of the information you are looking for in mind. In the previous chapter we examined the topic of scope in detail. The breadth and depth of the information you require will have an impact as you plan.

Consider Asking an Expert

Have you thought about using people, not just inanimate sources, as a way to obtain information? This might be particularly appropriate if you are working on an emerging topic or a topic with local connections. There are a variety of reasons that talking with someone will add to your research.

For personal interactions, there are other specific things you can do to obtain better results. Do some background work on the topic before contacting the person you hope to interview. The more familiarity you have with your topic and its terminology, the easier it will be to ask focused questions. Focused questions are important if you want to get into the meat of what you need. Asking general questions because you think the specifics might be too detailed rarely leads to the best information. Acknowledge the time and effort someone is taking to answer your questions, but also realize that people who are passionate about subjects enjoy sharing what they know. Take the opportunity to ask experts about sources they would recommend.

Determining Search Concepts and Keywords

Once you've selected some good resources for your topic, and possibly talked with an expert, it is time to move on to identify words you will use to search for information on your topic in various databases and search engines. This is sometimes referred to as building a search query. When deciding what terms to use in a search, break down your topic into its main concepts. Don't enter an entire sentence, or a full question. Different databases and search engines process such queries in different ways, but many look for the entire phrase you enter as a complete unit, rather than the component words. While some will focus on just the important words, such as Sarah's Google search that you read about earlier in this chapter, the results are often still unsatisfactory. The best thing to do is to use the key concepts involved with your topic. In addition, think of synonyms or related terms for each concept. If you do this, you will have more flexibility when searching in case your first search term doesn't produce any or enough results. This may sound strange, since if you are looking for information using a Web search engine, you almost always get too many results. Databases, however, contain fewer items, and having alternative search terms may lead you to useful sources. Even in a search engine like Google, having terms you can combine thoughtfully will yield better results.

The following worksheet is an example of a process you can use to come up with search terms. It illustrates how you might think about the topic of violence in high schools. Notice that this exact phrase is not what will be used for the search. Rather, it is a starting point for identifying the terms that will eventually be used.

> TOPIC: Violence in high schools	
> CONCEPTS:	
Violence	High School
violence	high school
OR	OR
bullying	secondary school
OR	OR
guns	12th grade
OR	
knives	
OR	
gangs	

Now, use a clean copy of the same worksheet to think about the topic Sarah's team is working on. How might you divide their topic into concepts and then search terms? Keep in mind that the number of concepts will depend on what you are searching for. And that the search terms may be synonyms or narrower terms. Occasionally, you may be searching for something very specific, and in those cases, you may need to use broader terms as well. Jot down your ideas then compare what you have written to the information on the second, completed worksheet and identify 3 differences.

> TOPIC: The involvement of women painters in the Impressionist movement had an effect upon the subjects portrayed.

> CONCEPTS:

Women		Painters		Impressionist Movement		Subjects
<input type="text"/>	&	<input type="text"/>	&	<input type="text"/>	&	<input type="text"/>
OR		OR		OR		OR
<input type="text"/>		<input type="text"/>		<input type="text"/>		<input type="text"/>
OR		OR		OR		
<input type="text"/>		<input type="text"/>		<input type="text"/>		
OR		OR		OR		
<input type="text"/>		<input type="text"/>		<input type="text"/>		
OR		OR				
<input type="text"/>		<input type="text"/>				
OR						
<input type="text"/>						
OR						
<input type="text"/>						

> **TOPIC:** The involvement of women painters in the Impressionist movement had an effect upon the subjects portrayed.

> **CONCEPTS:**

Women		Painters		Impressionist Movement		Subjects
women	&	painters	&	Impressionist Movement	&	subjects
OR		OR		OR		OR
woman		painter		Impressionism		
OR		OR		OR		
female		artist		Impressionists		
OR		OR		OR		
females		artists				
OR						
mother						
OR						
mothers						
OR						
Berthe Morisot						
OR						
Mary Cassatt (see below)						

Note: These are just two of the better known women Impressionists. Other names could be added or substituted.

Boolean Operators

Once you have the concepts you want to search, you need to think about how you will enter them into the search box. Often, but not always, Boolean operators will help you. You may be familiar with Boolean operators. They provide a way to link terms. Boolean operators are also discussed in the [Scope](#) chapter. The information in the two chapters complements each other and reading about this important topic again provides a review for the topics that overlap.

We will start by capturing the ideas of the women creating the art. We will use *women painters* and *women artists* as the first step in our sample search. You could do two separate searches by typing one or the other of the terms into the search box of whatever tool you are using:

women painters

women artists

You would end up with two separate result lists and have the added headache of trying to identify unique items from the lists. You could also search on the phrase

women painters and women artists

But once you understand Boolean operators, that last strategy won't make as much sense as it seems to.

There are three Boolean operators: *and*, *or*, and *not*.

And is used to get the intersection of all the terms you wish to include in your search. With this example

women painters and women artists

you are asking that the items you retrieve have both of those terms. If an item only has one term, it won't show up in the results. This is not what the searcher had in mind—she is interested in both artists and painters, because she doesn't know which term might be used. She doesn't intend that both terms have to be used. Let's go on to the next Boolean operator, which will help us out with this problem.

Or is used when you want at least one of the terms to show up in the search results. If both do, that's fine, but it isn't a condition of the search. So *or* makes a lot more sense for this search:

women painters or women artists

Now, if you want to get fancy with this search, you could use both *and* as well as *or*:

women and (painters or artists)

The parentheses mean that these two concepts, painters and artists, should be searched as a unit, and the search results should include all items that use one word or the other. The results will then be limited to those items that contain the word *women*. If you decide to use parentheses for appropriate searches, make sure that the items contained within them are related in some way. With *or*, as in our example, it means either of the terms will work. With *and*, it means that both terms will appear in the document.

Type both of these searches in Google Scholar (scholar.google.com) and compare the results. Were they the same? If not, can you determine what happened? Which result list looked better?

Here is another example of a search string, using both parentheses and two Boolean operators:

entrepreneurship and (adolescents or teens)

In this search, you are looking for entrepreneurial initiatives connected with people in their teens. Because there are so many ways to categorize this age group, it makes sense to indicate that either of these terms should appear in the results, along with entrepreneurship.

However, this search string isn't perfect. Can you pick out two problems with the search terms?

The third Boolean operator, *not*, can be problematic. *Not* is used to exclude items from your search. If you have decided, based on the scope of the results you are getting, to focus only on a specific aspect of a topic, use *not*, but be aware that items are being lost in this search. For example, if you entered

entrepreneurship and (adolescents or teens) not adults

you might lose some good results. Why? If you would like to see graphical representations of the effects of Boolean operators, take a look at the [Scope](#) chapter in this book.

There is a good overview of Boolean operator use at <http://libguides.mit.edu/content.php?pid=36863&sid=271372>

Other Helpful Search Techniques

Using Boolean operators isn't the only way you can create more useful searches. In this section, we will review several others.

Truncation

In this search:

Entrepreneurs and (adolescents or teens) you might think that the items that are retrieved from the search can refer to entrepreneurs plural or entrepreneur singular. If you did, you spotted a problem. Because computers are very literal, they usually look for the exact terms you enter. While it is true that some search functions are moving beyond this model, you want to think about alternatives, just to be safe. In this case, using the singular as well as the plural form of the word might help you to find useful sources. Truncation, or searching on the root of a word and whatever follows, lets you do this.

So, if you search on

Entrepreneur* and (adolescents or teens)

You will get items that refer either to the singular or plural version of the word *entrepreneur*, but also *entrepreneurship*.

Look at these examples:

adolescenc*

educat*

Think of two or three words you might retrieve when searching on these roots. It is important to consider the results you might get and alter the root if need be. An example of this is *poli**. Would it be a good idea to use this root if you wanted to search on *policy* or *policies*? Why or why not?

In some cases, a symbol other than an asterisk is used. To determine what symbol to use, check the help section in whatever resource you are using. The topic should show up under the truncation or stemming headings.

Here is the same search terms worksheet you saw earlier, but with truncation acknowledged:

> TOPIC: The involvement of women painters in the Impressionist movement had an effect upon the subjects portrayed.

> CONCEPTS:

Women		Painters		Impressionist Movement		Subjects
wom*n (see below)	&	painter*	&	Impressionis*	&	subject*
OR		OR		OR		OR
female*		artist*				
OR		OR				
mother*						
OR						
Berthe Morisot						
OR						
Mary Cassatt (see below)						

Note: Some systems use a different symbol for internal truncation, which might be called a wildcard. It might be a question mark, wom?n, but it is best to check the help files.

Note: These are just two of the better known women Impressionists. Other names could be added or substituted.

Phrase Searches

Phrase searches are particularly useful when searching the web. If you put the exact phrase you want to search in quotation marks, you will only get items with those words as a phrase and not items where the words appear separately in a document, website, or other resource. Your results will usually be fewer, although surprisingly, this is not always the case. Try these two searches in the search engine of your choice:

“essay exam”

essay exam

Was there a difference in the quality and quantity of results? If you would like to find out if the database or search engine you are using allows phrase searching and the conventions for doing so, search the help section. These help tools can be very, well, helpful!

Advanced Searches

Advanced searching allows you to refine your search query and prompts you for ways to do this. Consider the basic Google.com search box. It is very minimalistic, but that minimalism is deceptive. It gives the impression that searching is easy and encourages you to just enter your topic, without much thought, to get results. You certainly do get many results. But are they really good results? Simple search boxes do many searchers a disfavor. There is a better way to enter searches.

Advanced search screens show you many of the options available to you to refine your search, and, therefore, get more manageable numbers of better items. Many web search engines include advanced search screens, as do databases for searching research materials. Advanced search screens will vary from resource to resource and from web search engine to research database, but they often let you search using

- Implied Boolean operators (for example, the “all the words” option is the same as using the Boolean *and*)
- Limiters for date, domain (.edu, for example), type of resource (articles, book reviews, patents)
- Field (a field is a standard element, such as title of publication or author's name)
- Phrase (rather than entering quote marks)

Let's see how this works in practice.

Exercise: Google Searches

Go to the advanced search option in Google. You can find it at http://www.google.com/advanced_search

Take a look at the options Google provides to refine your search. Compare this to the basic Google search box. One of the best ways you can become a better searcher for information is to use the power of advanced searches, either by using these more complex search screens or by remembering to use Boolean operators, phrase searches, truncation, and other options available to you in most search engines and databases.

While many of the text boxes at the top of the Google Advanced Search page mirror concepts already covered in this chapter (for example, “this exact word or phrase” allows you to omit the quotes in a phrase search), the options for narrowing your results can be powerful. You can limit your search to a particular domain (such as .edu for items from educational institutions) or you can search for items you can reuse legally (with attribution, of course!) by making use of the “usage rights” option. However, be careful with some of the options, as they may excessively limit your results. If

you aren't certain about a particular option, try your search with and without using it and compare the results. If you use a search engine other than Google, check to see if it offers an advanced search option: many do.

Subject Headings

In the section in this chapter on advanced searches, you read about field searching. To explain further, if you know that the last name of the author whose work you are seeking is Wood, and that he worked on forestry-related topics, you can do a far better search using the author field. Just think what you would get in the way of results if you entered a basic search such as *forestry and wood*. It is great to use the appropriate Boolean operator, but oh, the results you will get! But what if you specified that *wood* had to show up as part of the author's name? This would limit your results quite a bit.

So what about *forestry*? Is there a way to handle that using a field search? The answer is yes (why else bring it up?). Subject headings are terms that are assigned to items to group them. An example is cars—you could also call them autos, automobiles, or even more specific labels like SUVs or vans. You might use the Boolean operator *or* and string these all together. But if you found out that the sources you are searching use *automobiles* as the subject heading, you wouldn't have to worry about all these related terms, and could confidently use their subject heading and get all the results, even if the author of the piece uses *cars* and not *automobiles*.

How does this work? In many databases, a person called an indexer or cataloger scrutinizes and enters each item. This person performs helpful, behind-the-scenes tasks such as assigning subject headings, age levels, or other indicators that make it easier to search very precisely. An analogy is tagging, although indexing is more structured than tagging. If you have tagged items online, you know that you can use any terms you like and that they may be very different from someone else's tags. With indexing, the indexer chooses from a set group of terms. Obviously, this precise indexing isn't available for web search engines—it would be impossible to index everything on the web. But if you are searching in a database, make sure you use these features to make your searches more precise and your results lists more relevant. You also will definitely save time.

You may be thinking that this sounds good. Saving time when doing research is a great idea. But how will you know what subject headings exist, so you can use them? Here is a trick that librarians use. Even librarians don't know what terms are used in all the databases or online catalogs that they use. So a librarian's starting point isn't very far from yours. But they do know to use whatever features a database provides to do an effective search. They find out about them by acting like a detective.

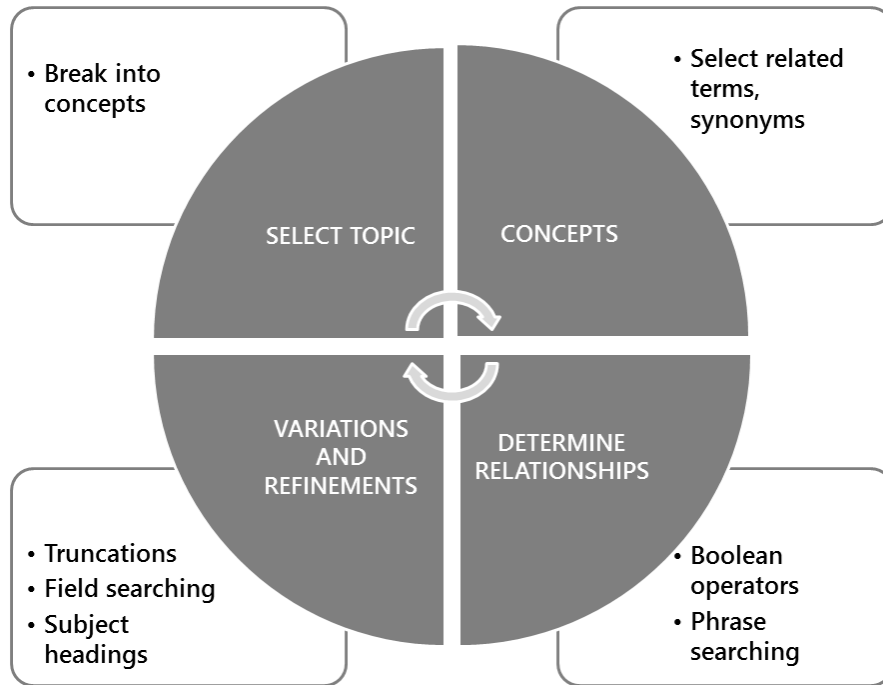
You've already thought about the possible search terms for your information need. Enter the best search strategy you developed, which might use Boolean operators or truncation. Scan the results to see if they seem to be on topic. If they aren't, figure out what results you are getting that just aren't right, and revise your search. Terms you have searched on often show up in bold face type, so they are easy to pick out. Besides checking the titles of the

results, read the abstracts (or summaries), if there are any. You may get some ideas for other terms to use. But if your results are fairly good, scan them with the intent to find one or two items that seem to be precisely what you need. Get to the full record (or entry), where you can see all the details entered by the indexers. Here is an example from the University at Albany's Minerva catalog, but keep in mind that the catalog or database you are using may have entries that look very different.

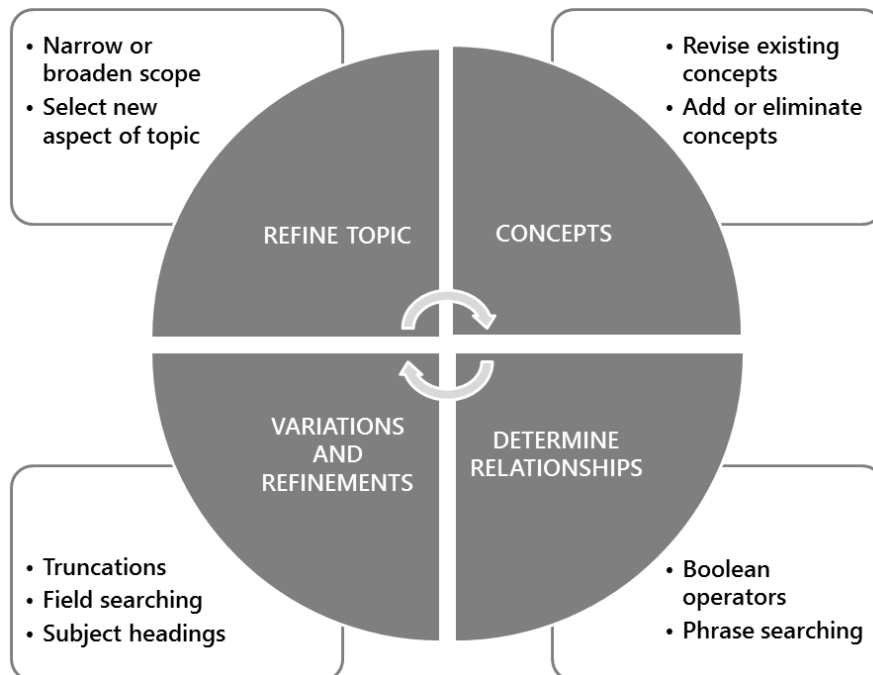
	001567898
Title	Web of deceit : misinformation and manipulation in the age of social media / edited by Anne P. Mintz.
Added Author	Mintz, Anne P.
Subject	Internet fraud.
	Electronic information resource literacy.
	Computer network resources — Evaluation.
	Internet searching.
ISBN	9780910965910
	0910965919
Publisher/ Date	Medford, N.J.: CyberAge Books, c2012.

Once you have the “full” record (which does not refer to the full text of the item, but rather the full descriptive details about the book, including author, subjects, date, and place of publication, and so on), look at the subject headings (they may be called descriptors or some other term, but they should be recognizable as subjects) and see what words are used. They may be identical to the terms you entered, but if not, revise your search using the subject heading words. The result list should now contain items that are relevant for your need.

This chapter presents a strategy for developing a successful search. This figure reviews the key points:



It is tempting to think that once you have gone through all the processes around the circle, as seen in this diagram, your information search is done and you can start writing. However, research is a recursive process. You don't start at the beginning and continue straight through until you end at the end. Once you have followed this planning model, you will often find that you need to alter or refine your topic and start the process again, as seen here:



This revision process may happen at any time, before or during the preparation of your paper or other final product. The researchers who are most successful do this, so don't ignore opportunities to revise.

So let's return to Sarah and her search for information to help her team's project. Sarah realized she needed to make a number of changes in the search strategy she was using. She had several insights that definitely led her to some good sources of information for this particular research topic. Can you identify the good ideas she implemented?

Exercise: Reviewing Search Strategies

Take this quiz online!

1. Now that the team has a draft thesis statement, the next step would be to:
 - a. Enter the thesis statement into a database, rather than the catalog
 - b. Select keywords and enter them into Google
 - c. Dissect the thesis statement to determine key terms, related terms, and Boolean operators or other searching techniques
2. If you are interested in the use of social media such as Twitter by college students for research purposes, which of the following is the best general search strategy:
 - a. (social media and Twitter) and research and college students
 - b. Social media and college students and research purposes
 - c. (social media or Twitter or Facebook) and research and college student*
3. The best place to start the search online is:
 - a. An online guide on the library's website
 - b. Google
 - c. The library's catalog
4. When searching a subject-specific database, it is especially important to...
 - a. Use any search refinements they provide that make sense
 - b. Check for the best subject headings to use
 - c. Both a. and b

5. Sarah realized that the order for doing the best research most often includes these steps:
 - a. Select topic, select keywords, do search, read and understand results, create product
 - b. Select topic, select keywords, do search, read and understand results, revise search and return to the process as needed, create product
 - c. Check for online assistance on the library's website, do the search, revise the search as needed, create product

Gather

Scenario

Harry Dosital is feeling overwhelmed by one of his class assignments. Harry would have been happy if the assignment was to write a traditional research paper but his professor has asked the class to solve a real life problem. The professor has asked the class to imagine a small city undergoing a natural disaster such as a flood or a tornado. Each group in the class is required to plan a hypothetical information command center for this city. The professor explains that the government needs to obtain accurate, up-to-date information on the scope of the damage and injuries sustained due to the disaster. This information is vital for the city to be able to provide adequate emergency and medical assistance to its citizens. Harry can see that this is an important function for any city in the midst of a crisis but he is not sure about where to get reliable information to help him construct a plan for the city.

Harry and his classmates do some brainstorming and decide to approach this assignment as if they were actually producing a research paper. Their first step will be to research recent disasters. They reason that this will provide some information about the way some cities have gathered information during disasters. If an information gathering strategy worked for other cities, it will work for their hypothetical city. There certainly have been a lot of natural disasters recently, so it shouldn't be too hard to find some information. Super Storm Sandy and Hurricane Irene are two recent events that immediately come to mind. The group starts to research Super Storm Sandy with Google and Wikipedia.

Harry and his classmates are engaging in the Gather pillar of the Seven Pillars of Information Literacy model. Just as municipalities needed to gather reliable information in order to provide vital services to their citizens, Harry and his group members need to gather information that will help them complete this assignment.

These information needs are components of the Gather pillar, which states that the information literate individual understands

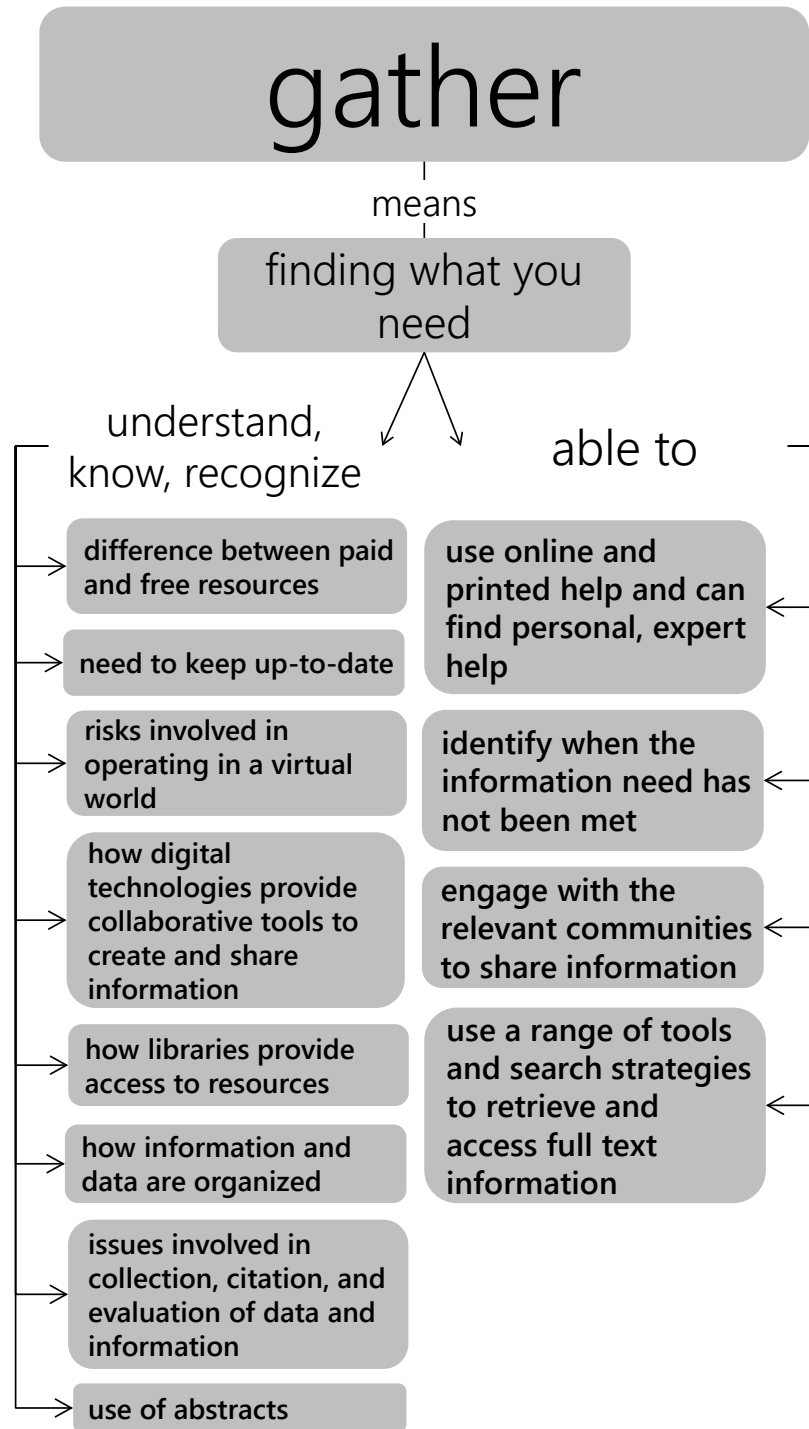
- How information and data are organized
- How libraries provide access to resources
- How digital technologies provide collaborative tools to create and share

information

- The issues involved in collection of new data
- The different elements of a citation
- The use of abstracts
- The need to keep up-to-date
- The difference between free and paid resources
- The risks involved in operating in a virtual world
- The importance of appraising and evaluating search results

They are able to

- Use a range of retrieval tools and resources effectively
 - Construct complex searches appropriate to different digital and print resources
 - Access full text information, both print and digital, read and download online material and data
 - Use appropriate techniques to collect new data
 - Keep up to date with new information
 - Engage with their community to share information
 - Identify when the information need has not been met
 - Use online and printed help and can find personal, expert help
- The abilities connected with the Gather pillar overlap, in some aspects, with those in other chapters. Where this is the case, those abilities are not addressed in this chapter.



Proficiencies in the Gather pillar

Information Formats and the Internet

Traditionally, information has been organized in different formats, usually as a result of the time it took to gather and publish the information. For example, the purpose of news reporting is to inform the public about the basic facts of an event. This information needs to be disseminated quickly, so it is published daily in print, online, on broadcast television, and radio media. More in-depth treatment of information takes longer to research, write, and publish, and traditionally was published in scholarly journals and books.

Today, information is still published in traditional formats as well as in newly evolving formats on the Internet. These new information formats are loosely defined as Web 2.0 formats and can include electronic journals, books, news websites, blogs, Twitter, Facebook, and location postings. The coexistence of all of these information formats is messy and chaotic. The process for finding relevant information is not always clear.

One way to make some sense out of the current information universe is to thoroughly understand traditional information formats. We can then understand the concepts inherent in the information formats found online. There are some direct correlations such as books and journal articles, but there are also some newer formats like tweets that didn't exist until recently.

Let's look at the news industry. Many traditional newspapers are shutting down and those that remain are retrenching. While there are many reasons for this, one of the major trends has been the rise of the Internet. In the United States, more than 50 per cent of the population reads the news online (<http://www.oecd.org/sti/ieconomy/oecdexaminessthefutureofnewsandtheinternet.htm>).

Indeed, online news sites provide a different and, some might argue, a more relevant experience for the reader. They offer video and sound, up-to-the-minute updates on breaking news, and the ability to interact with the content by posting comments. Another important feature of online news is that search engines can deliver content from the site in response to a query. In other words, readers don't have to visit a site such as the *New York Times* in order to read its content.

This has both positive and negative consequences. The positive consequence is that readers can quickly and conveniently obtain information from a variety of sources on a topic or event. The negative consequence is that it is more difficult to evaluate the credibility of the sources. The [Evaluate](#) chapter in this book provides some good strategies for evaluating information sources.

For Harry and his group, all of this means they will have to research many different kinds of information resources in order to create an effective information command center.

Twitter and Blog Postings

Many of the group's Google results are Twitter feeds and blog postings. These did not provide a lot of information. After all, a tweet consists of only 140 characters. However, these resources did help Harry's group by suggesting key people, cities, technologies, and other resources associated with Super Storm Sandy to research. Often a blog posting will provide a link to a longer, more useful resource. The students' review of blogs and tweets also provided an otherwise unthought-of insight. As Harry and his group were reviewing Twitter feeds posted during Super Storm Sandy, they noted that people were using Twitter to inform their friends and relatives about their whereabouts, their health, and the conditions of their surroundings. Since electricity was not available, most televisions and radios did not work, but mobile technologies like Twitter served as effective communication tools. Once Harry realized this, a Twitter feed was quickly incorporated into his command center's communication plan.

Newspaper Articles

One of the members of Harry's group suggested they should consult a newspaper to see what role the newspaper played to help the city understand the destruction caused by the storm. The group chose the *New York Times*. The *New York Times* can be accessed online and articles from the day of the storm can be viewed. However, the group found that more useful information was published in the *New York Times* in the days after the storm. Harry's initial search of the *New York Times* for articles containing the phrase *super storm Sandy* published on October 29, 2012 resulted in some blog postings from reporters and many stories about damage from the storm. But when Harry reentered his search without a date limit, he retrieved articles that analyzed how the region's municipalities performed during the storm. It takes time to conduct this type of analysis, so looking for information that was published days, weeks, or months after the storm took place was a good strategy.

Many other newspapers can be accessed online or at a local library in microfilm. Microfilm is a film image of the print version of a newspaper. Most libraries hold many years of newspaper issues on microfilm. A microfilm reader is required to view the microfilm version of a document. Libraries that own newspapers on microfilm also provide the microfilm readers.

Primary Sources

Another member of Harry's group recalled that he had cousins in New York City who experienced Super Storm Sandy firsthand. He offered to interview his cousins about their experiences during the storm. This type of information is known as a primary information or source. Primary sources are accounts from a person or persons who have firsthand knowledge of an event. Speeches, photographs, diaries, autobiographies, and interviews are all primary sources.

In this case, the primary source is still alive and is accessible to Harry's group. However, some researchers are not so fortunate. If this is the case, primary sources can still be found in a variety of locations and formats. There are many online sites that have created digitized collections of copies of diaries and letters from historical events. It is important to remember that primary sources are not limited to a single format. You may find them in books, journals, newspapers, email, websites, and artwork.

Scholarly Journal Articles

The results of the research that Harry and his group has done are useful, but Harry is concerned that there might be too much focus on Super Storm Sandy. He wants to find more information on crisis and disaster management in general. Harry thinks that there might be general standards or practices that should be incorporated into his group's plan. Journal articles and books might provide this information.

Harry starts his search for journal articles by using a multidisciplinary database because he is not sure which specific disciplines will cover the information he seeks. He constructs and executes a search query and finds that the abstracts included in the results help him choose several peer-reviewed, or scholarly, articles to read.

Scholarly journal articles usually include an abstract at the beginning of the article. An abstract summarizes the contents of the article. In an abstract, key points as well as conclusions are briefly described. Abstracts are often included in the database record. Researchers find this information helpful when deciding whether or not to retrieve the whole article.

Most of the articles that Harry chooses are available in PDF format from the database, but there are a few articles that look very relevant that don't have links to a PDF. Harry really wants to read these articles so he decides to try to find out if there is another way to obtain the full text. He consults a librarian who instructs him to look for the title of the journal (not the article) in the online catalog. The catalog record will provide information on whether the journal is available online from another database or if it is available in print.

Journals, and the articles they contain, are often quite expensive. Libraries spend a large part of their collection budget subscribing to journals in both print and online formats. You may have noticed that a Google Scholar search will provide the citation to a journal article but will not link to the full text. This happens because Google does not subscribe to journals. It only searches and retrieves freely available web content. However, libraries do subscribe to journals and have entered into agreements to share their journal and book collections with other libraries. If you are affiliated with a library as a student, staff, or faculty member, you have access to many other libraries' resources, through a service called interlibrary loan. Do not pay the large sums required to purchase access to articles unless you do not have another way to obtain the material, and you are unable to find a substitute resource that provides the information you need.

There is one more feature Harry found while searching in databases: some offer the option of an alert service. This feature allows Harry to enter the most productive search strings, as

well as his email address. When new items are added to the database that fit his search, he receives an alert. Harry found this to be a great way to keep up to date with new articles on his topic without having to initiate a new search.

Books

Next, Harry's group looks for books on the topic. They search the library's online catalog using search terms that were successful in their database searches. They find some great titles and head to the library stacks to retrieve them.

Most academic libraries use the Library of Congress classification system to organize their books and other resources. The Library of Congress classification systems divides a library's collection into 21 classes or categories. A specific letter of the alphabet is assigned to each class. More detailed divisions are accomplished with two and three letter combinations. Book shelves in most academic libraries are marked with a Library of Congress letter-number combination to correspond to the Library of Congress letter-number combination on the spines of library materials. This is often referred to as a call number and it is noted in the catalog record of every physical item on the library shelves.

Harry uses the call numbers to locate some books that he found in the catalog. He is happily surprised to find that there are also some really useful books sitting on the shelf right next to the books he previously identified. This is a handy way to find additional information resources on a topic. It is more efficient to first search the online catalog to locate relevant resources and then search the shelves.

Library of Congress Classification

A General Works — includes encyclopedias, almanacs, indexes

B-BJ Philosophy, Psychology

BL-BX Religion

C History — includes archaeology, genealogy, biography

D History — general and eastern hemisphere

E-F History — America (western hemisphere)

G Geography, Maps, Anthropology, Recreation

H Social Science

J Political Science

K Law (general)

KD Law of the United Kingdom and Ireland

KE Law of Canada

KF Law of the United States

L Education

M Music

N Fine Arts — includes architecture, sculpture, painting, drawing

P-PA General Philosophy and Linguistics, Classical Languages, and Literature

PB-PH Modern European Languages

PG Russian Literature

PJ-PM Languages and Literature of Asia, Africa, Oceania, American Indian Languages, Artificial Languages

PN-PZ General Literature, English and American Literature, Fiction in English, Juvenile Literature

PQ French, Italian, Spanish, Portuguese Literature

PT German, Dutch, and Scandinavian Literature

Q Science — includes physical and biological sciences, math, computers

R Medicine — includes health and human sexuality

S Agriculture

T Technology — includes engineering, auto mechanics, photography, home economics

U Military Science

V Naval Science

Z Bibliography, Library Science Citations

Citations

As Harry's group starts to read and digest all of the information they have gathered, they notice that many articles and books contain references to other articles and books. Even Wikipedia entries contain references. These consist of citations to resources that authors have quoted or paraphrased in their work or have used to research for their publications. Some of these citations look like they would provide great information. But the group is confused. They don't know if the citation is to a book or an article or something else.

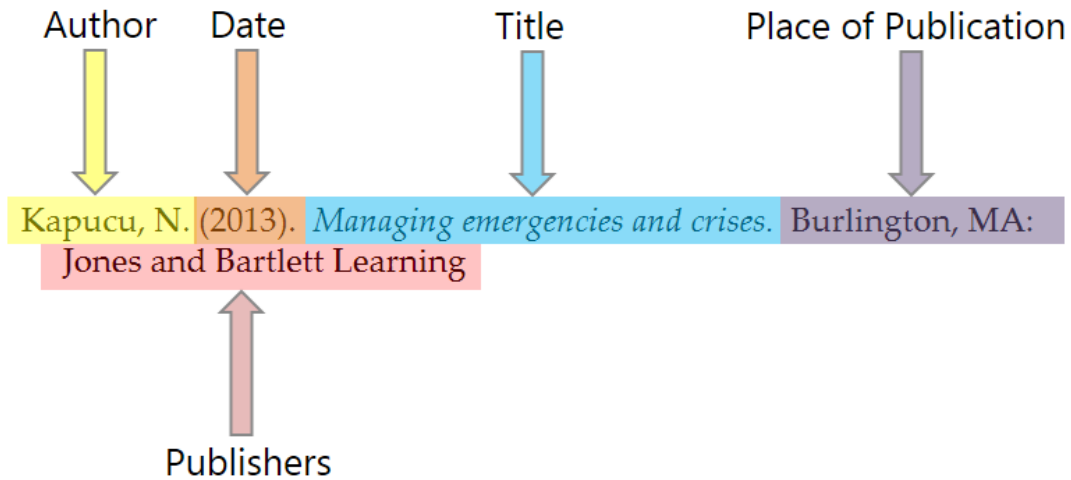
Citations can be confusing. There are many different citation styles and not many hard and fast rules about when to use a particular style. Your professor may indicate which citation style you should use. If not, the general rule of thumb is that the Social Sciences and Education disciplines use APA (American Psychological Association) citation style, while the Humanities and Arts disciplines use MLA (Modern Language Association) or the Chicago style. You can find detailed information about how to format a citation in these styles by consulting the latest *Publication Manual of the American Psychological Association*, for APA citations, the most recent copy of the *MLA Handbook for Writers of Research Papers*, or the current *Chicago Manual of Style*. You should be able to find copies of these publications in the reference section of your library. You can also obtain guidance on formatting citations in the APA and MLA style from the University at Albany's Citation Fox, available online at <http://library.albany.edu/cfox>.

However, just knowing what citation style is used doesn't always clear up the confusion. Each different information format is cited differently. The most common formats that you will encounter are books, chapters in books, journal articles, and websites.

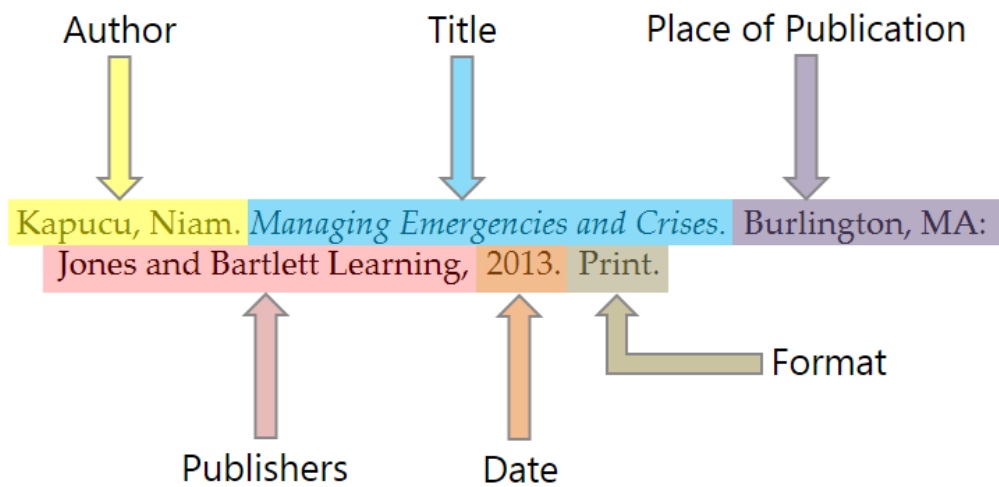
Take a look at the citations by clicking the button below or looking at the images in the following pages. You can see that there are differences between citation styles. You can also see that each information format contains different elements. When you try to determine whether a citation is for a book, book chapter or journal, think about the elements inherent in each of these formats. For example, a journal article appears in a journal that is published in a volume and issue. If you see volume and issue numbers in the citation, you can assume that the citation is for a journal article. A book chapter is usually written by a different author from the editors of the whole book. A whole book is often the easiest citation to decipher. It contains the fewest elements.

[Click here to explore the elements of a citation online!](#)

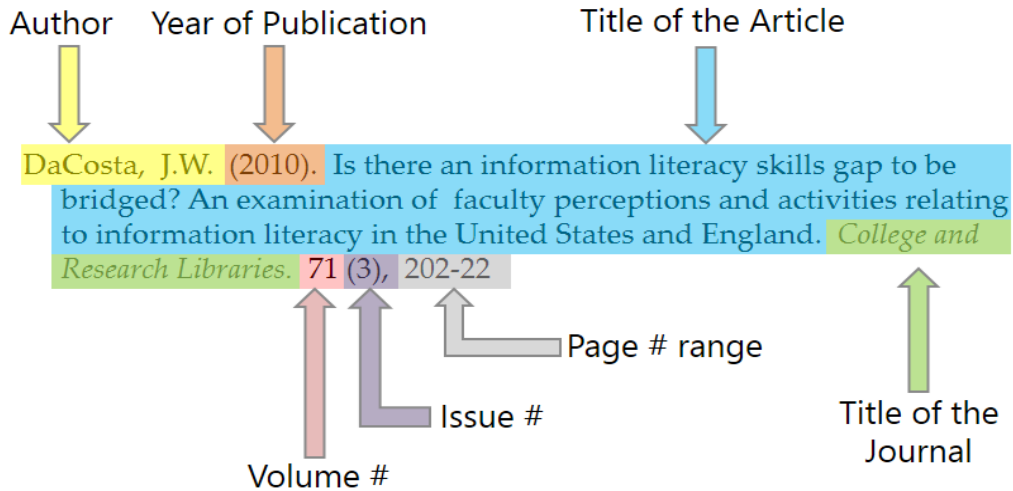
Citation to a Book APA



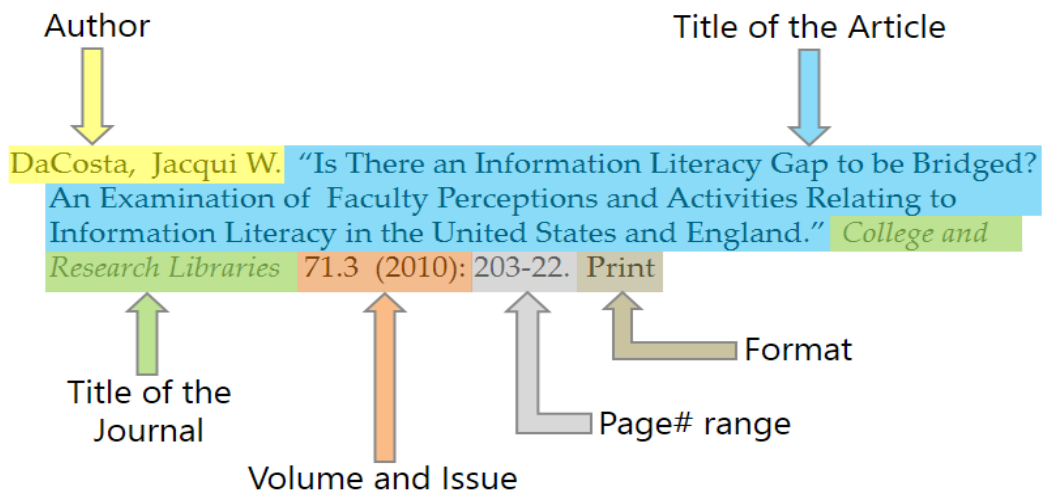
Citation to a Book MLA



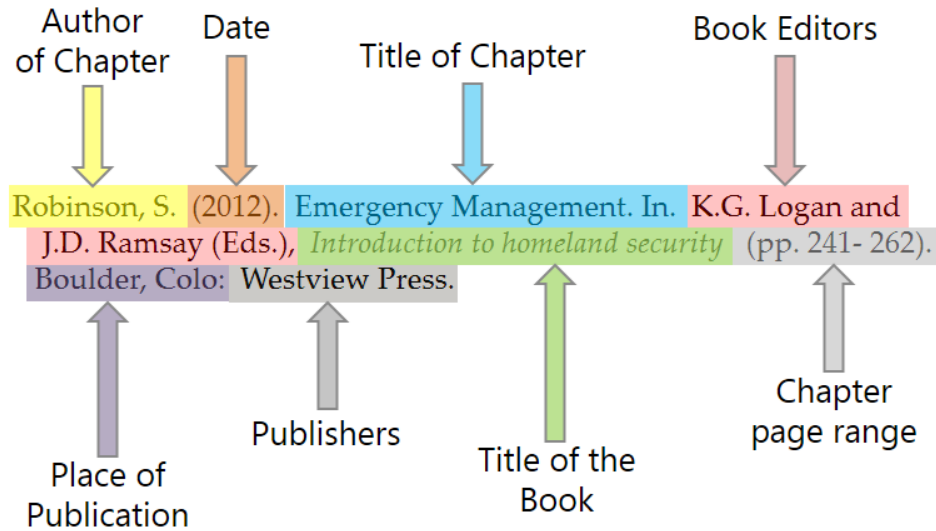
Citation to an Article from a Journal APA



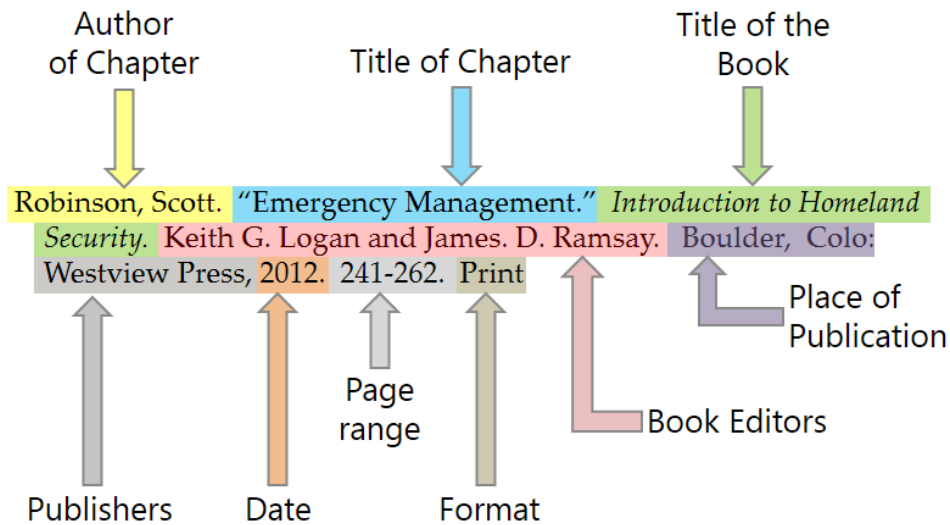
Citation to an Article from a Scholarly Journal MLA



Citation to a Chapter in a Book APA



Citation to a Chapter in a Book MLA



This chapter has discussed citations in relation to finding resources. You will encounter citations again in the [Manage](#) chapter, which covers how to use citations to share information with others.

Sharing Information

Harry had a chance to talk with members of some of the other groups in his class about the hunt for information. This was initially done informally before class started, but he wished there was a more formal process, since it was so helpful to all the groups who participated. Harry's group shared some of what they'd learned, and also found out about some strategies others had used. The students lamented that the professor hadn't set up some sort of electronic forum where they could share tips and resources, but then decided to do it themselves! They set up a wiki on PBWorks. It felt a bit strange at first, being collaborative in this way, rather than competitive, but it really helped everyone. One group was struggling to find information that met their needs, but between working with a librarian and consulting the wiki, they succeeded with their project.

Conclusion

Harry and his classmates have spent time gathering information to help them create a realistic and accurate crisis command center. They accessed and used Web 2.0 information sources in the form of Twitter feeds and blogs. They used online newspapers and online journal articles. They even gathered some very useful hard copy books. During this process, the students learned about different ways that information is organized including the Library of Congress classification system. Harry was amazed at the wealth of quality information he was able to gather. It took him a while and the process was more complicated than just searching the web, but Harry now feels more confident about acing the assignment. He also feels that he learned more than how to set up a command center. He learned how to engage in academic research!

Exercise: Comparing Search Strategies

Find a newspaper article about a national event, such as the 2013 Boston Marathon bombing. Make note of your search strategy.

Next find a newspaper article about a local event, for example, a flood in your area or a local crime or election. Make a note of your search strategy for this search.

Compare the two strategies. How are they alike? How are they different? Which newspaper article was easier to find? Why?

Exercise: Primary Sources

Take this quiz online!

1. Where would you find a speech by Franklin Delano Roosevelt in which he said, "The only thing we have to fear is fear itself."?
 - a. Web site of Presidential Speeches
 - b. Newspaper article dated Oct. 29, 1941
 - c. A print publication titled "Vital Speeches of the Day," which has been published since 1934
 - d. All of the above
2. Which of the following sources is the most likely to contain an interview with Steven Spielberg about his film "Lincoln," produced in 2012?
 - a. Article from a news magazine dated November 23, 2012
 - b. A blog written by a fan of Steven Spielberg
 - c. IMDb—A large online database of movie and television information
 - d. All of the above
3. Which source would have the original copy of a diary written a woman who lived in Tennessee during the Civil War?
 - a. The Library of Congress American Memory Project web site
 - b. The Southern Historical Collection, University of North Carolina at Chapel Hill
 - c. Local public library's collection
 - d. All of the above
4. Which of the following is a primary source?
 - a. A review of the film "Lincoln" by Steven Spielberg
 - b. A nonfiction book about the Civil War titled *The Fall of the House of Dixie : The Civil War and the Social Revolution that Transformed the South*
 - c. The Facebook privacy policy
 - d. A reporter's article about an event that happened yesterday, written from information gathered from bystanders

Exercise: Identifying Citations

Take this quiz online!

1. Joshi, M. (2013). Inclusive institutions and stability of transition toward democracy in post-civil war states. *Democratization*. 20(4), 743-770.

- a. Journal Article
- b. Book
- c. Book Chapter

2. Janney, Caroline E. *Remembering the Civil War: Reunion and the Limits of Reconciliation*. Chapel Hill, North Carolina: 2013. Print

- a. Journal Article
- b. Book
- c. Book Chapter

3. Blattman, Christopher and Edward Miguel. "Civil War." *Journal of Economic Literature* 48.1 (2010): 3-57. Print

- a. Journal Article
- b. Book
- c. Book Chapter

4. Barney, William L. "Rush to Disaster: Secession and the Slaves' Revenge." *Secession Winter: When the Union Fell Apart*. Robert J. Cook, William L. Barney and Elizabeth R. Varon. Baltimore: Johns Hopkins University Press, 2013. 77-96. Print

- a. Journal Article
- b. Book
- c. Book Chapter

5. Cooper, W.J. (2012) *We have the war upon us: The onset of the Civil War, November 1860-April 1861*. New York: Alfred A. Knopf.

- a. Journal Article
- b. Book
- c. Book Chapter

6. Cockrell, T. (2013). Patriots or Traitors: Unionists in Civil War Mississippi. In M.B. Ballard (Ed.), *Of times and race: Essays inspired by John F. Marzalek* (pp 23-35). Jackson, Mississippi: University Press of Mississippi.

- a. Journal Article
- b. Book
- c. Book Chapter

Evaluate

Introduction

In 2010, a textbook being used in fourth grade classrooms in Virginia became big news for all the wrong reasons. The book, *Our Virginia* by Joy Masoff, had caught the attention of a parent who was helping her child do her homework, according to an article in *The Washington Post*. Carol Sheriff was a historian for the College of William and Mary and as she worked with her daughter, she began to notice some glaring historical errors, not the least of which was a passage which described how thousands of African Americans fought for the South during the Civil War.

Further investigation into the book revealed that, although the author had written textbooks on a variety of subjects, she was not a trained historian. The research she had done to write *Our Virginia*, and in particular the information she included about Black Confederate soldiers, was done through the Internet and included sources created by groups like the Sons of Confederate Veterans, an organization which promotes views of history that de-emphasize the role of slavery in the Civil War.

How did a book with errors like these come to be used as part of the curriculum and who was at fault? Was it Masoff for using untrustworthy sources for her research? Was it the editors who allowed the book to be published with these errors intact? Was it the school board for approving the book without more closely reviewing its accuracy?

There are a number of issues at play in the case of *Our Virginia*, but there's no question that evaluating sources is an important part of the research process and doesn't just apply to Internet sources. Using inaccurate, irrelevant, or poorly researched sources can affect the quality of your own work. Being able to understand and apply the concepts that follow is crucial to becoming a more savvy user and creator of information.

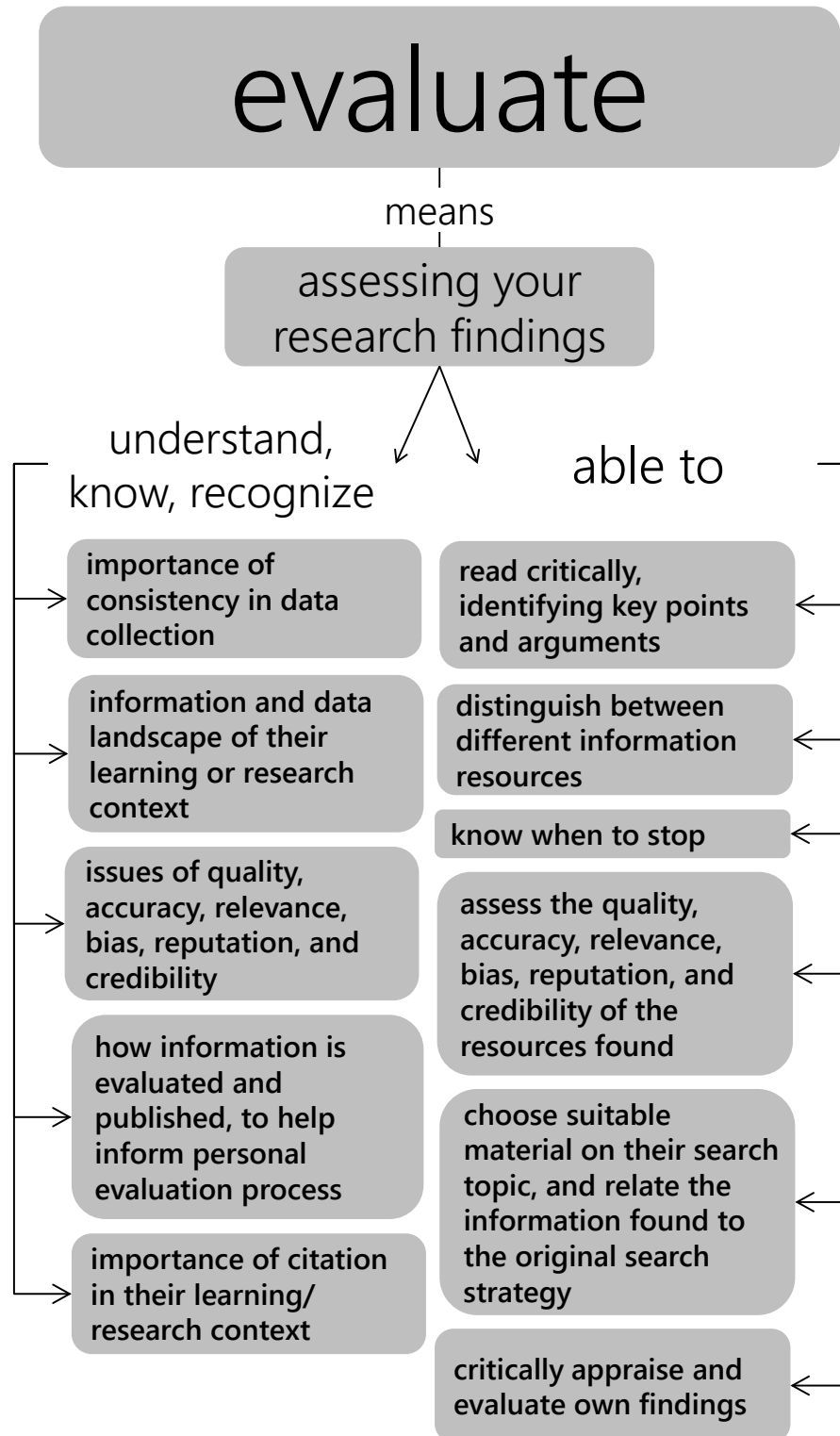
The Evaluate pillar states that individuals are able to review the research process and compare and evaluate information and data. It encompasses important knowledge and abilities.

They understand

- The information and data landscape of their learning/research context
- Issues of quality, accuracy, relevance, bias, reputation and credibility relating to information and data sources
- How information is evaluated and published, to help inform their personal evaluation process
- The importance of consistency in data collection
- The importance of citation in their learning/research context

They are able to

- Distinguish between different information resources and the information they provide
- Choose suitable material on their search topic, using appropriate criteria
- Assess the quality, accuracy, relevance, bias, reputation and credibility of the information resources found
- Assess the credibility of the data gathered
- Read critically, identifying key points and arguments
- Relate the information found to the original search strategy
- Critically appraise and evaluate their own findings and those of others
- Know when to stop



Proficiencies in the Evaluate pillar

The first section of this chapter will talk about some of the ideas and concepts behind evaluating sources (the abilities in the above list), while the second section will give you the opportunity to put your evaluation skills into practice.

Distinguishing Between Information Resources

Information is published in a variety of formats, each with its own special considerations when it comes to evaluation. Consider the following formats.

Social Media

Social media is a quickly rising star in the landscape of information gathering. Facebook updates, tweets, wikis, and blogs have made information creators of us all and have a strong influence not just on how we communicate with each other but also on how we learn about current events or discover items of interest. Anyone can create or contribute to social media and nothing that's said is checked for accuracy before it's posted for the world to see. So do people really use social media for research? Currently, the main use for social media like tweets and Facebook posts is as primary sources that are treated as the objects under study rather than sources of information on a topic. But now that the Modern Language Association has a recommended way to cite a tweet, social media may, in fact, be gaining credibility as a resource.

News Articles

These days, social media will generally be among the first to cover a big news story, with news media writing an article or report after more information has been gathered. News articles are written by journalists who either report on an event they have witnessed firsthand, or after making contact with those more directly involved. The focus is on information that is of immediate interest to the public and these articles are written in a way that a general audience will be able to understand. These articles go through a fact-checking process, but when a story is big and the goal is to inform readers of urgent or timely information, inaccuracies may occur. In research, news articles are often best treated as primary sources, especially if they were published immediately after a current event.

Magazine Articles

While news articles and social media tend to concentrate on what happened, how it happened, who it happened to, and where it happened, magazine articles are more about understanding *why* something happened, usually with the benefit of at least a little hindsight. Writers of magazine articles also fall into the journalist category and rely heavily on investigation and interviews for research. Fact-checking in magazine articles tends to be more accurate because magazines publish less frequently than news outlets and have more time to get facts right. Depending on the focus of the magazine, articles may cover current

events or just items of general interest to the intended audience. The language may be more emotional or dramatic than the factual tone of news articles, but the articles are written at a similar reading level so as to appeal to the widest audience possible. A magazine article is considered a popular source rather than a scholarly one, which gives it less weight in a research context but doesn't take away the value completely.

Scholarly Articles

Scholarly articles are written by and for experts in a field and generally describe formal research studies or experiments conducted to provide new insight on a topic rather than reporting current events or items of general interest. You may have heard the term "peer review" in relation to scholarly articles. This means that before an article is published, it undergoes a review process in order to confirm that the information is accurate and the research it discusses is valid. This process adds a level of credibility to the article that you would not find in a magazine or news article. Scholarly articles tend to be long and feature specialized language that is not easily understood by someone who does not already have some level of expertise on the topic. Though they may not be as easy to use, they carry a lot of weight in a research context, especially if you are working in a field related to science or technology. These sources will give you information to build on in your own original research.

Books

Books have been a staple of the research process since Gutenberg invented the printing press because a topic can be covered in more depth in a book than in most other types of sources. Also, the conventional wisdom for books is that anyone can write one, but only the best ones get published. This is becoming less true as books are published in a wider variety of formats and via a wider variety of venues than in previous eras, which is something to be aware of when using a book for research purposes. For now, the editing process for formally published books is still in place and research in the humanities, which includes topics such as literature and history, continues to be published primarily in this format.

Choosing Materials

When choosing a source for your research, what criteria do you usually use? Gauging whether the source relates to your topic at all is probably one. How high up it appears on the results list when you search may be another. Beyond that, you may base your decision at least partly on how easy it is to access.

These are all important criteria, to varying degrees, but there are other criteria you may want to keep in mind when deciding if a source will be useful to your research.

Quality

Scholarly journals and books are traditionally considered to be higher quality information sources because they have gone through a more thorough editing process that ensures the quality of their content. Generally, you also pay more to access these sources or may have to rely on a library or university to pay for access for you. Information on the Internet can also be of a high quality but there is less of a quality assurance process in place for much of that information. In the current climate, the highest quality information even on the Internet often requires a subscription or other form of payment for access.

Clues to a source's level of quality are closely related to thinking about how the source was produced, including what format it was published in and whether it is likely to have gone through a formal editing process prior to publication.

Accuracy

A source is accurate if the information it contains is correct. Sometimes it's easy to tell when a piece of information is simply wrong, especially if you have some prior knowledge of the subject. But if you're less familiar with the subject, inaccuracies can be harder to detect, especially when they come in subtler forms such as exaggerations or inconsistencies.

To determine whether a source is accurate, you need to look more deeply at the content of the source, including where the information in the source comes from and what evidence the author uses to support their views and conclusions. It also helps to compare your source against another source. A reader of *Our Virginia* may not have reason to believe the information the author cites from the Sons of Confederate Veterans website is inaccurate, but if they compared the book against another source, the inconsistencies might become more apparent.

Relevance

Relevance has to do with deciding whether the source actually relates to your topic and, if it does, how closely it relates. Some sources may be an exact match; for others, you may need to consider a particular angle or context before you can tell whether the source applies to your topic. When searching for relevant sources, you should keep an open mind—but not too open. Don't pick something that's not really related just because it's on the first page or two of results or because it sounds good.

You can assess the relevance of a source by comparing it against your research topic or research question. Keep in mind that the source may not need to match on all points, but it should match on enough points to be usable for your research beyond simply satisfying a requirement for an assignment.

Bias

An example of bias is when someone expresses a view that is one-sided without much consideration for information that might negate what they believe. Bias is most prevalent in sources that cover controversial issues where the author may attempt to persuade their readers to one side of the issue without giving fair consideration to the other side of things. If the research topic you are using has ever been the cause of heated debate, you will need to be especially watchful for any bias in the sources you find.

Bias can be difficult to detect, particularly when we are looking at persuasive sources that we want to agree with. If you want to believe something is true, chances are you'll side with your own internal bias without consideration for whether a source exhibits bias. When deciding whether there is bias in a source, look for dramatic language and images, poorly supported evidence against an opposing viewpoint, or a strong leaning in one direction.

Reputation

Is the author of the source you have found a professor at a university or a self-published blogger? If the author is a professor, are they respected in their field or is their work heavily challenged? What about the publication itself? Is it held in high regard or relatively unknown? Digging a little deeper to find out what you can about the reputation of both the author and the publication can go a long way toward deciding whether a source is valuable.

You can investigate the reputation of an author by looking at any biographical information that is available as part of the source. Looking to see what else the author has published and whether this information has positive reviews is also important in establishing whether the author has a good reputation. The reputation of a publication can also be investigated through reviews, word-of-mouth by professionals in the field, or online databases that keep track of statistics related to a journal's credibility.

Credibility

Credibility has to do with the believability or trustworthiness of a source based on evidence such as information about the author, the reputation of the publication, and how well-formatted the source is. How likely would you be to use a source that was written by someone with no expertise on a topic or a source that appeared in a publication that was

known for featuring low quality information? What if the source was riddled with spelling and formatting errors? Looking at sources like these should inspire more caution.

Objectively, credibility can be determined by taking into account all of the other criteria discussed for evaluating a source. Knowing that some types of sources, such as scholarly journals, are generally considered more credible than others, such as self-published websites, may also help. Subjectively, deciding whether a source is credible may come down to a gut feeling. If something about a source doesn't sit well with you, you may decide to pass it over.

Identifying Key Points and Arguments

Evaluating information about the source from its title, author, and summary information is only the first step. The evaluation process continues when you begin to read the source in more detail and make decisions about how (or whether) you will ultimately use it for your own research.

When you begin to look more deeply at your source, pay close attention to the following features of a document.

Introduction

The purpose of the introduction to any piece that has one is to give information about what the reader can expect from the source as a whole. There are different types of introductions, including forewords and prefaces that may be written by the author of the book or by someone else with knowledge of the subject. Introductory sections can include background information on why the topic was chosen, background on the author's interest in the topic, context pertaining to why the topic is important, or the lens through which the topic will be explored. Knowing this information before diving in to the body of the work will help you understand the author's approach to the topic and how it might relate to the approach you are taking in your own research.

Table of Contents

Most of the time, if your source is a book or an entire website, it will be divided into sections that each cover a particular aspect of the overall topic. It may be necessary to read through all of these sections in order to get a "big picture" understanding of the information being discussed or it may be better to concentrate only on the areas that relate most closely to your own research. Looking over the table of contents or menu will help you decide whether you need the whole source or only pieces of it.

List of References

If the source you're using is research-based, it should have a list of references that usually appear at the end of the document. Reviewing these references will give you a better idea of the kind of work the author put into their own research. Did they put as much work into evaluating their sources as you are? Can you tell from the citations if the sources used were credible? When were they published? Do they represent a fair balance of perspectives or do they all support a limited point of view? What information does the author use from these sources and in what way does he or she use that information? Use your own research skills to spy on the research habits of others to help you evaluate the source.

Evaluating Your Findings

In the case of *Our Virginia*, the author used a biased source as part of her research and the inaccurate information she got from that source affected the quality of her own work. Likewise, if anyone had used her book as part of their research, it would have set off a chain reaction, since whatever information they cited from *Our Virginia* would naturally have to be called into question, possibly diminishing the value of their own conclusions.

Evaluating the sources you use for quality, accuracy, relevance, bias, and credibility is a good first step in making sure this doesn't happen, but have you ever thought about evaluating the sources used by your own sources? This takes extra time, but looking at the reference list, bibliography, or notes section of any source you use to gauge the quality of the research done by the author of that source can be an important extra step.

Knowing When to Stop

For some researchers, the process of searching for and evaluating sources is a highly enjoyable, rewarding part of doing research. For others, it's a necessary evil on the way to constructing their own ideas and sharing their own conclusions. Whichever end of the spectrum you most closely identify with, here are a few ideas about the ever-important skill of knowing when to stop.

You've satisfied the requirements for the assignment and/or your curiosity on the topic

If you're doing research as part of a course assignment, chances are you've been given a required number of sources. Novice researchers may find this number useful to understand how much research is considered appropriate for a particular topic. However, a common mistake is to focus more on the number of sources than on the quality of those sources. Meeting that magic number is great, but not if the sources used are low quality or otherwise inappropriate for the level of research being done.

You have a deadline looming

Nothing better inspires forward motion in a research project than having to meet a deadline, whether it's set by a professor, an advisor, a publisher, or yourself. Time management skills are especially useful, but since research is a cyclical process that sometimes circles back on itself when you discover new knowledge or change direction, planning things out in minute detail may not work. Leaving yourself enough time to follow the twists and turns of the research and writing process goes a long way toward getting your work in when it's expected.

You need to change your topic

You've been searching for information on your topic for a while now. Every search seems to come up empty or full of irrelevant information. You've brought your case to a research expert, like a librarian, who has given advice on how to adjust your search or how to find potential sources you may have previously dismissed. Still nothing. It could be that your topic is too specific or that it covers something that's too new, like a current event that hasn't made it far enough in the information cycle yet. Whatever the reason, if you've exhausted every available avenue and there truly is no information on your topic of interest, this may be a sign that you need to stop what you're doing and change your topic.

You're getting overwhelmed

The opposite of not finding enough information on your topic is finding too much. You want to collect it all, read through it all, and evaluate it all to make sure you have exactly what you need. But now you're running out of room on your flash drive, your Dropbox account is getting full, and you don't know how you're going to sort through it all *and* look for more. The solution: stop looking. Go through what you have. If you find what you need in what you already have, great! If not, you can always keep looking. You don't need to find everything in the first pass. There is plenty of opportunity to do more if more is needed!

From Theory to Practice

Looking back, the *Our Virginia* case is more complicated than it may have first appeared. It wasn't just that the author based her writing on research done through the Internet. It was the nature of the sources she used and the effect using those sources ultimately had on the quality of her own work. These mistakes happened despite a formal editing process that should have ensured better accuracy and an approval process by the school board that should have evaluated the material more closely. With both of these processes having failed, it was up to one of the book's readers, the parent of a student who compared the information against her own specialized knowledge, to figure it all out.

Now that you know more about the theory behind evaluating sources, it's time to apply the theory. The following section will help you put source evaluation into perspective using something called the CRAAP test. You'll also have the opportunity to try out your new skills with several hands-on activities.

Evaluating Resources in Practice

When you begin evaluating sources, what should you consider? The CRAAP test is a series of common evaluative elements you can use. The CRAAP test was developed by librarians at California State University at Chico and it gives you a good, overall set of elements to look for when evaluating a resource. Let's consider what each of these evaluative elements means.

Currency

One of the most important and interesting steps to take as you begin researching a subject is selecting the resources that will help you build your thesis and support your assertions. Certain topics require you to pay special attention to how current your resource is—because they are time sensitive, because they have evolved so much over the years, or because new research comes out on the topic so frequently. When evaluating the currency of an article, consider the following

- When was the item written, and how frequently does the publication it is in come out?
- Is there evidence of newly added or updated information in the item?
- If the information is dated, is it still suitable for your topic?
- How frequently does information change about your topic?

Exercise: Assess Currency

Assessing currency means understanding the importance of timely information

Imagine that you are writing a paper for a Political Science class on Japan's environmental policy since the Kyoto Treaty. Identify one resource that you would find helpful in your research, and one resource that you would find less helpful. Write one sentence explaining why you would or would not use each resource, paying special attention to the currency of each item.

Relevance

Understanding what resources are most applicable to your subject and why they are applicable can help you focus and refine your thesis. Many topics are broad and searching for information on them produces a wide range of resources. Narrowing your topic and focusing on resources specific to your needs can help reduce the piles of information and help you focus in on what is truly important to read and reference. When determining relevance consider the following:

- Does the item contain information relevant to your argument or thesis?
- Read the article's introduction, thesis and conclusion.
- Scan main headings and identify article keywords.
- For book resources, start with the index or table of contents—how wide a scope does the item have? Will you use part or all of this resource?
- Does the information presented support or refute your ideas?
- If the information refutes your ideas, how will this change your argument?
- Does the material provide you with current information?
- What is the material's intended audience?

Exercise: Find Relevant Sources

Relevance is the importance of the information for your specific needs

You are researching a paper where you argue that vaccinations have no connection to autism. Which of these resources would you consider relevant? Why or why not?

Hviid, Anders, Michael Stellfield, Jan Wohlfart, and Mads Melbye. "Association Between Thimerosal-Containing Vaccine and Autism." *Journal of the American Medical Association* 290, no. 13 (October 1, 2003): 1763-1766. <http://jama.jamanetwork.com/article.aspx?articleid=197365>

Chepkemoi Maina, Lillian, Simon Karanja, and Janeth Kombich. "Immunization Coverage and Its Determinants among Children Aged 12 - 23 Months in a Peri-Urban Area of Kenya." *Pan-African Medical Journal* 14, no.3 (February 1, 2013). <http://www.panafrican-med-journal.com/content/article/14/3/full/>

Authority

Understanding more about your information's source helps you determine when, how, and where to use that information. Is your author an expert on the subject? Do they have some personal stake in the argument they are making? What is the author or information producer's background? When determining the authority of your source, consider the following

- What are the author's credentials?
- What is the author's level of education, experience, and/or occupation?
- What qualifies the author to write about this topic?
- What affiliations does the author have? Could these affiliations affect their position?
- What organization or body published the information? Is it authoritative? Does it have an explicit position or bias?

Exercise: Identify Authoritative Sources

Authority is the source of the information—the author's purpose and what their credentials and/or affiliations are.

The following items are all related to a research paper on women in the workplace. Write two sentences for each resource explaining why the author or authors might or might not be considered authoritative in this field:

Carvajal, Doreen. "The Codes That Need to Be Broken." *New York Times*, January 26, 2011, http://www.nytimes.com/2011/01/27/world/27iht-rules27.html?_r=0

Sheffield, Rachel. "Breadwinner Mothers: The Rest of the Story." *The Foundry Conservative Policy News Blog*, June 3, 2013. <http://blog.heritage.org/2013/06/03/breadwinner-mothers-the-rest-of-the-story>

Baker, Katie J.M. "Your Guide to the Very Important Paycheck Fairness Act." *Jezebel (blog)*, January 31, 2013, <http://jezebel.com/5980513/your-handy-guide-to-the-very-important-paycheck-fairness-act>

Accuracy

Determining where information comes from, if evidence supports the information, and if the information has been reviewed or refereed can help you decide how and whether to use a source. When determining the accuracy of a source, consider the following:

- Is the source well-documented? Does it include footnotes, citations or a bibliography?
- Is information in the source presented as fact, opinion or propaganda? Are

biases clear?

- Can you verify information from referenced information in the source?
- Is the information written clearly and free of typographical and grammatical mistakes? Does the source look to be edited before publication? A clean, well-presented paper does not always indicate accuracy, but usually at least means more eyes have been on the information.

Exercise: Find Accurate Sources

Accuracy is the reliability, truthfulness, and correctness of the content.

Which of the following articles are peer-reviewed? How do you know? How did you find out? Were you able to access the articles to examine them?

1. Coleman, Isobel. "The Global Glass Ceiling?" *Current* 524 (2010): 3-6.
2. Lang, Ilene H. "Have Women Shattered the Glass Ceiling." Editorial, *USA Today*, April 14, 2010, http://usatoday30.usatoday.com/news/opinion/forum/2010-04-15-column15_ST1_N.htm?csp=34
3. Townsend, Bickley. "Breaking Through: The Glass Ceiling Revisited." *Equal Opportunities International* 16, no. 5 (1997): 4-13.

Purpose

Knowing why information was created is a key to evaluation. Understanding the reason or purpose of the information, if the information has clear intentions, or if the information is fact, opinion or propaganda will help you decide how and why to use information

- Is the author's purpose to inform, sell, persuade, or entertain?
- Does the source have an obvious bias or prejudice?
- Is the article presented from multiple points of view?
- Does the author omit important facts or data that might disprove their argument?
- Is the author's language informal, joking, emotional, or impassioned?
- Is the information clearly supported by evidence?

Exercise: Identify the Information Purpose

Purpose is the reason the information exists—determine if the information has clear intentions or purpose and if the information is fact, opinion, or propaganda.

Take a look at the following sources. Why do you think this information was created? Who is the creator?

- <http://www.chevron.com/globalissues/climatechange/>

- <http://www.beefnutrition.org/>
- Fahrenheit 911 – Movie. <http://www.imdb.com/title/tt0361596/>
- Lydall, Wendy. *Raising a Vaccine Free Child*. Inkwazi Press, 2009
- <http://www.nwf.org/What-We-Do/Protect-Habitat/Gulf-Restoration/Oil-Spill/Effects-on-Wildlife.aspx>
- <http://zapatopi.net/treeoctopus/>
- Owen, Mark and Kevin Maurer. *No Easy Day: The Firsthand Account of the Mission That Killed Osama Bin Laden*. New York: Penguin, 2012.
- Your Brain on Video Games http://www.ted.com/talks/daphne_bavelier_your_brain_on_video_games.html

Conclusion

When you feel overwhelmed by the information you are finding, the CRAAP test can help you determine which information is the most useful to your research topic. How you respond to what you find out using the CRAAP test will depend on your topic. Maybe you want to use two overtly biased resources to inform an overview of typical arguments in a particular field. Perhaps your topic is historical and currency means the past hundred years rather than the past one or two years. Use the CRAAP test, be knowledgeable about your topic, and you will be on your way to evaluating information efficiently and well!

6

Manage

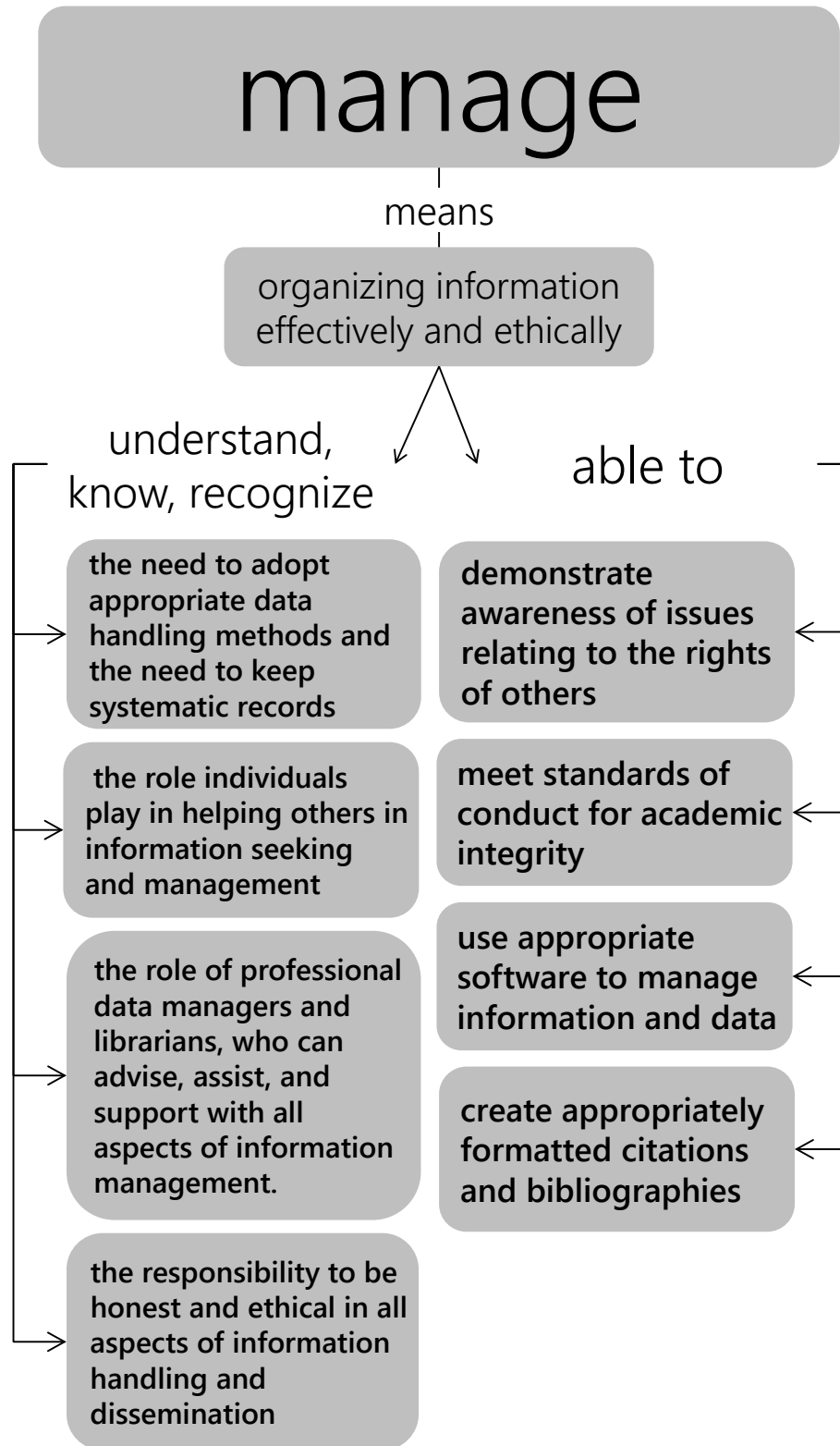
Now that you have gone through the processes involved to find and evaluate information, the next step is to start working with it. This is where the Manage pillar comes in: it focuses on the need to organize information professionally and ethically.

Individuals understand

- Their responsibility to be honest in all aspects of information handling and dissemination (e.g. copyright, plagiarism, and intellectual property issues)
- The need to adopt appropriate data-handling methods
- The role they play in helping others in information seeking and management
- The need to keep systematic records
- The importance of storing and sharing information and data ethically
- The role of professionals, such as data managers and librarians, who can advise, assist, and support with all aspects of information management.

They are able to

- Use bibliographical software if appropriate to manage information
- Cite printed and electronic sources using suitable referencing styles
- Create appropriately formatted bibliographies
- Demonstrate awareness of issues relating to the rights of others including ethics, data protection, copyright, plagiarism, and any other intellectual property issues
- Meet standards of conduct for academic integrity
- Use appropriate data management software and techniques to manage data



Proficiencies in the Manage pillar

It is wonderful to have access to information. It empowers us humans, with data and knowledge that leads us throughout our busy days and helps us organize our leisure time more efficiently. GPS devices and mobile phones help us get to unfamiliar destinations. We can find places to eat, to stay, and to get entertainment. All of this information is at our fingertips due to modern technology. We all take advantage of this technology to some degree and use this information to our advantage.

But there is another type of information—not just the kind that provides directions. We seek such information when we are ill and need to look up medical advice. We also seek information when in school—very few subjects require only the use of a textbook. We need to search for information and then use it in our intellectual work, because every paper or project produced in college is a product of someone's creativity.

So how should we handle this product of creativity (a.k.a information)? Let's think about a simple example: apple picking in the fall. It is a popular thing to do, especially here in the Northeast where most of the authors of this textbook live. People come to the farm, get bags or baskets, gather apples, and then line up to weigh them and pay. The farmers' hard work is being rewarded.

Now imagine a different situation. You worked hard and wrote a very good paper and your roommate just copied a couple of paragraphs and inserted them into her own paper because the topics were related. Was this fair? How were you rewarded for your hard work? Nobody is saying that your roommate should have paid you, as you would pay the farmer for apples. But she should not use your intellectual capital without attribution to you! What she did was an act of plagiarism—you will read more about it soon!

You might publish an article in your college newsletter. This article is your intellectual personal property and you hold the copyright, which means that no one has the right to reproduce all or any part of it (i.e. copy it) without your permission. If your roommate decides to use some information from your article in her paper, she should provide a citation (the information that will help the reader identify and find your article should they decide to do so). If she is using direct quotes from your article, again, she would need to put double quotes around your words and provide information about the author (you, in this instance) to avoid plagiarism. Keep reading to find useful information about avoiding plagiarism.

Copyright and plagiarism are just two aspects of intellectual property that you need to deal with. You have to respect copyright, i.e. the rights of the author and avoid plagiarism. However, there are more aspects to it. Have you heard of patents? If you are planning a career in science and technology-related fields then you also have to learn more about patents. Patents deal with creators' rights to their invention of new machinery or processes. Plants and design can also be patented. You can find useful information at the United States Patent and Trademarks Office (USPTO) <http://www.uspto.gov/patents/law/>. Trademarks and trade secrets are other aspects of intellectual property that you may have to deal with.

In addition to being aware of plagiarism, patents, trademarks, and trade secrets, you need to be mindful of open access issues, which relate to valuable research data and academic publications posted online for everybody to read. However, you cannot always just use the data from open access sources. You often need to ask the author for permission. Many open

access publications use Creative Commons licensing. You can read more about open access in the [Science Literacy](#) chapter.

There is a lot to learn about using information legally and ethically, but this knowledge will empower you in your academic work and ultimately allow you to succeed. The following examples and tips will get you off to a good start.

Unintentional Plagiarism

Have you ever thought about why teachers and professors seem to spend way too much time urging everyone to be sure to cite all of their sources properly? You've heard it all before: footnote this, endnote that, put this in the bibliography, capitalize this word, where are the italics, the commas, periods, hanging indents, yada yada yada! It's enough to make you give up and just wing it. But hold on a second while you gather your thoughts. Why do your professors always spend so much time urging you to do something that seems to have little practical purpose?

Scenario

Jackie was working on her 10-page research paper at the last minute. It was 3:30 am and her paper was due in class at 9:00 am. She finished the last sentence at 5:15 am, did a spellcheck and voila! Done! Groggy yet awake she went to class, turned in the paper and waited for her grade. She received an email from her professor that read, "There are some major issues with your research paper that I need to discuss with you. Please see me." Uh oh. What could it be?

When she nervously went to see him, Professor Muntz told Jackie that she hadn't cited any of her sources, and because she included a lot of direct quotes in her paper, she was guilty of plagiarism. She received an F on her paper and may be referred to the school administration for academic dishonesty.

Was she really guilty of something that bad? In fact, yes she was. In this chapter we will discuss the importance of managing your information sources and some tips on how to easily and effectively avoid Jackie's pitfall.

Real World Cases

Students often feel that they are being singled out in regard to plagiarism and academic dishonesty. But that is far from the case. There are numerous examples of scholars and other professionals who have been caught plagiarizing. One such person is Doris Kearns Goodwin, a famous historian who wrote the noted *Team of Rivals: the Political Genius of Abraham Lincoln* (2006). She included material in an earlier book, *The Fitzgeralds and the Kennedys* (1987), from three other sources without citing it, according to an article written by Michael Nelson.¹

Although she has since published other works, her reputation has been tarnished, and people may not take her work as seriously because of this. Unfortunately, as Nelson points out in his article, she is not the only well-known historian caught plagiarizing.

Another example, with a dramatic outcome, is that of Eugene Tobin. He was the president of Hamilton College in New York State, when it was discovered that he had included plagiarized material in speeches he had given over the course of almost a decade. He resigned from his position as the head of this prestigious institution, admitting his guilt.² Other college presidents and administrators have also been caught violating academic trust: if you try a search using the terms *plagiarism* and *college president*, you may be dismayed at the number of results.

Like some of the historians Nelson cites in his article, many students fall into a trap when they do research because they fail to mention where they found all of their information. Thousands of students in schools, colleges, and universities are guilty of committing plagiarism, but often they don't know they are plagiarizing.

Let's look at plagiarism and how to avoid it, and then continue on to some other intellectual property issues you may need to deal with.

What is Plagiarism?

In short, plagiarism is when you use words, thoughts, or ideas that belong to someone else without giving them credit. In the classroom (and in the world of publishing), documenting your information sources is the only way others can tell how thorough and careful you've been in researching your topic. If you don't tell readers where your information came from, they may think (and many do) that you either made up the information or "stole" it. Failing to cite your sources is plagiarism.

1 Nelson, 2002

2 Isserman, 2003

By managing the sources in your papers, you encourage others to do the same and you can be a go-to expert for your friends and classmates when they need help with how to find out how to cite sources properly. The information and advice you impart may help them avoid serious difficulties. Some students truly don't know that they are doing something wrong when they paraphrase information without citing the information source. They might feel that paraphrasing the words of someone who is clearly an expert on the topic is the best way to write an accurate paper. And because they aren't quoting it directly, it doesn't need quote marks or attribution, does it? While the penalties they receive might (and this is a big "might") be less severe than someone who buys a paper online or copies and pastes big sections of material into their work, the penalties could still be substantial. Raising your friends' awareness so they won't face this situation would be a kind thing to do.

Keeping Track of Your Sources

Try this the next time you do research. If you find some great articles on your topic, collect the following information about each as soon as you realize they will be helpful resources:

- Author name(s)
- Title of the article
- Name of the journal
- The volume number
- The issue number
- The date of the issue
- The name of the database where you found the article

Or, if you found a book, note the following once you think it might contain useful information:

- Author name(s)
- Title of book
- Place of publication
- Publisher's name
- Year of publication

Or, if you found a website you want to use, collect the following details before you leave the site:

- Author name(s)
- Title of article or webpage
- Title of overall website
- The date of the webpage (if any)
- The URL (or web address)

You might be able to get some of this information with a simple screenshot, but be sure to fill in any missing elements.

This information is often referred to as bibliographic information or metadata. It consists of essential information that identifies the information resource used to inform a research project.

You may not use every single item that you found when you gathered your sources, but having a list of all of the sources you considered will help you keep track of everything you use for your paper.

As you read each source, write down any of the authors' ideas, quotes, or thoughts you want to use and be sure to write down page numbers, if the source provides them. When you put your paper together, you will then have all the information you need to properly cite any quote, idea, or thought that came from each source.

Reference Management Software

Many researchers take the time to gather all of this information before they start writing. However, when they are ready to compile their footnotes or bibliography they can't find their preliminary notes. It may be the case that some notes are in one notebook, other notes are in a file in their computer and still others are missing entirely. Fortunately, software has been developed that helps researchers manage their source material. You may have heard of some of these reference management products. Endnote, Refworks, Mendelay, and Zotero, among others, all help manage the information gathering and retrieval process.

In addition to providing one central location for all of your references, these reference managers can

- import bibliographic information directly from a library catalog database,
- provide additional space for personal notations,
- create a bibliography or list of references in a variety of citation styles such as APA, MLA, Chicago, and more.

Some academic libraries provide access to Endnote or Refworks. If your library does not, Zotero is available free for use with the Firefox browser and Mendelay is also available at no charge from www.mendelay.com.

When to Cite

Now that you have gathered all of your information resources, you need to be mindful about how you used them in your research project. There are some very firm rules about what constitutes plagiarism:

- If you copy a sentence or paragraph verbatim (exactly) from a book, article, website, blog posting, or anywhere online or in print, you must provide information on the author and the publication in which the sentence or paragraph appears. This is known as “citing a source.”
- If you use some of the exact phrases in a sentence or paragraph, even if you are not copying the whole sentence or paragraph, you must cite your source.
- If you use original information that you have obtained from an interview or conversation with someone, you must cite your source.
- If you do not use the exact sentence or phrase but paraphrase it, or use the ideas inherent in the exact sentence or phrase, you must cite your source.
- If you reprint images, maps, diagrams, charts, or tables, you must cite your source.
- If you embed video files or audio files into your work, you must cite your source.

Exercise: Plagiarism Quiz

The following paragraph is from an article titled, “Hydraulic Fracturing Overview: Growth of the Process and Safe Drinking Water Concerns” in the March 1, 2012 issue of *Congressional Digest*.

The use of hydraulic fracturing continues to increase significantly, as more easily accessible oil and gas reservoirs have declined and companies move to develop unconventional oil and gas formations. Hydraulic fracturing is used for oil and/or gas production in all 33 U.S. states where oil and natural gas production takes place. According to industry estimates, hydraulic fracturing has been applied to more than 1 million wells nationwide. (p. 71)

Which of the following sentences does not plagiarize?

- a. As of March 2012, hydraulic fracturing has been applied to more than 1 million wells nationwide.
- b. Hydraulic fracturing has become more prevalent nationwide. More than one million wells have been created.
- c. According to the *Congressional Digest*, more than one million wells in the United States use hydraulic fracturing (*Congressional Digest*, 71).
- d. None of the sentences contain plagiarism.

Citation Styles

Citing sources and avoiding plagiarism should always be an author's intent, but it is easy to get confused about how to cite. Citation styles were introduced in the [Gather](#) chapter, but it is worth repeating that there are many different citation styles. The three styles that are used most often are APA (American Psychology Association), MLA (Modern Language Association), and Chicago. There are no hard and fast rules about when to use each style. Professors often have a preference for one style over another, so make sure that you check with your instructor about which style they prefer.

Creating properly formatted citations has become easier in recent years with the introduction of reference management software and citation generators. A citation generator is software that will help to correctly format your citations. Some popular citation generators are Noodlebib and Easybib, both are available for a fee. There are also free citation generators available online. You can search the web to retrieve them. These generators are handy to use but they often contain errors so it is important to check the results for accuracy. The following resources are useful tools for all writers.

- *Publication Manual of the American Psychological Association*, 6th edition for APA citations
- *MLA Handbook for Writers of Research Papers*
- *The Chicago Manual of Style*
- *Citation Fox* (available at the University at Albany, University Libraries website)

You should be able to locate the three manuals in the reference section of your library. *Citation Fox* is available at <http://library.albany.edu/cfox>.

Where to Go For Help

Even if you are a very organized person and have diligently collected bibliographic information on all of the information resources that you consulted during the research process, you may misplace essential information on a resource. You may think that since you can't find this information, you will be unable to use it. But there is another option—consult a librarian. Librarians have comprehensive knowledge about how information is organized and retrieved. They also have a wealth of information resources at their fingertips. Even if you can't retrace your steps to find the missing data, it is likely that a librarian will be able to help you find the bibliographic information you need. Librarians can also help you determine when and how to cite your work. They may even be able to help you navigate citation generators and reference managers. Librarians at your library are available to help you in person, by telephone, and via email and chat. Consult your library's website for contact information.

Ethical Issues and Intellectual Property

The Manage pillar includes the practice of professional and ethical use of information. Ethical treatment of information assumes that you are treating an author's rights appropriately and avoiding an act of academic dishonesty such as plagiarism. As a creator of information yourself, you should understand the importance of respecting other authors' rights and following the general rules set forth in legal documents (see the Useful Links about Intellectual Property section for citations to some of these documents).

There are many examples of intellectual property issues that you can find in the media. For example, in June 2013 as the authors were working on this textbook, the Supreme Court of the United States overturned the law that had previously allowed gene patenting. It might sound strange, but up until now if you were a scientist who studied the human genome and happened to discover a new gene, under the earlier law, you could patent it, thus assuring that whenever a person needed to have a medical test involving the gene they would have to pay you as a patent holder. These types of tests usually weren't covered by insurance companies and were very expensive.

As an information creator, you want to be respectfully treated by others. That is why you should constantly strive to improve your ability to practice fair treatment of other authors' works, including being cognizant of copyright, patents, and other issues associated with intellectual property.

Academic Integrity

You have already learned about plagiarism, often enemy number one when it comes to academic success involving research and writing. But there are other issues under the larger umbrella of academic dishonesty. First of all, every academic institution has a set of academic regulations that explain what is expected of students. Students are required to make themselves familiar with these rules.

Other examples of dishonesty that are mentioned in academic regulations are multiple submissions (one may not submit one project for two different classes), cheating on examinations, and forgery. Professors are dismayed when they have to talk to the students about these issues because, inherently, every teacher wants to believe that her students are honest. Unfortunately, plagiarism is so common that educators have begun using plagiarism detection software, such as Turnitin (see the Useful Links section). You obviously don't want to be identified as committing plagiarism by this software.

It is imperative to understand that everybody has to be accountable for their own work and respectful of the work of others. Future scholarship depends on the accuracy and integrity of prior scholarship. That is why, when doing research one must use the information produced

by other people responsibly, i.e. provide citations within the text and a list of references at the end of the paper with full citation information that will allow retrieval of the document. Remember what you have learned in this chapter about managing your sources and citation style. If you are diligent about applying this knowledge and careful about giving credit where credit is due, you should have no worries.

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Nelson, Michael. "The good, the bad, and the phony: Six famous historians and their critics," *The Virginia Quarterly Review*, 78, no. 3 (2002): 377-394.

Turnitin, 2013. <http://turnitin.com/>

United States Copyright Office, Copyright Law of the United States and the related laws contained in the Title 17 of the United States Code, Circular 92 (2011). <http://www.copyright.gov/title17/circ92.pdf>

Present

Scenario

Norm Allknow from the [Identify](#) chapter has done a lot of work since the last time we saw him. His research supports his thesis statement and he's got something to say. Now he needs to figure out how to say it.

He writes a 10-page paper starting with his thesis statement, followed by some facts from his research, and then briefly concludes that he has proved his point. He hands it in to his teacher and he's finished. Except that he starts to feel like he just did an awful lot of work for an audience of one person. Who else might be interested and how might he reach them? How can he communicate his message in ways other than a straightforward paper? How can he get the most out of his effort?

Presenting the Results of Your Research

In earlier chapters we discussed how to identify a research topic and how to focus in on specific questions that we hoped to answer. Then we discussed ways to search for, organize, and evaluate information that would help to answer those questions. Now it's time to think about the best way (or ways) to present the information.

Individuals adept at the Present pillar can apply the knowledge they have gained. They can present the results of their research, synthesize new and old information and data to create new knowledge, and disseminate their work in a variety of ways.

They understand

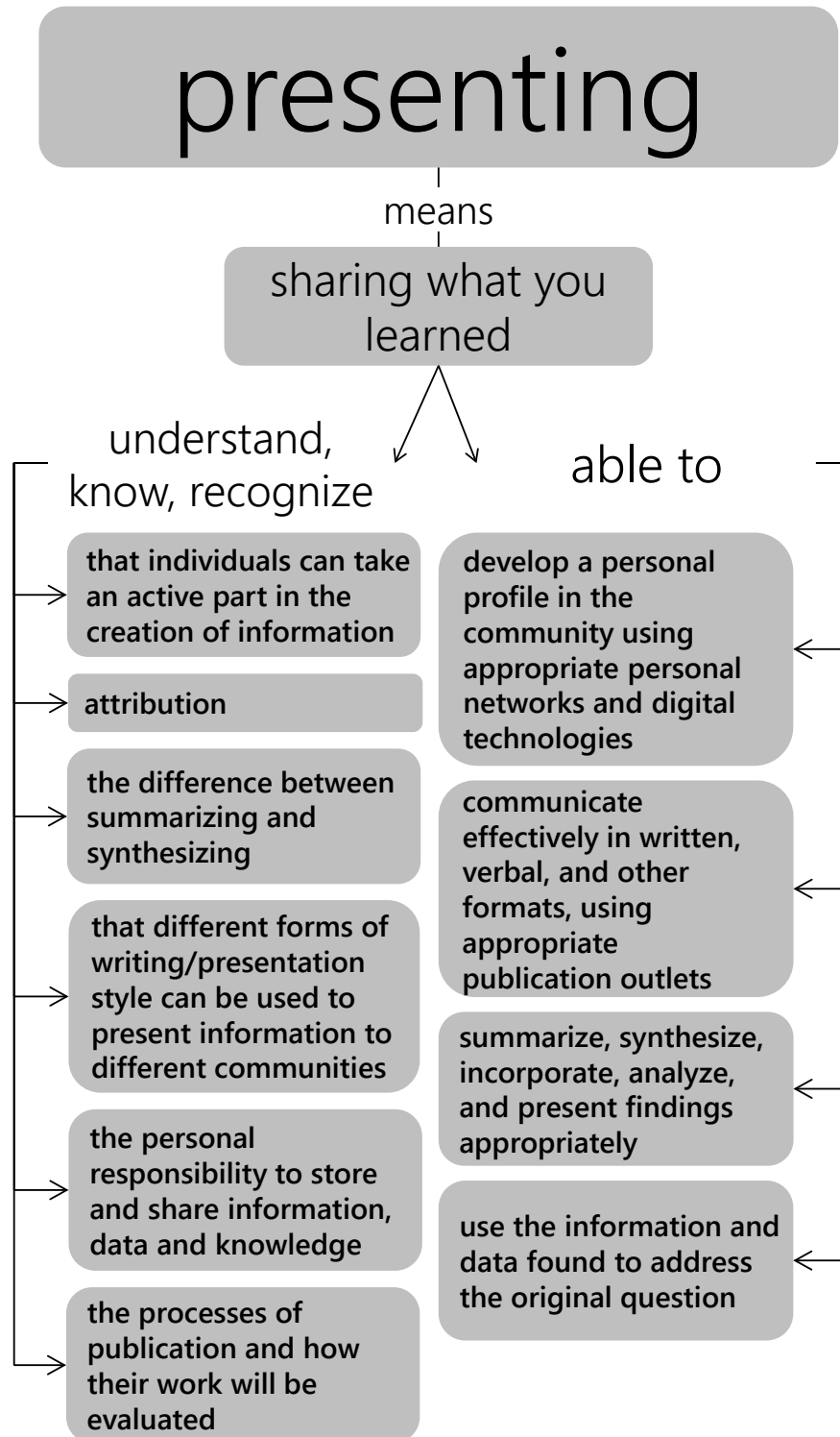
- The difference between summarizing and synthesizing
- That different forms of writing/presentation style can be used to present

information to different communities

- That data can be presented in different ways
- Their personal responsibility to store and share information and data
- Their personal responsibility to disseminate information & knowledge
- How their work will be evaluated
- The processes of publication
- The concept of attribution
- That individuals can take an active part in the creation of information through traditional publishing and digital technologies (e.g. blogs, wikis)

They are able to

- Use the information and data found to address the original question
- Summarize documents and reports verbally and in writing
- Incorporate new information into the context of existing knowledge
- Analyze and present data appropriately
- Synthesize and appraise new and complex information from different sources
- Communicate effectively using appropriate writing styles in a variety of formats
- Communicate effectively verbally
- Select appropriate publications and dissemination outlets in which to publish if appropriate
- Develop a personal profile in the community using appropriate personal networks and digital technologies (e.g. discussion lists, social networking sites, blogs, etc.)



Proficiencies in the Present pillar

Processing What You Find

In many or even most cases, during the process of finding a variety of information sources, you will begin to develop an answer to your research question. Even if you feel that you've already found the proof you need to support your thesis, it is still important to review the information and data you have to be sure you're clear about what it is (and isn't) telling you. Be careful not to let your own opinion lead you into a misinterpretation of your sources.

One useful way to consolidate the information you've found is to summarize what you think it says, and then find a definite source for each specific item in your summary. You can start by filling in the final box in the chart below, from the [Identify](#) chapter.

What do you already Know about your topic?	What do you Want to know about your topic?	How will you find information on your topic?	What have you Learned about your topic?

However, an expanded version of this same box can tell you a lot more about where the information is from, and will also prove useful when you need to cite a specific bit of information in your bibliography. In the left column of the following box, list what you have learned, bit by bit. In the right column, list where you found it. If it was found in more than one source, list them all and think about which one you find to be the most reliable or useful. Depending on where and how you present your findings, you may be called upon to defend your sources, so it pays to be prepared for this.

What have you learned about your topic?	Where did you learn it?

This exercise is just one way to process your information and may not be the best way for everyone. Summarizing in paragraph form is another way to accomplish the same task, with the added benefit that what you write in the summary can often become part of your final product. Just be careful that you aren't using paraphrased material without properly citing the source it came from. Verbally summarizing your findings, and especially your arguments in favor of your conclusions, to a friend, classmate, or teacher is an excellent way to confirm your mastery of the topic. While the means of summarizing can vary, the key at this point is to make sure you understand what you've found and how it relates to your topic and research question.

Now that you're confident in your knowledge of your topic, you can formally answer your original research question when you present what you've found. Did your original thesis/hypothesis turn out to be true? If so, say so! If not, why not? Be sure you're able to state the specifics that prove or disprove your projections. Was anything a surprise? Do any of your findings suggest future research possibilities?

One of the most satisfying parts of doing research is having something to add to a topic's base of knowledge. Think about what you found in relation to your original research question and compare it to all of the sources you examined on your topic. Did you discover something new? If your research involved experiments, you may have new results or data sets that others can use. Even if you didn't generate new data, maybe you saw new connec-

tions between existing sources that no one has written about before. Think about this as you begin to put together the presentation of your findings, you may have something to share!

Choosing How to Present

The way you finally present your research findings is largely dependent on your original goals. If you were doing the research for a class project, it's likely that the teacher provided you with fairly specific requirements and it would obviously be a good idea to stick to them.

Even if you did initially do the research for a class project though, you may find yourself in a situation similar to Norm at the beginning of the chapter, wanting to share your work more widely. You've already done the work, so why not get all the benefit you can?

Some of the more common ways of presenting information are discussed below, but the descriptions of them are not exhaustive and remember that these are not nearly all of the options. In addition, you can often combine more than one method of presentation to highlight different elements of your findings or to reach multiple audiences.

Written

Writing is the most established way to share your research findings. Benefits of writing include the ability to proofread, edit, and rewrite to get your presentation exactly right. Done skillfully, writing can hold your audience's attention and effectively deliver information. Done poorly, it can confuse or bore your audience to the point that they stop reading. To avoid this second possibility, if at all possible, have someone read your writing before you give it to the final audience. Take constructive criticism to heart, so that your voice is clearly heard.

Traditional Paper

One of the most common ways to present research findings, especially for students, is in a short paper written as a class assignment. The way this type of paper is formatted is determined by the teacher, and is fairly straightforward. The goal is usually to demonstrate to the teacher that you have understood the topic and can draw some conclusions from what you've learned.

Thesis/Dissertation

At higher levels of education, you may be called upon to write a thesis paper or even a dissertation. At this point, you are entering the realm of high level professional or scholarly expertise, and will be expected to produce original ideas and the necessary supporting

research to contribute to your field. The type of writing in theses and dissertations varies depending on the subject area, but generally these manuscripts are longer and more detailed than a traditional class paper. They also use more discipline-specific language, and can take several years to complete.

Scholarly Journal Article

Articles published in scholarly journals undergo a peer-review process (see the [Evaluate](#) chapter) to ensure that they are reliable and significant additions to the literature on a topic. If you get to a point in your research where you feel you have a contribution that others could use, investigate the possibility of submitting an article for publication, especially if your research is relevant to your intended career. It can be difficult to determine which journal to submit your article to, so don't hesitate to ask teachers, colleagues, or even the editor of the journal if your article's content is appropriate.

Blog/Tweet/Other Social Media

A relatively new option for getting your information out to a wide audience is to use social media tools. If you have your own blog or website you can easily publish your findings for the entire world to see (getting people to actually look at it is another issue, with many possible solutions). You can also use Facebook, Twitter or other tools to let people know what you're working on and to direct them to more detailed information that you've posted elsewhere online. While this may seem unusual, it is becoming more and more popular for researchers to share work online as it progresses, so that other interested parties can contribute and ask questions, making the final product more robust, whatever form it ends up taking.

Spoken

Presenting information verbally might seem easier than writing or terrifying, depending on your experience and personality. Ideally you will be thoroughly prepared and able to clearly explain your findings, while also being able to respond effectively to unanticipated questions. It takes practice and a deep knowledge of your topic to do this—even the best speakers get flustered once in a while. Don't be afraid to say you don't know the answer and always offer to follow up on a question.

Class Presentation/Speech

As with the class paper, a class presentation is one of the first experiences most students will have with verbally presenting their research. One great benefit of this type of presentation is that you will most likely receive detailed feedback on how well it was received and perhaps even get some suggestions on how to improve your delivery. Your fellow students will also be faced with the same task and can even provide this type of feedback before the actual presentation takes place.

Conference Presentation or Poster Session

As your expertise on a topic grows, you may want to reach a wider audience. You will also want to reach an audience that is interested in your topic. An excellent place to find this audience is at a professional conference in your field. Aside from the many other benefits of attending professional conferences, presenting at a conference will help you begin to make yourself known to other researchers in similar subject areas. Responding to audience questions will give you the chance to prove that you really know your material or, alternately, can point out gaps in your knowledge that may lead to new research opportunities. Poster sessions are a great way to get your feet wet, as your poster will be available for you to refer to and the atmosphere is not quite as overwhelming as standing in front of a full audience for a presentation.

Audiovisual

Visual images can have an immediate impact on how your audience reacts to and understands your presentation. Choose them wisely and use them at appropriate times! You can read more about how different visualizations of information affect the way that information is received in the [Visual Literacy](#) chapter. Below are just a few brief thoughts about how you might use visuals in your presentations.

Powerpoint/Prezi/Other Presentation Software

Powerpoint has been around long enough that most everyone knows it. For many purposes a slideshow that you speak over, or even a slideshow that is posted online for individual viewing, can succinctly get your point across. Newer presentation tools such as Prezi (prezi.com) use a similar underlying idea but enable you to create more dynamic presentations directly online. Keep in mind that in most cases, tools such as these are meant to accompany a speaker and to use them effectively takes forethought and practice.

Images

Images can be powerful tools to grab attention, condense information, and tell your story. Different types of images can be useful in different contexts. In an art class you may use reproductions of famous paintings or drawings, or images you've created on your own. In a business class, graphs and charts may be more appropriate. Just make sure the images you choose actually make your presentation more effective rather than distracting attention from your main point.

Song

Keeping your audience in mind, don't be afraid to present your material in an unusual manner. If you can create a song (as one example), you may make your audience curious enough to stay around for more detailed information later!

Video

With the tools available now, it is possible to create a quality video product to present your information without extensive training or a lot of money. New online tools are constantly being introduced (and retired, unfortunately) which enable you to enter your content (words, images, video, etc.) and have it processed into a completed video in a short amount of time. Your library is also likely to have tools available for you to use to create video and audio projects, including not only the editing software, but often the video cameras, microphones, and hard drives you'll need to create original content. Don't hesitate to ask a librarian for both access and help using these resources. Many libraries also offer introductory courses on the software they provide to get you off to a running start.

Choosing a Presentation Format

The examples above give you an idea of the variety of presentation venues available, but it's up to you to decide which is most appropriate at a given time. If you're unsure, experiment.

Exercise: Present Your Information in Different Formats

Take what you've learned about your topic and express it as a written paragraph, a 140 character tweet, and a Prezi. Try to draw a picture that clearly explains your findings. Which of these seems most complete? Which seems most effective? Which seems most attention grabbing? Which was the hardest to do? Attempting this exercise might help you to make your decision about which format to use, although there are other things to consider first, particularly your intended audience.

Audience

Who you plan to present to affects how, when, and what you will present. If you're presenting your findings in a paper that only your teacher will ever see, you will focus exclusively on what that teacher has asked for. When you're presenting for a less well-defined audience however, you must imagine what they may already know (or not) about your topic, as well as what might interest them and what forms of presentation might be most appealing to them.

Exercise: Plan for Your Audience

Audience	What might they know?	What presentation methods might appeal most?
Teacher of the class		
Fellow students		
Experts at a conference		
Your family at a holiday gathering		
A group of elementary school students		
Newscaster interviewing you		

How do the different audiences affect what you might or might not include in your presentation about your topic? How do they affect the ways you might choose to present the information?

Many times you will present to an audience composed of various groups or unknown groups (particularly if you're posting the presentation online). If you've considered a number of different audiences and chosen the content and methods most likely to appeal to most of them, your chances of success will be higher than if you only include what is most interesting to you.

Your Role in Creating and Sharing Information

When you finally do publish the results of your research, there are some things to think about in terms of what happens next.

What will you do with the information now that you're finished with it? If you've written a paper for a class there may be only one copy. Do you save it and the associated notes you've made in case you need them later or do you throw it away once you get the grade? It can be difficult to project what may be useful in the future.

If you've published more widely, there are likely to be more copies, either physical or digital. Who is responsible for maintaining those copies? In a more formal situation such as a scholarly journal, the article will be maintained as part of the archives of that journal. (However, there are some questions about online-only journals. What happens if the journal goes out of business? Some journals have contingency plans for this, but not all.) If you've given a speech, do you keep the notes? If you've published on a blog, are you archiving the blog, or will it disappear once you stop using it? Even if you decide to save absolutely everything, unless you have a plan for organizing it, you may not be able to find a specific item when you need it.

Another consideration about what happens after your work is shared is what the reaction to it might be. This depends on the audience, but if you've created something really interesting or important, you may find that there is follow-up to be done. You might just be responding to comments on a blog posting or you could find yourself presenting your findings at conferences and continuing to develop your research on the topic. There may be negative feedback as well, and this is where thinking ahead about how you can support each of your arguments is important. Online, of course, there may be everything from kudos to spam and you'll have to decide how seriously to take all of that feedback. As time goes by, you may find that your work is being cited by other researchers, which is a wonderful validation of your efforts.

You are a Creator of Information

During the research process, at times it can feel as if you are just collecting what others have written or said, and that your presentation is just going to repeat what is already known on the topic. While this may be true for introductory-level papers, once you know a little more about your topic, you will be synthesizing what you've discovered, and drawing your own conclusions. Once you publish these conclusions you will have created new information.

Before the advent of online tools, publishing your new information was difficult and often expensive. It was hard to reach a large audience because of the physical limitations of producing and distributing paper copies of publications. Now anyone can publish anything and make it available to the entire Internet-connected world in a matter of seconds. This means that you have a great opportunity to share your ideas and to communicate with people around the world who are interested in similar topics. It also means that you have to carefully consider what you publish because anyone, even an unintended audience, can find what you've published.

In addition to being able to share information freely, you also have access to tools to create and edit audio and video materials that were prohibitively expensive to create or adapt not too long ago. You can now share more interactive and engaging material with a wider audience than ever before. This is a great opportunity and a great responsibility— use it wisely!

Wider Connections

When you begin to share your own work, you gain insight into the processes of producing and publishing information, which will help you the next time you need to find sources for a research project. Now that you know what it took for you to produce information in a given format, you know what other creators had to do to produce their work. This can help you decide which sources will be most reliable and valuable for your own research.

Presenting your information is usually considered the final step in the research process. You tell the audience what you've found out and you go home. However, as we've seen, sometimes in the process of presenting or preparing to present, you uncover new questions and need to Identify that new information need. Or you may discover that what you thought was a reliable source was not so reliable and you need to Evaluate a little more. The research process is not linear, but a continuous cycle with various entry and exit points that change depending on your goals, topic, and methods. Ideally, for those who enjoy it, it never ends!

Visual Literacy

Scenario

Louis was recently hired as an office assistant for an advertising firm. His first project is to create a presentation to describe the firm's services to potential clients. His boss specified that it should be as visual as possible and be designed for a large projector screen. If the firm likes the work, it will be adapted into both a website and a printed pamphlet. Louis has some experience with creating PowerPoint presentations for school and has used Pinterest and other image-related tools, so he figures this will be a piece of cake.

Introduction

This chapter is different from most of the others in this textbook, in that it does not focus on one particular aspect or pillar of information literacy. Instead, it looks at a specific area of information literacy: visual literacy. So, while each of the previous chapters looked closely at only one pillar, this chapter will look at each pillar as it relates to the field of visual literacy.

Visual literacy has never been more critical. The Association of College and Research Libraries states,

The importance of images and visual media in contemporary culture is changing what it means to be literate in the 21st century. Today's society is highly visual, and visual imagery is no longer supplemental to other forms of information. New digital technologies have made it possible for almost anyone to create and share visual media. Yet the pervasiveness of images and visual media does not necessarily mean that individuals are able to critically view, use, and produce visual content. Individuals must develop these essential skills in order to engage capably in a visually-oriented society. Visual literacy empowers individuals to participate fully in a visual culture.¹

Currently, most models of information literacy do not include visual literacy elements. Emerging models such as transliteracy and metaliteracy do incorporate aspects of visual

¹ Visual Literacy Task Force, 2012, 1

literacy, but these models have not yet become mainstream information literacy approaches. Because of this gap, the authors of this textbook agreed on the need for a separate chapter dedicated to the subject.

A note on the lack of images in this chapter: You may find it surprising that the chapter about visual communication has very few pictures. This has to do with the high level of copyright restriction for publishing images; unlike text, one cannot quote a visual work and simply cite it without permission (more on this later). We requested consent to use several of the images referenced in this chapter, but at the time of publication, the permissions were not yet granted. The images we do use are within the public domain, and links and references have been provided for others so that you can view the images' external sources.

Definition of Visual Literacy

Visual literacy is the ability to identify, gather, evaluate, manage, use, create, and share visual material in an effective, ethical, and self-aware manner. Over the years, individual disciplines have created widely varying definitions that emphasize only one particular aspect of visual literacy. This chapter aims to take the broadest possible view, using an inclusive definition that can be applied to any field.

Brief History of the Term

The history of visual communication goes back to the cave paintings 30,000 years ago; the description of it only 2,500 years. . . . Visual literacy is 2,500 years old (as a skill) and 30 years young (as a term).²

The *idea* of visual literacy is not new. Using images to communicate precedes the use of text by many thousands of years. Discussions about the concept of visual language have been around for quite a while as well. Perhaps most famously, Sir Francis Bacon discussed visual literacy in the 1600s.³ Subsequent scholars in areas ranging from art history and appreciation to philosophy and psychology have continued to grapple with the concept. The field of photography has a long relationship with visual literacy. Henry Holmes Smith, an author and professor of photography at Indiana University in the 1950s, is credited with coining the term *visual literacy*.⁴ Smith described it as “a visual language, one that probably cannot

² Velders, 2000, 7

³ Bacon, 1857, 437

⁴ Pett, 1988

be taught until it is codified. . . . I can hardly wait to read some general principles on picture reading. . . .”⁵

Several years later, in 1969, a group of scholars and artists from a wide range of disciplines founded the International Visual Literacy Association, bringing the concept and the term into the mainstream. IVLA continues to be the standard bearer for visual literacy, publishing a journal and sponsoring an annual international conference.

Value of Visual Literacy

If students aren't taught the language of sound and images, shouldn't they be considered as illiterate as if they left college without being able to read or write? -George Lucas⁶

We live in an increasingly visual society. Since the creation of the computer desktop icon, there has been an exponential shift toward communicating with images. Whether for research, employment, or social interaction, visual literacy has never been more important. It is especially critical in the workplace, and will only become more so. Increased visual literacy also makes us smarter! Studies have shown that becoming more visually literate leads to greater overall intelligence and is correlated to greater performance in technical areas.⁷

Use of images has advantages for communication as well. One study found that humans process visual images several thousand times faster than text,⁸ while other research has shown that information conveyed with images is more intuitively understood and better recalled.⁹ Visual literacy is also unusual in its ability to span cultures and languages in a way that text does not.¹⁰ It is also remarkably conducive to metacognition. Literary theorist John Zuern states,

Visual materials engage us in a dialogue with those ideas out of which we gain an understanding based less on memorization and mastery than on critical, intellectually supple inquiry. Moreover, visualization can spark invaluable ‘ah-ha’ experiences that push learners’ understanding of concepts beyond an instrumental ‘application’ of ideas in a particular discipline . . . and open them to philosophical reflection on their own social, cultural, and political lives.¹¹

A well-known example of this is the photograph, *Flower Power*, taken by Bernie Boston in 1967. This is the famous image of a Vietnam War protester placing a flower in the barrel of a rifle held by a soldier. For many, this photograph came to symbolize the national divide between those who were for and against the war, in ways that no amount of words could.¹²

⁵ Smith, 1986

⁶ Daly, 2004

⁷ Burmark, 2002; Messaris, 1994

⁸ See note 6.

⁹ Chen, 1972

¹⁰ See note 6.

¹¹ Zuern, 2004, 47-48

¹² Montgomery, 2007

Many feel that the increase of photojournalism during this era was a significant catalyst in changing public opinion and speeding the United States' withdrawal from Vietnam.¹³

Visual Communication Challenges

Many think, as Louis first does, that we are all naturally skilled in visual literacy. But visual communication is in fact more difficult to learn and use than text. Part of this difficulty is related to the subtleties of visual communication. Whereas we know whether we can read a given word, it is easy to unwittingly misread an image. It is also much harder to copy or create images than letters.¹⁴ Using visual imagery to communicate a specific message is not simply a matter of a clear substitution of images for words, but is instead a complex process with no agreed-upon rules. Standards of image use and interpretation vary by discipline and there is no singular alphabet or grammar.¹⁵ So, becoming visually literate involves not only learning how to find and use images but also understanding the range of meanings they may have in different contexts.¹⁶

With this in mind, let's check in to see how Louis is doing.

At first things went smoothly. Louis created a basic presentation and then looked online for pictures to add. He found many websites that had most of the images he was looking for and he was able to copy and paste from these sites into his presentation. But now he is having some trouble. For one thing, some of the images don't look great when he zooms in, and he is worried about projecting them. Also, he would like to be able to change some of the images by adjusting brightness and colors and, for one, he wants to take out the background. Finally, he feels that the presentation is still pretty boring: there are a lot of facts and figures to share, and the slides are filled with lists and tables of data. He is sure there are tools to improve all of these issues, and probably places to look for examples, but he doesn't know where to start.

¹³ Newton, 2000

¹⁴ Chen, 1972

¹⁵ Elkins, 2003

¹⁶ Avgerinou & Ericson, 1997

Applying the Seven Pillars

Identify

This pillar focuses on understanding one's information needs so that a research question or goal can be formulated. What does this look like when applied to visual literacy? Let's start with Louis. He needs visual materials for a business presentation. This sounds simple, but there are many important details that he did not stop to consider. He needs to consider the audience: what is their culture? Is there a specific dialect of images—certain logos or symbols that have special meaning? Are there images to avoid because of their particular meaning either within the company or the broader industry? The intent is also important. In this case, the purpose is both to inform and persuade; each will influence which images are chosen and how they are used. There are also technical aspects: the presentation will be given in multiple formats, each with its own set of best practices and considerations. This includes ethical and legal aspects, which vary depending on the purpose and venue, and should especially be considered for any commercial use of images.

Based on these factors, Louis' research goal seems to be: find images in a variety of formats and resolutions that he can legally use for both in-house and public marketing. In general, tools for this stage can include subject manuals and magazines, websites of peer organizations, previous publications created by the institution one is working for, as well as relevant physical spaces. For Louis, it would make sense to look at the company website and all other materials, any previous presentations used, the product itself, the company offices (including architecture and even dress codes), as well as competitors' work.

Scope

This pillar centers on knowing your own knowledge and gaps, and being aware of what information is available. For visual literacy, this starts with your current ability to find and create images, and your awareness of what tools are available for these tasks. Finding and creating aren't just digital skills, but can include looking through magazines and books, creating collages, taking photographs, drawing, and more. Knowledge of available resources includes knowing where to discover more material, a process greatly aided by knowing your own gaps in knowledge and experience. In Louis' case, he knows that he does not have photo editing skills. This knowledge will help him direct and focus his search: he needs to either find images that don't need adjusting or he has to find and learn how to use photo editing tools. The awareness that images can be altered is also a critical aspect of the scope of visual literacy. Besides knowledge of tools, it is critical to know what types of images exist, what their particular qualities are, and how these influence usability and accessibility. Specific examples include photographs, paintings, videos, cartoons, and icons, to name a few. Also, one should discover existing formats and their differences and advantages. There

are numerous physical and digital formats each with distinct and important differences in resolution, size, adaptability, and accessibility.¹⁷

Many resources are available to assist with this stage of the process. There are countless physical and digital image repositories, including libraries, museums, galleries, and websites such as Picasa, Flickr, Pinterest, and many more. And, there are just as many tools for manipulating visual materials, including paint, scissors, scanners, software such as Photoshop, and several excellent programs that can be used online or downloaded for free. It is also possible to find classes offering help in using these tools, frequently offered by area schools, libraries, or community centers.

Exercise: Observing the Visual Landscape

Go to Google Images and study the results for searches using each of these terms:

professor

librarian

baby

Now, reflect upon what you found:

- What patterns did you notice?
- What assumptions underlie, or are promoted by, these images?
- How do you think Google Images finds the pictures?

Plan

This pillar involves choosing the best search tools and developing effective search strategies. Plan is closely related to the Gather pillar described next: you will find yourself going back and forth between these two pillars in the course of your research. In the gathering stage, as you enact the strategies you formulated in the planning stage, you will naturally find yourself revising your strategies and creating new plans. In this chapter, we will focus on the thinking components of Plan and the action elements of Gather. For Plan, concerns specific to visual literacy begin with knowing *where* to look for various types of visual materials. In addition to the previously mentioned sites, there are excellent dedicated image collections available through the Library of Congress, New York Public Library, and *ARTstor* (which requires a subscription). It is important to keep in mind that most of these images are NOT copyright free; they cannot be freely used for some purposes without permission. Several online resources do exist for images that are free to use (with attribution), even for commercial purposes. Some standouts include Stockfreeimages, Openphoto, Imageafter, as well as Pixelperfectdigital and Morguefile, which all have excellent advanced search options. Flickr also offers an advanced search that has the added feature of allowing you to view only images with Creative Commons licenses supporting reuse. For classical art, two good

¹⁷ What resolution should your images be? (n.d.)

online resources are Art Resource (which displays artworks from hundreds of museums around the world) and Web Gallery of Art (notable for its many high-resolution images).

Image searching can be challenging because subject terms for images have not been standardized. Most sites don't offer advanced searching, leaving it up to the researcher to find the best strategies. What works best for one repository often does not suit another, so part of this stage involves learning the internal logic of each resource. Thankfully, there are some techniques that allow for searching across several sites. Conducting a Google image search is currently the best method, due to Google's excellent advanced search option that allows for limiting by size, format, usage rights, and more. Google also allows you to search using an image as your search term, which can be terrifically helpful since it bypasses the problem of variations in words used to describe images. This is a perfect example of visual literacy: using one image to describe another image! This method can also be used to find information about an image you have, such as the species of a bird you photographed or the artist for a particular painting.¹⁸

Before we proceed, let's check in again with Louis.

Louis has decided to start fresh. He realizes that his project should focus on a clear goal, and that he wants to find images that clearly communicate his topic right from the beginning of his presentation—rather than adding them at the end as an afterthought. Knowing that he has limited experience in manipulating images, he attends a free Photoshop course taught at a local library. There, he learns some basic editing skills, as well as the differences between formats such as JPG and PNG, and what sizes and resolutions work best for different purposes. Armed with this new knowledge, Louis identifies several online image repositories that he plans to use. Once he finds the most appropriate images, he will download them and possibly alter some to better suit his needs. His next step is to start searching for and downloading images.

Gather

This pillar concentrates on using the strategies outlined in the planning stage to locate and access information. This is a particularly challenging process for visual literacy, although it may initially seem easy. While a vast amount of visual material is available online, and some good tools for finding it exist (as identified in Scope), conducting specific searches is quite difficult. Finding a precise image often requires hours of trial and error, and exploring multiple resources, and even when advanced searching is possible it may not yield the desired results. Often, descriptions for images are user-generated tags that lack consistency (even within a repository) and that change over time as new tags are added. This means that determining accuracy is quite difficult: is that actually a picture of Karl Marx, or is it Santa Claus as one tag says? Finding specific formats and resolutions is similarly challenging. For one, most images freely available online are not of high enough resolution or proper formats to be used for publications or large projections. And finding those that *are* is difficult because of inconsistencies in terminology. A few representative examples: *JPG* and *JPEG* are both used to describe the same format, while *dpi* and *ppi* are not the same but are often

¹⁸ Klosowski, 2013

used interchangeably—and these are some of the most-used formats and considerations for digital images!

Accessing images is equally challenging, at multiple levels. There is a wide range of the level of accessibility for visual materials, from watermark-protected images for sale (and often requiring signup to access) to high-resolution images that are easily accessed and legally free for all to use (quite rare). Often, the difference between the two is not immediately apparent: pop-up screens demanding payment often appear only once you have searched for and selected an image that you want to use. Now, reading the previous sentences, you may have thought, “But I get images easily all the time! Flickr, Pinterest, Google Images: just Right-Click and it’s yours!” This brings us to the other key aspect of online image accessibility: copyright. While it is true that one can often easily and instantly download an image, this is almost always in violation of copyright. From an earlier example: if you search online for *Flower Power Bernie Boston*, you will find links to hundreds of webpages posting this photograph. Most of these sites are doing so illegally, without permission of the copyright holder, which in this case is the Worcester Art Museum. Many websites seem specifically designed for open use, such as Pinterest, but nearly all of the postings are illegal while being firmly within the site’s stated intent.¹⁹ For images, it is often up to the researcher to make sure he or she is on ethical and legal solid ground. We will discuss this further in the sections on managing and presenting.

For visual materials, another important aspect of access involves saving copies. Because you will often want to use an actual image, rather than merely quoting or referencing it as you might a text, it will be necessary to have a copy of the image to use. This could mean a photocopy, scan, tracing, hand drawing, photograph, or, more often, a digital reproduction. Besides knowing how to copy or save an image, it is important to have a detailed record of its source. This can help you find the original image again later and has other benefits we will discuss in the Gather and Present sections of this chapter.

Evaluate

This pillar focuses on the evaluation of information in an ongoing review of one’s research process. Key elements related to visual literacy include determining quality, bias, and accuracy, as these are all especially tricky to determine for visual materials.

Quality

Quality in this case refers both to the substantive value and the visual strength of an image. An example to demonstrate the difference between the two: a deer crossing sign is quickly and universally understood (high substantive value), but does not achieve its purpose if it is faded (low visual strength). Evaluating for substantive value is as important for visual materials as any other resource type and involves many of the same considerations, including looking critically at key elements and identifying subjects, relationships, context, and purpose (including intended audience). Visual strength is equally important and includes such

¹⁹ Newman, 2012

qualities as brightness, clarity, contrast, hue, and saturation. These are important elements to consider both for evaluation and image creation. The size and format of an image also affect visual strength since what looks good in one venue may not in another; that wallet size photo of your sweetheart will probably be quite grainy if you make it into a poster. Some of these factors will be immediately apparent, as with the faded sign, but others require looking at the metadata for an image to determine file type, image size (which is not the same as the *displayed* size), resolution, and more. Legality is another key area of quality to assess. Who is allowed to use this image and for what purposes? There is a wide range of possible permissions and it is critical to determine whether your intended use is permitted. Many people have been sued—and fined or even jailed—for using images outside of a creator's intent. If you cannot determine what type of image reuse is allowed, you are better off not using the image.

Bias

Bias can be particularly hard to identify for images. Often it is not the image itself but its context or description that displays a bias. Sometimes it is what is *not* shown that reveals bias, as when something is cropped or left out of the frame for a specific intent. Other times the very fact of an image being used is revealing, as when the Danish newspaper *Jyllands-Posten* printed caricatures of Mohammed despite knowing this would be offensive to many Muslims. (In a remarkable added twist that highlights the many layers of visual literacy, when Yale University published a book about this incident it chose not to include any of the images.)²⁰

Accuracy

Accuracy is especially important to consider when evaluating images, since they can be easily altered in ways quite difficult to detect and are also often incorrectly described. The first step in assessing for accuracy involves looking carefully to see whether an image is believable and whether the captions seem to match the contents. One should consider both internal consistency (Does it look right, without strange shadows or edges or elements that seem off?) and external probability (Is this depicting a plausible thing or event?). Look for areas that appear too perfect or appear to be exact replicas of another area; tool marks left by software such as an unnaturally straight line, or a sudden break in color. As with any resource, consider the source: who published the image and why? It is also important to examine the metadata, ranging from the written caption to the digital information hidden within the image. Is this information consistent with the image, are the dates and descriptions correct? If the image is not original and is being reused, is it properly cited? A warning sign that an image is not a reliable resource is when there is no citation but the visual material is clearly from some other source.

All evaluation should be done in relation to your research goal: the most critical concern should be whether an item fits in the project context. Evaluation can inform your research process, with the search both responding to and suggesting adjustments to the original research question or desired product. Similarly, it is important to critically appraise your

²⁰ Cohen, 2009

own role in the process, looking for your own biases or habits that could limit results. Comparing your perceptions with others through discussion and mutual review can also be very revealing.

Exercise: Accuracy and Bias

Look closely at the following maps: what differences do you see?



Now, compare these maps to a current globe.

- Are all three equally accurate?
- What implied messages could be interpreted by some of the visualization choices made?

- **The map on top is from 1942, and the bottom map is from 1999, both printed in the United States. How might these facts be reflected in the layout of each map?**

Manage

This pillar relates to information management—organizing your findings to aid comprehension, preservation, and retrieval. As with any other area of information literacy, for visual literacy information management begins with collecting your materials. We discussed the importance of recording source information when copying or saving; at this stage you will want to make sure that information stays linked to the correct image. There are a number of ways to do this, ranging from including it in the file name (*AnselAdamsYosemite.jpg*) to simply pasting the image and its identifying information in a word document. Many image processing programs will allow you to embed this information within the image itself. Whatever method you use, it is essential to do so in a consistent manner to support effective organization. It is also very helpful to name images in descriptive and clear ways that distinguish them, such as *YellowLightningBoltBlackBgrnd.png*. Additionally, you may want to create folders for different subjects or image types.

Citation

Citation for visual materials can be tricky, but it is critical for both managing and presenting your findings. Using an established citation format facilitates organization of images both within a publication and also for your own use. It also maintains a connection of the source information to the image, which will be important when you want to use or reference the image later. It is important to be able to create a bibliography in at least one citation format, since both professors and publishers will require you to document your sources. There are several programs that work for textual and visual materials, to assist you with this process, as well as print and online guides specifically for image citation (one is linked in the Additional Resources list).

Another management tool that can be very useful is keeping a research journal or similar record of your process. Documenting where and how you sought information (including specific search terms and strategies) and what you found can be very helpful. A research journal can help you with future searching and also supports sharing your process and helping others with their research. Many of the best tools available today were created from a previous searcher recording and sharing their experience: there is nothing stopping you from contributing! Doing so also brings you into conversation with other scholars who can help you substantially improve your work.

Now let's look again at what Louis is up to.

Because his work will be used commercially, Louis narrowed his search to only sites supporting this type of use. He performed focused searches for specific images, making sure they had high enough resolutions for large projection and could legally be reused commercially. He carefully evaluated each image for relevance to his project, and for accuracy,

and originality. One image looked familiar, so he used it to do a reverse image search that revealed that the Flickr user who posted it was not, in fact, the image creator. The image was not free to use, so he wisely chose to exclude it from his presentation. He kept a running log of his process and recorded citations for each image that he collected. He also pasted a copy of each image into a Word document. He then made folders for different types of images and sorted the files in them by format type. He now has a searchable pool of images to use in creating his presentation.

Present

This pillar focuses on summarizing, synthesizing, and communicating your work to others. This is the pillar with the widest range of connections to visual literacy. Many books have been dedicated to this topic alone. In this chapter we will highlight the central aspects of Present, and share some methods and tools you can use. As mentioned in the [Present](#) chapter, a fundamental aspect of this pillar is recognizing that we are all information creators. This is also true for visual communication, although we may not be as aware of our creator role in using visualized information. Have you ever used an emoticon? Created a doodle? Sent someone a photo you found online? Made a collage? All of these involve creation and imaginative reuse of images. These activities also require the ability to understand and communicate using visual language, which in many ways is the essence of visual literacy.²¹ Now let's look at the basic components of Present.

Summarizing & Synthesizing

For visual materials, the line between summarizing and synthesizing is often blurred, because one often does both when presenting information visually. The act of visualization is itself a form of synthesis. It is important for you to be aware of what data came from where, and to note your own contributions, including your commentary (intended or not). It is very easy to forget a source and then fail to provide a citation, thinking all of the project is original work. You can also easily fail to recognize your own bias and believe your work is just an objective summary. For these reasons, we strongly recommended that you have others review your work and provide critical feedback before publication. Citations are also important for summarizing and synthesizing, because they will help with both remembering your sources and giving credit to the creators. However, as mentioned throughout this chapter, providing citations does not protect all or even most image reuse: always make sure to look carefully at the copyright information for any visual material.

Communicating

Communication begins with determining your purpose and then selecting images and presentation methods that best support your objectives. When you plan to use visual communication, it is helpful to work visually from the start and use tools designed for that purpose. Concept mapping is a widely used visualization method that involves drawing concepts and connections on paper (or a computer screen), which can be helpful in get-

²¹ Avgerinou & Ericson, 1997

ting free of verbal/intellectual patterns and starting to *think* visually. In this process one often finds that a certain visual logic arises, an intuitive sense of arc and layout that guides what content is chosen and how it is used. This is an important stage, because it involves immersing yourself in the internal rules and logic of the world of images.²² These activities should align with the final research goal and take into account the purpose of the project. The character of your intended audience should inform presentation style and type, image selection and size, and color schemes, as well as the tools and processes you use for editing images. For instance, while you might show large cartoon images zooming around a circus-themed background when presenting to young children, this likely would not be the best way to reach a worker's union. An added consideration that is often neglected is when *not* to use images. While visual communication is powerful, using an image to make every point may not be the best strategy: imagine learning that your partner is breaking up with you via emoticon and I'm sure you will agree. In any case, many excellent tools exist for every stage of presentation, ranging from concept mapping tools such as Bubbl.us and Mindomo to a vast array of editing and presenting tools. Some notable examples include presentation software such as PowerPoint and Prezi; timeline generators Dipity and Tiki-Toki; online photo editors Microsoft Publisher, Photoshop, Pixlr, and Splashup; and flexible and dynamic word cloud generators Wordle and Tagxedo.

Data visualization, which involves creating graphical displays of information or *infographics*, is another important area of visual communication. Using graphical displays is not new, but with many designers shifting from presenting information in traditional graphs and number tables to more inventive depictions in which every aspect including shapes and colors add significance, data visualization has recently gained significant traction. Infographics can be simple, such as pyramid-shaped graphs about ancient Egypt, or complex, multi-layered presentations such as the IVLA's Periodic Table of Visualization Methods. The massive infographics on the Kulula Airlines fleet of airplanes is a wonderful and novel example of using data visualization.²³ It is important to point out that it is easy to mislead with graphics, both intentionally or inadvertently. You should always check and re-check any infographic you develop for accuracy and bias. Soliciting external feedback can help you verify your work. (For a real-world example of misleading data visualization, go here.) As for the creation process, there are several helpful tools, including Microsoft Excel, Hohli Charts and Google Charts for making a variety of graphs; Gliffy for making flowcharts, Venn diagrams, etc.; and Visual.ly, Piktochart, and Infogr.am for making dynamic infographics.

An often overlooked component of presentation is the presenter him or herself. Many visual literacy scholars consider facial expression and body language to be key aspects of visual communication,²⁴ with some including broader performance aspects such as object use and placement.²⁵ *How* you present has significant impact. You should give careful thought to attire, stance, gestures, and expressions—especially when presenting to audiences of nationalities that may have different cultural associations from your own.

²² Arnheim, 1951

²³ Krum, 2008

²⁴ Messaris, 1994; Fransecky and Debes, 1972

²⁵ Debes, 1970

Exercise: Putting it All Together

- First, type out a thesis statement and three supporting arguments.
- Next, determine your audience.
- Now, using *only* images (which cannot contain text), demonstrate both your thesis statement and three supporting arguments. You can create images, use found images, or both.
- Each component can be either a single image (if this clearly communicates the thesis or argument) or a multimedia project (such as a Prezi) linking multiple images.
- Create correct citations for any image you did not create, using the APA or MLA style.
- Share your work by emailing it to a friend, using it for a class, or publishing it online in a blog or elsewhere.

Going Forward

Many believe that we are living in the most visual era yet, with today's students being the most visually immersed generation the world has seen. Visual literacy has never been more critical, and is considered a key workplace skill²⁶ viewed by employers as on par with the ability to read and write.²⁷ Now, more than ever, it is critical to become aware of your own visual communication skills, to actively practice and improve them, and to create new work. There has never been a greater need, or potential, for creators to actively and ethically reach out and share their work with others. In this chapter, we have tried to give you an outline for using images, as well as some resources to help you on your way. We have walked, along with our friend Louis, through the landscape of visual literacy. You may wonder how everything worked out with him, but we intentionally left this open, because that question is for you to answer. Now it is your turn to go out and share your voice: there is a world waiting to be read and be visualized.

Select Quotations

Francis Bacon

Emblem...reduces intellectual conceptions to sensible images; for an object of sense always strikes the memory more forcibly and is more easily impressed upon it than an object of the intellect...And therefore you will more easily remember the image of a hunter pursuing a hare, of an apothecary arranging his boxes, of a pedant making a speech, of a boy repeating

²⁶ Burmark, 2002

²⁷ Simons, 2002

verses from memory, of a player acting on the stage, than the mere notions of invention, disposition, elocution, memory, and action.²⁸

Henry Holmes Smith

Symbol systems and symbolic action constitute not only the greatest perils, but also the greatest hopes of mankind.²⁹

Philip Yenawine

[Visual literacy] involves a set of skills ranging from simple identification—naming what one sees—to complex interpretation on contextual, metaphoric, and philosophical levels. Many aspects of cognition are called upon, such as personal association, questioning, speculating, analyzing, fact-finding, and categorizing. Objective understanding is the premise of much of this literacy, but subjective and affective aspects of knowing are equally important.³⁰

Tad Simons

'Seeing is believing' goes the old saying, but this axiom has never been less true than it is today. We live in an age where photos, video, and film can be digitally altered to represent any reality imaginable...so it has never been more important to acquire the intellectual skills necessary to distinguish between visual fact and fiction, information and manipulation, reporting and propaganda.³¹

Roger Fransecky and John Debes

When developed, [visual literacy skills] enable a visually literate person to discriminate and interpret the visible actions, objects, symbols, natural or man-made, that he encounters in his environment. Through the creative use of these competencies, he is able to communicate with others. Through the appreciative use of these competencies, he is able to comprehend and enjoy the masterworks of visual communication.³²

Additional Resources

A Periodic Table of Visualization Methods: http://www.visual-literacy.org/periodic_table/periodic_table.html

²⁸ Bacon, 1857, 437

²⁹ Smith, Enyeart, and Solomon, 1986, 89

³⁰ Yenawine, 1997, 845

³¹ Simons, 2002, v-vi

³² Fransecky & Debes, 1972, 7

Columbia University's Image Size and Resolution Guide: http://www.learn.columbia.edu/mcah2/pdf/training_resolution.pdf

David McCandless' Ted Talk: http://www.ted.com/talks/david_mccandless_the_beauty_of_data_visualization.html

David McCandless' Blog: <http://www.informationisbeautiful.net/>

Edward Tufte's Website: <http://www.edwardtufte.com/tufte/>

Boston University's Guide to Finding and Using Images: <http://www.bu.edu/library/guide/findimages/>

Colgate University's Image Citation Guide: <https://sites.google.com/a/colgate.edu/colgatevr/citing-images>

Christine L. Sundt's Copyright & Art Pathfinder: <http://darkwing.uoregon.edu/~csundt/copyweb/>

International Visual Literacy Association Website : <http://ivla.org/drupal2/>

ACRL Visual Literacy Standards Graphic: <http://acrlvislitstandards.files.wordpress.com/2013/05/visualliteracyarray2.jpg>

ACRL Visual Literacy Standards Website: <http://acrlvislitstandards.wordpress.com/>

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Science Literacy

This chapter is devoted to the concept of science literacy. You have probably heard of specific types of literacy: computer literacy, visual literacy, media literacy, and many more. Science literacy is yet another, and, as you can probably guess, it is related to the natural sciences. To better explain science literacy let's begin with a story that goes back to 1986. April 26, 1986 was the day of the worst accident in the history of nuclear energy. This is when there were several explosions at the Chernobyl Nuclear Power Plant in Ukraine, then part of the Soviet Union. The explosions caused a fire that released radioactive fallout into the surrounding atmosphere. When this event took place, the author of this chapter was studying electrical engineering at Lvov Polytechnic Institute in Ukraine, which is about 300 miles from Chernobyl. The news of the disaster was kept from the Soviet public for several days, so as not to cast a shadow over approaching May Day celebrations. However, we engineering students learned about the disaster almost immediately, as some of our fellow students returned from Chernobyl where they had been doing student internships. The stories they told were frightening, but at that time nobody knew exactly what to expect, as a disaster of this scale had never occurred.

When the accident was finally officially announced, chaos ensued. No one knew how to react or what to do. What exactly was radiation? How dangerous was it? How far could radioactive clouds travel, and where was *this* cloud headed? A lack of accurate information and an overabundance of rumors did not help people cope with the situation. People shut their windows against the hot May weather for fear of letting in radiation. Air conditioners were practically non-existent at that time (and still are nowadays in Ukraine, for that matter). Someone said that iodine helped fight radiation, so supplies of iodine quickly disappeared from pharmacies. We drank tea with iodine, we put it into water, and it wasn't pleasant.

Let's investigate which coping strategies were effective and which were not. Let's begin with radiation. Does it travel through the air? Sure, it does. Does it help to close the windows to stay safe? Not really—radiation can get through glass and brick. Only heavy metals like lead can stop it. What about iodine? Does it really counteract the effects of radiation? This answer is not easily determined without some investigation. Of course, physicists, especially those specializing in nuclear physics, would know, but what about members of the general public?

Exercise: Iodine Case Study

1. Go to Google (or any other search engine such as www.bing.com or www.exalead.com) and type in *iodine and radiation*. Usually search engines do not need the connector *and* (nor that it necessarily be typed in upper case) as it is assumed that you want both of the terms to be present. When you do your searches online you may use different connectors (so-called Boolean operators—check the explanation in [Plan](#) chapter). They are *or*, *and*, and *not*. However, Google makes an exception for *or*—you should type it in upper case for it to be recognized as a connector. This strategy is useful when you expect to find limited information in a search on an unusual topic. The operator *or* can be very helpful to connect synonyms thus assuring better results.
2. Examine the results carefully. You most likely will find articles from popular media such as newspapers and online news websites. Watch for sources that have the .gov (stands for government) domain: do you see one from the Centers for Disease Control and Prevention (CDC)? Let's take a look.
3. The page you're looking at has the following URL: <http://emergency.cdc.gov/radiation/ki.asp>. This is a page from the "Emergency and Preparedness Response" site. If for some reason you do not have it in your results, just type in the URL or click on the link in this text. From this site we can learn some quick facts:
 - The chemical name for iodine is potassium iodide (KI). It's actually a salt of stable (not radioactive) iodine.
 - In the case of a radioactive event the radioactive iodine is released into the air and can be absorbed by the thyroid gland. To counteract the absorption, you can take potassium iodine (not radioactive). The non-radioactive iodine will be absorbed first, thus preventing thyroid from absorbing more (in this case radioactive) iodine in the next 24 hours.
 - It is important to take iodine only on recommendation of the doctor or public health official who is dealing with the consequences of the radioactive spill.
4. Among the results of our Google search you may see a short article from Los Angeles Times <http://articles.latimes.com/2011/mar/14/news/la-heb-iodine-tablets-radiation-quake-nuclear-plant-20110314> (June 25, 2013), which quotes the International Atomic Energy Agency about distributing "230,000 units of stable iodine to evacuation centers" near the Fukushima Daiichi and Fukushima Daini nuclear power plants in March 2011, when a tsunami struck the coast of Japan and damaged two nuclear plants.
5. Now back to the question—was it useful for people in Ukraine to take iodine after several days passed from the disaster? The answer is no, because it would only have been beneficial within first 24 hours after the exposure to radioactive iodine.

Defining Science Literacy

Now we are ready to discuss general science literacy, which means knowing enough about science to make good decisions in situations like the one just described. This ability is referred to as science literacy or scientific literacy. Science literacy can be measured thanks to Jon Miller, a political scientist who conducted research on how to measure this ability. Miller has published his findings in several books and articles, which are listed in the recommended readings on science literacy list at the end of this chapter. Unfortunately, his results were not encouraging: the number of American adults who met his criteria for science literacy was quite low, 28%.¹ On the other hand, the United States rated higher than several of the other nations included in Miller's study.

The number of adult Americans who are scientifically literate may be attributed to the undergraduate general education requirements at colleges and universities in the U.S.: higher education requirements that are unique to this country. Every college undergraduate has to take a certain number of science courses even if they are not majoring in the sciences. In fact, Miller found that the strongest predictor of science literacy in adults is completion of three to four science courses in college. The second strongest predictor of science literacy is having a college degree.² In other words, if you're in college (and there is a good chance you are, since you are reading this textbook), your chances of becoming science literate are already much better than those of your high school classmates who chose not to go to college.

Now we're ready for the definition of science literacy:

Science literacy is being well versed in all matters pertaining to basic science and scientific laws, to the extent that one is able to make sound decisions concerning their wellbeing and the wellbeing of their families, communities, and society as a whole.

This definition may look too broad; after all, it suggests that everything from our personal well-being to that of entire nations rests, at least in part, on science literacy. But proponents of science literacy make this very point by distinguishing five different types of science literacy: civic, cultural, practical, aesthetic, and consumer.

Civic Science Literacy

This is regarded as one of the most important science literacies, as it speaks to people knowing enough science to relate scientific laws and discoveries to matters of government and legislation. Someone with civic science literacy understands enough about science to comprehend the likely consequences of legislation involving scientific matters. For example, let's return to our conversation about nuclear disasters. It's no secret that the world needs sources of clean energy, taking into consideration how industrial pollution harms the environment and contributes to global warming. Nuclear energy is considered clean; there are no residual pollutants released into atmosphere through the production of energy

¹ Miller, 2010, 241-254.

² Miller, 1989.

using nuclear power. However, it is also common knowledge that nuclear energy can have disastrous effects on human health and the environment.

The bombing of Hiroshima and Nagasaki during World War II made this abundantly clear. Growing up in the former Soviet Union, we were shown images of Japanese children with leukemia making origami and told that this was something that should never happen again. And yet it did happen again, and right in Ukraine. The Chernobyl disaster released four hundred times more radioactive material into the atmosphere than the nuclear bomb that was dropped on Hiroshima. More recently, in 2011, a tsunami caused a reactor meltdown at the Fukushima Nuclear Power Plant in Japan. The Fukushima Daiichi nuclear disaster was the worst since Chernobyl and received the same severity rating on the International Nuclear Event Scale.

You may be thinking, OK, I get it. Nuclear power is potentially dangerous. But what do I do? Well, if you are a model of civic science literacy, you investigate the pros and cons of nuclear power to form an opinion as to whether we need this type of power generation. Once you form your own opinion, you can communicate with your congressmen and senators, and tell them what you think. You can exercise your power as a citizen by participating in decision-making that requires some knowledge of science. This is what civic science literacy is all about: using science to be an active and informed citizen. Hydraulic fracturing (also called fracking) is another example of an issue that calls for civic science literacy.

Practical Science Literacy

Practical science literacy entails knowing enough about scientific and natural laws to make decisions about one's day-to-day life and livelihood, as opposed to government and legislation. For example, a friend of mine who works as a landscape designer and permaculture gardener spent several months in the mountains of India studying the local residents' agricultural practices. She learned that they had developed specific farming methods that make the best use of the local terrain and climate, such as irrigating the fields in spring with the melting snow that runs down from the adjacent mountains. These people are applying principles of permaculture—adopting the most effective and sustainable agricultural methods for their particular ecosystem—and, in so doing, demonstrating sound practical science literacy.

Consumer Science Literacy

Consumer science literacy is related to practical science literacy. It refers to a person's ability to know enough science to make sound consumer choices whether he or she is shopping for food, medications, clothes, electronic devices, automobiles, or other items. For example, there are many recent publications in public media about genetically-modified organisms (so-called GMOs) and whether they are safe to consume. In order to make a decision about whether to buy genetically modified vegetables, one needs to understand basic processes that involve genetic engineering.

Cultural Science Literacy

This type of science literacy is the scientific knowledge that is generally assumed to be possessed by someone who is culturally literate, that is, someone familiar with the general knowledge and idioms that make up the dominant culture of his or her society. In other words, being culturally literate entails a mastery of certain scientific concepts and principles. For example, when you read an article about nutrition in a popular newspaper or magazine, you don't expect the author to explain what vitamins, protein, and calories are; these are things the author assumes you already know. And, of course, you do. Or do you? What *are* calories? How would you find out?

Aesthetic Science Literacy

Aesthetic science literacy refers to the ability to appreciate the beauty of scientific ideas. An avid proponent of science literacy, James Trefil provides an excellent explanation of this type of science literacy in his book, *Why Science?* Dr. Trefil, a physics professor, writes that he finds it helpful to bring the attention of friends to certain natural phenomena that, if unexplained, might go unnoticed or would not be appreciated in full, such as the very rare sight of a triple rainbow or sun dogs, two spots of light that sometimes are seen next to the sun. His friends, he says, are usually very grateful for the experience of uniting science and natural beauty in one great story.³

Citizen Science

So-called citizen science is a great way to improve general science literacy, especially for adults. Citizen scientists are science enthusiasts who help scientists in various disciplines conduct their research, primarily by collecting data. For example, there are citizen astronomers who watch the sky on a regular basis studying various celestial objects and phenomena, from stars and planets to galaxies. They take pictures of celestial objects and events, and post them online so that professional astronomers can download them and use them in their research. In other words, researchers mine the visual data collected by citizen scientists and then develop scientific theories and discoveries based on them. Another example is amateur bird watching. Birdwatchers provide valuable data—for example, about where certain species are migrating—to professional ornithologists who might otherwise lack this data, as it takes many people to conduct this type of research. And not only do citizen scientists provide data to the professional scientific researchers; in the course of their data collection, they also increase their own knowledge and improve the overall science literacy of their community. Another way science literacy is increased is through museums. Have you ever been to a science and technology museum, a nature preserve, or a conservancy on a school trip? If you have, you may remember how much you learned about science during those trips.

³ Trefil, 2008, 70.

Creating and Disseminating Scientific Information

Scientific publications come in many different forms such as books, conference proceedings, technical reports, and peer-reviewed, or refereed, articles. Primary research articles are especially important in the world of scientific information. Such articles, often referred to as primary sources, are written by the scientists who actually conducted the research being described or reported in the article. Not every scholarly article published in the natural sciences is a primary research article, and it's important to be able to tell these primary sources from articles that summarize or comment on scientific research conducted by others, so-called secondary sources. Good examples of secondary sources are the articles published in the science section of the *New York Times* or *Scientific American*; such popular articles report on recent scientific breakthroughs and discoveries, and generally cite primary research articles published in scholarly journals like *Science* and *Nature*.

Popular articles are written by science journalists, whose job is to make scientific research intelligible to people who are not scientists by profession. These journalists typically indicate where the research they are describing can be located, so that interested readers can track down the original study by searching the catalogs and databases at their local public or college libraries. All they need are the names of the authors who wrote the article and the journal in which it appeared. You can practice this in the following exercise.

Exercise: Tracing a Primary Research Article From Secondary Publications

1. Browse through one of the popular scientific publications such as the science section of the *New York Times* (comes out on Tuesdays) or *Scientific American*. Find a short article that looks interesting and is easy to understand.
2. Look for the following:
 - an article that is reporting about a recent study that has been published in a scholarly journal;
 - the title of the journal;
 - the name of the author(s); and
 - an indication of when the original study appeared: sometimes the secondary source will say that the research was published in a latest issue of *Science* or *Nature*.
3. Once you find some of these facts (journal title and the authors should be sufficient), you can start to search for the primary source in the resources provided to you by your school—the library catalog or databases.
4. Catalog search: in a catalog search, you can find out whether your school subscribes to a particular journal by searching for the journal by title.
5. Best case scenario: your library has it! The next step will be to figure out the available article format(s). You might have several options:

- **Electronic version—great!** It means you can access it right away. Once you get to the online (or electronic) version of the journal, you are given a choice of searching within this publication. An author search should be sufficient to locate the article.
- **Print version—good!** You can search in databases or a discovery service tool such as eDiscover for your article by entering the journal title and the authors. Once you locate the record about the article, which will include volume and issue number, page numbers, the article title, you can also find the call number and take a walk to the shelves where you will find the issue of the journal that includes your article.
- **Microform version—still good!** Again, after searching databases and locating the exact information about the article, you should be able to locate the appropriate microfilm reel or microfiche on the shelf. Before the widespread and easy access to online versions of materials, microforms were used to save space by photocopying and preserving documents on film. Libraries are equipped with microform readers—if you need help using a reader, ask the library staff.

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Science.gov and More

Did you know that a good deal of scientific research is financed by the United States government? Check out the *Statistical Abstract of the United States* and you will see how much money is budgeted for research and development in the areas of life sciences, engineering, and many other scientific fields. This research has to be made available to the public because it is paid for with tax dollars. That is why it is possible to search through various databases using the government gateway to scientific information, Science.gov., and to access full text at this site on topics in the fields of health and medicine, physics and chemistry, applied science and technology, and natural resources and conservation.

Another good way to look for scientific information is to browse through the websites of individual government agencies such as the Department of Energy, or the National Library of Medicine (NLM) and PubMed (also listed under the registered trademark MEDLINE—you will see the two terms used interchangeably). The NLM database contains many of the latest publications in various medical fields. If you are searching for

information for class projects or personal needs, you can find some surprising results in these databases.

Data Repositories

Researchers accumulate a lot of data in the course of their work, and not all of this data is used in their publications. Sometimes this data just sits in filing cabinets waiting to be discovered; in the worst case scenario, it may get lost for good. Now scientists can preserve their data and make it available to other scholars by using digital data repositories. Data repositories can be either institutional or private, depending on their creators and hosting entities. The SUNY Digital Repository—a fairly recent initiative—allows researchers from all SUNY campuses to deposit their data into one warehouse where it can be accessed by anybody. Some data repositories are discipline-specific, such as the NCBI (National Center for Biotechnology Information) from the National Institutes of Health. It is another example of information which is provided for free by the federal government. You can find it at <http://www.ncbi.nlm.nih.gov/>.

Science Zines

Our discussion up until now has primarily focused on scientific information consumption; the different ways of learning what others already know about science. But it's important to bear in mind that you are a creator as well as a consumer of information. When you produce your own writing and social media projects, you are creating unique information entities that other people can use, especially if you publish them for free on the web. The realization that information dissemination takes place at both large and small scales led to the development of science zines. Science zines are small pamphlets, usually created on 8.5" x 11" sheets of paper, and folded into small booklets. They are distributed "guerilla style" in places like coffee shops and hair salons, where people are likely to be looking for something to read. In the following exercise, you will create a science zine of your own.

Exercise: Science Zine

Science zines are small pamphlets (made out of a single 8.5" x 11" sheet of paper) that provide basic information about a particular science topic. They can address a broad range of audiences, from kindergarteners to a college-educated, adult population. A science zine's goal is to bring science information to the general public in an unconventional way, making it a "cool" and easy (and unlikely) way of spreading science literacy. Science zines are often left at bus stops, hair salons, and cafes in hopes that they will be picked up and read. You can start thinking of unlikely places to put your zine!

It is important to find software that can provide an appropriate and easy-to-use template, which will allow placing all of the zine pages on a single 8.5" x 11" sheet. Microsoft Publisher is a good example of such software. Most schools provide appro-

appropriate tools to help students with their projects—check with information technology services on your campus or ask at the library to see what is available at your school.

Step 1

Think about your prospective audience: who would you like to read your zine? Your dorm neighbors? Your parents? Your little brother or sister? Perhaps you volunteer at a summer camp?

Select a topic and conduct preliminary research (identify, scope and plan):

Identify will help you figure out what you don't know about your topic and how to proceed.

Scope will help you figure out how much you need to find out about your topic in order to have enough information for your zine.

Plan will equip you with some helpful tools that you might use in your research.

Your research should include basic definitions, any controversy there may be about the topic, and why it is important for the public to become familiar with this topic. It is also important to have your personal opinion about the topic or issue, because you will be collecting information and formatting it for publication. It has to look persuasive.

Step 2

Create a page-by-page outline of your zine, with visual and written scripts. You can make drawings by hand to illustrate your topic. You can also use computer software to produce images; insert clip art, drawings, and photographs—anything that will help communicate your key points. Depending on who your audience is, you can even make it look like a comic book. See some good examples at <http://smallsciencezines.blogspot.com/>.

Important! Make sure you provide appropriate credits for all images that you're using. You will find plenty of useful advice in [Manage](#) chapter of this textbook.

Step 3

Time to put it all together and print it out. Then get the scissors and a stapler and... Congratulations! You created your own zine!

Lifelong Learning

Our knowledge base changes constantly. We learn new things that others have gone to a lot of trouble to discover. We also forget things, some of these things are probably not that important anyway (and some are). Sometimes we learn that previous discoveries were wrong and that there is new, updated knowledge for us to learn and use. Seventy years ago, most

educated adults did not know about DNA, but this doesn't mean that they weren't science literate; science literacy is maintaining familiarity with the knowledge base of one's era. But this base is always evolving. We must always be prepared to learn about new scientific discoveries. It may be challenging, as Jon Miller, who conducted the science literacy study, points out, but it is possible and necessary. It will involve a critically important skill—life-long learning. You can see it prominently featured in the information literacy pillars *Identify* (being information literate involves developing a learning habit so new information is being actively sought all the time) and *Gather* (the need to keep up to date with new information).

Having a basic understanding of science and the ability to influence our lawmakers in all matters related to science is crucial to participating in our democracy. Ten years ago, legislators and policy makers were addressing stem cell research; today, it is hydraulic fracturing. We don't know what scientific issue will demand our attention ten years from now. But if we hope to be able to make informed decisions, we must cultivate and maintain our science literacy. You can do this by reading popular scientific publications like *Scientific American*, *Discover*, and the *New York Times* science section. Check the web—all of these publications extend their reach online with blogs and discussion boards where everybody is welcome to comment and ask questions. Keeping an eye on the latest scientific news will help you understand the latest trends in science and technology, and how they are likely to impact the future. You can make a difference by being proactive and making your voice heard.

Good luck and happy science literacy trails!

Bibliography

Miller, Jon D. "The Conceptualization and Measurement of Civic Scientific Literacy for the Twenty-First Century." In *Science and Educated American: A Core Component of Liberal Education*, edited by Jerrold Meinwald and John G. Hildebrand, 241-254. Cambridge, MA: American Academy of Arts and Sciences, 2010.

Miller, Jon D. "Scientific Literacy." Paper presented at the Annual Meeting of the American Association for the Advancement of Science, San Francisco, CA, 1989.

Trefil, James. *Why Science?* New York: Teachers College Press, 2008.

Conclusion

Review of the Seven Pillars

At the beginning of this text, you learned about the Seven Pillars of Information Literacy and how each of these pillars represents a set of understandings and abilities that will help you become a better researcher and a more savvy citizen of the information world we live in. We have also covered Visual Literacy and Science Literacy to further enhance your knowledge.

When you first started reading this book, you may have already been skilled in some of these areas while other concepts may have been totally new to you. Developing these skills is not necessarily a linear process that starts in one place and ends in another. The process also won't end after you've finished reading this book. You will continue to grow as a researcher as you take on more challenging research projects. These skills will serve you not only in your academic life, but also in your professional and everyday life.

Here is a quick review of the main points from each of the chapters.

Identify

Identifying your need for information is a crucial first step in your research process. Navigating the current information environment requires critical thinking, and the ability to investigate what is available and whether it is presented in a clear and straightforward manner. Properly identifying your information needs makes the search process more productive and improves the quality of your results. Defining your research question is a key step in the process and may require several topic revisions depending on your investigation. The [Identify](#) chapter contains useful exercises for you to practice.

Scope

Determining the scope of your research entails not only knowing what you need to know about your topic, but also knowing what information is available and which forms of that information will be most relevant to you. Information exists in a variety of formats, in-

cluding books, articles, and government documents, and it can be found using tools that are both basic and specialized.

Plan

Planning your research step by step is vital to a success of your project, whether you're trying to find information for your personal use or working on a class assignment. You can ensure success by closely following several steps. Self-reflection at the beginning stage of the planning process helps you reassess your own attitudes toward the research process and identify the areas unknown to you. The selection of appropriate research tools, whether library catalogs, databases, or authoritative web sources, will help to save time. Another time-saving trick is consulting an expert, such as a librarian. The final step in this process is determining the best search concepts and keywords for your research. Once you determine your search concepts and keywords you will soon begin to see results.

Gather

Gather helps you with the actual process of collecting information after you've mastered your skills within the Identify, Plan, and Scope pillars. The Gather phase concentrates on the importance of understanding that there are different types of information and distinguishing between them. It also emphasizes the importance of critical evaluation. The [Gather](#) chapter includes tips on searching library catalogs and databases as well as advice on understanding the Library of Congress classification system. The chapter also reviews another important skill for a college student: being able to write a proper citation in the publication style required by a professor, whether it is MLA, APA, or another style.

Evaluate

In the process of gathering your sources, it's important to evaluate them on criteria such as how relevant they are to your topic, the quality of the information in the source, the author's credentials for writing on the topic, and other characteristics that may be relevant to your research. Different types of sources play different roles in the research process and may need to be evaluated in different ways. Knowing when to stop searching for and evaluating sources in order to meet deadlines and avoid becoming overwhelmed is also an important part of this pillar.

Manage

Managing information is concerned with being able to organize information both ethically and professionally. Much of the information that is out there is someone's intellectual property, which means when you use the information, you have a responsibility to acknowledge that person's contribution, usually through citation. Citation helps to avoid plagiarism. Plagiarism is the intentional or unintentional use of someone else's ideas without giving proper credit; examples of plagiarism are not limited to the academic world. Style manuals for each of the most common citation styles (APA, MLA, and Chicago) are likely to be available at your library. You can also use a citation generator as a reference or ask for help from a librarian.

Present

Presenting the results of your research is important as it sums up the long journey during your information quest. An early step for presenting the information you have found is to decide who your audience is, whether it's your friends, family members, classmates, instructors, or an even wider audience. Your research can be presented in a wide variety of ways, including written, verbal, or visual formats. Examples include written materials such as research papers or blog posts, verbal modes such as presentations or songs, and visual methods such as photographs or flowcharts. It is important to keep your intended audience in mind.

Visual Literacy

This chapter addresses the application of information literacy to visual materials. It begins with an historical overview and definition of visual literacy and then looks at each of the Seven Pillars in relation to this. Particular attention is given to the difficulty of finding and accessing images, evaluating these images for accuracy and resolution, and the citation of visual materials. The Present pillar is discussed at length, with multiple examples of tools and approaches given for creating and sharing your work. This chapter concludes with a series of relevant quotations and additional resources relating to visual literacy.

Science Literacy

Science literacy is related to one's ability to understand basic concepts and laws of science and to use this knowledge in everyday life. There are several types of science literacy: civic, cultural, practical, consumer, and aesthetic. The chapter presents an overview of each of these types and provides an overview of other science-related concepts and movements that are all related to information. The chapter also addresses creating and disseminating scientific information, the open access movement, citizen science, and lifelong learning as an important component of science information literacy. Keeping up with the latest scientific

discoveries after graduating from college will help you remain scientifically literate. Case studies and exercises emphasize a practical approach to science literacy.

Further Reading

As you continue to develop your research skills and knowledge, you may wish to do further reading on information literacy. These resources may not use the Seven Pillars of Information Literacy as a lens, but they will all help you become a more knowledgeable researcher. The following items can be purchased through online retailers or borrowed from your library.

Badke, William.B. *Research Strategies: Finding Your Way Through the Information Fog*. Bloomington, IN.: IUiverse, Inc., 2011.

Chernow, Barbara.A. *Beyond the Internet: Successful Research Strategies*. Lanham, MD.: Bernan Press, 2007.

Fulton, Crystal. *Information Pathways: A Problem-Solving Approach to Information Literacy*. Lanham, MD.: Scarecrow Press, 2010.

Stebbins, L.F. *Student guide to research in the digital age*. Westport, CT: Libraries Unlimited, 2006.

The Information Literacy User's Guide Chapter 1: Identify

Exercise: Taking Stock of What you Already Know

What do you know?	How do you know it?	How confident are you in this knowledge?

The Information Literacy User's Guide Chapter 1: Identify

KWHL Chart

What do you already know about your topic?	What do you Want to know about your topic?	How will you find information on your topic?	What have you Learned about your topic?

The Information Literacy User's Guide Chapter 3: Plan
Simple Search Terms Worksheet

>TOPIC:		
<input type="text"/>		
>CONCEPTS:		
<input type="text"/>	&	<input type="text"/>
OR		OR
<input type="text"/>		<input type="text"/>
OR		OR
<input type="text"/>		<input type="text"/>
OR		OR
<input type="text"/>		<input type="text"/>
OR		OR
<input type="text"/>		<input type="text"/>
OR		OR

The Information Literacy User's Guide Chapter 3: Plan

Exercise: Reviewing Search Strategies

1. Now that the team has a draft thesis statement, the next step would be to:
 - a. Enter the thesis statement into a database, rather than the catalog
 - b. Select keywords and enter them into Google
 - c. Dissect the thesis statement to determine key terms, related terms, and Boolean operators or other searching techniques
2. If you are interested in the use of social media such as Twitter by college students for research purposes, which of the following is the best general search strategy:
 - a. (social media and Twitter) and research and college students
 - b. Social media and college students and research purposes
 - c. (social media or Twitter or Facebook) and research and college student*
3. The best place to start the search online is:
 - a. An online guide on the library's website
 - b. Google
 - c. The library's catalog
4. When searching a subject-specific database, it is especially important to...
 - a. Use any search refinements they provide that make sense
 - b. Check for the best subject headings to use
 - c. Both a. and b
5. Sarah realized that the order for doing the best research most often includes these steps:
 - a. Select topic, select keywords, do search, read and understand results, create product
 - b. Select topic, select keywords, do search, read and understand results, revise search and return to the process as needed, create product
 - c. Check for online assistance on the library's website, do the search, revise the search as needed, create product

The Information Literacy User's Guide Chapter 3: Plan

Exercise: Reviewing Search Strategies [Answer Key]

1. Now that the team has a draft thesis statement, the next step would be to:
 - a. Enter the thesis statement into a database, rather than the catalog [If the team enters a long string of words, such as a thesis statement or a whole topic or research question, into a database, catalog, or search engine, it will try to find items that contain that exact phrase. This type of search won't be very successful.]
 - b. Select keywords and enter them into Google [Using keywords is a good approach, but Google won't provide results that are academic in nature, so it is not the best place for the team to turn. In addition, some thought needs to go into selecting the keywords.]
 - c. Dissect the thesis statement to determine key terms, related terms, and Boolean operators or other searching techniques. [Yes, you are right—this is what the team should do. They can then develop a good search to start off with.]
2. If you are interested in the use of social media such as Twitter by college students for research purposes, which of the following is the best general search strategy:
 - a. (social media and Twitter) and research and college students [There is a problem with one of the Boolean operators.]
 - b. Social media and college students and research purposes [This doesn't capture the potential search terms. In addition, using "research purposes" might miss a lot of good sources because it might not always be phrased that way.]
 - c. (social media or Twitter or Facebook) and research and college student* [This is the best strategy of those presented here. Facebook, as you know, is a very popular social network tool, and should be included in the list. If you are searching in a web search engine, use the phrase "college student*" (with quote marks). This isn't needed for most databases.]
3. The best place to start the search online is:
 - a. An online guide on the library's website [Yes, if there is one available, this would be a great place to start. The librarian who created the guide will provide tips for how to proceed. This will help you with your planning.]
 - b. Google [Google might provide a few good sources, but it will require a lot of sifting to find them. There are far better places for the team to start.]
 - c. The library's catalog [The catalog might provide some good sources. Keep in mind that because library catalogs contain a limited number of entries, the team might need to consider a broader search than it would use in a database.]

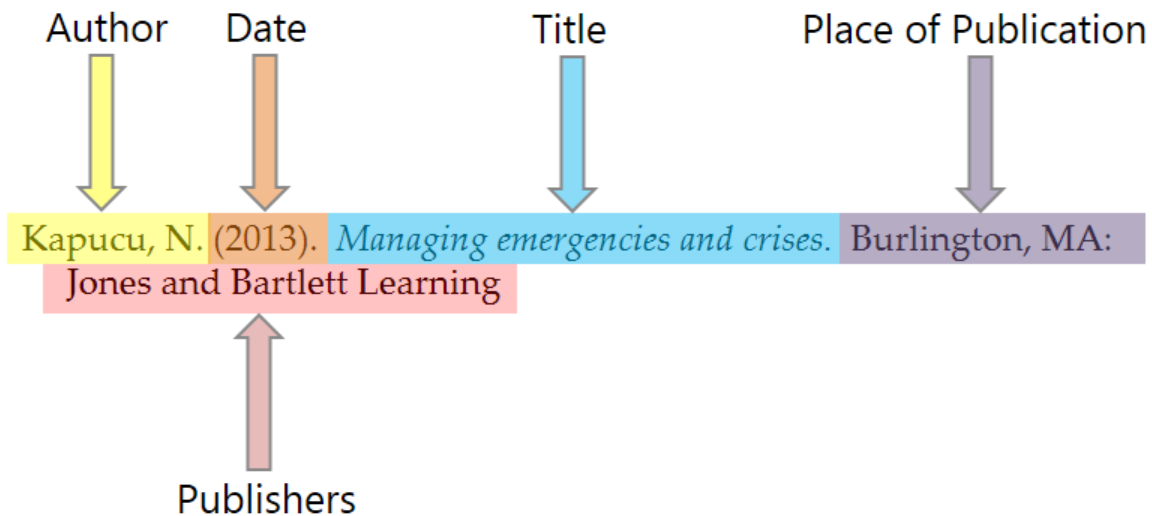
4. When searching a subject-specific database, it is especially important to...
 - a. Use any search refinements they provide that make sense [Yes, this is important, but the team shouldn't stop with this strategy.]
 - b. Check for the best subject headings to use [Yes, this is important, but the team shouldn't stop with this strategy.]
 - c. Both a. and b [The team members will get the best results if they use both of these search strategies.]

5. Sarah realized that the order for doing the best research most often includes these steps
 - a. Select topic, select keywords, do search, read and understand results, create product [The first steps are fine, but most often, it is not a straight shot from topic selection to product creation, as implied by this set of activities. Try again.]
 - b. Select topic, select keywords, do search, read and understand results, revise search and return to the process as needed, create product [This is a great strategy to follow. It is important to realize that topics and search strategies are revised throughout the process and this has an effect on searching for and finding information. The best researchers don't skip this part of the process.]
 - c. Check for online assistance on the library's website, do the search, revise the search as needed, create product [A number of steps are missing in this strategy. Look for a better one.]

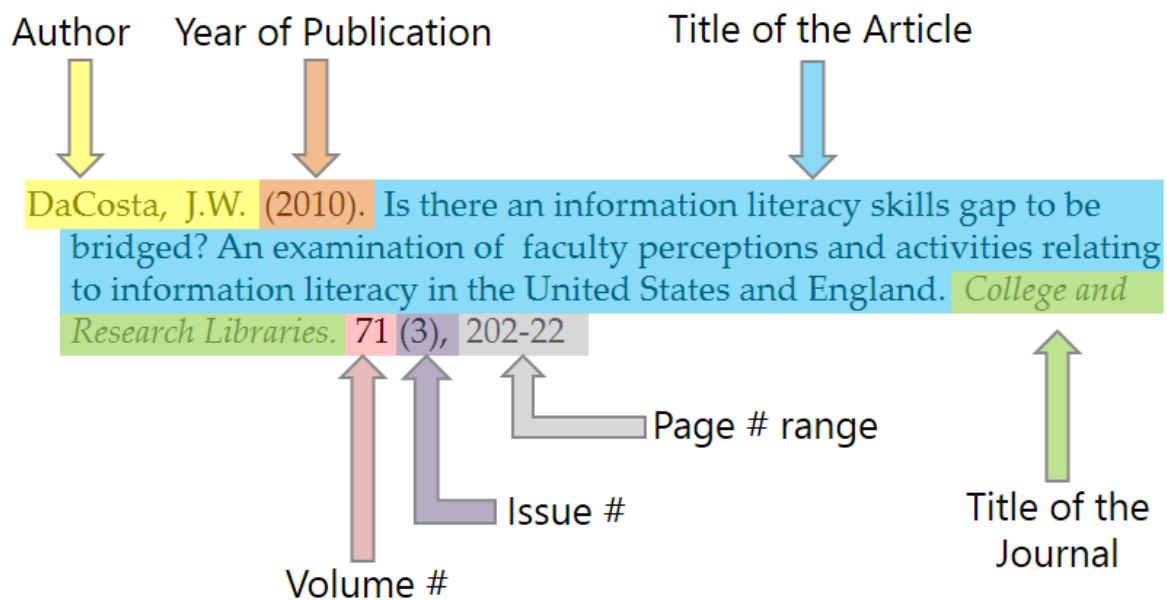
Exploring the Elements of a Citation

[Click here to explore the elements of a citation online!](#)

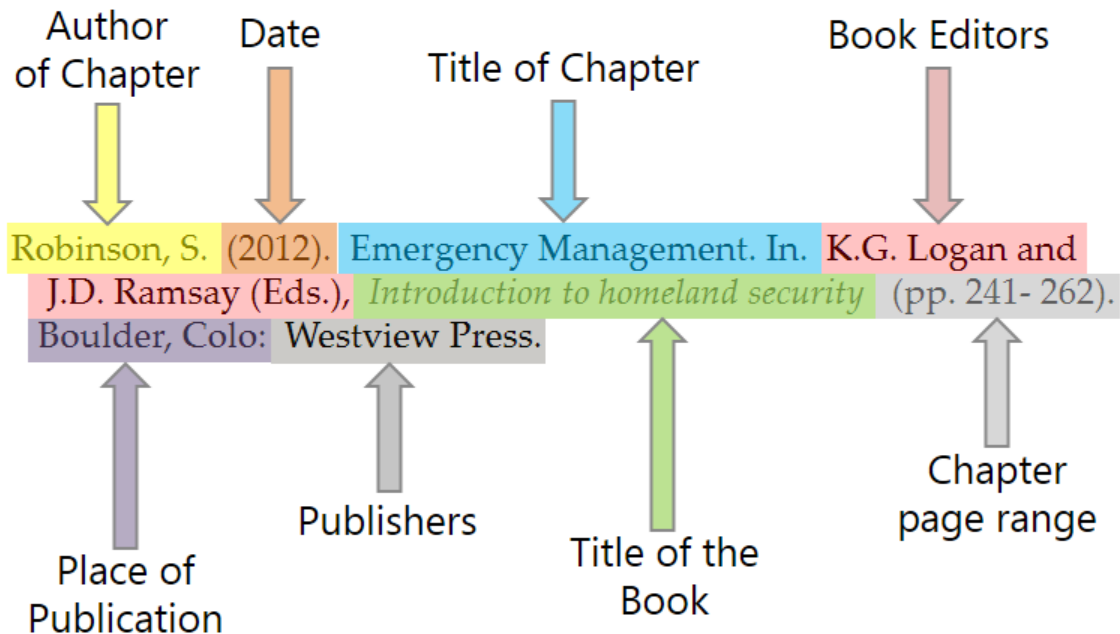
Citation to a Book APA



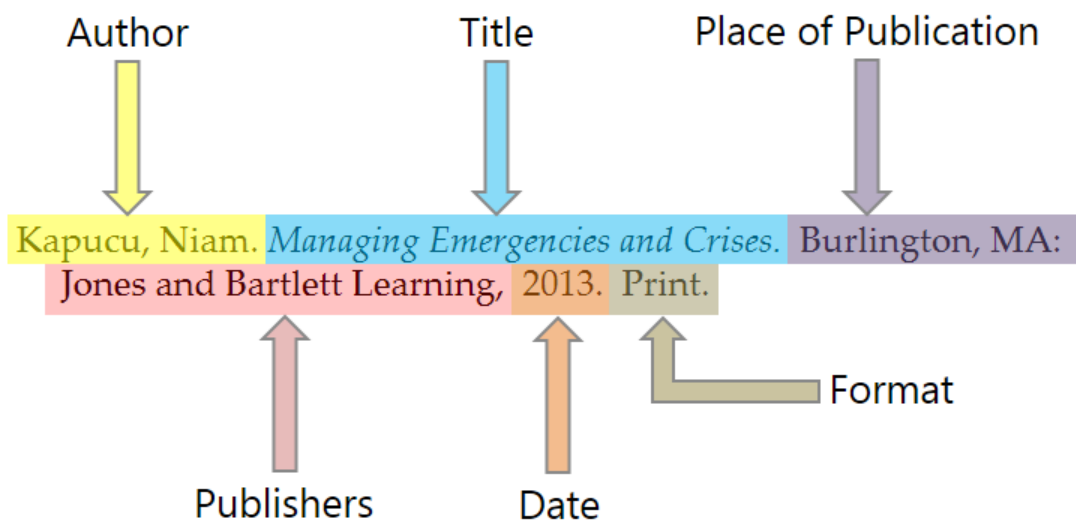
Citation to an Article from a Journal APA



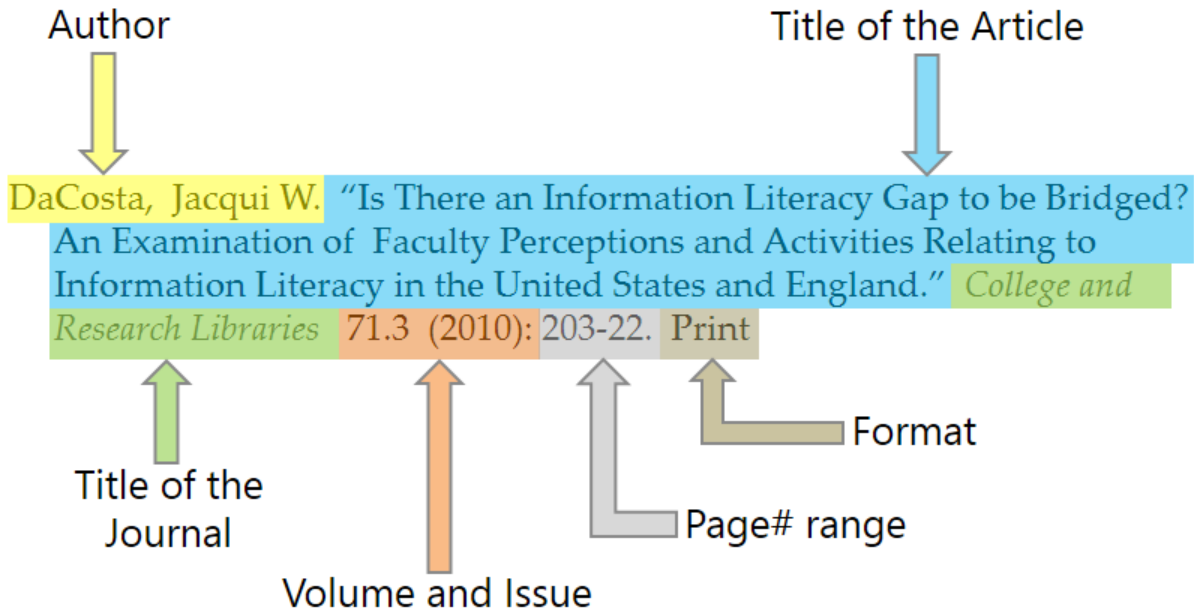
Citation to a Chapter in a Book APA



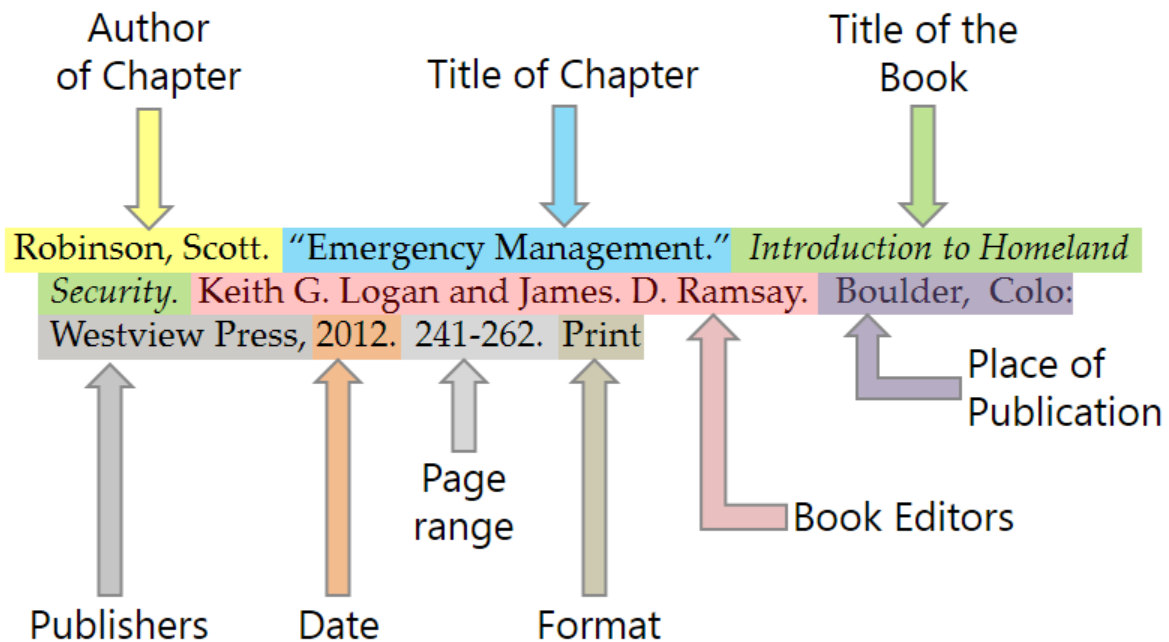
Citation to a Book MLA



Citation to an Article from a Scholarly Journal MLA



Citation to a Chapter in a Book MLA



The Information Literacy User's Guide Chapter 4: Gather

Exercise: Primary Sources

1. Where would you find a speech by Franklin Delano Roosevelt in which he said, "The only thing we have to fear is fear itself."?
 - a. Web site of Presidential Speeches
 - b. Newspaper article dated Oct. 29, 1941
 - c. A print publication titled "Vital Speeches of the Day," which has been published since 1934
 - d. All of the above
2. Which of the following sources is the most likely to contain an interview with Steven Spielberg about his film "Lincoln," produced in 2012?
 - a. Article from a news magazine dated November 23, 2012
 - b. A blog written by a fan of Steven Spielberg
 - c. IMDb –A large online database of movie and television information
 - d. All of the above
3. Which source would have the original copy of a diary written a woman who lived in Tennessee during the Civil War?
 - a. The Library of Congress American Memory Project web site
 - b. The Southern Historical Collection, University of North Carolina at Chapel Hill.
 - c. Local public library's collection
 - d. All of the above
4. Which of the following is a primary source?
 - a. A review of the film "Lincoln" by Steven Spielberg
 - b. A nonfiction book about the Civil War titled *The Fall of the House of Dixie : The Civil War and the Social Revolution that Transformed the South*
 - c. The Facebook privacy policy
 - d. A reporter's article about an event that happened yesterday, written from information gathered from bystanders

The Information Literacy User's Guide Chapter 4: Gather

Exercise: Primary Sources [Answer Key]

1. Where would you find a speech by Franklin Delano Roosevelt in which he said, “The only thing we have to fear is fear itself.”?
 - a. Web site of Presidential Speeches [It is true, it should be here, but where else would it be found?]
 - b. Newspaper article dated Oct. 29, 1941 [It is true, it should be here, but where else would it be found?]
 - c. A print publication titled “Vital Speeches of the Day,” which has been published since 1934 [It is true, it should be here, but where else would it be found?]
 - d. All of the above [Yes, you are right. All three would contain the speech.]

2. Which of the following sources is the most likely to contain an interview with Steven Spielberg about his film “Lincoln,” produced in 2012?
 - a. Article from a news magazine dated November 23, 2012 [Yes, this is quite likely]
 - b. A blog written by a fan of Steven Spielberg [This might be possible, but there is a more likely source]
 - c. IMDb –A large online database of movie and television information [Databases may contain full-text information sources, but usually lead you to other resources. See if you can select a better choice.]
 - d. All of the above [No, two of these answers are not likely. See if you can select a better choice.]

3. Which source would have the original copy of a diary written a woman who lived in Tennessee during the Civil War?
 - a. The Library of Congress American Memory Project web site [It is possible that they would have mounted a digital version on their site, but it would be a replica of the original.]
 - b. The Southern Historical Collection, University of North Carolina at Chapel Hill. [Yes, you are right!]
 - c. Local public library’s collection [This is unlikely. They might have a later reprinting, if the diary was published, but not the original.]
 - d. All of the above [You will want to pick the best answer of the other three choices]

4. Which of the following is a primary source?
- a. A review of the film “Lincoln” by Steven Spielberg [Because a review is a commentary on a primary source, the review isn’t primary (but the film itself would be!) Try again to determine which is primary.]
 - b. A nonfiction book about the Civil War titled *The Fall of the House of Dixie : The Civil War and the Social Revolution that Transformed the South* [The author would have used primary sources when writing this book, but the book itself is secondary. Try again to determine which is primary.]
 - c. The Facebook privacy policy [Yes, you are right. Facebook wrote their own privacy policy (it is worth taking a look at), so it would be primary]
 - d. A reporter’s article about an event that happened yesterday, written from information gathered from bystanders [The reporter’s article itself is secondary. He used primary sources (the bystanders) as background material for the article. Try again to determine which is primary.]

The Information Literacy User's Guide Chapter 4: Gather

Exercise: Identifying Citations

1. Joshi, M. (2013). Inclusive institutions and stability of transition toward democracy in post-civil war states. *Democratization*. 20(4), 743-770.
 - a. Journal Article
 - b. Book
 - c. Book Chapter
2. Janney, Caroline E. *Remembering the Civil War: Reunion and the Limits of Reconciliation*. Chapel Hill, North Carolina: 2013. Print
 - a. Journal Article
 - b. Book
 - c. Book Chapter
3. Blattman, Christopher and Edward Miguel. "Civil War." *Journal of Economic Literature* 48.1 (2010): 3-57. Print
 - a. Journal Article
 - b. Book
 - c. Book Chapter
4. Barney, William L. "Rush to Disaster: Secession and the Slaves' Revenge." *Secession Winter: When the Union Fell Apart*. Robert J. Cook, William L. Barney and Elizabeth R. Varon. Baltimore: Johns Hopkins University Press, 2013. 77-96. Print
 - a. Journal Article
 - b. Book
 - c. Book Chapter
5. Cooper, W. J. (2012) *We have the war upon us: The onset of the Civil War, November 1860-April 1861*. New York: Alfred A. Knopf.
 - a. Journal Article
 - b. Book

- c. Book Chapter
6. Cockrell, T. (2013). Patriots or Traitors: Unionists in Civil War Mississippi. In M.B. Ballard (Ed.), *Of times and race: Essays inspired by John F. Marzalek* (pp 23-35). Jackson, Mississippi: University Press of Mississippi.
- a. Journal Article
 - b. Book
 - c. Book Chapter

The Information Literacy User's Guide Chapter 4: Gather

Exercise: Identifying Citations [Answer Key]

1. Joshi, M. (2013). Inclusive institutions and stability of transition toward democracy in post-civil war states. *Democratization*. 20(4), 743-770.
 - a. Journal Article [Correct!]
 - b. Book [You will notice there is a volume number and page numbers. Therefore, it isn't a book.]
 - c. Book Chapter [Did you see the name of a publisher? Books always have that as a part of the citation.]
2. Janney, Caroline E. *Remembering the Civil War: Reunion and the Limits of Reconciliation*. Chapel Hill, North Carolina: 2013. Print
 - a. Journal Article [Did you see a volume number? Or page numbers? Try again.]
 - b. Book [Exactly right.]
 - c. Book Chapter [If it were a book chapter, there would be a chapter title, and page numbers. Knowing this, what would you select now?]
3. Blattman, Christopher and Edward Miguel. "Civil War." *Journal of Economic Literature* 48.1 (2010): 3-57. Print
 - a. Journal Article [Correct!]
 - b. Book [You will notice there is a volume number and page numbers. Therefore, it isn't a book.]
 - c. Book Chapter [Did you see the name of a publisher? Books always have that as a part of the citation.]
4. Barney, William L. "Rush to Disaster: Secession and the Slaves' Revenge." *Secession Winter: When the Union Fell Apart*. Robert J. Cook, William L. Barney and Elizabeth R. Varon. Baltimore: Johns Hopkins University Press, 2013. 77-96. Print
 - a. Journal Article [While there are page numbers, there is also a publisher, which is not an element of journal article citations. Choose again.]
 - b. Book [*Secession Winter* is a book, but what is being cited here is "Rush to Disaster." Select again.]
 - c. Book Chapter [You are right.]

5. Cooper, W. J. (2012) *We have the war upon us: The onset of the Civil War, November 1860–April 1861*. New York: Alfred A. Knopf.
 - a. Journal Article [Did you see a volume number? Or page numbers? Try again.]
 - b. Book [Exactly right.]
 - c. Book Chapter [If it were a book chapter, there would be a chapter title, and page numbers. Knowing this, what would you select now?]

6. Cockrell, T. (2013). Patriots or Traitors: Unionists in Civil War Mississippi. In M.B. Ballard (Ed.), *Of times and race: Essays inspired by John F. Marzalek* (pp 23-35). Jackson, Mississippi: University Press of Mississippi.
 - a. Journal Article [While there are page numbers as many articles have, there is also a publisher, which is not an element of journal article citations. Choose again.]
 - b. Book [*Of Times and Race* is a book, but what is being cited here is “Patriots or Traitors.” Select again.]
 - c. Book Chapter [You are right.]

The Information Literacy User's Guide Chapter 7: Present

Exercise: Plan for Your Audience

Audience	What might they know?	What presentation methods might appeal most?