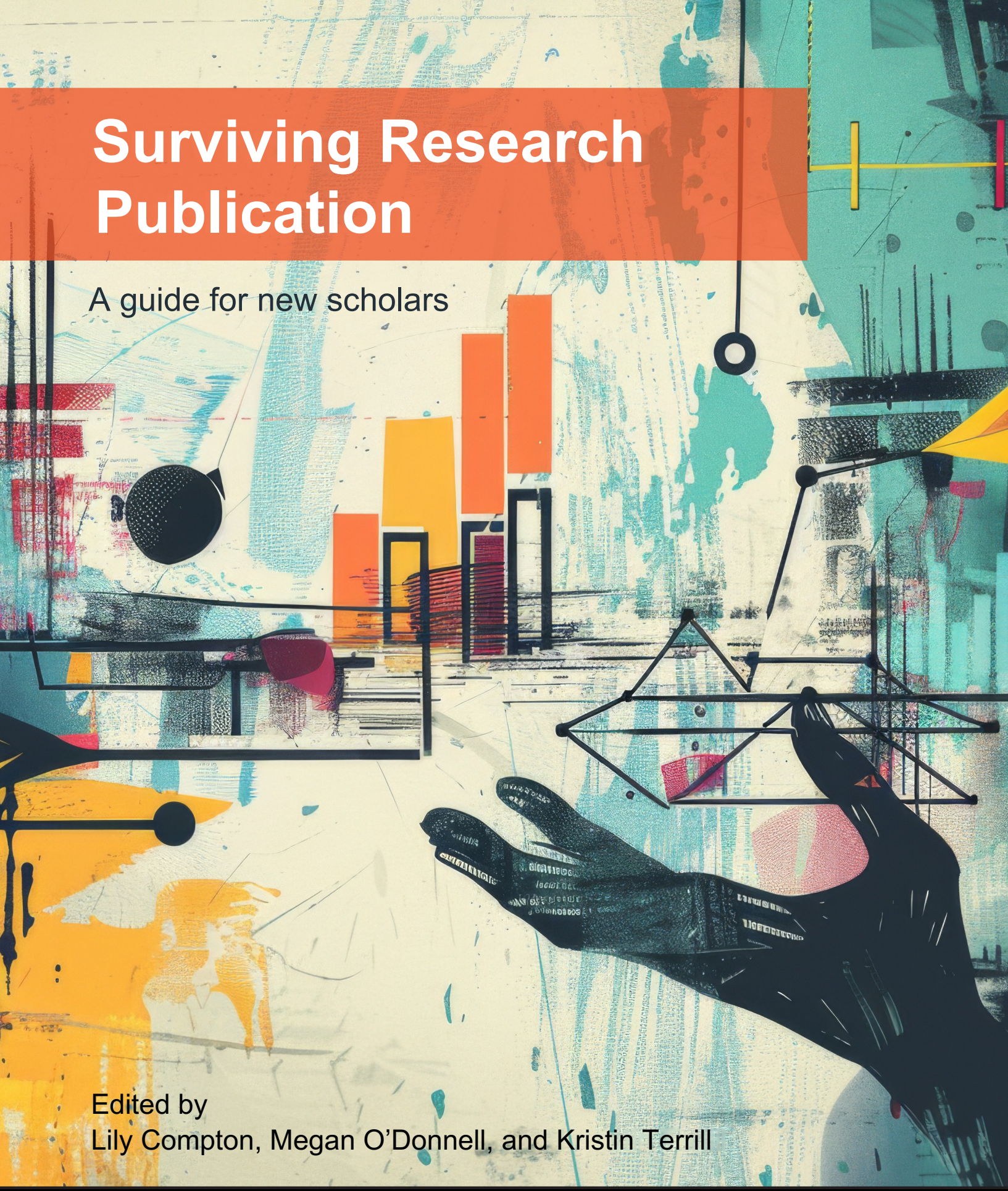
Surviving Research Publication

A guide for new scholars



Edited by
Lily Compton, Megan O'Donnell, and Kristin Terrill

Iowa State University
Digital Press

Surviving Research Publication

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Foreword

You've finally made it. Often years of hardwork, dedication, late nights, missed social events, frustrations, doubts, and pure grit have gotten you to this point of publishing your own exciting research findings. Congratulations!

Publications are the 'coin of the realm' when it comes to the academic world. They are used to evaluate the quality, quantity, and impact of the work that you have spent much of your time as a graduate student accomplishing. Publications are used as a record of your accomplishments for promotions, job searches, and funding. They are a reflection of you as a researcher, your institution, and academe as a whole. Ensuring that your work has been carried out in an ethical manner, proper citations have been given, that your findings are a true reflection of the work of the results gleaned from the work you have carried out, and you have presented that work in an appropriate manner all feed into that reflection. Not only are your publications important for those things, but the world looks to academic research to help solve vexing problems that exist in the world around us and the human condition. The public trust in research is quickly eroded when shortcuts are taken, findings are misrepresented, or improper credit is given. Failure on our part to self-regulate and put our best foot forward sows seeds of mistrust, low confidence in citing our work, and potentially complete disregard for the work that we do. Trust is erased in an instant. Regaining trust takes many years of time and energy and the need for doubling down on proving that the work is sound and the reporting of our research results has been carried out appropriately.

This guide can help you miss common pitfalls, shed light on things you may have never thought of, and give you a measure of confidence that the work you are putting out there is meeting the expectations of publishers, funders, and most importantly, the public. Put its contents to use. The hard work that you have put in to make it to this point deserves it.

Best wishes in your research endeavors.

Jerry Zamzow
Associate Vice President for Research
Iowa State University

Introduction

This book was written to help current and future graduate students successfully produce a dissertation or thesis. We start with literature reviews and end on how to format papers strategically (aka, how to format as you write rather than at the end). In between we cover citations, literature searches, social media, research metrics, research integrity, authorship, copyright, plagiarism, and how to format everything from simple text to complex tables.

The book editors have been working with graduate students collectively for more than thirty-five years. We are all staff members of Iowa State University, two in the Graduate College and one at the University Library. All three of us have observed graduate students struggling to navigate the complex bureaucracy that is the modern university. While struggling is a core part of the graduate student experience we believe that knowing what bureaucratic processes to follow and who can help you throughout your journey should not be. This is the driving concept behind this book which is a guide for things every graduate student must navigate—often on their own—but is part of no degree program. In short, it's a guide to *surviving research publication*.

The book focuses on three areas we know students struggle with. Part 1: Basics introduces students to core concepts needed to succeed: literature reviews and searches, citations, research impact, and the publishing process. Part 2: Ethics ventures into the how we conduct research and what behaviors to avoid while conducting research. Part 3: Technology focuses on how to use technology to write, with a focus on formatting for accessibility not just readability. Throughout the book we focus on not just *what* but *why* so the reader will be both informed and educated on these topics.

A Note About Generative AI (GenAI)

We started this project in 2022, the same year Chat GPT was released to the public. Generative AI (GenAI) chat tools brought new questions to core concepts (such as authorship, copyright, plagiarism, and research integrity) and we found ourselves asking, researching, and interrogating not just new, possibly questionable practices, but existing practices in a new light. In the end we decided that while a versatile and powerful tool, GenAI chat tools are *just tools*. And what matters most with a tool is how it's used—thoughtfully, ethically, and with integrity—which is why you'll find call out boxes addressing how GenAI is challenging or changing research in the lab and on the laptop throughout the book.

This information is likely to become outdated quickly, so always check current policies and procedures before committing to using (or ruling out) these tools.

PART I

Basics

1. Literature Reviews

Megan O'Donnell

This chapter covers the skills and methodologies needed to successfully research and write a professional level literature review that can be used in an academic research **publication** such as a book chapter, paper, thesis, or dissertation. It also introduces resources to get you started.

Glossary

Artificial intelligence (AI): Artificial intelligence is a general term for machines and programs that can "reason, learn, and act in such a way that would normally require human intelligence or that involves data whose scale exceeds what humans can analyze."[1]

Data management: Steps and procedures used to organize, document, account for, and secure your digital data. Citations are a form of data that needs to be managed well for a successful literature review.

Editorial style guide: Guidelines and rules for the writing and formatting of documents to maintain uniformity across materials.

Generative Artificial Intelligence (Gen AI): A type of artificial intelligence that uses large training datasets to create, generate, new content based on its training data.

Gray literature: Literature created and distributed outside of a publishing industry. Gray literature includes government documents, reports, blogs, theses, dissertations, pamphlets, newsletters and much more. Both print and digital materials can be gray literature.

Literature: A subset of written material addressing a particular topic. Often used informally to refer to all scholarly work on a particular subject i.e., "I'll check the literature."

Scholarly publications (scholarly literature): Literature written for a specialty audience that presents research results such as journal articles, conference proceedings, books, and book chapters

Overview

Questions

- What is the purpose of a literature review?
- How do I conduct a literature review?
- What kind of review should I conduct?

Objectives

- Describe how literature reviews can situate papers and work as a stand-alone research methodology
- Summarize the four stages of a literature review.
- Identify the best type of literature review for your research objectives.

What Is a Literature Review?

A **literature** review is both a research process, where you research and analyze relevant literature, and an original work of scholarship that summarizes and synthesizes what you have learned. Literature reviews introduce and situate your research in the context of existing knowledge. They are an essential part of the research process and introduce you to vital skills you will use throughout your career.

Undergraduate research is often limited to short, narrative literature reviews, since topic mastery is not needed to write a term paper. As a graduate student your reviews will be in-depth and comprehensive. You will need to search for, acquire, and read literature both old and new to get a full understanding of your topic and to put your research in context: to explain why it matters. You may collect and analyze data as part of the process or follow a more organic and less structured methodology. Regardless of the type of review you choose to perform, literature reviews have four stages:

1. **Searches** to locate relevant literature.
2. **Analysis** using methods that match your goal.
3. **Synthesis** of prior literature to create new knowledge.
4. **Reporting** of your work, typically through a written summary.

---

1. Stryker, Cole, and Eda Kavlakoglu. 2024. "What Is Artificial Intelligence (AI)?" Google Cloud. August 16, 2024. https://cloud.google.com/learn/what-is-artificial-intelligence, archived at https://perma.cc/35K7-TQTL.

Beyond gaining and reporting your deep understanding of a topic, literature reviews can also accomplish specific research goals through different methodologies. The next section will introduce you to the most common types of reviews and how they can be used effectively.

Literature Review Types and Methodologies

There are many ways to conduct a literature review, from unstructured and iterative to reproducible statistical synthesis. Example questions a literature review can answer include:

- What is known, and unknown about a topic?
- Why is my research important and how can it inform future research?
- What is being studied, what methodologies are being used, and are they effective?
- What commonalities, trends, or differences are there?

The methodology you choose for your literature review should match your field, research question, and publishing goals. Some literature reviews, such as review articles and systematic reviews, can stand on their own as independent publications while others are better suited to introducing and situating a larger body of scholarship, such as an article or dissertation. If you plan to conduct a publishable review then it is best to treat it as a research project; be thoughtful in its design, scope, documentation, **data management**, and reporting.

While some review types use a strict methodology others may have no defined methodology. Six common kinds of literature reviews are characterized in this chapter to give you a general understanding of the options and variety available. As you review them keep in mind that there is no definitive and agreed upon list of review types and mixed methods reviews are common.

Narrative (Traditional, Exploratory)

This is the most common form of literature review. A narrative review identifies and explains what is known about a topic by summarizing what has already been written. It is often published as part of a larger body of work, such as a background or introduction section of a paper or book chapter. Included literature is selective which can make objectivity questionable.

Best for: synthesizing existing knowledge and identifying gaps in research before presenting your own.

- **Searches**: comprehensiveness varies.
- **Analysis**: intuitive and integrative.
- **Synthesis**: narrative and descriptive (i.e., story driven); results are usually presented chronologically

or by theme.

- **Reporting**: Typically, part of a larger body of work such as a research article or report. Methodology is not typically reported.

Systematic (Cochrane)

A systematic review aggregates and analyzes existing scientific evidence to answer a new, narrowly defined research question. Systematic reviews are good for objectively summarizing and examining information from multiple studies, identifying gaps in current research, and for identifying beneficial or harmful interventions, actions, or treatments. Systematic reviews can only be performed when an aggregation of studies and outcomes can answer a research question rather than collecting new data. Systematic reviews were developed for medical research, but the methodology is not discipline-specific. This kind of review is best attempted by a team rather than an individual, both to control for bias and to share the workload. Graduate students should not attempt a systematic review on their own as it is a very intensive endeavor.

Systematic reviews and meta-analyses

Systematic review has become a synonymous term for the three kinds of Cochrane systematic reviews: *interventions*, *diagnostic test accuracy*, and *qualitative evidence synthesis*. However, Cochrane reviews are not the only kind of literature review to use systematic and reproducible methodologies. Terminology for these other types of systematic literature reviews is far from standardized, but the term "systematized review" is sometimes used.

A **meta-analysis** is often the next step after a systematic review. It analyzes and synthesizes quantitative data obtained from reviewed studies using statistical methods to account and correct for bias. Because the methodology is quite rigorous it is not uncommon to have a statistician on your review team when attempting a systematic review and meta-analysis. If performing a systematic review on qualitative data, then a meta-analysis may not be needed or even possible, but your methodology should still be transparent and well-documented.[2]

Best for: Narrow research questions that can be fitted to the PICO (Population/Problem, Intervention, Comparison, and Outcome) framework and can be answered by analyzing existing scientific studies.

2. Campbell M., McKenzie J. E., Sowden A., Katikireddi S. V., Brennan S. E., Ellis S. et al. (2020) Synthesis without meta-analysis (SWiM) in Systematic Reviews: Reporting Guideline. *BMJ,* 368:l6890. https://doi.org/10.1136/bmj.l6890

- **Searches:** Rigorous, comprehensive, structured, and reproducible. Working with a librarian to develop search terms, strings, and manage citations is highly encouraged if not required. May or may not include **gray literature**.
- **Analysis:** Comprehensive and analytical. Unlike most other types of reviews, systematic reviews are concerned with the outcomes of *studies* not individual publications. So, outcomes and data from the same study must be identified and linked for analysis regardless of the publication.
- **Synthesis:** See sidebar: Systematic reviews and meta-analyses.
- **Reporting**: Published as a stand-alone piece of research and scholarship. A systematic review includes a comprehensive reporting of methodology and reporting guidelines, such as PRISMA, may need to be followed.

Scoping (Mapping)

This category of review is focused on identifying how much is known, and has been written, on a topic and what gaps in knowledge exist. Many literature reviews start as unstructured scoping reviews before adopting a more rigorous methodology.

Best for: identifying areas for further research. Can precede a more in-depth literature review or study.

- **Searches**: Comprehensive and exhaustive within the constraints of the time and money one can dedicate to it. Source variety is important and should include ongoing and in-progress research as documented in **gray literature**.
- **Analysis**: Categorical examination of the known research (i.e., methodologies, depth, breadth, etc.); rigor varies depending on the field.
- **Synthesis**: May be presented as tables or graphs.
- **Reporting**: Varies. Can remain unpublished and used to inform a more rigorous review.

Descriptive (State of the Art)

Descriptive reviews aim to identify patterns and trends in a field by analyzing what has been written, who wrote it, methods used, and more. If used to examine current and developing research, then the "state of the art" name may apply.

Best for: Broad questions that analyze a field of study.

- **Searches**: Structured and the methodology is shared with readers, especially if a representative sample is used. Gray literature should also be searched and included in the analysis.
- **Analysis**: Categorical examination of characteristics such as authors, publication year, topic or sub-

ject, methods, etc. that form a dataset for analysis.

- **Synthesis**: focused on trends and patterns in how a field operates, such as how often research is conducted, on which topics, by whom, and using which methods and instruments. A descriptive review can also be used to analyze publication trends and research fields active on a particular topic.
- **Reporting**: Typically published as a stand-alone piece of scholarship. May be accompanied by tables and charts that explain and summarize data collection and analysis.

Theoretical

Theoretical reviews examine existing theories, concepts, and frameworks with the aim of identifying knowledge gaps, new concepts, or relationships.

Best for: Combining multiple conceptual frameworks or when a body of research exists but lacks a unifying theory or framework.

- **Searches:** Comprehensive. A structured (even "systematic") approach is typical but more holistic approaches that integrate new sources/ideas as they are discovered is also possible.
- **Analysis:** Varies. You may start with a general question that gains clarity as more sources are analyzed and incorporated. A categorical examination by theme or characteristic could produce a dataset.
- **Synthesis:** Varies. Interpretive or content analysis are the most common. May be fully narrative and conceptual or more data driven and evidence based.
- **Reporting:** Varies. Some formal formats exist but are not widely used. May be published as a stand-alone piece of scholarship or as part of a larger body of work.

Critical (Integrative, Argumentative)

Critical reviews aim to synthesize and critique a body of research on a topic to refute or counter a dominant belief, or make room for new theories and perspectives. This form is susceptible to bias but is an important form of critique.

Best for: countering dominant beliefs or developing or claiming new theories.

- **Searches:** Focuses on significant/influential publications that have impacted a field.
- **Analysis:** Through and critical. Author must demonstrate mastery of their topic and literature to make a persuasive argument.
- **Synthesis:** Narrative (i.e., story driven) and argument/interpretive based. Results are often pre-

sented chronologically or by theme.

- **Reporting:** Varies . Can be published as a stand-alone piece of scholarship or as part of a larger body of work.

Literature Review Assistance

Before you decide on a literature review methodology you will need to locate the sources that will underpin your review. Searching for literature is covered in detail in Chapter 3, but there is a step you may want to take before that: Talk to a librarian.

Academic librarians specialize in knowing how **scholarly** information systems work and how to use them effectively and efficiently. Librarians are valued and essential members of systematic review teams because of their expertise in this area. Most universities employee multiple librarians with different subject specialties. Meeting with the librarian who covers your field is worthwhile as they can quickly connect you with key resources.

Your school's library website should have a section called "find your librarian," "ask a librarian," or simply "research assistance." From there you will typically be directed to fill out a form, send an email, or to contact the librarian whose expertise matches your topic. If you are not sure who to contact, go with your best guess. Librarians work collaboratively and should transfer you to a colleague if they are unable to help.

If you have never worked with a librarian before, you can review Iowa State University's Library Lifehacks guide which outlines the kind of services librarians offer, how to prepare for a meeting, and other services a librarian can assist with.

AI update: use in literature reviews

AI tools that specialize in literature discovery and analysis have gained popularity since the release of Chat GPT 3.5 in late 2022. Currently, these tools are not considered compatible with systematic or systematized review literature searches as their performance is not transparent or reproducible. They may however be useful for some mixed methods, exploratory, and general searches and do offer new ways to visualize, explore, and discover literature. More information on using **Generative AI (GenAI)** tools for literature reviews are detailed in Chapter 3.

Before using any of these tools, it is best to consider what they bring, both good and bad, to your research. Cheng, Calhoun, and Reedy provide four questions to ask to help researchers guide their use of AI tools in academic writing, including the literature review process:

1. Have I used generative AI in a fashion to ensure that the primary ideas, insights, interpretations, and critical analyses are my own?
2. Have I used generative AI in a fashion to ensure that humans will maintain competency in core research and writing skills?
3. Have I double checked to ensure that all the content (and references) in my manuscript is accurate, reliable, and free of bias?
4. Have I disclosed exactly how generative AI tools were used in writing the manuscript, and which parts of the manuscript involved the use of generative AI?[3]

Other uses of AI tools during systematic and systematized reviews should be similarly evaluated to ensure they are not introducing bias or uncertainty into your research. You should also consult your major professor and journal policies regarding the use of AI if you plan to publish your review.

Conclusion

Literature reviews can be used to answer a variety of questions and range from narrative arguments to deep systematic and statistical inquiries. Before you decide on the type of literature review you want to perform you should first acquaint yourself with the existing literature. This is best done with a librarian's assistance and through exploratory searches and reading (see Chapter 3). But first, you will need to be able to recognize and locate sources through citations, which is covered in Chapter 2.

3. Cheng, A., Calhoun, A. & Reedy, G. Artificial intelligence-assisted academic writing: recommendations for ethical use. *Adv Simul* **10**, 22 (2025). https://doi.org/10.1186/s41077-025-00350-6.

Key Points

- Literature reviews consist of searching, analyzing, and reporting on a body of literature that relates to your topic.
- Literature reviews can be published on their own or as part of a larger body of work and should establish how your research relates to, and builds upon, existing knowledge.
- You should choose a literature review methodology that matches your field, research question, and publication goals.

Resources

Literature Review Resources

- Berdanier, C. G. P. & Lenart, J. B. *So, You Have To Write A Literature Review: A Guided Workbook for Engineers*. First edition. John Wiley & Sons Inc., 2020.
  - ISU Ebook link.
- Booth, Andrew, Anthea Sutton, Mark Clowes, Marrissa Martyn-St. James, and Andrew Booth. *Systematic Approaches to a Successful Literature Review*. Third edition. SAGE, 2022.
  - ISU book link.
- Galvan, Jose L., and Melisa C. Galvan. *Writing Literature Reviews: A Guide for Students of the Social and Behavioral Sciences*. Seventh edition. Routledge, 2017.
  - ISU Ebook link.
- Harris, David J. *Literature Review and Research Design: A Guide to Effective Research Practice*. Routledge, 2019.
  - ISU EBook link.
- *How to Conduct a Literature Review: A Guide for Graduate Students: Let's Get Started!* Iowa State University Library Research & Course Guides, 2025, https://instr.iastate.libguides.com/gradlitrev
- Machi, L. A. & McEvoy, B. T. *The Literature Review: Six Steps to Success*. Third edition. Corwin, 2016.
  - ISU Book link.

Systematic Review Resources

- Booth, Andrew et al. *Systematic Approaches to a Successful Literature Review*. Third edition. SAGE, 2022.
- Purssell, Edward., and Niall. McCrae. *How to Perform a Systematic Literature Review: A Guide for*

Healthcare Researchers, *Practitioners and Students*. 1st ed. Springer International Publishing, 2020. ISU Ebook link

- University of Illinois-Chicago Library of the Health Sciences. “Systematic Reviews Spring 2024 Webinar Series”. https://www.youtube.com/playlist?list=PLIWfbRDKfTxap6xUBBMH0-nqQFtF9H9wv

2. Citations

Megan O'Donnell

In this chapter you will learn more about how citations are used by scholars and research professionals, how to read them, how to use them in research, and how to manage them quickly and efficiently.

Glossary

Citation manager (reference manager, bibliographic management software): Software and services that manage information source **metadata** and integrate with writing applications to make citations easy to add, format, and update.

Editorial style guide: Guidelines and rules for the writing and formatting of documents to maintain uniformity across materials.

Metadata: Often called "data about data," metadata is data that describes something such as person, place, thing, or event. In the context of citations, the author(s), article title, journal title, date published, keywords, page numbers, and abstract are all metadata that describe a journal article.

Serials: Information sources that are released in parts and usually in sequence. Newspapers, magazines, journals, podcasts, and TV shows are all considered serials.

References (Reference Section, Bibliography, Works Cited): A section within scholarly works that provides a list of sources the author(s) used.

Overview

Questions

- Why do academics care so much about citations?
- What are citations used for?
- How do I read and locate a source from a citation?

Objectives

- Purposely use and understand citations in your own research
- Identify a **citation manager** that fits your needs

What Is a Citation?

A citation is a link that connects two different sources of information. In the same way that a hyperlink sends you to a specific web page, a citation directs you to a specific source of information. Unlike a hyperlink, a citation is usually meant to be human-readable (i.e., your computer does not bring you to the source, instead you use the **metadata**, the information included in the citation to locate the source yourself).

How Are Citations Used?

Citations indicate where and from whom a fact, idea, or quote came from. They bestow *attribution* and acknowledge the information's origin. While citations to books, papers, and articles are common, you can also cite:

- Software and datasets
- Television shows and films
- Presentations, personal communication, and interviews
- Pieces of art, images, and audio recordings
- Other forms of media including websites, videos, reports, etc.

Writers use citations to build and support, or to refute, facts and arguments. Citations form evidence trails that map the sources a writer has used to build their knowledge, argument, or experiment. This lets readers follow arguments, understand experimental designs, and fact-check what is being claimed.

Citation counts as quality measures

Citation counts (how many times something has been cited) can be used to understand the influence and impact of information and knowledge across time and communities. In general, more citations indicate that more people have read and used a source than sources with fewer citations.

Sources that cover controversial, popular, or broadly important topics naturally accrue more citations than sources on very narrow and specific topics that only a few specialists will make use of. For this reason, citation counts are not a good indicator of *quality* but can be used to help understand the *reach* or *importance*.

For example, a review article published in 1995 has ninety-five citations (not bad!) while a paper establishing a new research methodology that has since been widely adapted, has over six-thousand citations (!!). Both are solid pieces of research, but their purpose and impact are quite different.

Another thing to remember is that citation counts are *neutral*, they don't consider how a source is cited, just that has been. A citation only indicates the source of information and does not necessarily indicate agreement or disagreement with the source material. This is one way citation counts can be misleading; controversial and retracted research can accrue citations just as easily as groundbreaking and well executed research.

Scholarly impact metrics, such as citation counts, are discussed in detail in Chapter 5.

Why Is Citation Important?

There are two very important arguments for citing information. The first is an ethical argument: citing is a way of giving credit to others for their work and ideas. The second is that it shows your work and allows others to understand, check, and follow the evidence you have reviewed and incorporated into your research. Citations also provide readers and researchers with a way to track the flow of ideas and information across time, space, institutions, and fields of study.[1]

When Do I Need to Cite a Source?

If the words or ideas are not yours, or you have previously published it, then it needs to be cited. This applies to both direct quotes (" ") and paraphrased (i.e., summarized) information. If you reuse a fact, statistic, data, equation, formula, image, picture, video, etc. then it too needs to be cited. Failure to properly cite is plagiarism (see Chapter 10).

The one exception is that information that is considered general or common knowledge does not require

1. The overlapping fields of bibliometrics and scientometrics analyze citations to obtain new knowledge such as which articles have had the most influence and how active or productive a field of research is.

citation. For example, the knowledge that the television show "The Sopranos" aired from 1999-2007 does not need to be cited, but an interview with a cast member, or a quote from a particular episode of the show, would need to be cited.

How Do Plagiarism and Citation Relate?

Plagiarism is the opposite of citing. Where citation gives credit, plagiarism denies it. Plagiarism is unethical and sloppy, and is considered a serious ethical and professional violation, especially when done consistently and with intent.[2] The site Retraction Watch regularly publishes stories about research paper retractions and misconduct cases tied to plagiarism. If you are uncertain if a citation is necessary, add a citation. Reviewers and editors should alert you if a citation is unnecessary. For details on how copyright relates to plagiarism and citations, see Chapter 7.

Reading and Formatting Citations

Citations are formulaic shorthand instructions for locating information. Despite an abundance of formatting styles, they nearly always contain the same components. This means that if you learn to identify the components you can read any citation in any style.

Citation Anatomy

While formatting between styles varies, there are four core components that are included in nearly every citation:

- **Author(s):** the name(s) of the people, organizations, and institutions who made the work.
- **Title(s)**: the specific title of the work being cited and, if part of a larger collection, the title of the collection. For example, citations for book chapters also include the title of the book and a journal article citation includes the title of the journal not just the article.
- **Date published**: when the work was made or published.
- **Publisher**: the people, company, or organization that made the work available. Publisher is usually omitted in journal article citations.

Some information sources and citation styles may also include the following:

2. The Iowa State University policy on research misconduct aligns with the federal definition and can be found at: https://www.policy.iastate.edu/policy/research/misconduct

- **Type:** typically used for things other than books and articles. Examples include presentation, webinar, podcast, video, dataset, white paper, photograph, feature film, etc.
- **Date accessed:** the date you found/used the resource. This is especially important for content that updates or changes frequently, such as online content like social media posts which can be edited, removed, and deleted.
- **Identifiers:** unique codes associated with a resource that can be used to locate it. Examples include hyperlinks, page numbers, digital object identifiers (DOIs), and database accession numbers.

Below are examples of citations for a book, a book chapter, a journal article, and a website. Each includes a key (in bold) showing how the core components are used to put together a complete citation.

Book

- **Author name. *Title*. Place of publication: Publisher, Year.**
- Sedaris, David. *Let's Explore Diabetes with Owls*. New York: Little, Brown, and Co., 2013.

Book Chapter

- **Author name. "Chapter title." *Book title*. Ed. Editor name. Place of publication: publisher, Year. Chapter page numbers.**
- Sedaris, David. "Hejira."*Every True Pleasure: LGBTQ Tales of North Carolina*. Ed. Wilton Barnhardt. Raleigh, NC: University of North Carolina Press, 2019. 157–158.

Journal Article/Magazine

- **Author name. "Article title." *Journal title* volume number. Issue number (Year): Article page numbers. DOI.**
- Gana, Myrsini and David Sedaris. "Is David Sedaris Funny in Greek?" *World Literature Today* 88.2 (2014): 41-44. doi:10.7588/worllitetoda.88.2.0041.

Website

- **Author name. "Title of page/work." *Title of webpage/website*. Publisher of website. Date of publication. Website URL, Date accessed.**
- Sedaris, David. "Santaland Diaries."*Christmas and Commerce*. This American Life. 20 December 1996. https://www.thisamericanlife.org/47/christmas-and-commerce, 13 August 2020.

With practice it will become easier to identify each component and to associate specific combinations

of components as representing different types of resources. For example, if a citation contains two titles, then you immediately know that you are looking for information found in a collection or in a **serial**.

Practice: reading citations

Like many things, practice is the best way to learn how to read a citation. Practice identifying the component parts of each citation when you encounter them then try to identify the kind of resource they represent. You can practice using the five citations below. Visiting the links will help you find the answer.

HINT: *Start with the most common elements, such as author and title, then identify the other elements through a process of elimination.*

- Ballou, Nick, Matti Vuorre, Thomas Hakman, Kristoffer Magnusson, and Andrew K. Przybylski. 2025. "Perceived Value of Video Games, but Not Hours Played, Predicts Mental Well-Being in Casual Adult Nintendo Players." *Royal Society Open Science* 12 (3): 241174. https://doi.org/10.1098/rsos.241174.
- Broussard, Meredith. *Artificial Unintelligence: How Computers Misunderstand the World*. The MIT Press, 2018, https://doi.org/10.7551/mitpress/11022.001.0001.
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Citation Styles

Citation styles are part of **editorial style guides.** These guides establish consistency throughout publications which makes them easier to read and navigate. In addition to formatting citations, style guides also cover:

- page formatting such as fonts, titles, and **reference** lists;
- style mechanics such as lists, numbering, and hyphenation;
- grammar, voice, tenses, and abbreviations;
- tables and figure formatting and labeling;
- formatting for images, charts, graphs, and tables.

There are a great variety of style guides to support different types of publications and fields of research.

Some fields have universally adopted a style while others may use two or more interchangeably. Journals also sometimes have their own style, usually a variant on one of the more popular styles. This is why learning how to read citations in any style is important.

If you get to choose which style to use, then you may want to adopt a style common in your field to gain familiarity with it. When writing for a class, ask your instructor. When you are planning to submit writing for publication, check the journal or publisher's website for their style requirements. Make sure to note if there is a style version number too, as some publishers may not have updated to the latest version. No matter which style you use, the important thing is to use it consistently.

Below you will find profiles of three common academic citation styles—APA, Chicago, and IEEE—to give you a better idea of how different styles vary. Each profile uses the same article, ("Is David Sedaris Funny in Greek?" published by *World Literature Today)* to make comparison easy.[3]

APA Style

Online APA style manual

Created and maintained by the American Psychological Association, APA style is common in social and behavioral sciences, education, business, and nursing. APA is characterized by using parentheses for in-text citations and an alphabetical reference list.

- **In-text citation with page range:** (Gana & Sedaris, 2014, pp. 42–43)
- **Reference list citation:** Gana, M., & Sedaris, D. (2014). Is David Sedaris Funny in Greek? *World Literature Today*, *88* (2), 41–44. https://doi.org/10.1353/wlt.2014.0209

Chicago

Online Chicago style manual

Created and maintained by the University of Chicago, there are two kinds of Chicago citation styles: notes and bibliography and author-date. Notes and bibliography style is used by some humanities scholars. Author-date is used in the life and physical sciences as well as in the humanities and social sciences. Both styles use alphabetical reference lists/bibliographies, but their in-text citation practices are very different.

3. Gana, Myrsini, and David Sedaris. 2014. "Is David Sedaris Funny in Greek?" *World Literature Today* 88 (2): 41–44. https://doi.org/10.1353/wlt.2014.0209.

Chicago Notes and Bibliography

Uses numbered endnotes or footnotes for in-text citations and an alphabetical bibliography (reference list) with full citations at the end of a publication. The notes are in order of appearance, can contain pages numbers, and may be abbreviated.

- **Note citation with page range:** 1. Gana and Sedaris, "Is David Sedaris Funny in Greek?," 42–43.
- **Abbreviated note citation with page range:** 1. Gana and Sedaris, "Funny," 42-43.
- **Bibliography (i.e., reference list):** Gana, Myrsini, and David Sedaris. "Is David Sedaris Funny in Greek?" *World Literature Today* 88, no. 2 (2014): 41–44.

Chicago Author-Date

Very similar to APA, Chicago author-date also uses parentheses for in-text citations and an alphabetical reference list at the end of the publication.

- **In-text citation with page range:** (Gana and Sedaris 2014, 42-43)
- **Reference list:** Gana, Myrsini, and David Sedaris. 2014. "Is David Sedaris Funny in Greek?" *World Literature Today* 88 (2): 41–44.

IEEE Style

2023 Online IEEE reference guide (PDF)

Created and maintained by the Institute for Electrical and Electronics Engineers, IEEE is used in engineering, computer science, and information technology fields. It is characterized by numerical in-text citations that match a numbered reference list at the end of the publication. The citations in the reference list may contain abbreviated journal titles for words commonly found in journal titles (e.g., "Annuals" can be abbreviated to "Ann.") but abbreviation is not required and can make it harder to locate sources.

- **In-text citation with page range:** [1, pp. 42–43]
- **Reference list:** [1] M. Gana and D. Sedaris, "Is David Sedaris Funny in Greek?," *World Literature Today,* vol. 88, no. 2, pp. 41–44, 2014.

Regardless of the style, citations form an important evidence chain between your work and the work of other scholars and researchers. Learning how to read and use citations lets you quickly recognize top authors, topical journals, keystone publications, and search databases. As you explore and gain experience with citations, you will also need to manage them, the information source they represent, and your attached notes. One of the easiest ways to do this is to use a citation manager.

Citation Management

Depending on your field, research methodology, and topic, you may need to read and cite anywhere between a few dozen to hundreds of information sources during your degree program. This task can be made much simpler by using a **citation manager**.

Citation managers are applications that allow you to save, organize source materials and format citations and reference lists. Most of these applications are cloud-based, but a few have stand-alone desktop applications that do not require a connection to the internet. The main benefits and features of a citation manager are:

- Collect and organize information source citations to create a personal library
- Store and organize digital copies of your sources (i.e., PDFs) with the citations
- Automatically format and insert citations and reference lists
- Easily convert to a different citation style

🎥Citation Management video

In this video the Boston College Libraries gives an overview of how to use Zotero, an open-source citation manager which demonstrates features common to nearly all citation managers.[4]

While the primary job of a citation manager is to manage citations, some of them can also be used to store and manage attached files and notes. These functions let citation managers act as a personal and portable research library that you can continue to build and use throughout your career.

4. Boston College Libraries. 2020. "Citation Management." YouTube. June 3, 2020. https://www.youtube.com/watch?v=s0W2ws-vYDY.

🎥Paperpile Overview video

Kate Lechtenberg at the University of Iowa demonstrates how Paperpile, a citation manager that works with Google Drive, can connect to libraries, auto-download PDFs, and has a PDF viewer that supports highlighting and notetaking.[5]

Citation Managers vs. Citation Generators

In addition to citation managers, there are also several tools available that are only citation *generators*. Unlike citation managers, they do not store files or notes. Their sole function is to provide the citation you would use at the end of your paper in the style you specify. Many databases have built-in citation generators, and there are several tools outside databases like EasyBib, Citation Machine, and Grammarly. AI chat tools like Chat GPT can also attempt to format citations but are prone to errors and hallucinations and are not recommended. Unless you are doing a very short paper with a limited number of sources to track, a citation manager is your best bet.

Regardless of whether you choose to use a citation manager or a citation generator, keep in mind that these tools are only as good as the data they can pull in. You should expect to spend time reviewing and correcting all citations when you first import or create them. This could mean something as simple as changing an all-caps title within a database into sentence case, adding data into fields that need to be included in the citation but were not imported, or changing the source format because metadata is incorrect (for example, a journal article mistakenly classified as a website).

Import and Export

The last three functions that we will cover are about what kinds of files you can put in and get out of your citation manager and how and when to use these options.

Import

There are three primary ways to import data into a citation manager:

5. Kate Lechtenberg. 2017. "PaperPile overview." YouTube. November 7, 2017. https://youtu.be/y7vDPfSr-k0?si=GFr_w18XfzyGI-SO.

- **Text files.** These files contain specially formatted citation metadata and are used to import citations from databases and other citation managers. While they can be used for single sources, text files are best used for large batches of citations. Two common formats supported by most managers and databases are BibTeX (.bib), and RIS (.ris).
- **Browser plug-ins.** These tools retrieve metadata from web pages and import it into your manager. Plug-ins require websites to provide metadata to work and their success varies based on both the quality of the metadata and the type of resource. Plug-ins are useful for citing online resources such as videos, blogs, and news articles. Only one source can be imported at a time, but some managers can also try to download and import a PDF copy at the same time.
- **PDF imports**. Like browser plug-ins, PDF imports attempt to read metadata from the PDF and match it against an existing database of citations. Success varies widely across both PDFs and managers as each application uses slightly different methods. The age and quality of the PDF will also make a difference. Most managers can import multiple PDF files at a time and this method is useful if you are migrating to a new citation manager or wish to import an existing collection of PDFs into your manager.

Exporting

You may need to export data from your manager to share a reading list with a colleague or to migrate to a new citation manager. Citation managers typically only export metadata for all, or only the selected, sources. In other words, they can export a list of citations that another manager can read and import. Most citation managers cannot export:

- Folders
- Tags and labels (dependent upon manager and file format)
- PDFs and attached notes/files

Migration

Migrating to a new citation manager can be complicated if you use it for managing and organizing citations and PDFs/notes. Importing just citations (i.e., just metadata) *is easy* but importing the rest, such as collections, labels, tags, and files—that's complicated.

Each citation manager has different features and handles data for citations and attached files differently. For this reason, you should expect to dedicate several hours to the process. You may also lose some of the data you had in your prior manager. Below are some tips for migrating to a new manager.

- Export and import one folder/collection at a time to preserve them.
- Import only citation metadata and then use the auto-download feature to download open access

copies of papers. While convenient, you will lose any notes/annotations on your old copies as well as paywalled publications.

- Use the find/detect duplicates feature to merge duplicate entries.

Choosing Your Citation Manager FAQs

It is worth thinking about how you plan to use a citation manager, what features are important to you, and what your budget is.

How Many Sources and Citations Am I Managing?

If your paper has only a few citations, then adopting a citation manager may not be worth the effort. However, if you plan to write multiple papers, are working on a project with many readings/citations, or want to organize your notes, then adopting a citation manager early is a good investment.

Does It Support My Word Processor and Devices?

Most citation managers support Microsoft Word on Windows and Mac but support for online word processors like Google Docs and Word 365, as well as native support LaTeX editors, is not as common. As many managers are web applications, they can run on any device that can run a browser. However, many have features that are only available if you install the full software on a computer. Only a few citation managers have full applications for mobile devices (iOS and Android) as well as Linux and Unix.

Do I Want to Manage PDFs and Notes, or Just Citations?

Most citation managers provide limited, free cloud storage so you can attach PDFs and note files but due to the size of PDF files, the free space often fills up quite quickly. If managing PDFs and notes with your citations is important, then you will probably need to pay a subscription fee or use a manager like Zotero with a desktop installation where everything—citations, PDFs, and notes—is stored on your hard drive and there are no additional charges.

Cloud storage and file management

Most citation managers **do not work** with third-party cloud storage services such as Box, Google Drive, and OneDrive due to syncing problems that can cause file and database corruption. It is best to purchase storage from your citation manager directly to prevent this from happening, or to manage your PDFs offline, directly on your desktop.

Paperpile is one notable exception: it saves attached PDFs, notes, and annotations to Google Drive.

What Can I Afford?

Costs for citation managers range from zero (free) to hundreds of dollars a year. Some only have fees for storage while others require a license or subscription after a trial period. Wikipedia has a useful table that compares and tracks the costs of the most popular applications.

Which Software Does My Major Professor Use?

Collaboration is easier when everyone uses the same tool so you may want to ask your major professor if they have a preference. It may also be worth asking coauthors for the same reason.

Will I Need to Analyze My Citations?

Using a citation manager will save a lot of time if you plan to analyze citations as part of a literature review or manage studies and papers included/excluded in a review. This is because most managers have tools that let you batch import and export citations, remove duplicates, add tags, move to folders, and edit metadata.

Review Your Options

The following sources offer additional information about different citation managers and can assist you in identifying one that meets your needs.

- Which citation manager?: This page compares three popular citation managers supported by the Iowa State University library: Endnote Basic, Mendeley, and Zotero.
- Comparison of reference management software: A Wikipedia page with detailed tables comparing citation managers including cost, storage limits, and more.

What If I Already Have a Lot of PDFs Saved?

Most managers can import **metadata** from PDFs. However, the accuracy and quality of the imported metadata will vary widely depending on PDF and application used.

Summary

Citations are more than just pointers to information sources, they are also critical markers for showing your work and bestowing credit. Failing to cite a source is plagiarism when you use someone else's ideas, words, or work. Learning to read citations—in any style—is mostly a matter of practice and, because there

are many styles to choose from, using a citation manager to automatically format your citations can save a lot of time. Citation managers can also be used to organize PDFs of articles and for notetaking and are especially useful for managing large numbers of citations or working collaboratively.

Key Points

- Citations point to other information sources.
- Citations credit authors for their original words, ideas, and discoveries and failure to use them can result in plagiarism.
- There are many citation styles but all of them use the same core building blocks.
- Which citation style you use is a matter of personal preference, instructor preference, or publisher preference.
- Citation managers are valuable tools for managing large numbers of citations and PDFs .

Resources

- Citation Style Guides. Iowa State University Library Research & Course Guides, https://instr.iastate.libguides.com/styleguides
- Wikipedia. "Comparison of reference management software." Last edited September 22, 2025. https://en.wikipedia.org/wiki/Comparison_of_reference_management_software
- Dan Coffee. Zotero for Citation Management. Iowa State University Library Research & Course Guides, https://instr.iastate.libguides.com/zotero
- Jesse Garrison. EndNote & EndNote Web. Iowa State University Library Research & Course Guides, https://instr.iastate.libguides.com/endnoteweb
- Mendeley LibGuide. Elsevier, https://elsevier.libguides.com/Mendeley

3. Literature Searches (and Using the Library)

Kate Garretson and Megan O'Donnell

This chapter covers how to use databases to search for, locate, and evaluate scholarly literature. You will also learn which databases are relevant to your research, how to access the full text of materials you need, and who to contact for help.

Glossary

Abstract: A section at the beginning of scholarly articles that provides a summary of the contents.

AI search tools: Online tools that use AI technology to find relevant materials, usually scholarly articles, in response to a human-supplied prompt. Some tools can also generate summaries or charts about their results. The features and the quality of the generated output varies from tool to tool.

Boolean operators: Commands that are used to expand or limit search results within databases.

Citation chaining: The act of following citations—either forward or backward—to locate additional relevant sources, to track how an idea or concept has changed over time, or to identify related topics and literature.

Conclusion: A section within scholarly works that offers a detailed explanation of the paper's findings and conclusions.

Database: A collection of digital, structured data that can be searched and accessed.

Field searching: A database advanced search feature that allows you to target specific parts of an **item record** to pinpoint your search and narrow your results. For example, the title field or the author field.

Item record: Information about an item (e.g., a book, scholarly article, DVD, etc.) within a collection (e.g., a scholarly literature database, a library, etc.) that allows for the identification, location, circulation, and general management of the item. For example, a library book record would include information about the item's title, author, and location within the library.

Interlibrary loan (ILL): A service that allows you to borrow an item owned by another library, typically free of charge.

Introduction: A section within scholarly works that provides context for the research and claims of the work within that field of study.

Methods: A section within scholarly articles that describes the specific processes and procedures used for the research project or experiment.

Nesting Boolean operators: Using parentheses with **Boolean operators** to affect the order in which they are executed within the search string.

Peer review: The evaluation of a manuscript submitted to a journal or publisher by one or more

independent researchers (sometimes called referees) within the same field to determine whether it is worthy of publication. Referees evaluate the manuscripts on their contribution to the field and the accuracy of the contents.

Phrase searching: The use of quotation marks around two or more words to indicate that they should be treated as a single keyword.

References (Reference Section, Bibliography, Works Cited): A section within scholarly works that provides a list of sources the author(s) used.

Results: A section within scholarly papers that details what the author(s) found and typically has several figures (such as charts and graphs) to highlight specific data or results.

Search string: A search formed from letters, numbers, and symbols used to find specific information. Search strings used within scholarly literature databases combine keywords with Boolean operators and other symbols to search efficiently and precisely.

Scholarly publications (scholarly literature): Literature written for a specialty audience that presents research results. Includes journal articles, conference proceedings, books, and book chapters.

Subject librarian: A librarian at an academic library who specializes in a specific field, topic, major, or discipline. They help select the databases the library offers, have a strong understanding of the specialized search features within those databases, and offer consultations to provide help with selecting which database to search, how to create search strings, and more.

Subject terms: Words located in the subject field of an item's record within a database or catalog. These words are part of a very specific and controlled set of terms unique to each database and are the official ways of talking about topics within that database or catalog. These words are sometimes found in a database's ***subject term thesaurus*.**

Subject term thesaurus: A complete and searchable list of the controlled set of terms unique to each database that are the official ways of talking about topics within that database or catalog. Entries within this thesaurus will show you related terms and other useful information that can help your searches.

Overview

Questions

- Which databases should I use for my literature review?
- Are there tips and tricks to searching?
- How do I access the materials I need?
- Who can I go to for help?

Objectives

- Recognize which databases are applicable to your research.
- Construct advanced search strings to improve results.
- Identify the typical sections within scholarly articles and what they tell you about the article's contents.

The Internet

The Internet is often the first place people go looking for information, because web search engines can find a wide range of content on the open web and many people are comfortable searching there. Even academic research can start on the Internet, because it contains many types of resources and information sources. There are several key points about the open web to keep in mind when beginning a literature review:

- **Lots of things but not *all* things:** Web search engines will find many types of materials, and those materials will vary in their quality and intended audience. While the open web does contain a plethora of high-quality scholarly publications and other valuable resources, there are just as many materials behind paywalls, located on private servers, or not available digitally at all.
- **The structure and indexing of the open web:** There is no formal organization of content on the open web, nor is there a comprehensive index of all items available on it. While many large search engines like Google have massive indexes that power their search engines, they still miss content. Additionally, there are ways content creators can exclude their content from being indexed by search engines.
- **Web search engine algorithms:** When searching the open web, many factors affect search results. Some of these factors can be controlled, such as which search engine and browser you use, whether you use a virtual private network (VPN), and other privacy settings. But there are factors you cannot control, such as the placement and inclusion of sponsored links and content, and how search

algorithms respond to your profile (which includes personal information such as your location, age, ethnicity, and more).

In contrast to the open web, scholarly literature **databases** are purposefully organized and made to be searchable. They have comprehensive indexes and offer the ability to adjust the parameters of a search in sophisticated and robust ways. Additionally, scholarly literature databases have a clear intended audience: researchers.

Setup

Before you start searching the open web or scholarly literature databases, consider these questions:

1. What resources do you have access to? Think about resources available to you through places like:
    a. University or community college libraries;
    b. Public libraries;
    c. The open web.
2. What types of resources do you need?
    a. Consider how current your topic is and what effect the flow of information might have on the types of resources you need as well as the types of resources available.
3. How much personal information are you willing to share?
    a. As mentioned above, certain web browsers and web search engines collect information about you if you use them. If you want to search more privately, consider using a VPN or browsers and search engines that do not collect that information.
    b. Many apps and websites require a login to access information or to use their service. What information are you comfortable sharing when creating those accounts? If you are concerned about privacy or even just spam emails, consider creating a dedicated email account that is separate from your personal or professional email for these cases.

Scholarly Literature Databases

Scholarly literature databases specialize in helping people search for and locate published information. What is included within a database, what features it has, and who can access it depends on the database's scope and mission. Does the database specialize in a particular topic, discipline, or type of information? Or is it a generalist database, which contains a bit of everything? Is it an open access database, meaning it is available through the open web? Or is it a subscription-only database that requires institutional affiliation? Knowing a database's scope and purpose will help you determine if it will be useful

to you and how best to use it. This chapter's examples and activities will primarily use the open access scholarly literature databases Google Scholar, Lens, and PubMed. If you would like to use a different database you may, but you should expect different results.

Practice: Brainstorm keywords

1. Open a new document and start a section titled "keywords."
2. Spend five minutes writing down all relevant terms and phrases you can think of that describe your topic. Include things like names, time periods, and locations when relevant. Do not forget synonyms, related ideas, and terminology that may no longer be in use. Keep an eye out for phrases that might need to stay together to make sense for your research.

We will return to this list in later exercises. If you do not yet have a research topic you can use one of the following to practice:

- Smoking prevention or cessation among adolescents
- Plant-based diets and health
- Sustainable concrete and the construction industry

Going to the database's "About" page is a good way to find out about database scope, mission, and accessibility. For example, Google Scholar was built to be a "simple way to broadly search for scholarly literature."[1] It is a generalist database that does not specialize and has extremely limited advanced search features. In comparison, PubMed is a specialized database, designed to support "the search and retrieval of biomedical and life sciences literature with the aim of improving health—both globally and personally."[2] To achieve this, it offers a simple search, advanced search features, and other tools to help searchers find information.

1. Google. https://scholar.google.com/intl/en/scholar/about.html
2. National Library of Medicine, "About," PubMed, accessed August 11, 2025, https://pubmed.ncbi.nlm.nih.gov/about/, archived at https://perma.cc/Y9RT-2YHE.

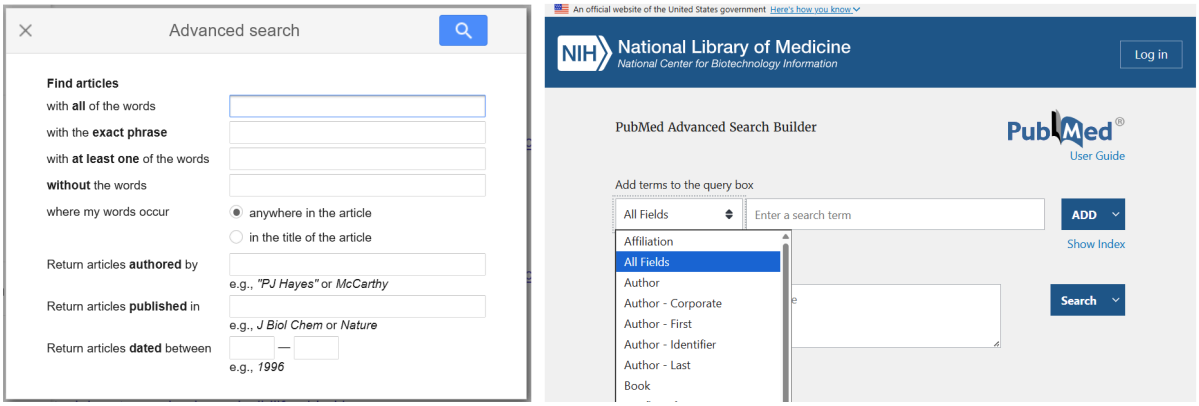


Figure 3.1 *A comparison of the advanced search screen for the generalized scholarly database, Google Scholar (left), and the specialized database, PubMed (right).*

Specialized databases offer a range of discipline-specific content for multiple audiences. For example, the open database Common Chemistry includes field-specific information about chemicals and compounds such as density, boiling point, melting point, but does not contain scholarly literature. This specialized database would be useful as a quick reference or for educational uses. For a literature review, the paywalled database SciFinder would be a better choice because it includes scholarly materials, along with even more field-specific information and ways to search, like by reaction and patent. Some specialized databases contain content for multiple audiences. For example, SageData, often used for finding information related to business fields, has the capability to find the number of households by state within the United States that consumed barbecue sauce in 2020. Need to drill down to the Census tract level of barbecue sauce consumption? It can do that too!

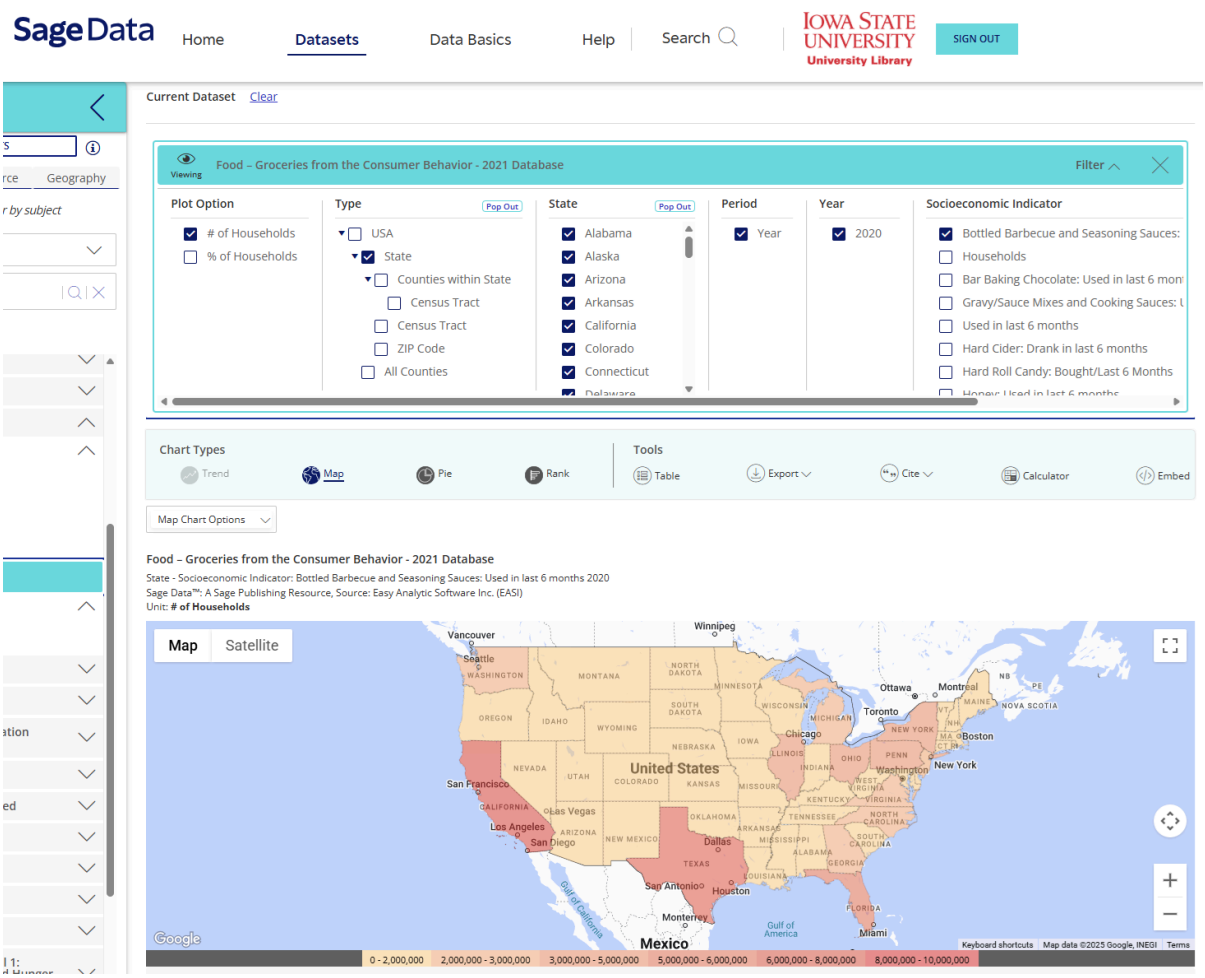


Figure 3.2 *A map showing comparing the number of US households by state that bought barbecue sauce in 2020 from the SageData database.*

Whatever your needs, there is likely a discipline-specific database related to it. Finding the right one for your research and getting access to it will be the first step in your search. The in-depth and specialized content within discipline-specific databases is essential for a thorough literature review, and in section 3.4, you will see how some of the specialized search features within these databases can help you zero-in on the information you need.

Practice: Compare results

In this exercise we'll compare how using the same search yields different results in three different databases: Google Scholar, Lens, and PubMed.

Search for "gender discrimination nursing students" (without the quotation marks) in each database and observe and contrast:

- The number of results;
- The number of shared results on the first two pages;
- The accuracy of the results (use your best judgment);
- The dates of the newest and oldest results.

As you review your results consider things such as:

- Did one database outperform the others?
- Did the database with the most results also provide the most accurate or relevant results?
- Which database would be best for historic research on the topic (20+ years old)?

Analyzing your results in this way will draw attention to discrepancies, strengths, and weaknesses of specific databases.

Besides differences in what topics are covered, databases also specialize in different types of information. Some databases only include:

- **Scholarly publications** that present research results such as journal articles, conference proceedings, books, and book chapters;
- Popular press publications such as magazine and newspaper articles, and books we read for fun rather than for research;
- **Gray literature,** unpublished research, such as preprints, theses, reports, and policy documents;
- Patents and standards which document inventions and formal guidelines that ensure uniformity;
- Images, films, datasets, historical materials, and more.

Because of the variety of databases and materials available, choosing a database that matches your purpose is important; using the wrong database can mean you may find irrelevant, very few, or even no results. Luckily, each database has a purpose statement—such as those mentioned earlier from Google Scholar and PubMed—to help you decide if they will suit your needs. Libraries also offer guides, classes, and consultations to help researchers choose the best databases. Setting up a consultation with a **subject librarian** who knows your topic area can save you time and frustration. Librarians know the databases for their subjects very well and can point you toward the best database for your research. Keep in

mind that “best” does not mean “perfect” or “only.” A good literature search includes the examination of multiple databases to make sure that all relevant information is found.

Practice: Identify relevant databases

Visit the Iowa State University Library’s Articles & Databases page and use the Subject drop-down box to select a category that matches your research topic or discipline. Browse the smaller list of databases to locate ones that match your discipline and topic.

If your topic is trans- or cross-disciplinary, meaning it is studied in more than one field or discipline, you should look at databases for each relevant subject. You may also want to explore the Database Types list if you are looking for specific types of information, such as patents or datasets.

Scholarly Literature Database Features

Search features for scholarly literature databases vary depending on the opportunities provided by the content within the database. For example, you will not find a filter to limit by census tract within a chemistry database, but you will find ways to limit by protein-based sequences. While it may take you a little time to learn the specialized search features within discipline-specific databases, talking with a librarian who knows the database you are using will help speed the process. Additionally, there are many search features that are common across all scholarly literature databases. Once you have mastered the search features and techniques in this chapter you will be able to apply them to any database, regardless of discipline.

Basic Search Versus Advanced Search

Most databases default to a single simple search box. When you are first starting out, this simple search can be a good way to see how many relevant results you can get with two or three initial keywords, such as those you identified in the setup document you created at the beginning of this chapter. If you are satisfied that the database contains what you need, you can move on to the advanced search options to get a more focused and targeted set of results.

Doing a basic search within scholarly databases will seem very similar to a web search, and their core purposes are the same: to help you locate useful information. However, there are some key differences in how the algorithms within databases treat your **search strings** and how they display results. For example, web search engines prioritize sponsored links (i.e., ads) at the top of search results and may also prioritize nearby locations or AI-generated summaries. Scholarly databases, on the other hand, only return

the result of your search. This offers *you* the chance to choose what you want to prioritize within your search results through advanced search options.

Advanced search options are usually on a different screen than the basic search box. Typically, they are linked under or near the basic search box. The advanced search screen typically has two to three boxes that allow you to target specific fields, limit or expand your results, and apply **subject terms** or filters.

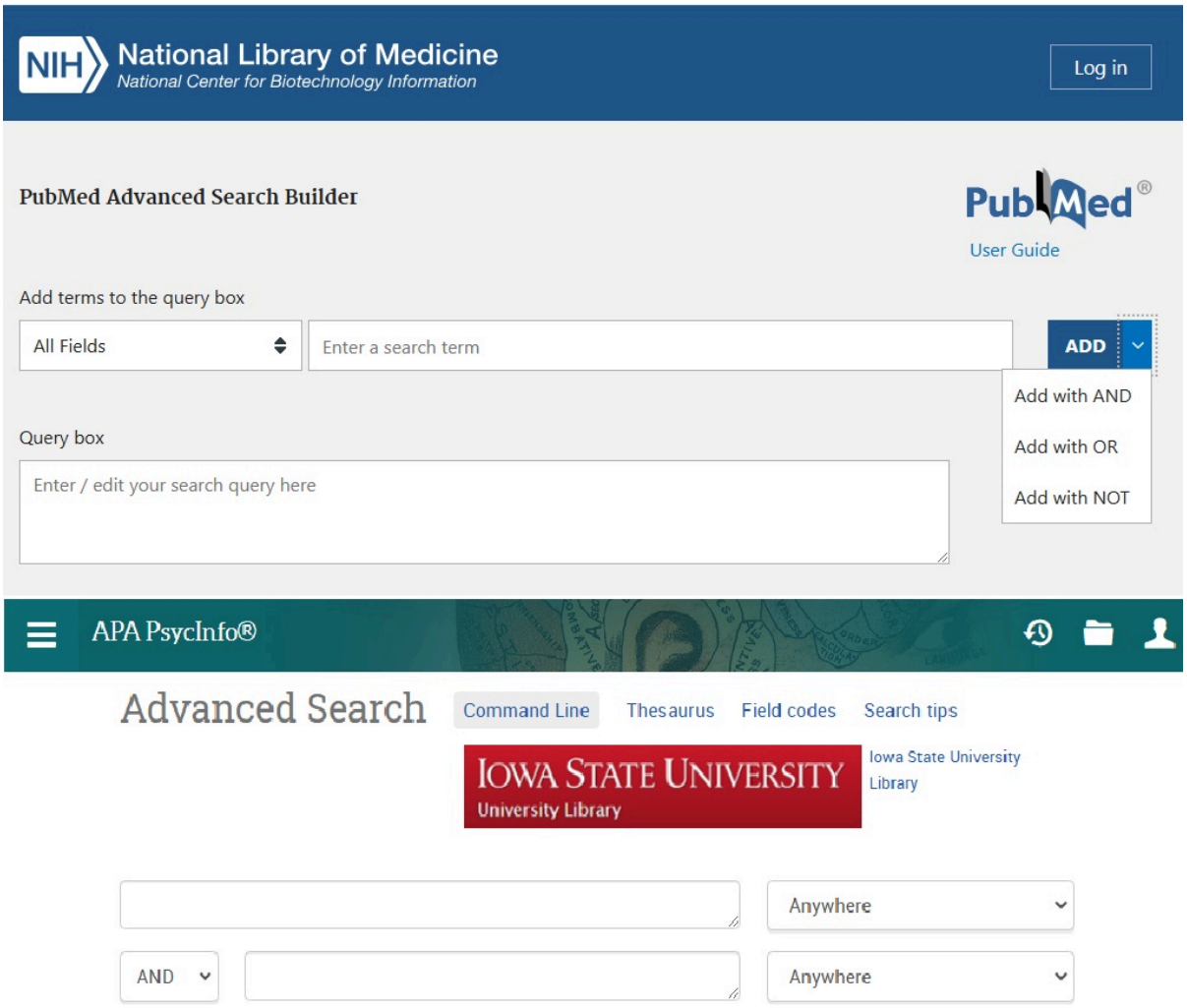


Figure 3.3 *The advanced search screens for PubMed (top) and Lens (bottom) have multiple search boxes and as well as ways to easily change the default Boolean operator.*

Filters, limiting, and other search features

The ways to filter and limit your search results, both before and after you type in your search string, will vary from database to database. However, most offer the ability to filter by things like date, geographical location, or format type. Some also offer filters for properties like online full text, format (article, review article, editorial, book, etc.), author institution, and language. Some databases have "sticky filters" that will stay even if you modify your query or type in a new one, while others will make you reselect your filters and limiters every time you do a search.

Most, but not all, databases include the ability to use wildcard and truncation symbols which let you search for multiple forms of a word without typing all of them out (see PubMed's documentation).

Some databases support proximity searching which allows you to search for words that are within a certain number of words from each other (see PubMed's documentation). This can be helpful for locating information that uses very general terms that might be expressed through variations in phrases. For example, a phrase search for "curriculum theory" would not return publications including:

- "theory of curriculum"
- "theory of lyric curriculum"
- "curriculum theory"

but a proximity search set for "within four words" would find all three.[3]

Boolean Operators

Boolean operators are logic commands that can be used to expand or limit your database searches. There are three Boolean operators, and they should always be typed in capitals when entered in a search string to be recognized as a Boolean operator.

- **AND** *narrows* search results. Using it instructs the database that you only want search results that contain all the words joined by AND. For example, the search string "Paris AND architecture AND medieval" will return results that only contain all three words. Records with only one or two of the terms will not show up in search results for that search string.
- **OR** *expands* search results. Using it instructs the database that you want search results that contain one or more of the words joined by OR. The search string "Paris OR architecture OR medieval" will return results that address every possible combination of these terms. OR is best used in combination with AND to return useful results.

3. Amanda Bezet, "The Research Process: Proximity Searching," National University Library, accessed August 11, 2025, https://resources.nu.edu/researchprocess/proximity, archived at https://perma.cc/8QH4-CX9R.

- **NOT** *excludes* terms from search results. Using it instructs the database to exclude irrelevant results by targeting specific words or phrases. This is useful when a word has more than one meaning or when a closely related but irrelevant topic uses the same search terms. For example, if you want to exclude Paris from search results about medieval architecture, you could use "architecture OR medieval NOT Paris."

Databases never explicitly tell you what Boolean operators they use by default but it is nearly always AND. Using the advanced search screen within a database will let you see and control what operators are used, and on what field you want them applied (e.g., "title"). Knowing which Boolean operators are connecting your keywords, what fields your search string is focused on, and being able to change or tweak all of that as needed is essential to creating an effective search string.

Practice: Boolean operators

To see how Boolean operators can affect your search results, let's research different types of field materials for the sport cricket. Go to Lens' structured search page for scholarly works. Use the "Query Text Editor" to adjust the search to the following sample searches:

- cricket AND pitch
- cricket AND field
- cricket NOT insect
- cricket NOT insect AND pitch OR field

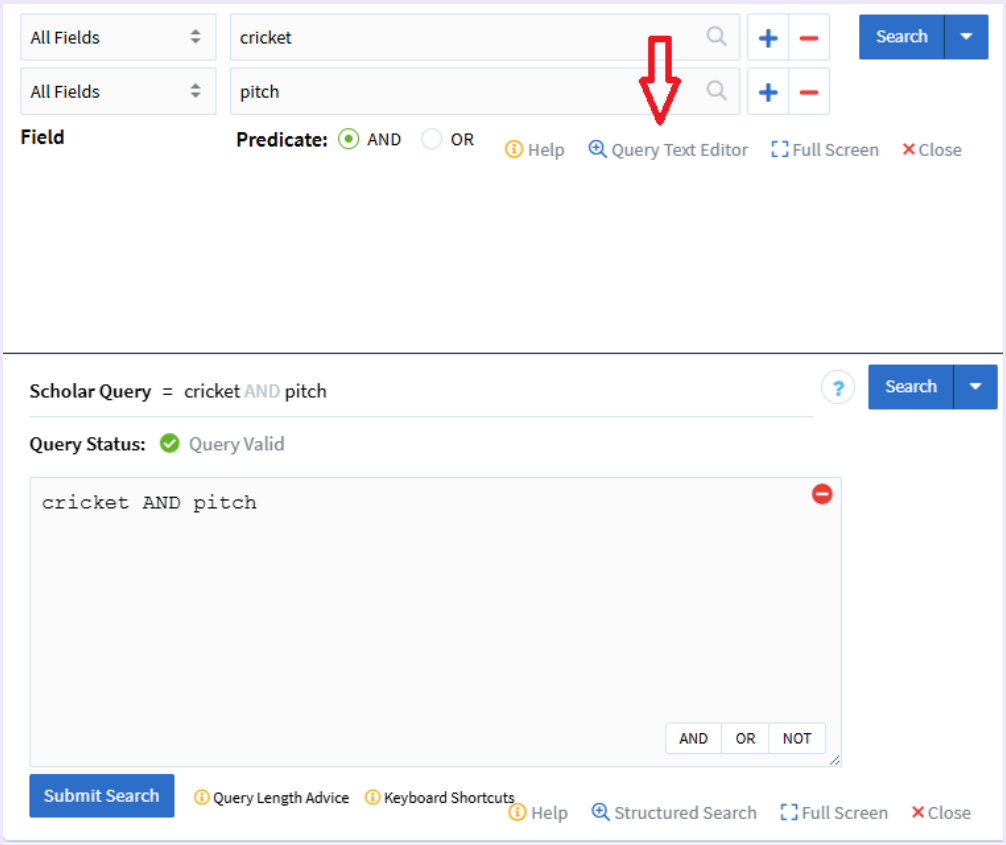


Figure 3.4 *Where to find the "Query Text Editor" button (top half) and what the "Query Text Editor" screen looks like (bottom half).*

As you review the results from different searches consider:

- The total number of results for each search;
- The relevance of the results to the research focus stated above;
- The effect the order of the Boolean operators had on the results.

Phrase Searching

Sometimes, the topic you want to research is made up of more than one keyword. For example, if you are researching *artificial intelligence*, getting back results that contain only one of those words would not be helpful. To avoid getting results about artificial colors or emotional intelligence, you need to use **phrase searching.** When quotation marks are placed around "artificial intelligence," database search algorithms will only return results where those words occur together. While this can help eliminate irrelevant results like those mentioned above, words spelled incorrectly may result in zero search results. Similarly, too many words surrounded by quotation marks can also cause zero search results.

Field Searching

The advanced search screen typically has options to target specific database fields such as title, author, date, etc. **Field searching** tells the database to only search specific parts of an **item record** to pinpoint searches and narrow results. For example, if you are searching for publications *about* William Shakespeare rather than *authored by* William Shakespeare, you could put "Shakespeare" in the *subject field* to limit your results to publications about him. This technique is also your best bet when you need to search for a *known item* (i.e., you are searching for something you found using a citation or re-finding an item that you know some information about, such as the title or author). Searching within the correct field for the information you need can help reduce irrelevant results like in the examples mentioned above. However, using the right field but the wrong keyword can result in irrelevant results. To make sure you are using the right keywords, you will want to look at the **subject terms** for the database or catalog you are using.

Subject Terms

Subject terms are descriptive words and phrases assigned to an item's record within a database or catalog. They are the official way of describing topics within a database and each database has its own vocabulary, called a **subject term thesaurus**. Using this feature of scholarly literature databases can be very helpful because it allows you to accurately identify topics and concepts that span multiple fields, use different terms, or have been called different things over time. Perhaps you are interested in researching how people stop smoking. If you search for "stop smoking" in a database (for example PubMed) you are likely to get some results. However, you would get more relevant results if you used the subject term, "smoking cessation," which is the official PubMed vocabulary term for this topic. While some database subject terms may be easy to find and use, others may be more complex and harder to navigate. PubMed and many other health databases use the Medical Subject Headings (MeSH) thesaurus, which is precise and requires training and practice to use well. If you plan to use subject terms in your search, expect to spend some time reviewing the subject term thesaurus as well as tutorials or other training materials and help pages, such as those PubMed offers for learning how to navigate and use MeSH.

Subject term thesaurus

The figure below depicts the entry for the subject term “smoking cessation” which is used by MeSH and PubMed. It contains a list of alternative terms as well as outdated subject terms (which provides insight into how this topic has been described over time). In this case, “Smoking/prevention & control” and “Smoking/therapy” were subject terms for this topic during different timeframes. This information could be useful when searching databases to help find additional or historical literature on this topic.



Figure 3.5 *The “Smoking Cessation” subject entry within MeSH.*

Practice: Find subject terms

Using your database of choice, try to locate its subject term thesaurus. Then return to the document you created for Practice: Brainstorm keywords and work through the following exercises.

- If the database does have a thesaurus, search it for additional terms that relate to your topic and add them to your list. Pay close attention to broader or narrower terms for your topic
- If it does not have a thesaurus, do a search with the keywords you have, and review the search results. Go through the articles and see if you can find any subject terms listed in the subject field of the records that you could add to your list of keywords.

Search Strategies

After you have practiced the basic search techniques—**Boolean operators**, **phrase**, **field**, and **subject** searching—you are ready to level up your searches using more advanced methods and strategies.

Nesting Boolean Operators

Earlier in the chapter, you learned how to use **Boolean operators** to combine your keywords to include or exclude certain search results. You can take this a step further by **nesting** your keywords and Boolean operators using parentheses. Any keywords within parentheses will be searched first. Using parentheses sets the order for how your Boolean search is executed and can reduce the number of irrelevant results. Take this **search string** for a research question involving the effect of a dog on a person's mental health:

dog AND stress OR "mental health"

If we enter this string as is into ISU's Quick Search, we return about 1.5 million article results. We can reduce that down to around 18,700 by placing a pair of parentheses like so:

dog AND (stress OR "mental health")

This placement of parentheses means Quick Search will first find search results that contain either stress or "mental health" and then search for dog within those results. Nesting is highly effective and is one of the most important advanced search techniques you can learn as it gives you execute multiple search commands at once.

Practice: Nesting Boolean operators and keywords

Using your updated keywords list, try to:

- Combine some of your keywords within a single search box using Boolean operators but do not use parentheses;
- Combine some of your keywords within a single search box using Boolean operators and parentheses;
- Combine some of your keywords within multiple search boxes with Boolean operators and parentheses.

As you review the results from these different searches consider:

- The total number of results for each search;
- The relevance of the results to the research focus stated above;
- The effectiveness of different search techniques within different databases.

Constructing Your Search String

Creating effective and precise search strings entails applying all the database search features we have covered to your search terms. If you can combine these techniques effectively, you will create a search string that will provide the widest possible search for relevant results. For most literature reviews, you will likely use several iterations of your search string so do not think you are failing or not doing it right if you need to tweak your search string to get better results from the database you are currently searching. However, keep in mind some literature reviews require logging all search strings or may require using only a few search strings to intentionally limit results (see Chapter 1).Let's use an example research question investigating smoking prevention and adolescents to see how all the search features can be combined. Let's say you have identified the following keywords for the two important parts of your research question:

"smoking prevention," "smoking cessation," prevent

adolescent, adolescents, teenager, teenagers, youth

If you only have one search box, grouping the keywords for each of the important parts of your question together using OR and parentheses will give you the best results. To do so, you will take all synonyms and related keywords and put OR between each of them to create a string. Treat keywords that are more than one word as a single element by using phrase searching (in other words, do not put OR between words that need to remain together to make sense, like "smoking prevention") Next, place parentheses around the entire string of keywords. For example:

("smoking prevention" OR "smoking cessation" OR prevent)

Repeat this step for each of the important parts of your research question. The last step is to connect all of the groups of parentheses with AND. For example:

("smoking prevention" OR "smoking cessation" OR prevent) AND (adolescent OR adolescents OR teenager OR teenagers OR youth)

This process will widen the search to include any combination of the terms appearing within each set of parentheses, helping you retrieve more studies that discuss your research question. If the database you are using allows for **truncation** or **wildcards**, this is also where you could use those features to search for multiple forms of a word using a single search term; for example, using teen* would return teen, teens, teenager, and teenagers. In this example, we can use truncation on both teenager and adolescents to create the following modified search string:

("smoking prevention" OR "smoking cessation" OR prevent) AND (adolescent OR teen* OR youth)*

If you are in an advanced search screen with multiple search boxes, instead of separating the important parts of your research question using parentheses, you can just use a separate box for each part. For example:

"smoking prevention" OR "smoking cessation" OR prevent
AND
adolescent OR teen* OR youth*

Practice: Create Complex Search Strings

Using all your updated keywords and the practice search strings from the previous practice exercises, try to create a complex search string using as many as possible of the database search techniques covered thus far.

As you review the results from different iterations of your search string, consider:

- The total number of results for each search
- The relevance of the results to the research focus stated above
- How you had to modify your search string to each database you used.

Resources for the advanced use of Boolean operators

For more information and examples of how to use these search techniques and Boolean operators to form longer and more complex search strings, check out some of these resources:

- Boolean operators tutorial from Lens support
- Search syntax from Lens support
- Search techniques from PubMed

You can see examples of search strings used in research within these two papers, where the authors have included their search strings and methodology, so their results can be replicated:

- Fahad A. Alsahli, Naif M. Alruwais, Leyan S. Alsultan, et al., "Interventions for Prevention of Tobacco Smoking in School-Aged Children and Adolescents: A Systematic Review and Meta-Analysis," *Cureus* 17, no. 1 (2025): e77008, https://doi.org/10.7759/cureus.77008.
- Mihirkumar P. Parmar, Mankirat Kaur, Sravani Bhavanam, et al., "A Systematic Review of the Effects of Smoking on the Cardiovascular System and General Health," *Cureus* 15, no. 4 (2023): e38073, https://doi.org/10.7759/cureus.38073.

Scheduling a consultation with a subject librarian is always a great way to get help. Academic libraries often have librarians who focus on specific topics or majors, and they curate the materials and resources available through the library for those topics. They know the databases that cover those topics well and can give you advice on how to construct your search string or use the database-specific search features.

Citation Chaining

Many databases offer **citation chaining** tools to help you find both older and newer publications related to the one you are currently reading. Citation chaining—following citations either forward or backward in time—can be useful for discovering key publications, related literature, and for tracking how an idea or concept has changed over time. To find older materials, you *chain backward* by looking at the sources a publication cites. As citations are links to evidence the author(s) used for their arguments, they may be relevant for your own research. Citation chaining backward is also a great way to uncover historical terms for a topic that may not be present in modern database thesauri and can be used to expand your searches. *Chaining forward* helps you find newer materials by seeing what has cited the source you are currently reading.

Look for links in databases that say "cited by" to *chain forward* and use **References** or Works Cited sections to *chain backward*.

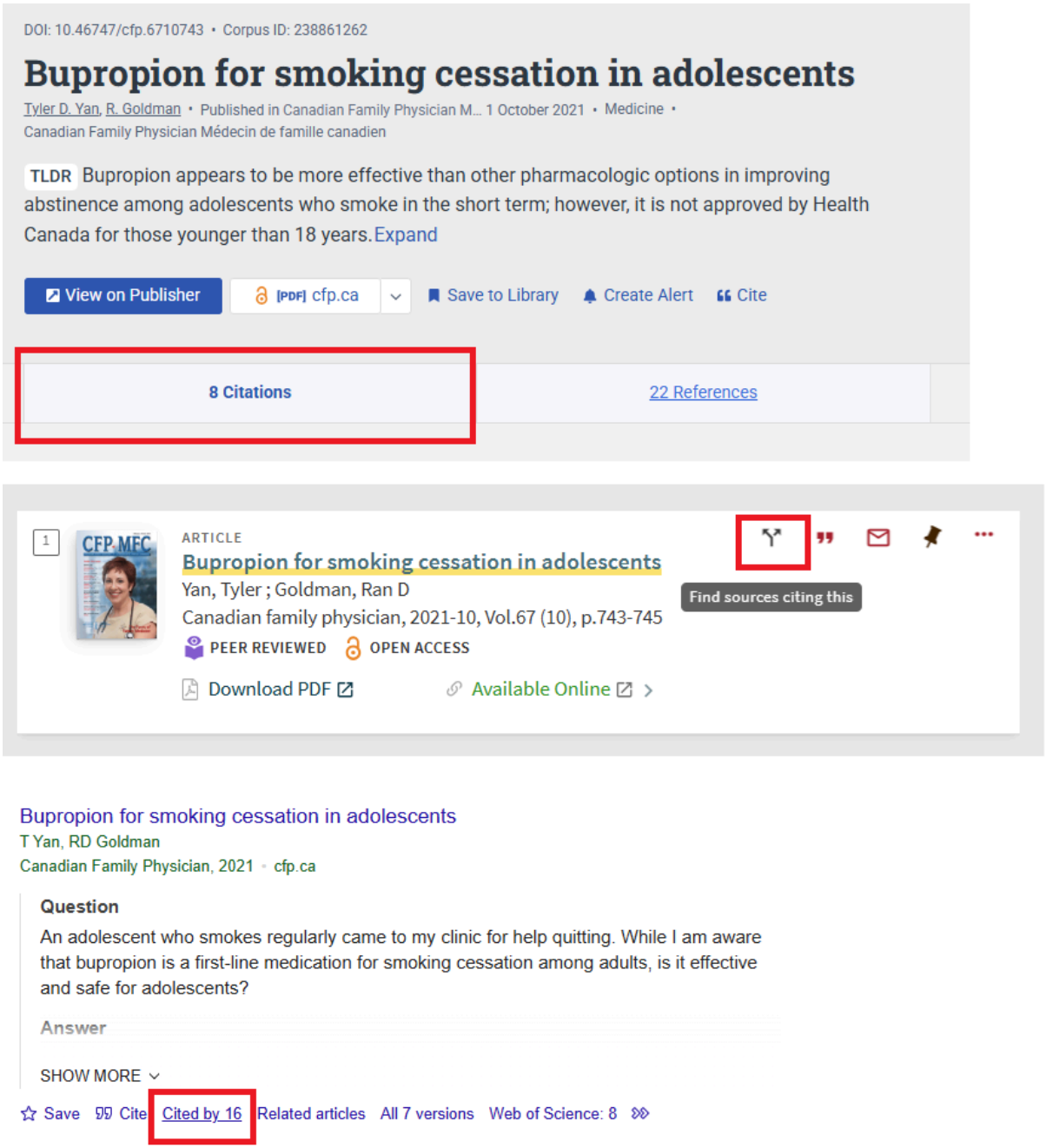


Figure 3.6 *Where to find the citation chaining tools within Semantic Scholar (top), Quick Search (middle), and Google Scholar (bottom).*

The examples in Figure 3.6 use the same article, but the number of citations is different depending on the database. This is because all databases have differences and limitations regarding the materials they have access to, which has a direct effect on the number of citations they count (see Chapter 5 for a deeper discussion of this topic). For this reason, it is worth checking multiple databases to uncover the most sources.

AI update: databases and literature searches

How we interact with scholarly databases is likely to change dramatically and rapidly thanks to new tools and advances with AI. Clarivate, the owner of Web of Science, has employed AI for several years in its products[4] and other database companies are following suit. Learning how databases work, and how to search them yourself, will allow you to double-check the results these AI tools provide and share your methods in a way that others can reproduce by replicating your searches. The latter part is vital for systematic and systematized literature reviews (see Chapter 1) as there are known reproducibility problems with using **AI for literature searches**.[5] Currently, there are a plethora of specialized AI tools that can assist with literature searches, with varying degrees of success. Most of these tools can do the following:

- **Semantic "analysis":** These tools rely on generative large language models (LLM) to create summaries, pull information from articles, create charts, and sometimes to provide an "answer" to a research question. An example of this type of tool is Elicit. "Analysis" and "answer" are in quotation marks here because these tools do not analyze or understand research papers the same way a human does. Humans analyze *content* and *meaning* when they read, while generative LLM tools analyze *patterns* in-text, such as the order, frequency, and relationships between words. This allows them to mimic human logic and writing by predicting word order and sentence construction. These tools are highly persuasive and can easily deceive through this mimicry, so it is important to remember they are not experts and should never be treated as such. Regardless of how accurate a generative AI summary sounds or how accurate an AI chart looks, you must always remain the "human in the loop"[6] and verify all claims. After all, as the author you are responsible, and liable, for what you write and publish.
- **Literature mapping:** These tools specialize in finding and mapping connections between publications, topics, authors, and more. They create interactive maps that help us visualize, understand, and explore connections in a new way. An example of this type of tool is Research Rabbit. These tools are limited by what sources they have access to—and like any database they do not have access to everything—which means the results will often be skewed to favor open access and online materials. To get the most complete picture you should use several tools, just as you should search several databases.

4. Francesca Buckland, "Bringing Generative AI to the Web of Science," Academia & Government, *Clarivate: Academia and Government*, November 7, 2023, https://clarivate.com/academia-government/blog/bringing-generative-ai-to-the-web-of-science/, archived at https://perma.cc/YLQ4-AX5J.

5. Ball, Philip Ball. "Is AI Leading to a Reproducibility Crisis in Science?" Nature Publishing Group UK. December 5, 2023. https://doi.org/10.1038/d41586-023-03817-6.; Odd Erik Gundersen, Yolanda Gil, and David W. Aha. "On Reproducible AI: Towards Reproducible Research, Open Science, and Digital Scholarship in AI Publications." AI Magazine 39 no. 3 (2018): 56–68. https://doi.org/10.1609/aimag.v39i3.2816.

6. Ethan R. Mollick and Lilach Mollick, "Assigning AI: Seven Approaches for Students, with Prompts," SSRN Scholarly Paper no. 4475995 (Social Science Research Network, September 23, 2023), https://doi.org/10.2139/ssrn.4475995.

Obtaining Full Text and Saving Searches

So far, we have focused on how to search in databases, but they have other helpful functions such as links to help us obtain full text copies and the ability to save and get alerts based on searches.

Tracking Down Sources

After you have located a publication to read or save, the next step is to locate the *full text* (i.e., a copy of the actual publication, not just a database record of it). Some databases include full text and provide a copy of the materials they have records for through links or buttons that say "PDF Full Text" or "HTML Full Text." Some databases only offer full text copies of *some* of the materials they have records for, and others are built only for searching and have no links to full text.

There are multiple web browser extensions that can help you seamlessly access resources that may look like they are behind a paywall but are available somewhere online for free. Some extensions like Unpaywall are free and do not require a subscription whereas others, such as LibKey Nomad, only work for users affiliated with institutions who have a subscription with them. Even then, institutions are limited to what their libraries subscribe to and not everything is available digitally.

When you cannot locate the full text, either online or in your library's print collection, **Interlibrary Loan (ILL)** is a great option. ILL allows you to obtain materials behind a paywall or located hundreds of miles away at little or no cost by borrowing them from another library. You can place orders for anything in the library's general collection such as articles (typically delivered as PDFs) and books (typically delivered in print). Content that can be delivered digitally can arrive in as little as two hours but orders that require an item to be shipped will take at least a few days to arrive. Digital content (PDFs) is yours to keep but physical items (like books) will be lent according to their home library's rules.

If you are having trouble locating physical items within a library (or your item is only available as a physical item because it has not been digitized), the easiest thing to do is call the library's main desk and ask for help, or check the library website for information about finding, borrowing, and requesting items in the collection. For example, check out the ISU library's page on Find, Borrow, Request to see options for ILL, physical, and digital items.

Saved Searches and Search Alerts

After you have spent some time using different databases, you will likely develop a preference for ones that have useful features and good results for your topic. One of those useful features is the ability to *save searches*. This is handy when you want to resume your previous work or need to revisit an older search. Some databases also have an option to automatically record your search history. This allows you

to review your entire search history for a topic, focus on the ones that were effective, and resume your work from there. You may also be able to set up an automated alert based on your saved search. Alerts have different options in each database, but they typically email you when there are new results that match your saved search. This can be useful for keeping track of fast-moving research and for ensuring you do not accidentally omit new papers after completing your literature review.

You will need to make an account with each database to use the save search and alerts features.

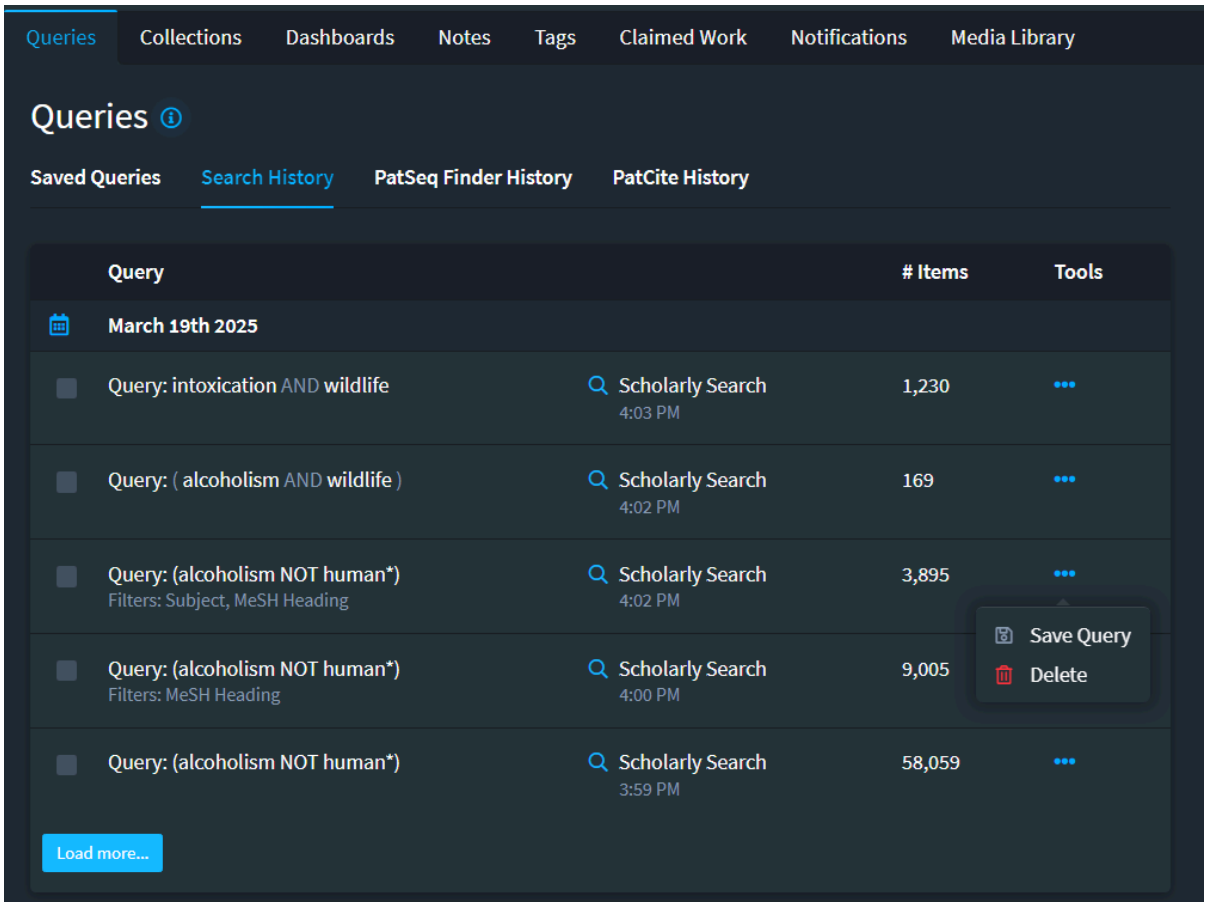


Figure 3.7 *Creating an account on Lens allows you to keep a record and review your search history. In the example pictured above we can see how the user started with the search string "alcoholism NOT human", was unsatisfied with the results, and eventually settled on "intoxication AND wildlife". Using the menu under the Tools column you can easily select a search to save.*

Reading Scholarly Materials

Once you have located and saved your sources, the next step is to read and analyze them. The reading and analysis you will do while searching for publications is less intensive than the reading and analysis you will do once you start writing your literature review. There are several different types of scholarly

materials, such as empirical studies, literature reviews, case studies, and theoretical articles, and each serves a different purpose. Knowing what they are, and how to use them to aid your searching can save you time and help you avoid unintentional gaps in your research.

Reading to Expand Your Search

Chapter 1 outlined some of the types of scholarly articles you might encounter during your search, such as **gray literature** and different types of literature reviews. Knowing what type of scholarly publication you are looking at will give you an idea of what sections to expect and in what order you might want to start reading them. Reading scholarly articles is not like reading your favorite book. It is likely you will need to read a scholarly article more than once, and sometimes, it is best to read the sections of a scholarly article out of order. While these different types of scholarly materials have different headings within them, almost all scholarly materials have one or more of the sections listed below. Understanding the content and purpose of each section will help you judge whether a publication is relevant to your research, give you an idea of how the paper fits into the larger context, and much more.

Common Sections Within Scholarly Articles

One of the best places to start is with the **abstract** of the paper. This is because the abstract summarizes the paper and gives you a general idea of what the authors were trying to accomplish, along with briefly describing their experiment or methodology, findings, and analysis. Reading the abstract can tell you if the paper is relevant to your research and whether it is worth your time to examine it more thoroughly. Similarly, the **conclusion** section offers a much more detailed version of the abstract. This is also a good section to prioritize reading first because it will let you know if and how the findings within the paper are useful to your research.

The **introduction** section provides context for the paper's research and claims within that field of study. For example, it may include definitions for special terminology or initialisms used within the paper, name key researchers within the field, and describe how the paper fills a gap in research within the field. This section is a good place to look for good references in context.

The **methods** section describes the specific processes and procedures used for the research project or experiment. This is where a systematic or systematized literature review article might provide the exact search strings used and the criteria for including or excluding results from those search strings. The **results** section details what the author(s) found and typically has several figures (such as charts and graphs) to highlight specific data or findings.

The **references** section provides a list of sources the author(s) used. From a searching standpoint, you can use this section as a curated list of relevant sources or as an indicator of the major voices within

the academic conversations on the topic at hand (at least, according to the paper's authors). It can also provide possibilities for future research topics.

Conclusion

Searching for scholarly literature is a foundational skill which takes time and practice to master. Understanding the databases and resources available to you will help you decide whether to start searching within a more general database or a specialized one. Subject librarians can be a big help due to their familiarity with the databases and database search features for their subject. Once you are ready to begin creating search strings, you now know of several search features and techniques to help you find relevant publications. Taking the time to document variations of your search strings as well as saving relevant articles or citations using citation management programs will help keep you organized and save you time in the long run.

Key Points

- General databases are a good place to start, but specialized databases will have more in-depth scholarly materials on a specific topic.
- All databases will have a simple search and an advanced search; however, databases can vary in the specific searching techniques they use.
- Most databases use Boolean operators and offer multiple options for filtering and limiting results.
- Subject librarians can help with identifying relevant databases as well as how best to search those databases.
- There are browser extensions that can help you access the full text of an article for free, but ILL is a good option as well.
- Reading scholarly sources is different from reading popular materials. It is often in your best interest to skip around the sections to make sure it is relevant to your needs before reading the whole article.

Resources

- *Citation Chaining with 3 Tools*, directed by Iowa State University Library, 2025, 07:25, https://www.youtube.com/watch?v=x9gxOwrIAF0.
- Iowa State University Library Instruction Services. "Search Techniques," in *Library 1600: Introduction to College-Level Research*. Iowa State University Digital Press, 2021. https://iastate.pressbooks.pub/lib160/part/chapter-3/.
- Purdue OWL. "Reading for Graduate School—Purdue OWL—Purdue University." Accessed September

29, 2025. https://owl.purdue.edu/owl/graduate_writing/graduate_writing_genres/graduate_writing_genres_reading_for_graduate_school.html.

4. Demystifying the Publishing Process

Megan O'Donnell

Publication of scholarly work is often considered a significant step in one's career. Publication signifies that your work is advanced enough to share with other professionals and that you have contributed to your field. Publishing during graduate school is a worthy goal, but the road to scholarly publication is complicated. This chapter provides an overview of how the scholarly publishing industry functions, the journal article publication process, communication with editors, publication costs, and how to locate a journal for your manuscript. **Open access** and **predatory publishers** are also contextualized and explained.

Glossary

Accepted manuscript (post-print): The final peer-reviewed scholarly manuscript accepted by a publisher. Accepted manuscripts contain the same information as the final published form but lack copyediting, typesetting and formatting.

Article processing charge (APC): A fee charged to authors by publishers to make publications open access. These fees typically replace journal subscriptions, which are paid by libraries, and are different from other charges a publisher might levy on authors such as page charges, color charges, and submission charges.

Artificial intelligence (AI): Artificial intelligence is a general term for machines and programs that can "reason, learn, and act in such a way that would normally require human intelligence or that involves data whose scale exceeds what humans can analyze."[1]

Copyright: A set of rights a creator of a work is entitled to by law. Copyright covers tangible works of creative expression such as writing, drawing, music, and even architecture. The main rights a copyright holder has are control over reproduction (copy, reprint), distribution (how it is accessed), public display and performance (where it can be played, and who can see it) and derivative works (spin-offs, translations). The copyright holder also has the right to transfer these rights, in whole or in part, to someone else.

Digital object identifier (DOI): A unique string of numbers and letters assigned to a digital object, such as a journal article or dataset. Unlike other URLs, DOIs are registered with a broker system that keeps the location of the object updated so it can always be found.

Generative artificial intelligence (gen AI): A type of artificial intelligence that uses large training datasets to create new content, such as text and images.

Gray literature: Literature created and distributed outside of the scholarly and retail publishing industries. Gray literature includes government documents, reports, blogs, theses, dissertations, pamphlets, newsletters, pre- and post-prints, and much more. Both print and digital materials can be gray literature.

Institutional repository: an online, typically open access, collection of research and scholarship that was produced at one institution. Universities, research institutes, and government agencies are examples of entities that provide this service.

Manuscript: In the context of scholarly publishing, a manuscript refers to the text submitted for review and publication. In a more general sense, it refers to unpublished text of any kind.

Monograph: A focused, lengthy, and in-depth scholarly publication that is typically authored by a single person. Monographs are often published as books due to their length. Monographs can be published by retail or scholarly publishers.

Open access: Online scholarly publications that are free of most licensing and copyright restrictions, which makes them free to read, download, reuse, and redistribute.

Peer review: The evaluation of an article or manuscript submitted to a journal by one or more independent researchers (sometimes called referees) within the same field to determine whether the work is worthy of publication. Referees evaluate the articles or manuscripts on their contribution to the field and the accuracy of the contents.

Preprints: An early draft of a complete scholarly paper. Preprints are typically copies of a manuscript that is later submitted to a publisher.

Preprint server: An online, open access collection of draft papers, e.g., **preprints**. Preprint servers are typically discipline-specific and run by non-profits, universities, or scholarly publishers.

Predatory publisher: An opportunistic publisher that exploits the academic need to publish. Predatory publishers may violate codes of ethics, do not follow industry best practices, or may simply be incompetent.

Retail publishing (trade publishing): The industry that produces written materials for a broad audience. Types of publications it produces include newspapers, magazines, and books (fiction and non-fiction, cookbooks, puzzle books, children's books, etc.).

Scholarly publications (scholarly literature): Literature written for a specialty audience that presents research results; this category includes journal articles, conference proceedings, books, and book chapters.

Scholarly publishing (scientific, research, or academic publishing): An industry that focuses on exchange of research and scholarship through a formal system of communication. Individual publications are records of knowledge-making and accomplishment, and function as part of an ecosystem of related knowledge through formal citation. The most common types of publications are journal articles, books, book chapters, and conference proceedings.

1. Google Cloud, "What Is Artificial Intelligence (AI)?," Google Cloud, accessed August 12, 2025, https://cloud.google.com/learn/what-is-artificial-intelligence, archived at https://perma.cc/35K7-TQTL.

Overview

Questions

- How does scholarly publishing work and how is it funded?
- What do I need to know before I submit a manuscript to a journal?
- What is the editor's role in the publication process?

Objectives

- Understand the basics of the scholarly publication process including the peer review process and the role editors play in approving or declining manuscripts.
- Understand how open access and scholarly publishing interact and the impacts on authors and readers.
- Successfully locate a journal that matches your research topic.

AI use in creating scholarly publications

Using **AI**, especially **generative AI**, in the preparation and creation of scholarly work raises several difficult ethical and legal issues regarding authorship, bias, copyright, methodology, interpretation, originality, research integrity, and more.[2]

There are strong arguments that gen AI technology can act as a valuable writing assistant by helping with grammar, word choice, translation, or sentence construction, but such tools can also be used to create content with gibberish, nonsense, and false information. To address this dichotomy, publishers and journals have started to release guidelines for use and reporting of GenAI technology in the creation of scholarly work, including for text, figures, and data analysis.

Before you begin your research, it would be wise to talk to your major professor about which technology you plan to use, for which tasks, and to what extent. You should also check the policies of your school and of any journals you plan to submit to as well.

What Is Scholarly?

Scholarly publications are different from other types of publications. In general, they are:

- written for other experts and practitioners in the same field;
- judged and scrutinized by peers before publication;
- focused on presenting new ideas, knowledge, or evidence obtained through rigorous and original research and scholarship;
- supported by citations that ground and provide evidence to the author's arguments or observations

This chapter primarily focuses scholarly *journal articles* because they are the most common and attainable publication for a beginning scholar to pursue. Even if you do not plan to publish a journal article, this chapter will be useful for understanding how scholarly information is made.

The Scholarly Publishing Industry

A publisher is an entity, typically a business, that prepares and sells media such as books, magazines, newspapers, and journals.[3] Sometimes their staff create the content they publish, but more often they accept submissions from independent creators such as novelists, cookbook writers, journalists, and academics.

The **scholarly publishing** industry focuses on the exchange of research and scholarship through a formal system of written communication. It is distinct from **retail publishing** which is the industry that publishes content to sell to a general audience. In retail publishing, authors seek out, or are offered, contracts to produce content on a particular topic. In contrast, scholarly publishers do not pay authors for article **manuscripts** which are the text submitted for review and publication.

Another key difference is that retail publications are made to sell for a profit, so only manuscripts and stories that editors think they can sell are published. Scholarly manuscripts do not need to be commercially viable to be published. Instead, they are vetted by an editor and then reviewed by the author's peers

2. Cornell University Task Force, *Generative AI in Academic Research: Perspectives and Cultural Norms* (Cornell University, 2023), 33, https://live-cu-research-innovation.pantheonsite.io/generative-ai-in-academic-research/, archived at https://perma.cc/U4RG-QMM9.

3. Publishers can publish all kinds of media, from the written word to movies and sound recordings but text publishing is the focus of this handbook.

(i.e., fellow practitioners of their discipline). If the research is solid and well-reported, then it is approved for publication. This process is known as peer review and it is a defining trait of scholarly publishing.

The Publication Process

There is a great deal of variety to be found among the thousands of scholarly journals available to read and publish in, both in their content, and in the particularities of their publication process. While the requirements and details of each journal's publication process are slightly different, they all generally follow the same general workflow.

Who Reviews Your Work?

Peers are only one of the groups who will review the work you submit for publication. In general, you can expect the following people to review your work after you have submitted it to a journal:

- **Editors (editor in chief, associate editor, section editor)** are responsible for setting and enforcing publication standards. They are the first people to review your work, and typically only read the abstract and cover letter. They check that the manuscript is formatted correctly and meets the journal's submission criteria. You should expect to communicate with editors throughout the review and publication process. Editors are typically experienced professionals in their field and some publishers provide them with monetary compensation.
- **Peer reviewers** are selected by the editor to thoroughly read and review your manuscript to ensure it meets the journal and field's rigor and reporting requirements. The job of a peer reviewer is to ensure that the research is original, meaningful, ethical, accurate, thorough, and well-reported. Peer reviewers do not receive compensation for their work and most forms of peer review are considered confidential, meaning they must not "us[e] information obtained during the peer review process for [their] own or another's advantage, or to disadvantage or discredit others."[4] Serving as a peer reviewer is considered service to the profession and it is not uncommon for fourth year PhD students and postdocs to serve as peer reviewers alongside researchers with decades of experience. The most common types of peer review, "single-anonymized" and "double-anonymized," do not allow for interaction between authors and reviewers, as identities are kept secret, but other forms, such as open-review, collaborative peer review, and post-publication review, do.[5]
- **Production editors and copy editors** review your manuscript after it has been approved for publica-

4. COPE, "Ethical Guidelines for Peer Reviewers, Version 2," September 1, 2017, https://publicationethics.org/guidance/guideline/ethical-guidelines-peer-reviewers.

tion. Their job is to ensure that your publication follows the journal's style guide, and to apply typesetting and layout styles. The level of service each journal provides for this varies, but you should expect them to make changes to your manuscript to accomplish this goal. Copyeditors can be staff members or freelancers employed by the journal.

Submission and Publication Workflow

There is a common saying in the United States that you can only pick two out the three: good, fast, or cheap. Good work done quickly is not *cheap*, good work done cheaply is not *fast*, and fast work done cheaply is not *good*. While the saying is a generalization, it is a useful truism for understanding scholarly publishing, which is not known for being fast or cheap, but is generally considered a *good* system, albeit one that is slow because it relies on unpaid (cheap) labor of peer reviewers.

Shepherding your manuscript—from submission to review through revision—can take a long time. Part of this is *demand*—the more submissions a journal receives, the longer it will take for your paper to get its turn—and part of this is by design—it takes time to find reviewers, for reviewers to provide comments, and for authors to revise their writing and analysis based on those comments.

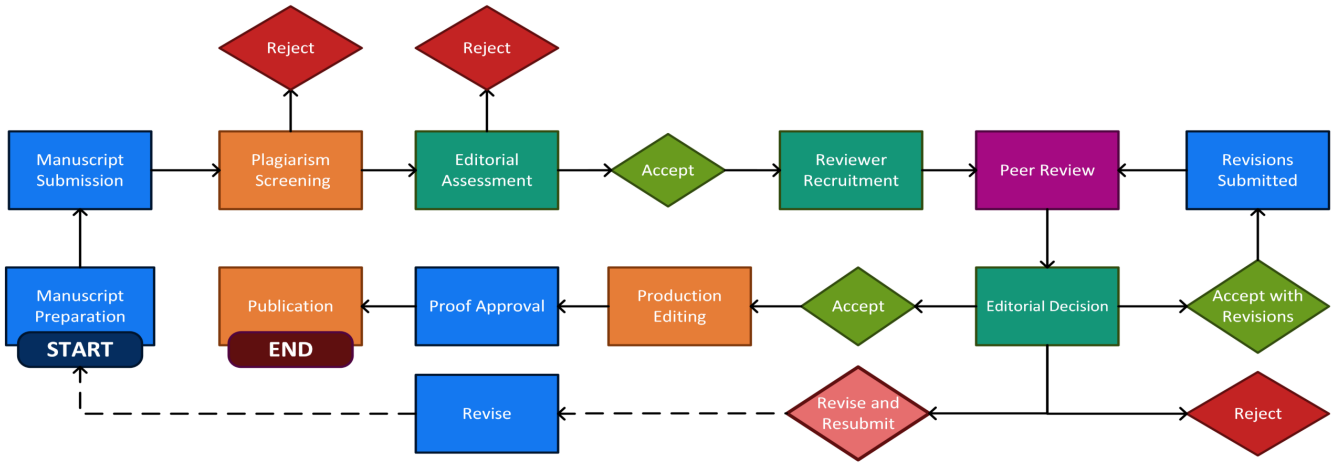


Figure 4.1 *This diagram displays a typical journal article publication workflow which includes three stages where rejection is possible: an initial screening (plagiarism screening, editorial assessment, and editorial decision); a peer review loop (editors can accept with no/minor/major changes, or send the manuscript through another round of peer review); and an optional "revise and resubmit" loop, which is a type of rejection that encourages the author to resubmit their paper after substantial changes are made.*

5. Diksha Devara, "The Various Models of Peer Review," *The Clean Copy*, October 10, 2023, https://www.thecleancopy.com/the-various-models-of-peer-review/, archived at https://perma.cc/YZ3Z-CQX6

What follows is a generalized overview of how an article manuscript becomes a journal article. The diagram in figure 4.1 provides a simplified version of the process that may help you understand at what stages a paper can be rejected and where, and how, a submission can be delayed.

1. **Manuscript preparation**. This stage is spent formatting your manuscript to meet journal criteria, such as citation style, line spacing, figure labeling, etc. (see Chapters 12–14). You will also need to write and prepare a cover letter to submit with the manuscript.
2. **Manuscript submission.** Submitting your manuscript and cover letter to the journal can be a lengthy process. You will need to enter information about authors (name, email, institution, etc.) as well as additional information (conflict of interest statements, funding information, acknowledgment, etc.) and files (appendixes, figures, supplements, etc.), as applicable into the journal submission system.
3. **Plagiarism screening.** In this stage manuscripts are screened for plagiarism using automated tools (see Chapter 9). Manuscripts can be rejected at this stage if large parts of the submitted manuscript are found to reuse text, whether that text is yours or someone else's. Mention in your cover letter if you are reusing your own unpublished work that has been previously used in a class assignment, or that you plan to include as part of your thesis or dissertation, to avoid a false finding of plagiarism.
4. **Editorial assessment**. A journal editor reviews the submitted manuscript and cover letter and decides whether they meet the journal's aim and scope. Submissions are generally reviewed in the order they are submitted. It may take longer than expected to complete this step if you submit to a popular journal.
    a. **Accept**. Editors accept manuscripts for peer review that meet the journal's aim and scope criteria and are correctly formatted.
    b. **Reject**. A rejection at this stage is called a *desk rejection* because the manuscript "didn't get past the editor's desk." The most common reasons for desk rejections are 1) because the manuscript was not formatted correctly, and 2) it did not meet the journal's stated aim and scope. Authors who receive a rejection at this stage should consider submitting to a different journal or revising the manuscript.
5. **Reviewer recruitment**. After accepting a manuscript, the editor locates experts in the field who are willing and able to review it. This step may take extra time to complete if reviewers are hard to locate or unavailable.
6. **Peer review**. Journals have different peer review criteria but broadly speaking, reviewers ensure the research is original, meaningful, and follows the standards of the field. Reviewers are typically given 2 to 4 weeks to review a manuscript, but this step may take longer if reviewers disagree, as a new reviewer may need to be recruited to break a tie.
7. **Editorial decision**. The editor reviews the peer reviewer's reports and decides what happens to the paper next. In general, one of four decisions is made:
    a. **Accept**. The editors and reviewers have found nothing to improve or correct and the journal will

publish the manuscript as it was submitted (this is uncommon but can happen).

b. **Accept with (major/minor) revisions**. Reviewers have found some areas to improve or correct before the article can be published.
    i. **Major revisions.** The requested changes are significant enough that after revision, the manuscript is sent through a second round of peer review, typically with the same reviewers.
    ii. **Minor revisions.** The requested changes are minor enough that the editor may work with the authors directly, rather than sending the manuscript through a new round of peer review.
c. **Revise and resubmit**. Reviewers and the editor have determined that substantial changes need to be made for the manuscript to be published in the journal. If you receive this verdict, you can submit your manuscript to a different journal or revise the manuscript to better fit the original journal's criteria. Either way, you must restart at step 1.
d. **Reject**. The manuscript has been deemed unfit for publication by the journal. The editor should include details on the reason for rejection and may supply reviewer feedback to help authors decide what to do next.

8. **Contract negotiation and signing**. After your manuscript is accepted you will be sent a publication contract to review and sign. These contracts outline the terms of publication as well as any fees that need to be paid. If you are publishing with a subscription journal, then your contract will likely include a transfer of copyright from you to the publisher. If you are publishing open access, then transfer of copyright is not typically part of the contract but the publisher may include language granting them exclusive licensing rights. See Section 4.6 to learn more about open access and Chapter 7 for details on publishing contracts, negotiation, and copyright.
9. **Production editing.** The manuscript is formatted following the journal's editorial style guide.
10. **Proof approval.** A preview of the formatted paper is sent to you for final review. You should review the proofs carefully to ensure that no errors were introduced during production editing, as this is your last chance to find and correct errors. Substantial changes are not allowed at this stage as they would invalidate the peer review and editorial decisions in steps 6 and 7.
11. **Publication.** The paper has been reformatted, finalized, and is available to read!

Advice from your Peers

While developing this chapter we reached out to the r/PhD Reddit community and asked, "what do you know now that you wish you knew before publishing your first paper?" While many of the answers have been incorporated into the content of this chapter, we have chosen some of the best to quote or paraphrase.

> *"It is quite likely that your paper will get rejected at least once and, sometimes a rejection is just an indication that that wasn't the right journal for your work. It's not personal—usually."*
>
> *"You are responsible for all work you produce. Peer reviewers cannot catch every mistake and often don't have time to double check your code and calculations for errors. Check your work carefully so mistakes aren't published."*
>
> *"I think students who want to publish a certain number of papers while in school would benefit from the knowledge that it can take a very long time to get a paper published and you can encounter delays at any step. I once had to wait 3-4 months to be sent my proofs."*
>
> *"Might be an unpopular opinion, but I like 'reviewer 2'. Authors may want to bypass quality control check or glorify the conclusions and implications etc. I think reviewer 2 is the one ensuring that the standard stays satisfactory."*
>
> *"The more you write and publish, the exponentially better you get. Your first paper is not the sum or the pinnacle of what you're capable of achieving."*
>
> *"I have a PhD in History. No matter how great you think your work is, the world doesn't change. If you die, the world continues. Stay humble and remember that it's mostly a personal endeavor done for self-satisfaction"*
>
> *"Celebrate submissions, not acceptance."*

Publication Delays and Early Access

Depending on how much of a backlog a journal has, steps 8–10 can take days, even years in extreme circumstances, to complete. To help with this problem, some journals issue an early release version of papers online without an assigned issue and volume. The name and details of this service vary, but most publishers release the last draft to pass peer review and assign the early copy a **DOI**, a unique string of numbers and letters that helps identify and locate cited works.[6] However, access to these early copies may be restricted to subscribers. **Preprint servers** and **institutional repositories** (see section 4.6) can solve both problems by offering early and open access to research that would otherwise get

6. For example, Wiley issues " early view " articles which have been through both peer review and copy/production editing.

caught in a slow publication process but they are not compatible will all journal policies (see Chapter 7).

Correspondence and Feedback

Throughout the submission and revision process, your primary point of contact with the journal will be through an editor. These professionals are experienced and published researchers, and they may work with a dozen or more submissions a day. For this reason, it is important to keep your communication with them respectful, clear, and concise. Similarly, while you may not correspond with your peer reviewers directly, it is important to keep in mind that they are fellow professionals who have volunteered their time to read and review your work.

For information on how to respond to editors, and revise your manuscript see Preparing to Publish, Chapter 7.

Cover Letters

First impressions matter, and cover letters are your chance to grab an editor's attention. Well-written cover letters quickly and clearly explain why the research matters and why the editor should be interested. At minimum, your cover letter should:

- Summarize your research, its importance, and its potential impact.
- Clearly explain how the research matches the journal's aim and scope.
  - Relating your work to recent papers published in the same journal is a good way to do this.
- Confirm that the contents of the manuscript have not been previously published.
  - You must disclose if the manuscript contains content used in a class assignment or presented at a conference, or if it comprises part of your thesis or dissertation. Most publishers are okay with these uses as they are not considered to be formal scholarly publications, but some do not allow it or may want additional information.
  - If you have made a preprint of the manuscript available, state where and when this was done and include a link.
  - If you are reusing someone else's work—such as a figure or chart—confirm that you have secured copyright permission to reuse it in your manuscript or that you believe your use constitutes fair use. More information on copyright can be found in Chapter 7.
- Confirm that all authors have approved the manuscript and its submission to the journal.
  - This ensures that your research has been conducted with integrity and that all authors have agreed to its publication.

Depending on the field and journal, you may also need to disclose funding award information, potential conflicts of interest, and your research methodologies. While writing a cover letter will probably feel like a chore, it is a good way to ensure you are submitting to a journal that is a good match for your research.

Reviewer Feedback and Revisions

In an ideal world, peer reviewers would only ever provide *constructive criticism* i.e., criticism that helps you improve your work. Peer reviewers who can explain not just what needs to be improved but how and why, without being insulting, are gems, and like gems they are rare and worth valuing.

Sadly, many of us have not been taught how to provide and receive constructive criticism. This results in peer review comments that can be frustratingly vague, strangely precise, inaccurate, or inscrutable. If you receive feedback like this, remember that peer review is *not personal* and *you are not alone*. In fact, getting less than constructive criticism is common enough that the term "reviewer 2" has become shorthand for the worst possible kind of reviewer: one who is critical but not constructive or helpful.[7]

If you receive a review from a "reviewer 2," don't panic. Take a step back and critically examine the feedback. Is there a grain of truth in their comments? Was something misread? Is their writing style more direct and blunter than you are used to? Is it a difference in opinion? Or are they truly being rude or unreasonable? Sometimes it can be hard to tell. Remember, you are under *no obligation to address every piece of feedback*. This is especially true if you feel the reviewers were rude or unable to be impartial in their review. When you submit your revisions, you should include justifications to the editor for why you have chosen not to address specific reviewer feedback. The editor, not the reviewer, has the final word, so if they agree with you the manuscript will be published despite a critical review.

Where to Publish

There are two ways to approach the task of matching your work with a potential publisher. You can choose a journal to publish in first and cater your research and writing to match their preferences, or you can locate a publisher after your research and writing are complete. Both are valid strategies. The former requires more familiarity with your discipline, but the latter may leave you with a paper that has no obvious home. This is why it is important to speak to your major professor about your publishing and research goals before starting a research project.

7. Song Jin's " How not to be the dreaded reviewer #2 " provides helpful reminders and guidance about how to provide constructive feedback during the review process while David Peterson's " Dear Reviewer 2: Go F' Yourself " is tongue-in-cheek research that shows that it's reviewer #3, not #2, is that it troublemaker. Both publications serve as a reminder that peer review feedback is often difficult to give and receive.

Database Searches and Analysis

You can easily identify which journals are publishing research on your given topic through database searches. The best way to do this is to use a database that has an *analyze your results* feature. Three databases that support this are Lens (open access), Scopus (subscription) and Web of Science (subscription). The practice activity, *Find journals in Lens*, will demonstrate how to use this feature to pinpoint possible journal matches.

Practice: Find journals in Lens

This activity will demonstrate how you can use scholarly databases to locate journals that match your given topic and introduce the "analyze results" function found in some databases.

1. Open a browser and go to https://www.lens.org/
2. Click Scholarly Works, then run a search using keywords that describe your research.
    a. Search for **"video games" AND "mental health"** if you just want to practice
3. Click the **Analysis** tab. The screen will refresh and should load a set of data visualizations based on your results. Look for the one titled "Top journals" (you may need to scroll to the bottom of the page).
4. Next, use **filters** to narrow your search and examine things such as:
    a. Restricting results to only the past 3-5 years.
    b. Restricting results to only journal articles.
5. When you are happy with your results click the chart's **Settings** button, click **Downloads**, and then choose **CSV**.
6. Open the CSV file using a spreadsheet or text file program. You should see a list of the journals from the chart and the number of matching results for each. You can use this file to take notes on journals that are a good match.

Another good way to look for possible publishing locations is in the literature you have already read. Things to examine include:

- What journals you read or cite the most;
- What journals are cited by the papers you are reading;
- Which journals you read but do not see cited;

By asking questions like these you should start to see a clear pattern emerge, one where only a few jour-

nals stand out. Comparing and combining these results with the results of a database search will give you a list of journals that are worth investigating in more detail.

Aim and Scope

After locating a few promising journals to investigate, you next need to read the fine print and check each journal's *aim* (goal) and *scope* (topic) statements. These statements establish the disciplines and topics the journal covers as well as its primary goals, which can range from publishing only a certain type of study[8] to providing a place to publish and share null or negative results in a particular field.[9] You should only submit to journals whose aim and scope match those of your paper, and your cover letter should address how your article meets these requirements. You can find a journal's aim and scope information on their website under headers such as:

- Aim and Scope
- Journal Information
- Criteria for Publication

Matchmaking Services

Many large publishers and some independent groups offer automated "matchmaking" services to help authors identify possible journals to submit to. These tools use machine learning and AI analysis techniques to compare your writing with articles their journals have previously published. These tools should be able to provide good recommendations, but keep in mind 1) tools owned by a publisher will only cover that publisher's journals, and 2) outside tools will be limited by what data (i.e., which journals) they were able to include, which typically biases them toward open access publications. So, use with caution, check the results, and do your own research.

Example matchmaking services:

- Edanz's My Journal Selector
- Taylor and Francis' Journal Suggester (publisher specific)
- Elsevier's "Match my abstract" option on their Find the right journal page (publisher specific)

8. *Systematic Reviews* aims to publish high quality systematic reviews on the topic of human health.
9. *Journal of Negative Results* aims publish ecology and evolutionary biology papers that are rigorous but do not pass significance testing thresholds.

Other Criteria

Journal metrics (see chapter 5) as well as the time it takes to publish and the cost to publish might also be criteria to consider when picking a journal to publish in (see *Preparing to Publish, Chapter 7*).

Open Access Publishing

Traditionally publishers have relied on selling journal subscriptions for income. While individuals can subscribe to journals, publishers make most of their money selling subscriptions to academic and research libraries. These subscription journals often require authors to transfer copyright and ownership of the final manuscript to them. This enables the publisher to control who can access, read, copy, and redistribute the content they publish. In other words, signing a contract with a subscription journal typically gives the publisher the right to place your work behind a paywall and limits how you can reuse your own work.

Both retail and scholarly publishing have traditionally asked or required authors to transfer ownership of their works, their **copyrights**, to the publisher (see Chapter 7). This makes sense in retail publishing, where authors are paid for their work but it makes less sense in scholarly publishing where authors, reviewers, and editorial boards are unpaid and publishers make immense profits.[10] This oddity is not a quirk, it is by design, and it is one of the primary motivators of the *open access movement* which seeks to make all online scholarly literature free to read, copy, reuse, and redistribute.

The Rise of Open Access

The open access movement can trace its roots back to the efforts of two groups of physicists who were trying to find ways to easily share digital information between research groups in the late 1980s and early 1990s. One led to the creation of the World Wide Web,[11] the other created a server where physicists

10. Yonghong An, Michael A. Williams, and Mo Xiao, "High Prices and Market Power of Academic Publishing Reduce Article Citations." *ProMarket*, April 24, 2024. https://www.promarket.org/2024/04/24/high-prices-and-market-power-of-academic-publishing-reduce-article-citations/, archived at https://perma.cc/RW75-B3LQ. Stephen Buranyi, "Is the Staggeringly Profitable Business of Scientific Publishing Bad for Science?" *The Guardian*, June 27, 2017. https://www.theguardian.com/science/2017/jun/27/profitable-business-scientific-publishing-bad-for-science, archived at https://perma.cc/B2BV-HTFJ.

11. "A Short History of the Web." n.d. CERN. Accessed August 23, 2024. https://home.cern/science/computing/birth-web/short-history-web.

could store and retrieve digital **preprints**,[12] early drafts scholarly papers **.** Both inventions were crucial to imagining a future where scientists and scholars could quickly and freely share their research with each other online rather than await slow moving, and limited, print copies. In the early 2000s three key meetings discussed, refined, and affirmed this vision and established the criteria that we now know as **open access**: online works of research and scholarship that are free to read, copy, reuse, and redistribute.[13]

Flavors of Open Access

While open access seems simple it has been difficult to implement at scale because it changes how the scholarly publishing industry is funded. For this reason, you will encounter different types of open access such as:

- **Green open access**: author posted preprints and accepted manuscripts.
- **Gold open access**: authors must pay their publisher a fee to make their work open access.
- **Hybrid open access:** authors may publish their work behind a paywall for free or pay a fee to their publisher to make their work open access. Subscription journals that offer an open access option use this model.

These terms typically describe the business model used by an open access publisher.[14] We'll cover gold and hybrid in detail later, as well as the economic implications of having authors pay to publish, but first we will look at how green open access works.

Green Literature Networks

Unlike a publisher, which *produces and sells* content, green open access relies on institutional repositories and preprint servers which *collect and archive* scholarly content. These collections are stable and reliable resources that are typically run by governments, research institutions, and nonprofit institutions. Unlike scholarly publishers, they primarily contain **gray literature** such as:

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12. You've probably head of this "server" which was renamed arXiv in 1998 and it is the world's largest and longest running open access scholarly archive.

13. Each meeting issued a statement in support of open access and these statements are still relevant today: 1) Budapest Open Access Initiative, 2) Bethesda Statement on Open Access Publishing, and 3) Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities.

14. Wikipedia does a good job of summarizing the different types of open access and includes less common types such bronze and diamond.

- **Preprints:** early drafts of a complete scholarly paper that has not undergone peer review.
- **Accepted manuscripts:** the final peer-reviewed scholarly manuscript accepted by a publisher.
- **White papers, technical reports, and progress reports:** documents that have not been officially published but contain information worth documenting and sharing.
- Research posters, presentation slides, and other forms of scholarly communication that are not formally published.
- Copies of *some* published content, (see "Piracy vs. Preprints").

Authors share their work through preprint servers and repositories for a variety of reasons. Sometimes authors choose to test ideas by releasing a preprint before submitting a manuscript to a publisher. Or the authors may wish to share preliminary work as quickly as possible before their manuscript enters a lengthy review process. Last, repositories and preprint servers can provide a way for authors who publish in journals that do not have an open access option to make a copy of their work open without violating publishing contracts. Many publishers have specific clauses that allow for this type of sharing but not all (see Chapter 7). While they may not have the final polished product, preprint servers and institutional repositories play an important part in the scholarly ecosystem as they make available content that might otherwise be lost or hard to find.

Piracy vs. preprints

While they may appear similar, *shadow libraries* such as Library Genesis, Sci-Hub, and Z-library are not the same as preprint servers and institutional repositories.

Preprint servers and institutional repositories respect copyright law and only distribute content with permission from the copyright holder, typically the author(s) or publisher. This limits what they can post, but everything on these sites is legal to read and download.

In contrast, shadow libraries distribute content regardless of copyright status and without permission. Their collections are large, but they are also illegal and should be avoided.

If you have difficulty obtaining legal copies of literature, *speak with a librarian*. Libraries work together nationally and internationally to share materials, and these services are typically cheap or free.

Before you share

Some fields have well-established repository and preprint practices while others are less receptive to the practice. Always research your options *before you publish* and double-check contracts *before signing* them, to ensure you are sharing your work legally and within the accepted norms of your field.

- **Before you publish:** Check the policies of the journal(s) you plan to submit to using Open Policy Finder to ensure they support preprints and always include information about where your preprint is posted (repository name, link, posted date, etc.) in your cover letter to avoid problems later in the review process.
- **After publication:** check the terms of your publication contract to see which version of your work you can share. Some publishers only allow sharing of preprints, others support both preprints and accepted manuscripts, and others do not allow either. Next check for additional requirements, such as including a full citation to the published version as well as a link. You can use Open Policy Finder to check, but your publication contract takes priority over this information.

Chapter 7 covers copyright and publishing contracts in more detail.

Open Access Publishers

In contrast to subscription publishing, works that are published open access can be read for free by anyone in the world. Publishing open access typically does not require the transfer of ownership and copyright. Instead, authors remain the owners of their work when they publish. This allows them to reuse their work after publication without having to ask permission from their publisher.

There are two primary types of open access journals:

- *Gold open access journals*: these journals are sustained by and make profits through **Article Processing Charges (APC)**, a fee charged to authors in exchange for publishing content open access. These fees replace subscriptions as the journal's main form of revenue and are different from other charges a publisher might levy on authors such as page charges, color charges, and submission charges.
- *Hybrid open access journals:* subscription journals that offer authors an option to make their work open, and retain ownership and copyright, in exchange for paying an APC.

Both types of journals provide access to their published papers for free. The only difference is how they are funded and who pays them.

If you are interested in pursuing open access options, start with these steps:

- Read this guide: to learn about the steps you will need to take. The steps include locating open access journals and publishers, evaluating options, acquiring funding, and more.
- Explore your **institutional repository**. Iowa State University's community can explore the Iowa State University Digital Repository.
- Check if your institution has its own press. Iowa State University's community can explore the Iowa State University Digital Press.
- Read your publishing contract carefully to ensure that the agreement with the publisher includes a non-exclusive license (see Chapter 7).
- Make an appointment with a university librarian to discuss your options or learn more.

Scholarly Publishing Economics

We have learned how subscription publishing differs from open access publishing, both in their funding models, and in who retains copyright over published content. However, there's one last part that needs to be discussed: why it is so expensive to both read and publish scholarly articles. The short answer is that the market for scholarly publishing is broken and lacks competition to keep costs both competitive and fair.

Academic journals are odd because *demand to read* has very little impact on their cost, there are no cheap alternatives to a research paper, each paper is unique, and results are not interchangeable.[15] There is an established monopoly in scholarly publishing, with just a few publishers publishing most of the world's research. A good analogy is the US internet provider market: there are only a few big providers for the country and each company has a regional monopoly which has kept prices significantly higher in the United States than other countries.[16] Grossman and Brembs estimate that it costs about US$195–$723 to professionally publish a scholarly article.[17] However, subscription prices cost about US$4,000-$5,000 per article, and open access articles cost about US$1,400-$2,200 per article on average.[18] So while open

15. Green open access is the closest we have, but subscription and hybrid publishers often prohibit participation to maintain the uniqueness—and cost—of their product.

16. Yarrow, Andrew L. 2021. "The Scandalous Cost of Internet in America." Milken Institute Review. June 17, 2021. https://www.milkenreview.org/articles/the-scandalous-cost-of-internet-in-america.

17. Alexander Grossmann and Björn Brembs. "Current Market Rates for Scholarly Publishing Services." preprint, *F1000Research*, July 1, 2021, https://doi.org/10.12688/f1000research.27468.2.

18. Alexander Grossmann and Björn Brembs. "Current Market Rates for Scholarly Publishing Services." preprint , *F1000Research*, July 1, 2021, https://doi.org/10.12688/f1000research.27468.2.

access publishing is cheaper than subscription publishing, open access publishing is still inflated and both kinds of publishers are profiting.

Driving Demand

Although *demand to read has* very little if any effect on the cost of a published article, there is a large demand *for publication* and this has driven prices up . Professional researchers and scholars are often required to publish by their employer and evaluated based on their publication record. Universities, for example, judge a faculty member's research performance based on several factors, including how many articles they have published, how often they have been cited, and the prestige of the journals that published their work. That last criterion is problematic as it conflates journal reputation with research quality which gives publishers a reason to charge higher prices. Perhaps the best example of this is that *Nature*, one of the world's longest running and most prestigious science journals, charges an APC of US$12,290, which is about seventeen times Grossman and Brembs' max estimated production cost and more than five times the average APC cost.[19]

Despite inflated prices, *demand to publish* has continued to rise and shows no signs of slowing. From 2003-2023, the number of science and technology publications increased by 170 percent[20] and, presumably to keep up with demand, the number of open access journals tripled between 2009–2021.[21] Unfortunately demand to publish and the invention of gold open access journals created an unexpected by product: predatory open access publishers.

Avoiding Predatory Publishers

As we learned earlier, scholarly publishing is an industry driven by the demand to *publish* rather than the demand to *read*. The industry is also unusual in that each publication is unique and one journal cannot substitute another. We also learned that open access publishing has changed the way journals are funded, with publishers collecting APCs from authors, rather than collecting subscription fees from

19. Nature "Publishing Options." Accessed July 2, 2024. https://www.nature.com/nature/for-authors/publishing-options.

20. Benjamin Schneider, Jeffrey Alexander, and Patrick Thomas, *Publications Output: U.S. Trends and International Comparisons*, Executive Summary NSB-2023-33 (NCES: National Center for Science and Engineering Statistics, 2023), https://ncses.nsf.gov/pubs/nsb202333/executive-summary.

21. Mikael Laakso, Lisa Matthias, and Najko Jahn, "Open Is Not Forever: A Study of Vanished Open Access Journals," *Journal of the Association for Information Science and Technology* 72, no. 9 (2021): 1099–112, https://doi.org/10.1002/asi.24460.

libraries. These changes have resulted in a system that is vulnerable to exploitation and predatory practices.

Predatory publishers are publishers who intentionally deceive or cause harm to authors and readers while pursuing personal gain or profit. Some of the most common predatory practices include:

- Failure to openly disclose publication fees;
- Fraudulently claiming to provide peer review services, or providing inadequate peer review services;
- Intentionally misleading people to believe a journal or publisher is affiliated with a prestigious organization;
- Failure to properly archive and maintain published works over time (i.e., your work could disappear);
- Lack of misconduct policies and procedures;
- Fake or inaccurate editor and reviewer lists.

Predatory open access journals—which charge authors money in exchange for substandard publication—are what is typically meant when one hears the term "predatory publisher," but there are other flavors of predatory publishing including:

- Predatory conferences and meetings;[22]
- Exploitive book publishers, called "vanity presses";
- Paper mills, in which authors pay unscrupulous editors to publish poor quality papers in legitimate journals to artificially inflate the authors' publishing record.[23]

While all of these are legitimate concerns, predatory open access journal publishers are the most common and the focus of this section. To be clear, *open access publishing is not inherently predatory*. Predatory publishers are defined by their intent to exploit and deceive, not their funding model.

22. Christine Ro, "What Is It like to Attend a Predatory Conference?," *Nature* 631, no. 8022 (2024): 921–23, https://doi.org/10.1038/d41586-024-02358-w.

23. Frederik Joelving, "Paper Mills Are Bribing Editors at Scholarly Journals, Science Investigation Finds," *Science*, January 18, 2024, https://www.science.org/content/article/paper-mills-bribing-editors-scholarly-journals-science-investigation-finds; Holly Else and Richard Van Noorden, "The Fight against Fake-Paper Factories That Churn out Sham Science," *Nature* 591, no. 7851 (2021): 516–19, https://doi.org/10.1038/d41586-021-00733-5.

Vanity presses

Exploitive book publishers, often called vanity presses, have existed for a long time. While not all are predatory, the Society of Authors and the Writers' Guild of Great Britain have found that most of these presses offer services that are not what most authors would consider trustworthy. After you graduate you may be contacted by these businesses regarding the publishing your thesis or dissertation, so exercise caution.

Identifying a Predator

Identifying a predatory publisher is not easy. There are different publishing norms across cultures and disciplines, and it can be difficult to know if what you have observed is a quirk of the community, a mistake, or intentionally predatory. Professor Jörg-Rüdiger Sack sums up the problem well:

> *"Whether or not a journal is predatory is not a binary decision; there is a broad spectrum of predatory journal behaviors. To assess whether a journal should be considered predatory, a number of parameters need to be considered, often in combination. Analogously for publishers, while some publishers clearly exhibit general predatory behavior, others may publish a mix of journals—some definitely predatory, some less so, yet others not. This often depends on the strength and independence of editorial boards."*[24]

Because this is complicated matter, the best way to determine whether a journal is predatory is *to do your own research*. Read articles from previous issues, check the editorial board, and review journal policies. If everything is well-written, clearly presented, and research is good quality then that is a good sign! On the other hand, if you cannot find policies, the editorial board seems off, and the research in past articles is not great, then that is not so good. If your review unearths both good and bad practices, then the best thing is to check with a peer or a librarian who can offer a second opinion before deciding.

Details on different types of predatory publishers, as well as a list of warning signs of predatory practices can be found on the Iowa State University Library's Understanding Predatory Publishers guide.

Summary

Scholarly publishing is a complex enterprise. It takes many steps to see an article through publication

24. Wim Meester, "The Guardians of Scopus," Elsevier Connect, February 10, 2021, https://www.elsevier.com/connect/the-guardians-of-scopus.

and the cooperation and work of multiple people other than the authors. Peer review is a critical step, but a lengthy one that improves the final manuscript. Knowing how to communicate with an editor is key to getting through the process, as is knowing your options for publishing: subscription or open access. Last, scholarly publishing is expensive and vulnerable to exploitation so it is important to do your own research before you submit to ensure you are publishing with someone you trust.

Resources

- Cotos, Elena, et al. *Preparing to Publish*. 2nd ed., Iowa State University Digital Press, 2026, https://doi.org/10.31274/isudp.2026.252.

Scholarly Publishing Industry and Open Access

- Buranyi, Stephen. "Is the Staggeringly Profitable Business of Scientific Publishing Bad for Science?" *The Guardian*, June 27, 2017. https://www.theguardian.com/science/2017/jun/27/profitable-business-scientific-publishing-bad-for-science, archived at https://perma.cc/B2BV-HTFJ.
- Elder, Abbey. "Open Access Publishing: Where to Start," Iowa State University Library Research & Course Guides, https://instr.iastate.libguides.com/OApub
- Van Noorden, Richard. "Open Access: The True Cost of Science Publishing." *Nature* 495 no. 7442 (2013): 426–29. https://doi.org/10.1038/495426a.

Predatory Publishers

- O'Donnell, Megan. 2025. "Understanding Predatory Publishers," Iowa State University Library Research & Course Guides. Last modified September 12, 2025. https://instr.iastate.libguides.com/predatory/intro.
- Ro, Christine. 2024. "What Is It like to Attend a Predatory Conference?" *Nature* 631 (8022): 921–23. https://doi.org/10.1038/d41586-024-02358-w.
- Ruen, Matt and Teresa Schultz, hosts. "Problematizing 'Predatory' Publishers." SPARC OA 101 series. Webinar. 1hr 29 min 59 sec. Posted May 23, 2025. https://youtu.be/IEhNqOC_1UU.
- Shen, Cenyu and Leena Shah. "Predatory Publishing Practices: What Researchers Should Know before Submitting Their Manuscript." *Insights* 36 no 1 (2023). https://doi.org/10.1629/uksg.631.

Key Points

- Scholarly publishing specializes in disseminating research papers and uses a peer review system to ensure quality.
- Peer reviewers are volunteers who provide feedback on papers and advise editors on if a paper should be revised, rejected, or published.
- Editors are experienced professionals in their field and set and enforce publication standards.
- A journal's aim and scope statements define what type of research it publishes and can be used to help you locate a match for your manuscript.
- Open access publishing typically involves paying a fee but you may also be able to make a preprint or accepted manuscript available open access through a preprint server or institutional repository.
- Always investigate a journal before submitting to avoid predatory publishers.

5. Research Impact

Megan O'Donnell

This chapter focuses on the professional aspects of research associated with achievement, assessment, and networking. First, we will explore how scholarly achievement is tracked and measured using **research metrics**. We will also examine how **open access** maximizes readership, which can boost metrics scores, and how sharing other outputs (such as data or code) can also boost impact. Last, we will look at how **persistent identifiers** (PIDs) and **online social networking** can boost both your visibility.

Glossary

Altmetrics: Alternative research impact metrics that use the number of views and downloads a work has received as well as press coverage and social media "buzz" rather than using more traditional measures of research impact (see definition).

Institutional repository: A collection of scholarly research created by the institution it represents. Institutional repositories often contain both gray literature (such as dissertations, reports, and preprints) as well as copies of officially published and peer-reviewed materials.

Online social networking (social networking): The process of connecting with other people through online tools and messages.

Persistent identifier (PID): A digital reference to an object, person, or organization which remains consistent despite changes to where the information is digitally stored. A **DOI** is a type of PID that is used for "digital objects" such as journal articles, digital images, and datasets.

Preprint server (preprint repository): A free online collection of gray literature. There are preprint servers that serve specific countries, regions, and disciplines as well as multidisciplinary and general-purpose servers. Wikipedia has a list of over seventy different preprint repositories that you can explore to find one relevant to your area of study.

Research impact (scholarly impact): Observable changes that happened because of a piece of specific research or scholarship. Impact can happen within the research community and beyond it by influencing government, culture, industry, or research practices.

Research metrics: Measurements that attempt to quantify the research impact (see definition) of typical products of scholarly work.

Overview

Questions

- How is research success measured and evaluated?
- What are the benefits and drawbacks of publishing open access?
- How do I engage with other professionals online?

Objectives

- Understand how research metrics are calculated, how they are used and their limitations.
- Be able to judge a journal's reputation using multiple measures
- Explore and locate online professional networks for your field.

Measures of Scholarly Achievement

Understanding and measuring the impact research and scholarship has *outside of* and *within academia* is difficult. All of us would like others to read, appreciate, and benefit from our work but not all of us work in areas where **research impact** is easy to observe. The impact of new, life-saving medical treatments can be measured by counting the number of positive treatment results, but the impact of the discovery of a new-to-science beetle is harder to quantify and observe.

Research metrics—measurements of research impact—have emerged as a useful tool for addressing this problem. They provide unified quantitative measurements to help us understand how "important" or "impactful" research is. Metrics like these can be used by university administrators to evaluate how well their faculty members, departments, and entire school are performing compared to peer institutions and may be factored in when considering a grant award. They can also be used to compare journals and individual papers or by graduate students looking for a potential mentor or employer. There are many metrics available—from citation counts to various indexes—and strong opinions on how much they matter and how they should be used. In this section we'll look at three of the most common research metrics—Journal Impact Factor, citation counts, and h-index—to introduce you to how they are calculated, what they mean, and how they are used and misused.

Journal Impact Factor: a Journal-level Metric

Journal Impact Factor (JIF, or commonly *impact factor*) is arguably the most well-known research metric. JIF compares the number of articles a journal publishes in a year with the number of citations the same

journal received during the two prior years. In short, it is a rough estimate of *the average number of citations journal articles might receive two years after publication* in a particular journal.[1] This is a useful number for understanding how "active" a journal is—how often its content is read and cited—but it is a poor predictor of the number of citations an article is likely to obtain, because citations are not evenly distributed.[2]

JIF can be used effectively and appropriately to help librarians choose journals to subscribe to and for comparing how often journals—not articles—are cited. It can also be used to compare journals within a disciplinary field. However, JIF is most often misused as a measure of journal *prestige* and *quality* rather than *activity*. This has led to JIF being misused as a proxy measure of quality for individual papers, and by association, of author, lab, and school quality and prestige. This is why journals advertise high JIF scores, and you may find them in resumes, and tenure and job applications. These misuses are prevalent and despite multiple attempts to dethrone it, JIF still reigns supreme.

While the process for calculating a journal's impact factor is relatively simple, not all journals have a JIF. This is because Clarivate, the company that issues JIF scores, has strict criteria for inclusion. Furthermore, the phrase "journal impact factor" is trademarked which means publishers cannot calculate and issue it themselves. There are various reasons a journal may not be assigned a JIF, including being too new or having ethics violations, so the presence or absence of a JIF should never be used as the sole measurement of journal quality.

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1. Two years is considered an adequate amount of time for most new papers to be cited but a five-year JIF score is also available for disciplines that publish at slower rates.

2. "Dissecting Our Impact Factor." 2011. Nature Materials 10 (9): 645. https://doi.org/10.1038/nmat3114.
Nielsen, Mathias Wullum, and Jens Peter Andersen. 2021. "Global Citation Inequality Is on the Rise." *Proceedings of the National Academy of Sciences of the United States of America* 118 (7): e2012208118. https://doi.org/10.1073/pnas.2012208118.

Impact factor criticisms and controversies

The problems with Journal Impact Factor go deeper than misuse; there is also controversy over which journals receive them, which data is used or omitted in its calculation, the transparency of the calculations, and JIF's outsized role in journal reputation.

Recently, the publisher *eLife* adopted an experimental publishing model that incorporated aspects of preprint repositories (see Chapter 4 for more information on preprints).[3] Nearly two years after implementation, Clarivate, the owner of JIF, decided that this new model does not meet its peer review standards and *eLife* will no longer receive a JIF score. *eLife* expects this will negatively impact the number of submissions it receives because JIF is misused in promotion and tenure applications.[4]

How to Locate JIF Scores

JIFs are included in Clarivate's Journal Citations Report, which is a subscription product. Instructions on how to use it and other journal-level metrics are available on the Iowa State University library's Journal Evaluation Tools guide.

How to Use Journal Impact Factor Scores

Never use a JIF score to evaluate the merit of an article. JIF can be used—with other journal metrics—as a proxy measure of how selective or prestigious a *journal* is.

JIF scores range from over 500 to less than 1. Each discipline will occupy a narrow band within this range based on publication schedules, citation culture, and number of active authors and journals. Medical and multidisciplinary journals typically have the highest JIF scores because they publish frequently, have large authorship pools, and accumulate large numbers of citations. Smaller fields, or fields that publish less frequently, will have JIF scores on the lower end of the total range.

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3. "Publishing and Peer Review at eLife · eLife." n.d. eLife. Accessed December 16, 2024. https://elife-container.pubpub.org/peer-review.

   Brainard, Jeffrey. 2022. "Journal Declares an End to Accepting or Rejecting Papers." *Science (New York, N.Y.)* 378 (6618): 346. https://doi.org/10.1126/science.adf4964.

4. Brainard, Jeffrey. 2024. "Open-Access Journal eLife to Lose 'Impact Factor.'" *Science (New York, N.Y.)* 386 (6724): 839. https://doi.org/10.1126/science.adu7465.

Citation Counts: a Publication Level Metric

Citation counts are one of the most direct metrics for understanding the impact of scholarly publications. The math is simple: it is the total number of citations a publication has accumulated to date. Despite simple math, citation counts are notoriously difficult to calculate. As we saw in Chapter 3, each database contains different content. This means that even the most comprehensive database cannot provide 100 percent accurate citation counts and, since there is often significant overlap between databases, you also cannot add counts from different databases together to get a total count. Instead, accurate counts require examining and combining data from multiple sources. The practice activity *Citation count cleanup* gives you an introduction into how to process citation data for this purpose and some of the errors and complications you may encounter.

How Locate Citation Counts

Scholarly databases are your best sources for citation count data. The process for locating and downloading the data is slightly different for each but the Iowa State University Library's Promotion and Tenure Resource Guide has instructions for some of the most popular databases.

How to Use Citation Counts

Citation counts are affected by several well-known biases and shortcomings. First, scholarly databases are limited in scope and typically only include officially published, widely distributed scholarly content, which means citations from research reports, theses and dissertations, government publications, preprints, books, popular press content, and smaller publishers are omitted. As such, citation counts are best thought of as a measure impact *within the research community*, and not beyond it. Another shortcoming is that newly published works should never be judged by a citation count, as it typically takes at least a year, and often more, for a work to be cited. Citation distribution is also biased and favors well-published authors over new authors, men over women, and papers written in English over those in other languages.[5] While imperfect, citation counts are still the best direct indicator of how influential a publication is.

5. Davies, Sarah W., Hollie M. Putnam, Tracy Ainsworth, Julia K. Baum, Colleen B. Bove, Sarah C. Crosby, Isabelle M. Côté, et al. 2021. "Promoting Inclusive Metrics of Success and Impact to Dismantle a Discriminatory Reward System in Science." PLoS Biology 19 (6): e3001282. https://doi.org/10.1371/journal.pbio.3001282Di Bitetti, Mario S., and Julián A. Ferreras. 2017. "Publish (in English) or Perish: The Effect on Citation Rate of Using Languages Other than English in Scientific Publications." *Ambio* 46 (1): 121–27. https://doi.org/10.1007/s13280-016-0820-7Ray, Keisha S., Perry Zurn, Jordan D. Dworkin, Dani S. Bassett, and David B. Resnik. 2024. "Citation Bias, Diversity, and Ethics." *Accountability in Research* 31 (2): 158–72. https://doi.org/10.1080/08989621.2022.2111257

Last, as covered in Chapter 2, citation counts are neutral and do not consider *why* an author is citing a paper. Citations typically support arguments or point to evidence or examples, including papers that have been retracted[6] so it is important to remember that impact or influence is not always positive.

6. Piller, Charles. 2021. "Many Scientists Citing Two Scandalous COVID-19 Papers Ignore Their Retractions." American Association for the Advancement of Science. March 8, 2021. https://www.science.org/content/article/many-scientists-citing-two-scandalous-covid-19-papers-ignore-their-retractions.Woo, Seokkyun, and John P. Walsh. 2024. "On the Shoulders of Fallen Giants: What Do References to Retracted Research Tell Us about Citation Behaviors?" *Quantitative Science Studies* 5 (1): 1–30. https://doi.org/10.1162/qss_a_00303

Practice: Citation count cleanup

Because there is no definitive source for citation counts you will probably need to track your own data to document citations accurately. The easiest way to do this is to export and combine search results from different databases.

In this activity we'll examine how many citations this article has received since its publication through December 2024, using five different databases:

> *Christina J. Campbell, Aleksey Maro, Victoria Weaver, and Robert Dudley, "Dietary Ethanol Ingestion by Free-Ranging Spider Monkeys (Ateles Geoffroyi)," Royal Society Open Science, ahead of print, The Royal Society, March 16, 2022. https://doi.org/10.1098/rsos.211729.*

Below are the citation counts from each database when this book was published:

- Dimensions: 10 citations
- Google Scholar: 11 citations
- Lens: 1 citation
- Scopus: 7 citations
- Web of Science: 6 citations

Activity

1. Download ch_05_Practice_Citation-Counts_raw.xlsx and open it on your computer using Excel or another spreadsheet program of your choice (the instructions below are written for Excel).
2. Take a few minutes to explore the data. Each tab contains the raw, downloaded citation data from the database noted in the tab. You will quickly notice that each database formats their data differently.
3. Create a new tab. This will be where we combine the data. The core attributes we need to analyze the data for citations counts are:
    - Source (i.e., database name)
    - Authors
    - Article title (or "title")
    - Publication year (or "PubYear" or "year")
    - Source title (or "publication")
    - Document type (or "Publication type")
    - DOI

Add matching headers to your new spreadsheet for each attribute.

4. Copy the matching data from each of the database tabs into the new worksheet, filling in the name of the tab the data came from in the "source" column. When you are done you should have 36 rows of data, including the column labels (row 1).
5. Select all the data. Go to the Data tab on the ribbon and click Sort. Choose to sort by Article Title, A to Z and Source Title, A to Z, and make sure the "My data has headers" box is checked.
6. Now that the data is sorted by article and source, we can quickly see both duplicate and missing val-

ues. Because DOIs are unique, and less prone to typos, this is the best field to use to screen for duplicates. However, because Google Scholar's data did not include DOIs we first need to fill in as many of those missing values as possible. Go ahead and do that for the nine rows of Google Scholar data that is duplicated in another database.

7. Select all the data. Click the Remove Duplicates button in the Data tab. Ensure the "My data has headers" box is checked, then check the box next to "article title" and "DOI" and none of the others. You should have 15 rows of data left, including the header. A quick scan of the data will reveal that one set of duplicates was not removed. Go ahead and remove it by hand and you will be left with fourteen total rows and thirteen unique citations.

At this stage the next step would be to review each citation to ensure it's valid. In this case, there are three mistakes in the data:

- "Alcohol discrimination and preferences in two species of nectar-feeding primate." (DOI: 10.1098/rsos.160217) This citation is a mistake since it was published six years before Campbell et al. (2022) and should be removed.
- "Exploring Early Career Teacher Attrition and Career Switching in Higher Education: A Narrative Study" (DOI: 10.70315/uloap.ullli.2024.0101002): this citation came from *Dimensions*. The publication date is within range, but the topic is wrong and is not a valid citation when checked against the actual paper so it should be removed.
- "Recuperación de contraseña Recupera tu contraseña" (no DOI). This citation came from Google Scholar. It is a valid citation from a Spanish language wine publication, but Google Scholar is linking to the wrong article.

You can check your work by reviewing the "final list" workbook within Practice Citation Counts workbook.

After all that work, we have 12 unique and valid citations. One more than Google Scholar reported, three more than *Dimensions* reported, and *nearly double* what Scopus and Web of Science reported. As this practice exercise has demonstrated, there is a lot of inconsistency and noise in citation data, even from trusted sources, and it can be well worth your time to investigate it, especially if you need to report citation counts for assessment.

H-index: an author level metric

H-index is a metric that can be used to compare an author's publication performance against other authors. An author's h-index number indicates that an author has written *h* number of papers, and each paper has at least *h* citations. For example, a score of 3 means that an author has written three papers and all of them have been cited at least three times.

To calculate an h-index, create a list of all an author's publications, from the most cited to the least cited (works with zero citations are omitted). Next, compare the number of citations against its position on the list. The *work lowest on the list with more citations than its rank* is the author's h-index. This example is for a researcher with five publications with citation counts of 54, 30, 6, 1, and 1.

Table 5.1 H-index is best calculated by making a list. This example shows the number of citations a fictional author has received for their five (total) publications.

Article number	Citations
1	54
2	30
3	6
4	1
5	1

This author's h-index is 3 because their third work is the last one with a citation count (n=6) greater than the paper's position on the list (third).

How to Locate H-index Scores

As shown above, h-indexes can be calculated by hand, but most authors rely on scholarly databases to calculate it for them. Databases with author profiles (such as Google Scholar, Lens, Web of Science, and Scopus) all provide h-index calculations based on the papers and citation counts present in the database *and* associated with the author's profile.

How to Use H-index Scores

Like JIF, h-index scores are only comparable to those within the same discipline, because of differences in publication and citation frequency as well as authorship rules. H-index is also biased toward established authors, as only papers with citations are used in the calculation and citations take time to accumulate. The h-index also rewards authors that publish frequently over those that produce fewer and deeper works (such as review articles and books) or who publish more selectively. In short, because an h-index score oversimplifies an author's publication record it should never be used as the sole criteria to judge someone's publication performance. Like JIF, it is often asked about or included on academic CVs and resumes.

Research Metric Reform

The three examples of research impact—JIF, citation counts, and h-index—have hopefully clarified how research metrics are used as well as their shortcomings and weaknesses. At this point we will address why they are used in individual evaluation. The answer is that academia and research do not operate in a bubble, they are part of a greater national and international economic market and as Hasselberg elegantly stated:

> *Governments want their national universities to increase their productivity. This means that they want to spend less money per unit produced. They want teachers to teach more students for less money. They want less waste of time and resources. They want researchers to be more productive in terms of publication. Above all they want research that contributes directly to the GNP [Gross National Product].*[7]

In short, the pressure to show a return on investment—be it time, money, or something else—is the driving force behind research metrics. This has created a "publish or perish" environment that rewards publication quantity over quality and encourages questionable ethics and misconduct to get ahead.[8]

In 2013, a group of researchers attempted to address this problem by issuing the Declaration on Research Assessment (DORA) which contained eighteen recommendations; chief among them was that for journal-based metrics be eliminated from individual evaluation. DORA is more than ten years old now, and while there has been progress, research metric reform is still a contentious topic and journal metrics remain in use.

Altmetrics

While research metrics primarily track citations within other scholarly publications, **altmetrics**, or alternative metrics, look at other measures of impact such as the number of views and downloads a work has received, as well as press coverage and social media "buzz," to try to provide a more balanced perspective. For example, a paper with no citations but thousands of downloads shows evidence it is being *read*. This can be helpful for highlighting newer publications that have not accrued citations or for showing impact beyond academia, as members of the public and industry and government employees read papers too.

Playing and Gaming the System

As you advance in your professional career you will become more aware of how research metrics are used and how they can influence your choices and career goals. Like all systems that use counts and formulas, there are strategies that can be used to raise your research metrics. Some of these are completely ethical (such as the choice of which journal to submit to); others, such as citing papers only to

7. Hasselberg, Ylva. 2012. "Drowning by Numbers." Confero Essays on Education Philosophy and Politics 1 (1): 19–44. https://doi.org/10.3384/confero13v1121207a.

8. Wesel, Maarten van. 2016. "Evaluation by Citation: Trends in Publication Behavior, Evaluation Criteria, and the Strive for High Impact Publications." Science and Engineering Ethics 22 (1): 199–225. https://doi.org/10.1007/s11948-015-9638-0.

increase citation counts[9] or using AI to quickly produce many low-quality papers, are not. There is at least one simple way to increase citations that is both ethical and legal: publish open access.

Open Access Advantages

As discussed in Chapter 4, the goal of open access is to make scholarly publications free to read, copy, reuse, and redistribute. Publishing open access can also boost your research metrics. In this section we will discuss how to use open access to meet career goals.

Before you share

Some fields have well-established repository and preprint practices while others are less receptive to the practice. Always research your options *before you publish* and double-check contracts *before signing* them, to ensure you are sharing your work legally and within the accepted norms of your field.

- **Before you publish:** Check the policies of the journal(s) you plan to submit to using Open Policy Finder to ensure they support preprints and always include information about where your preprint is posted (repository name, link, posted date, etc.) in your cover letter to avoid problems later in the review process.
- **After publication:** check the terms of your publication contract to see which version of your work you can share. Some publishers only allow sharing of preprints, others support both preprints and accepted manuscripts, and others do not allow either. Next check for additional requirements, such as including a full citation to the published version as well as a link. You can use Open Policy Finder to check, but your publication contract takes priority over this information.

Chapter 7 covers copyright and publishing contracts in more detail.

The Benefits of Open Access

Open access comes with readership and citation advantages. Depending on your field and topic, it may be important to provide easy access to your work for others. This includes fellow students and academics, but also members of the public, government workers, medical practitioners, and more. Making your work openly available online, through preprints or publishers, increases and diversifies readership,

9. "Citation cartels" are one such unethical phenomenon tied to scholarly publishing and evaluation where authors make a pact to inappropriately cite each other to boost their numbers.

which results in more citations overall and from more geographic regions.[10] Open access publications can also strengthen a résumé or CV by giving reviewers a chance to evaluate your work firsthand—the last thing you want is to frustrate a reviewer with a paywall!

Open access not only helps equalize information access, it also helps you retain control of your work. Subscription publishing contracts typically require that the author transfer ownership of their work to the publisher. In contrast, most open access publishing contracts use a system where authors give permission for the publisher to distribute their work rather than transferring ownership (see Chapter 7 for details). By retaining control of your work, you can share it with whomever you want, when you want and can reuse it new ways (such as in a thesis or dissertation chapter) without needing to ask permission first.

Open access is not only for journal articles. You can also publish books and book chapters open access, as well as data, code, presentations, and posters. Sharing different outputs attracts different audiences and can highlight different skill sets. Datasets can showcase organization and documentation skills, while posters can highlight your ability to communicate visually and concisely. There is also research showing that papers with open data are cited more often and that data papers—which are about datasets, not research results—promote data reuse, which results in more citations.[11] In short, work that is open is work that can be found, explored, read, and reused, which benefits both authors and readers. Sharing more also lets you link your work together, creating a linked showcase that can be accessed by tools, not just people.

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Persistent Identifiers (PIDS): The Power of Linked Data

A **DOI** is a **persistent identifier (PID)** used for digital objects such as journal articles, software, and datasets. You have likely seen DOIs in citations and clicked them to access articles. However, PIDs are more than hyperlinks. The unique identifier, typically a nonsense string of letters and numbers, is tied to a detailed record and the web address is only a small, but vital, part of it.

Unique ids are nothing new. Databases run on them, as do point of sale systems, inventories, and museum collections. The linked record behind the identifier is what makes PIDs special and powerful. The record contains more than an up-to-date web address; it also describes what kind of thing the identifier is assigned to. These records are maintained independently from the content they describe and can be updated to "point" to a new web address. This means that if a record is kept up-to-date, a change in ownership or a new website design does not break a PID link. This is especially important for the maintenance of the scholarly research record which uses citations to link to related information and evidence and why most journals and books have DOIs assigned to them. This is also why you should always include a persistent identifier, such as a DOI, in your citations whenever possible. Because they are persistent and digital, PIDs can do much more than just bring us to a web address, they can be used to build digital maps of connections between *things*, including *people*.

ORCID: A PID for People

Your name is often not only *your* name, it is probably shared by other people with the same, or a very similar, name. Or maybe it is hard to spell, or to type, or is too long for most forms. As a scholar, relying on only a name to identify you can also cause problems with citations (which often abbreviate names) and this carries over into scholarly databases which in turn, affects research metrics.

Take the names *Charlie Longfellow* and *Cooper Longfellow*. The first names are different but when abbreviated they are the same. This means a paper authored by a *C. Longfellow* could be by, and attributed to, either author. Similar names also cause confusion when trying to determine who someone is. Authors do not typically work for one institution their entire career. For example, it can be hard to know if the C. Longfellow who got their PhD at Iowa State in 2016 is the same C. Longfellow who worked at UC Davis in 2025.

ORCID, which stands for Open Researcher and Contributor ID, was created to solve this problem. ORCID provides two important functions. First, it gives authors a unique way to identify themselves and to associate their educational history, employment, and publications with a unique ID. This helps journals, databases, individuals, and tools verify and disambiguate authors with similar names. Second, your ORCID record can be set up to automatically update whenever your PID is associated with something new. This helps you maintain an accurate record of your scholarly work with minimal effort.

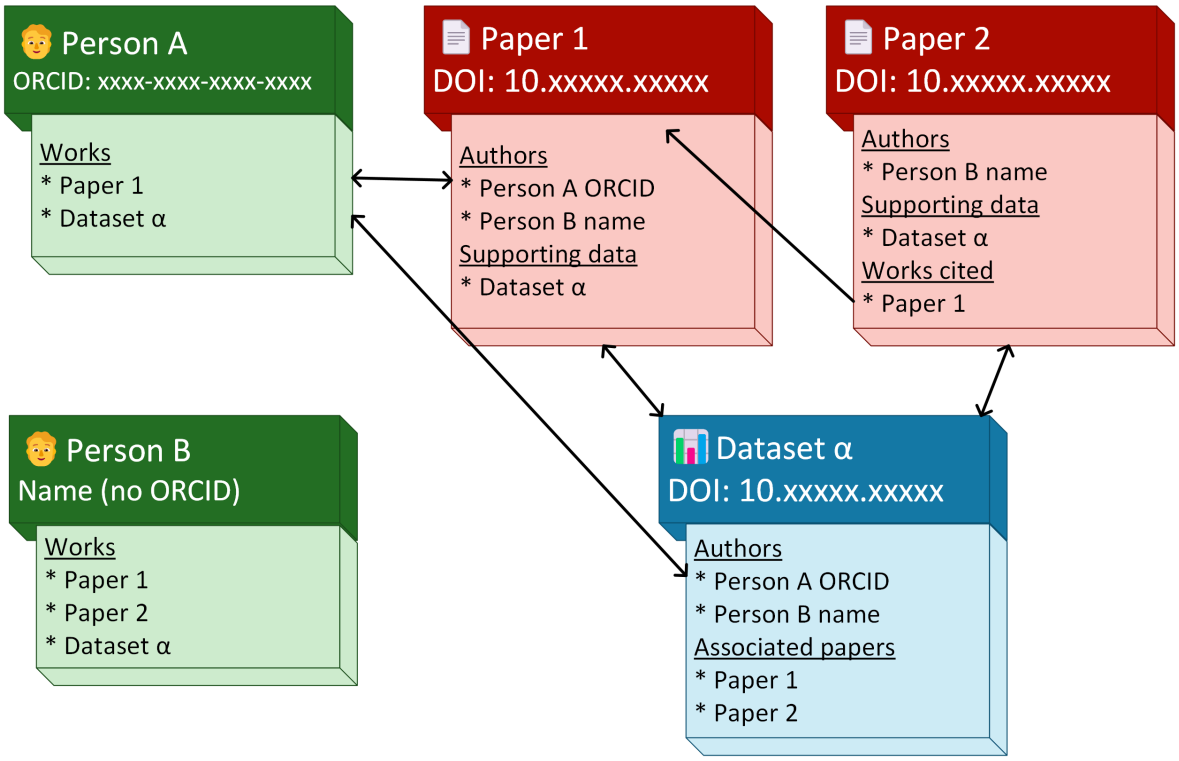


Figure 5.1 *Having an ORCID and using it in your publications—papers, datasets, talks, etc.—creates a network of links which allow others to easily verify authorship and find your other work.*

Using an ORCID is more accurate and secure than using just your name. It improves the data in databases and can help you establish a clear track record of your contributions—both research and community work, such as membership in and service for professional organizations, awarded grants, patents, peer review service, and more. Maintaining your ORCID can also automate the submission of forms and creation of resumes, through tools such as SciENcv (which allows you to choose which publications to include as part of an NIH or NSF grant application).

Register and set up your ORCID profile

Registering for an ORCID is simple. Visit orcid.org/register and complete the form. You will be asked to enter:

- Your first (given) and last (family) name
- A primary and secondary email address. Using a personal email as your primary is recommended so you can keep and update your ID when you graduate or change institutions.
- A password (tips for strong passwords)
- Current employment. This is optional but we recommend completing it if you are employed by a research or academic institution to help validate your record.
- Visibility. Set this to "everyone," as the value of an ORCID is a publicly visible record that connects you and your work.

After registration you can add additional details to your ORCID profile. To get started, try to add:

- Additional names, such as prior names, and various abbreviations of your name.
- Links to personal websites and social media accounts you use professionally.
- A short biography statement about what you study and other professional interests.
- Your education, such as degrees earned—and in process—and any additional training or certifications you have earned.

The rest of the fields may or may not apply depending on where you are in your career. If you have awards, grants, published papers, academic presentations, etc., then add them! Otherwise, do not worry, you can always come back and add them later. There are multiple ways to add works to your record so check ORCID's documentation to learn about your options before you start.

One thing to keep in mind is that while PIDs like DOI and ORCID have been in place for decades, they are not universally supported by all systems and publishers. Luckily many governments have recently mandated their use in contract and award systems, which means other organizations (such as publishers) are likely to update their systems to satisfy these new requirements.

Scholarly Social Networks

The last element of research impact is **online social networking**, the process of connecting with others through online sites and tools. Professional social networking emphasizes the promotion of skills and celebrations of achievements alongside community-building and job seeking. It is both similar to and different from personal social networking, where you interact with friends and family more than peers and coworkers.

Social media fragmentation

Prior to 2023, Twitter—now X—used to be the place to go for academic and research networking, as well as information sharing. While it could be challenging to learn, the amount and variety of content was hard to beat. Things began to change in 2023 after Twitter was sold and there are now multiple text, image, and video-based social media services all competing for audiences, including academic and research audiences.

While social media can be very powerful its use is *optional*. You can have a successful scholarly career without it, but many find professional and personal enjoyment as well as community through it.

The lineup of online networking platforms is ever-evolving, so instead of profiling specific sites this section provides an overview of four of the most common and popular types of networks.

Networks for Job Seekers and Professional Promotion

These sites excel in helping job seekers locate jobs and for employers to locate skilled employees. The emphasis is on the digital resume and curriculum vitae which is typically your profile page. Education, employment, and skills are highlighted and can be used by the site to recommend jobs to you or to recommend you to employers. Some of these sites, such as LinkedIn, also support blogs and direct messages, allowing them to be used for both direct and indirect online networking. These sites are used by scholars and researchers but they were not built for this audience and lack tools, such as citation tracking, found on more specialized platforms.

Networks for Scholars and Researchers

These sites were built specifically for scholars and researchers. They have special features made for this audience, such as the ability to search, link, and promote scholarly works, track citations, ask questions, and create communities of discourse on research topics. Knowledge Commons and Research Gate are good examples of social platforms made to connect scholars and researchers with other people working in their field.

Social Media Networks

Sites like Instagram, TikTok, Bluesky, and Facebook can be used for both personal and professional online networking. If you plan to use them for professional networking, it might be wise to create a separate account (see next section) to better control which details you share with coworkers and peers. Since

these sites were not made specifically to support scholarship and research, you will need to add links to other sites to help people find your work.

Private Networks

The last type of social network is invite-only. Discord, Slack, and messaging apps often host small (and not so small) and close-knit communities. The conversations in these communities are still professional but are typically more casual.

Going Professional

What does it mean to be *professional*? Is it simply the act of working and earning a wage? Does it require wearing a suit? Do you need to speak a particular way, be part of an organization, or use specific tools?

While it is a simple question, the answer is complex because professionalism is a *cultural construct*—there is no one correct answer, and each community has different expectations. The best way is to determine what your community considers professional is to observe the behavior of peers and signal your professionalism the same way.

However, there is one near universal signal and expectation of professionalism: courtesy. Regardless of the other ways to signal professionalism, courtesy is vital for online interactions which typically lack the nuance of body language, facial expressions, and full context. Even if you disagree with someone, be polite about it. This above all else shows a high level of professionalism online.

Last, some acts are not seen as professional because they do not align with the shared values of the profession or your employer. For example, sharing a photo of a tower of empty beer cans is not considered professional because it does not align with the value of *sobriety* that is expected in the workplace. This is why you should be mindful of not only how you *treat* others but also what you *share* with them.

A note about politics

Sharing your political viewpoints is something that should be done carefully as a professional. If your viewpoint is not in alignment with those you work with—or wish to work with—it might discourage people from interacting with or employing you.

However, if politics are influencing your work or profession then it may be appropriate to engage in a thoughtful—and courteous—discussion. Use your best judgment, and watch your peers, before jumping in.

Different Accounts, Different Audiences

If you already use social media, you should consider if you would like to keep your personal activity separate from your professional activity. If you frequently post hot-takes or instigate arguments online it may be best to not share that activity with your coworkers as online disagreements can easily turn into workplace disagreements. Similarly, if you have hobbies or other recreational activities that could be seen as unprofessional then it is best to keep these two audiences separate. This can be done by creating dedicated accounts for personal use and professional use or by using different platforms to reach different audiences. Last, go where your peers are. Investing time into building a profile on a site none of your peers use is not worth the time, so find your people before you start!

Building a Brand

Building an online brand does not require a theme song or catch phrase, only consistency. An account that posts mostly cat photos with only the occasional update on your research is more likely to be followed by cat lovers than fellow researchers. Conversely, an account that is 90 percent research and 10 percent cats will naturally be more appealing to researchers than cat lovers. To get started, make sure you do the following when opening a new account or updating a profile:

- **Use your real name.** Professional social media is not anonymous; it is about *you*. If you need to choose a username, think carefully about how others might perceive it. For example, the username "porkchop" might be apt for a meat scientist, but an odd choice for a botanist.
- **Use a photo that highlights your face** for your profile. This will help people you meet online relate to you and it will help them recognize you if you ever meet in person.
- **Post a short biography** that explains who you are and what your interests are. Where you work or go to school, your area of research, and even things like your hometown give people basic facts to associate with your name which makes you more memorable.

These three things will help establish your personal brand. After that, all that is left is to decide what to share, and how much to engage.

The Art of the Humble Brag

There is nothing wrong with using online social networks to celebrate and promote your work. Doing so can help you locate peers who do similar work and provide a feeling of gratification. However, it is important to build a reputation before jumping into celebrating your own success. This means you must first *give* to the community before you seek to *take* congratulations, much less potential boosts to your metrics. Your following doesn't need to be large before you start, but if your first—and only—posts only celebrate you, then there's not much for others to engage with. So, take some time to learn your community—and appreciate the work of others—before celebrating your own successes.

Rules of Engagement

We have already learned that watching your peers and modeling their behavior helps establish you as a professional in a community. However, it is possible to follow peers that demonstrate a wide range of professional behaviors and personalities, including ones that contradict each other. The key is to watch how other people interact with different accounts. Social media can encourage bombastic behavior, but more is not always better. Sometimes the most "popular" posts and accounts are ones that make people angry, which is not good behavior to model or mimic. Consider the following before diving in:

- **Be yourself but be safe**. Sharing too many personal details can expose you and your account to dangers, such as hacking and identity theft. Limit the details of what you share to stay safe online and off.
- **Don't overshare**. Keep your account focused on your goal (promoting yourself and your work) not on your personal life.
- **Uplift and appreciate good work**. This makes you part of a community and keeps your brags humble.
- **Don't shout into the void**. If your peers are not on the platform, or do not engage much, then you do not need to either.
- **Have fun and take a break if it is not fun**. Social media and online networking can be powerful—and fun—ways to promote yourself and your work but it is *optional*.

Online networking can be rewarding both professionally and personally. Which networks you engage with, and how much, is up to you. You should also be mindful of who you share certain details and activities with and consider setting up different accounts if you want to keep your personal life personal. But above all else remain courteous when interacting with others online to signal professionalism.

Summary

Research metrics are used to assess the success of both individuals and their work. Whether or not they are successful hinges on them being used in concert with other metrics and in the context of what they can and cannot measure. Open access can raise metric scores by making your work easy to find and free to access and PIDs can be used to link your work together making it easy to explore. Last, online networking can be professionally and personally rewarding and potentially boost your research metrics.

Resources

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Key Points

- Research metrics attempt to measure scholarly achievement but are often misused.
- Publishing open access, papers as well as other materials, like data and code, can boot your research metrics.
- PIDs help link research and researchers together which makes everything easier to find, read, use, and cite.
- Online social networking can be used to build a personal brand, boost research metrics and to build and find community.

PART II

Ethics

6. Research Ethics, Regulations, and Protocols

Lily Compton and Megan O'Donnell

Iowa State University has a long-standing reputation as a leading land grant research institution. This reputation is built on its history of excellence in research and its commitment to a strong ethical research culture. The Office of the Vice President for Research is responsible for updating the Iowa State University's Responsible Conduct of Research (RCR) training policy to:

1. align with "new policy requirements from federal agencies and current changes in the industry on research integrity and ethical issues" and
2. follow ethical codes with "the principles of ethical conduct, honesty, integrity, respect and transparency in the scholarly activities." (Office of Research Ethics)[1]

The goal of this training policy is to encourage ethical research practices that build trust across our research community, our sponsors, and society at large.

In this chapter, we will briefly review the different components of **research ethics**, why they matter, and how they impact individual researchers and scholars as well as our institutions. We will focus specifically on Iowa State University's training policy related to Human Subject Research and the Institutional Review Board that impacts a large subset of our graduate student researchers. We will also address research integrity and research misconduct.

1. "Responsible Conduct of Research Training," Iowa State University Office of Research Ethics, https://compliance.iastate.edu/research-integrity/responsible-conduct-of-research/

Glossary

Exempt research: Human subject research that is subjected to fewer regulatory requirements compared to non-Exempt Research[2]

Institutional Review Board (IRB): "Federally mandated committee that ensures that 1) the rights, well-being, and safety of human subjects in research are protected; and 2) that [institutional] research is compliant with applicable federal and state regulations as well as [institutional] policies and guidelines."[3]

Research ethics: Moral principles for conducting research that define acceptable and unacceptable behavior in one's area of practice. Research ethics can be defined and informed by personal, cultural, and disciplinary perspectives as well as local laws and policies.

Research integrity: "Active adherence to the ethical principles and professional standards essential for the responsible practice of research"[4]

Research misconduct: "Fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results"[5]

Retraction: The formal process of removing a publication from the scholarly record. Retractions can occur due to mistakes (e.g., data or calculation errors) but removal due to violations of research ethics and integrity are the most common (e.g., plagiarism, intentional manipulation, etc.).

Trustworthy research: Research that has earned a high degree of confidence by the public and society by demonstrating research integrity, adherence to ethical standards, and rigorous professional practice.

2. "Modifications to Exempt Research," Iowa State University Office of Research Ethics, https://compliance.iastate.edu/wp-content/uploads/sites/4/pdf/exempt-research-modifications.pdf

3. "About the IRB," Iowa State University Office of Research Ethics, https://compliance.iastate.edu/research-ethics-compliance/irb/about-the-irb/

4. Stanley G. Korenman, Teaching the Responsible Conduct of Research in Humans (RCRH). (The Office of Research Integrity, 2006), https://ori.hhs.gov/education/products/ucla/chapter1/page02.htm

Overview

Questions

- What is the difference between research ethics and regulations?
- What role do institutional review boards play in human subject research?
- What is research misconduct, and how can it be prevented?

Objectives

- Compare research ethics and regulations.
- Identify the protocols to comply with research regulations for human subject research.
- Implement best practices to successfully complete research including dissertations and theses.
- Identify the steps to preserve research integrity and avoid research misconduct.

Research Committees, Ethics, and Compliance

Research institutions are required by law to have systems and staff in place to teach responsible conduct of research and address allegations of research misconduct. Additionally, institutions are responsible for ensuring that researchers—faculty, staff, and students—are following all applicable research procedures, laws, and policies on research related to humans, animals, biohazards, and radiation.

At Iowa State University, there are four research compliance committees[6] to support researchers and offer guidance for safe and responsible research conduct involving dangerous substances, sensitive data, and to studying people and animals with minimal risk and harm.

The four research compliance committees are:

1. **IRB** for the involvement of human subjects in research;
2. **Institutional Animal Care and Use Committee (IACUC)** for humane care and use of animals in

5. "Office of Science and Technology Policy," The Office of Research Integrity, https://ori.hhs.gov/content/chapter-2-research-misconduct-office-science-and-technology-policy

6. "Research Ethics & Compliance," Iowa State University Office of Research Ethics, https://compliance.iastate.edu/research-ethics-compliance/

research;

3. **Institutional Biosafety Committee (IBC)** for safe conduct of work involving hazardous biological materials;
4. **Radiation Safety Committee (RSC)** for the safe use of radioactive materials and radiation-producing devices.

Research Ethics

Before we can define research ethics, we must first differentiate ethics from regulations. Research regulations are codified formal rules and laws that govern how research can be done, and federal or state agencies or regulatory bodies usually enforce such regulations. Codified human and animal research regulations force us to consider harm to others and our professional, moral, and legal responsibility to mitigate it. The four research compliance committees just introduced are examples of institutional regulatory bodies that enforce research regulations.

Ethics are the "norms of conduct that distinguish between acceptable and unacceptable behavior."[7] Research ethics refer to moral principles and values that guide behavior and decision-making when conducting research. Researchers need to not only consider the ethics and steps needed to guarantee protection of themselves, test subjects, and coworkers when working with substances that can be harmful, such as viruses or radioactive substances, but also the ethics and principles of *others*. The ethical standards of research are based on our individual and collective understanding of the world. What we consider ethical may be viewed differently by others, so it is important to try to understand the concerns and viewpoints of others when designing and conducting research.

There are multiple levels of ethics to consider when planning and conducting a research project. Here are three examples and why they matter.

1. **Personal ethics**: These ethics are impacted by values we learn through societal influences, e.g., our upbringing, life experiences, and personal communities. Researchers' personal values can influence how they make, interpret, and apply their beliefs in decision-making. "For example, two people could agree that murder is wrong but disagree about the morality of abortion because they have different understandings of what it means to be a human being."[8] In this example, how they interact with a participant or interpret the data may be influenced by their personal views.

7. David B. Resnik, "What Is Ethics in Research & Why It Is Important," National Institute of Environmental Health Sciences, December 23, 2020, updated December 23, 2024, https://www.niehs.nih.gov/research/resources/bioethics/whatis

8. Resnik, "What Is Ethics in Research & Why It Is Important."

2. **Disciplinary ethics**: These ethics are influenced by the people in your field of study (e.g., colleagues and peers) and the standard of conduct defined by governing professional bodies to coordinate the research activities. The Hippocratic oath is an example of disciplinary ethics within the medical profession. It ensures that physicians' ethical duties to the patients prioritize the principles of beneficence, non-maleficence, and confidentiality influence their decision-making.[9]
3. **Institutional and organizational ethics**: These ethics serve as guiding principles to determine how studies are conducted and to ensure that steps are taken to protect research subjects (such as people and animals) and comply with federal and state regulations. For example, Community Based Organization Partners (CBOP) formed a CBOP Community Ethics Review Board[10] in Flint, Michigan to complement the two universities' IRBs after the Flint community lost trust in researchers and their institutions. Because CBOP members included community members, they were able to explicitly address community-level concerns.[11]

9. Helen Askitopoulou and Antonis N. Vgontzas, "The Relevance of the Hippocratic Oath to the Ethical and Moral Values of Contemporary Medicine. Part II: Interpretation of the Hippocratic Oath-Today's Perspective," *Eur Spine J* 27, no. 7 (2018): 1491-1500. doi:10.1007/s00586-018-5615-z https://pubmed.ncbi.nlm.nih.gov/29786117/
10. "CERB," Community Based Organization Partners, https://www.flintcbop.com/cerb
11. Kent D. Key, "Expanding Ethics Review Processes to Include Community-Level Protections: A Case Study from Flint Michigan," *AMA J Ethics* 19, no.10 (2017):989-998. doi: 10.1001/journalofethics.2017.19.10.ecas3-1710. https://journalofethics.ama-assn.org/article/expanding-ethics-review-processes-include-community-level-protections-case-study-flint-michigan/2017-10

Ethics vs. regulation/Law

"Most societies also have legal rules that govern behavior, but ethical norms tend to be broader and more informal than laws. Although most societies use laws to enforce widely accepted moral standards and ethical and legal rules use similar concepts, ethics and law are not the same. An action may be legal but unethical or illegal but ethical."[12]

- **Legal but unethical.** An approved psychological study on participants' responses to stress in social situations may include proper steps to minimize deceptions (since the participants are not informed of the stressors they will encounter) would be legal. However, the study could be unethical due to the lack of transparency if the participants were not fully informed of the nature of the study or the stressors they will experience, even if they were deemed minimal.
- **Illegal but ethical.** A researcher of an approved study on the safety and efficacy of a new drug discovers the pharmaceutical company is withholding crucial data that could potentially harm the public and decides to break their confidentiality agreements. The act of releasing the data would be illegal in this case but ethical because it prioritizes the ethical principle of beneficence.

The distinction between ethics and regulation is important because researchers need to comply with the legal requirements but also maintain high ethical standards when conducting research.

Research Compliance

Research compliance refers to the process of meeting the regulations that govern research activities set by federal and state agencies, governing bodies, institutions, and private funding agencies. To ensure that institutions produce **trustworthy research** that maintains public trust, institutions may take multiple steps to protect the integrity of research outcomes, including the following:

1. **Rely on research committees**: Monitor rules and regulations, provide oversight and support
2. **Implement RCR training policy:** Comply with federal agencies such as the National Science Foundation (NSF), National Institutions of Health (NIH), and others
3. **Provide access to RCR training**: Use the Collaborative Institutional Training Initiative (CITI Program) or institutional RCR training
4. **Implement Conflict of Interest and Commitment (COIC) Disclosure Policy:** Identify circumstances that may influence professional actions or decisions
5. **Incorporate Mechanisms to Report Concerns:** Ensure effective reporting protocols are in place

12. David B. Resnik, "What Is Ethics in Research & Why It Is Important," National Institute of Environmental Health Sciences, December 23, 2020, updated December 23, 2024, https://www.niehs.nih.gov/research/resources/bioethics/whatis

More details about the RCR, COIC, and mechanisms to report concerns will be covered later in this chapter.

The importance of compliance

The Iowa State University's Office of Research Ethics lists three reasons why you should comply with the rules and regulations:

- **"Compliance Can Make and Save You Money":** Following the rules can prevent delays, injuries and damages, loss of data and productivity, and missed opportunities and deadlines.
- **"It's Your Reputation":** Maintaining a credible reputation goes a long way to obtaining future funding and facilitating a long-standing career in the field.
- **"It's the Law":** Not complying with the regulations can lead to monetary fines, loss of funding or privileges for the investigator and ISU, and even a jail sentence for the investigator in series cases.

Source: The Office of Research Ethics, *Compliance Matters*.

Human Subject Research and the IRB

In the United States, human subject research is primarily regulated by three federal agencies: the US Department of Health and Human Services, the Office for Human Research Protections (OHRP), and the US Food and Drug Administration (FDA). These agencies require institutions conducting human subjects research to ensure that such research is approved by an **IRB.**[13] These agencies have established regulations that must be followed by institutions and researchers.

The origin of the IRB can be traced back to public outrage over research and medical practices that were conducted without due consideration of risk and harm to the participants. While medical and research malpractice were not limited to the twentieth century, the following three major cases greatly influenced the codification of human subject protections that we see in the United States today.

1. **Nuremberg Doctor's Trial (1946).** This pivotal trial involved the United States accusing and finding twenty Nazi German doctors guilty of conducting human experimentation, torture, and mass murder under the directive of pursuing misguided and unscientific principles of eugenics and racial purity. The trial led to the establishment of the Nuremberg Code, which emphasized voluntary consent and

13. "About the IRB," Iowa State University Office of Research Ethics, https://compliance.iastate.edu/research-ethics-compliance/irb/about-the-irb/

protection of human subjects.

2. **Thalidomide scandal (1953-1970s).** Thalidomide, marketed as a tranquilizer and sedative for anxiety and morning sickness, was prescribed without adequate safety research, leading to severe birth defects in an estimated 10,000 to 20,000 pregnancies worldwide. It was not approved by the US FDA and was widely used in over forty countries. The devastating consequences highlighted the need for rigorous testing and ethical oversight in drug development, emphasizing the importance of protecting vulnerable populations like pregnant women. This tragedy underscored the necessity for informed consent and robust safety protocols.
3. **Tuskegee Syphilis study (1932-1972).** This multi-decade study on untreated syphilis was performed by the United States government on a community of Black American men in impoverished Macon County, Alabama. Participants were promised free medical care in exchange for their involvement but were not informed of their syphilis diagnosis or the use of placebos and ineffective treatments. This deception led to over 100 preventable deaths and the spread of the disease among the wives and children of the infected men. The study exemplifies the devastating consequences of unethical research, causing multigenerational harm and deep-seated mistrust. It highlighted the need for transparency, informed consent, and respect for human subjects.

Cases like those mentioned above were the reason the US Congress called on the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research to create guiding principles for conducting human subject research. The 1979 Belmont Report, produced as a result of the charge to the Commission from Congress, outlined three basic principles for the ethical conduct of research with human subjects[14]:

1. "Respect: Treat each person as a free individual with dignity
2. Beneficence: Do good and avoid harm
3. Justice: Treat people fairly."

Read Part B: Basic Ethical Principles of the Belmont Report to learn more about these three principles in more detail.

The National Commission then described an emergent structure and function for ethics review boards at institutions that later became known as **Institutional Review Boards**. "IRBs became the roof beam in

14. "Ethics and Research in the Community," The Office of Research Integrity, 2004, https://ori.hhs.gov/education/products/mass_cphs/training_staff/RCReng/RCRHome.htm

the framework for the protection of rights and interests of human participants in research and remains so today."[15]

Human Subject Research and IRB at Iowa State University

"The Institutional Review Board (IRB) is a federally mandated committee whose purpose is to ensure that 1) the rights, well-being, and safety of human subjects in research are protected; and 2) that Iowa State University research is compliant with applicable federal and state regulations as well as Iowa State policies and guidelines.[16]

The Iowa State University's **Human Subjects in Research Policy** includes three key requirements:

i. All researchers, including graduate students, who wish to conduct research involving human subjects must receive approval or exemption from the IRB before starting any human subject research activities.
ii. Human subject research must remain under IRB oversight until the research is complete.
iii. Principal and supervising investigators are ultimately responsible for protecting the rights, well-being, and safety of human subjects in research and making their research at Iowa State University compliant with applicable federal and state regulations as well as Iowa State policies and guidelines.

Required training: All members of a research team must complete Required Human Subjects Research Training (CITI) before an IRB application can be reviewed. This includes graduate students completing human subject research for dissertations, theses, and creative components.

Required IRB applications: The principal investigator(s) must submit IRB applications for review. The IRB reviews the type of submission, including new applications, modifications, continuing review, and study closure.[17] They also determine if the human study research is exempt. Principal investigator(s) should keep in mind that modifications to exempt research may result in the loss of exemption and require another IRB review.

15. Institute of Medicine (US) Committee on Assessing the System for Protecting Human Research Subjects, *Preserving Public Trust: Accreditation and Human Research Participant Protection Programs,* (Washington (DC): National Academies Press, 2001), https://www.ncbi.nlm.nih.gov/books/NBK43592/#a200047f4ddd00025
16. "Human Subjects in Research," Iowa State University, updated April 2021, https://www.policy.iastate.edu/policy/humansubjects
17. "Submission and Review," Iowa State University Office of Research Ethics, https://compliance.iastate.edu/research-ethics-compliance/irb/submission-and-review/

Review process: In order to obtain IRB approval, an IRB application (protocol) must be submitted, describing research plans and procedures for the project. The protocol requires detailed plans for inviting participants, collecting data, protecting privacy and confidentiality, obtaining informed consent, and minimizing risk. The IRB's review will then focus on whether the plans and procedures satisfy regulatory criteria for approval, which are based on the Belmont ethical principles. Researchers are encouraged to review the IRB website for various resources, informed consent templates, and topic-specific guidance.

Review timeline: Researchers should plan for IRB review of new protocols to take about four to six weeks, while protocols involving modification and continuation reviews may take three to four weeks. For protocols that require review by the full IRB, materials must be submitted two weeks before the IRB meets. Check the IRB Meeting Schedule/Application Submission Deadlines. All other protocols can be submitted for review when they are complete and consistent throughout the protocol. Protocols are reviewed in the order in which they are received by the IRB office.

Supervising student projects involving human participants

Question: I am a course instructor (or major professor or advisor). My students are required to work on projects that require human participation. Do they need IRB approval? And what are my responsibilities as the instructor (or major professor or advisor)?

Answer: As a course instructor (or major professor or advisor), you are responsible for determining whether your student(s)' class projects require IRB approval. You are also responsible for ensuring the rights and welfare of the human subjects. To learn more about which projects require IRB approval, read Student Projects Involving Human Participants [PDF]. The course instructor's (or major professor's or advisor's) oversight responsibilities are included on page 4.

(Alternative link: Office of Research Ethics, *Policies & Guidelines: Student Projects Involving Human Participants*)

Graduate Student Research (Class Assignments, Dissertations, Theses, and Creative Components)

Student-led research can be conducted for two purposes: 1) educational purposes and 2) to develop/contribute to generalizable knowledge. In many cases, class assignments involving human subjects that are completed purely for educational purposes will not need IRB approval. However, graduate students who wish to share their findings beyond the classroom, (e.g., for publications, presentations in an academic conference, or in a dissertation, thesis, or creative component) must obtain the IRB approval or exemption before initiating the research, since the purpose of the human subject research is designed to develop or contribute to generalizable knowledge.

Human subject research conducted by graduate students may not require IRB approval if it does not meet the IRB-regulated human subjects research criteria. Here, IRB-regulated human subjects research is defined as follows:

Research is "A systematic investigation, including research development, testing, and evaluation, designed to develop to contribute to generalizable knowledge" (45 CFR 46.102(d)). A human subject is "A living individual about whom an investigator (whether professional or student) conducting research obtains (1) data through intervention or interaction with the individual, or (2) private and identifiable information (45 CFR 46.102(f)). OR Any experiment that involves an FDA-regulated test article (drugs, medical devices, food additives) and one or more human subjects (21 CFR 50.3)."[18]

Student projects at Iowa State University involving human participants

Graduate students conducting research should determine if their projects require an IRB review. The Iowa State University IRB provides guidance for student projects[19] as below:

- Student Projects Involving Human Subjects
- Oral History Projects

Graduate students can also complete an online self-test or use the Exempt Review Wizard to see if their research can receive an exemption, i.e., be considered exempt research. To learn more, visit the Office of Research Ethics web page on OneAegis (IRBManager) How-To Guide.

If there are modifications to **exempt research**, graduate students should first consult with their principal or supervising investigator. Certain modifications can result in the loss of exempt certification, including "changes in research procedures, participant characteristics, the content or scope of information to be collected, privacy or confidentiality measures."[20]

Graduate students conducting human subject research that are not exempt research must complete the Required Human Subjects Research Training (CITI). **It is advisable to complete this training early in the graduate academic journey.**

Since protocols are reviewed in the order they are received, graduate students should check the IRB Timelines and Meeting Schedules[21] and plan accordingly to get approval or exemption and to avoid a delay in data collection for their projects. This includes data collection for dissertations, theses, and creative components.

Check out the *Frequently Asked Questions.* If you are still confused, email the IRB team at irb@iastate.edu.

18. "IRB Oversight of Student Projects Involving Human Participants," Iowa State University Office of Research Ethics, https://compliance.iastate.edu/wp-content/uploads/sites/4/pdf/IRB-oversight-student-projects.pdf

Scenario: Graduate student research and necessary IRB steps

Student A is a doctoral student in the Department of Psychology. She is working on her dissertation research focusing on undergraduate students' uses of social media and their self-esteem. What steps should she take to ensure compliance?

Graduate students completing capstone projects (e.g., dissertation, thesis, or creative component) involving human subjects should check if an IRB approval is required. To successfully complete their dissertation/thesis, graduate students must complete the following steps:

1. Decide if an IRB approval[22] is required using recommended self-test and decision trees (under Researcher Tools) and the links under IRB Guidance for Projects.
2. Complete the Required Human Subjects Research Training (CITI) if required.
3. Apply for an IRB review[23] and get the approval or certification of exemption.
4. Complete the research based on the approved IRB protocol.
5. Submit modifications or continuing reviews to IRB[24] as needed.
6. Insert a copy of the approval letter or exemption certification letter in the dissertation/thesis. Do not include the entire IRB protocol as it may contain information that presents confidentiality risks (e.g., names of research locations, etc.).
7. Submit a study closure.[25]

19. "Do I need IRB Approval?," Iowa State University Office of Research Ethics, https://compliance.iastate.edu/research-ethics-compliance/irb/do-i-need-irb-approval/
20. "Modifications to Exempt Research," Iowa State University Office of Research Ethics, https://compliance.iastate.edu/wp-content/uploads/sites/4/pdf/exempt-research-modifications.pdf
21. "Submission and Review," Iowa State University Office of Research Ethics, https://compliance.iastate.edu/research-ethics-compliance/irb/submission-and-review/
22. "Do I Need IRB Approval?," Iowa State University Office of Research Ethics, https://compliance.iastate.edu/research-ethics-compliance/irb/do-i-need-irb-approval/
23. "Submission and Review," Iowa State University Office of Research Ethics, https://compliance.iastate.edu/research-ethics-compliance/irb/submission-and-review/
24. "Submission and Review," Iowa State University Office of Research Ethics, https://compliance.iastate.edu/research-ethics-compliance/irb/submission-and-review/

Scenario: Graduate student dissertation with or without an approved or exempted IRB

Student B is a doctoral student in the Department of English. His research focused on students' views about using ChatGPT to write their essays. He successfully defends his findings at his oral examination. After finalizing his written dissertation, he uploaded his file to his ProQuest account. A day later, he received an email requesting some minor formatting changes and a copy of the IRB approval letter.

In the scenario above, there are two possible outcomes.

- Student B has an approved or exempted IRB protocol. He addresses the reviewer's request by inserting a copy of his IRB approval or exemption letter in the appendixes because he went through the proper procedures.
- Student B does not have an approved/exempted IRB protocol. He is unable to meet this request because he did not submit an IRB protocol for review and approval or certification of exemption before he conducted his research. In this situation, he will not be allowed to submit his dissertation because his human subject research was not reviewed and approved by the IRB. Conducting human subject research without prior IRB review or approval constitutes noncompliance and can have serious consequences. In this case, he may not be able to include any of his data or analysis in his dissertation. He will likely need to delay his graduation since he must start over with his research by submitting an IRB protocol for review and approval, and then collecting and analyzing new data, and rewriting and redefending his dissertation. (Retroactive IRB approval will not be granted.)

Research Integrity and Research Misconduct

Research integrity "is the practice of conducting research in a way that promotes trust and confidence in all aspects of science. This includes the entire research life cycle, from hypothesis to experiment, through to publication and the formation of the scientific record."[26] (Stanford Medicine, n.d.) It is necessary to produce **trustworthy research** to ensure the reliability and reproducibility of the results and maintain the public's confidence and trust in the outcomes of the research. Research methods must follow the commonly accepted standards that govern methodological rigor, from the setting up of the research to the reporting of the results. Research integrity is important to uphold because scientific knowledge builds upon existing research. If any research draws upon inaccurate studies, that research

25. "Submission and Review," Iowa State University Office of Research Ethics, https://compliance.iastate.edu/research-ethics-compliance/irb/submission-and-review/

26. "Research Integrity," Stanford Medicine, https://laneguides.stanford.edu/research-integrity

and all future connected research will be undermined and can lead to errors, mistrust, and waste of resources, e.g., time and money.The Office of Research Integrity[27] lists four shared values in scientific research:

1. **"HONESTY:** convey information truthfully and honoring commitments,
2. **ACCURACY:** report findings precisely and take care to avoid errors,
3. **EFFICIENCY:** use resources wisely and avoid waste and
4. **OBJECTIVITY:** let the facts speak for themselves and avoid bias."

When research integrity is negatively impacted, it can sometimes lead to allegations of **research misconduct**. Research misconduct can severely erode the public's trust in the research outcomes and potentially harm public safety.

There are three types of research misconduct as defined by the Office of Science and Technology Policy (OSTP) in the Federal Policy on Research Misconduct.[28] These are fabrication, falsification, and plagiarism. While this Federal Policy only applies to federally funded research, most research institutions (including Iowa State University) adopt the same definition for their institutional policy.

Iowa State University's research misconduct policy

Iowa State University provides the following definitions:

- **"Research misconduct** means fabrication, falsification, or plagiarism in proposing, performing, or reviewing research or in reporting research results. It also includes ordering, advising, or suggesting that subordinates engage in research misconduct. The misconduct must depart significantly from accepted practices of the relevant research community and must be committed intentionally, knowingly, or recklessly. It does not include honest error or differences of opinion.
- **Fabrication** is making up data or results and recording or reporting them.
- **Falsification** is manipulating research materials, equipment, or processes, or changing or omitting data or results so that the research is not accurately represented in the record.
- **Plagiarism** is the appropriation of another person's ideas, processes, results, or words without giving appropriate credit."[29]

27. "Part I: Shared Values," The Office of Research Integrity, https://ori.hhs.gov/education/products/RCRintro/Parts/p1.html

28. "Research Misconduct," The Office of Research Integrity, https://ori.hhs.gov/education/products/RCRintro/c02/1c2.html

Iowa State University is highly committed to safeguarding the research integrity at our campus. The Office of the Vice President for Research (OVPR) has the mission "to promote a vibrant and supportive environment for scholarly and artistic endeavors, foster ethical code of research, and integrate research into the education, outreach, and engagement missions of the university."[30] The OVPR provides support and services to guide researchers and help to facilitate professionalism and research success. It also maintains institutional research policies and incorporates three key ways to safeguard research integrity.

1. **Education through RCR Training Courses and Other Trainings**
   The NSF and the NIH require RCR training for all personnel involved with their funded research programs. Besides the principal investigator(s), this requirement includes undergraduate and graduate students as well as postdoctoral scholars. The OVPR oversees the Responsible Conduct of Research Training—NSF and NIH Required policy and is responsible for verifying that the necessary training has been completed. The RCR training can be completed through GRST 5650 Responsible Conduct of Research in Science and Engineering or the Collaborative Institutional Training Initiative (CITI) Program. This policy is only relevant to personnel on NSF and NIH grants.Additionally, as mentioned earlier in this chapter, there may be other trainings required to comply with federal, state, local, and institution regulations. For example, Iowa State University researchers working with human subjects must also meet the requirements in the Human Subjects in Research Policy. (See also 6.2.2 and 6.2.3). Researchers can also identify the relevant trainings by visiting the one or more of the four research compliance committees websites.
2. **Responsibility to Report Research Misconduct**
   Federal policies and regulations may require that institutions have mechanisms for investigating research misconduct and take corrective actions. Iowa State University has adopted these requirements in the Research Misconduct Policy and encourages all members of the University community "to report observed, suspected, or apparent research misconduct."[31] Furthermore, Iowa State University has the Non-Retaliation Against Persons Reporting Misconduct Policy to protect individuals who reported research misconduct. Individuals are also encouraged to report research misconduct concerns through the ISU Compliance and Ethics Hotline.
3. **Research Integrity Officer (RIO) and Allegations of Research Misconduct**
   The Iowa State University OVPR appoints a Research Integrity Officer (RIO)[32] to investigate and man-

29. "Research Misconduct," Iowa State University, updated February 12, 2024, https://www.policy.iastate.edu/policy/research/misconduct

30. "Research at Iowa State University," Iowa State University, https://research.iastate.edu/about/

31. "Research Misconduct," Iowa State University, updated February 12, 2024, https://www.policy.iastate.edu/policy/research/misconduct

age reported research misconduct cases. When the RIO receives allegations of research misconduct, the RIO will take necessary steps to assess if an inquiry is warranted. The RIO will initiate an inquiry process as necessary, and take further steps as listed in the Research Misconduct Policy if "the allegation falls within the definition of research misconduct and may have substance." Steps may include the notification of supervisors, administrators, and respondents, preservation of research records, and the submission of the inquiry report to the Vice President for Research (VPR). If the VPR determines that an investigation is warranted, more steps will be taken, including the creation of an investigative committee who will be charged to conduct an impartial and unbiased investigation.If research misconduct has been filed against a graduate student and an inquiry is warranted, the RIO will notify the Dean of the Graduate College and the student's Director of Graduate Studies to determine the action steps. If there is an investigation involving a graduate student, the Senior Vice President and Provost will consult with the Dean of the Graduate College and the student's Director of Graduate Studies.

Retractions of Research

Publishers recognize the importance of safeguarding the integrity of scholarly works they publish. To maintain public trust and confidence in their publications, they implement measures such as article corrections, retractions, and removals or withdrawals. Each journal has its own guidelines to determine whether a correction or a retraction is appropriate. (For more detailed policies, see the guidelines from publishers like Elsevier and Wiley). This subsection focuses on the retraction of published works.

According to Noorden, more than 10,000 research papers were retracted in 2023.[33] **Retraction** is defined as the formal removal of a scholarly work due to serious flaws, and it helps maintain the integrity of the scholarly record by alerting readers that the publication is no longer considered valid. Retractions typically occur because of either honest mistakes or intentional misconduct. In cases of honest mistakes, authors can request editors retract their paper. This type of retraction, known as self-retraction, is viewed as the ethical and honorable course of action after discovering a serious error. Smaller errors may be addressed through a correction notice rather than retraction.

Retractions resulting from research misconduct indicate serious violations of research or publication policies, such as fabrication, falsification, or plagiarism. In these cases, editors, not authors, are respon-

32. "Research Misconduct," Iowa State University, updated February 12, 2024, https://www.policy.iastate.edu/policy/research/misconduct

33. Richard Van Noorden, (2023). "More than 10,000 research papers were retracted in 20203 – a new record," *nature,* December 12, 2023, https://www.nature.com/articles/d41586-023-03974-8

sible for the retraction, often against the author's wishes. Papers retracted for misconduct are a significant blemish on an author's career and represent the most severe outcome. Regardless of the reason, retractions can cause complication not only for publishers but also for anyone who relied on or cited the retracted publication. Therefore, publishing companies actively monitor potential cases of research misconduct.

In cases where a dissertation, thesis, or creative component is involved in proven research misconduct, the Senior Vice President and Provost will consult with the Dean of the Graduate College and the Director of Graduate Studies regarding any actions against the student. There are no term limits on when a research misconduct investigation can be conducted on a dissertation, thesis, or creative component. That is why it is important to safeguard your research to avoid future complaints, especially when your dissertation, thesis, or creative component may have contributed foundational information to your future research and publications.

Conclusion

Research ethics and integrity are important to uphold in any research endeavor. Adhering to the standards and practices for personal and professional reasons can benefit not only the researchers but also their institutions and the collaborators. If you want to ensure a long and successful career with a solid reputation in your field of study, be sure to take the necessary steps to produce dissertations, theses, or creative components that will not be open to allegations of research misconduct. The University Library, the Graduate College, the OVPR, and the ORE are great places to find more information and help.

Key Points

- Researchers have to follow disciplinary and institutional ethics, and they may also have personal ethics that influence how they conduct their research.
- Researchers also have to comply with regulations or laws set by the state or federal government.
- Research including theses and dissertations involving human subjects must be approved by the Institutional Review Board (IRB) before data is collected. Take the necessary steps because there is no retroactive approval.
- Research integrity promotes trustworthy research.
- Research misconduct can happen through fabrication, falsification, and plagiarism.

Resources

Research Ethics and Compliance:

- Iowa State Office of the Vice President for Research. *Investigator Handbook: A Guide to the Research Process at Iowa State University.* Revised February 2022 (originally published April 2011). https://www.research.iastate.edu/wp-content/uploads/2022/02/Investigator-Handbook-_ORE-Feb-2022.pdf or located from this page: Iowa State University Iowa State Research. https://research.iastate.edu/for-researchers/creating-a-proposal/.
- Iowa State University Office of Research Ethics. "Research Ethics & Compliance." https://compliance.iastate.edu/research-ethics-compliance/.
- Iowa State University Research Data. "Policies and Compliance." https://dataservices.iastate.edu/Policy.
- The Office of Research Integrity. "The Belmont Report, Ethics and Research in the Community." https://ori.hhs.gov/education/products/mass_cphs/training_staff/RCReng/RCRBelmontReport.htm.

Human Subject Research and the IRB:

- Iowa State University Graduate College. "Approval for Research." https://www.grad-college.iastate.edu/student/Thesis-Dissertation.
- Iowa State University Graduate College. "Human Subjects in Research Policy." https://www.grad-college.iastate.edu/student/Thesis-Dissertation.
- Iowa State University Office of Research Ethics. "Humans: Institutional Review Board." https://compliance.iastate.edu/research-ethics-compliance/irb/
- Iowa State University Office of Research Ethics. "IRB Oversight of Student Projects Involving Human Participants." https://compliance.iastate.edu/wp-content/uploads/sites/4/pdf/IRB-oversight-student-projects.pdf
- Iowa State University Office of Research Ethics. "Policies and Guidance." https://compliance.iastate.edu/research-ethics-compliance/irb/policies-and-guidance/
- Iowa State University Office of Research Ethics. "IRB Training Sessions and Workshops." https://compliance.iastate.edu/research-ethics-compliance/irb/irb-training-sessions/

Research Integrity and Research Misconduct:

- Iowa State University. "Research Misconduct Policy." Last modified February 12, 2024.

https://www.policy.iastate.edu/policy/research/misconduct

- Iowa State University. “Research Objectives and Responsibilities Policy.” https://www.policy.iastate.edu/policy/research/objectives-responsibilities
- Retraction Watch. https://retractionwatch.com/
- Steneck, Nicholas H. *ORI Introduction to the Responsible Conduct of Research*. The Office of Research Integrity, 2007. https://ori.hhs.gov/sites/default/files/rcrintro.pdf
- The Office of Research Integrity. https://ori.hhs.gov/

7. Copyright Basics for Article Publication

Lily Compton; Kristin Terrill; and Abbey Elder

Snap a picture. Draw a doodle. Write a blog post. The moment you create something tangible, you are the author, creator, and copyright owner of your work. In this chapter, we will review the basics of copyright, licenses, and fair use and how they impact your academic publications. Understanding these concepts will help you negotiate and protect your rights as an author while balancing your need or desire to disseminate your scholarly works. Conversely, this will also help you identify how to review licenses and request permission to use the works of other authors and creators.

Glossary

Addendum: A supplementary document that modifies or clarifies existing terms and conditions in an existing publishing contract or adds new terms to the contract.

Copyright: A set of rights that a creator of a work is entitled to by law. Copyright covers tangible works of creative expression such as writing, drawing, music, and even architecture. The main rights a copyright holder has are control over reproduction (copy, reprint), distribution (how it is accessed), public display and performance (where it can be played, and who can see it), and derivative works (spin-offs, translations). The copyright holder also has the right to transfer these rights, in whole or in part, to someone else.

Creative Common licenses: A set of standardized copyright license options that authors can apply to their work to set predetermined terms regarding how their work may be shared and reused. For downstream users, these licenses make it clear what permissions the authors have granted, and therefore, what users can do with the works.

Embargo period: A predetermined amount of time during which someone, typically a publisher, has exclusive rights to distribute a work. For journal articles this means only the publisher can provide legal access to the work during the embargo period.

Licenses: Terms, either negotiated or applied broadly (see Creative Commons licenses), which dictate how audiences and readers can use an authors' materials. Licenses typically include specifications for who, what, and how long permissions are provided for the reuse of a work.

Open access publishing: Model of publication that allows readers to freely access, use, download, reuse, and redistribute specific online scholarly publications.

Retained rights: The rights (e.g., rights to use the work in teaching or include the work in a thesis or dissertation) retained by an author after signing a publishing contract.

Overview

Questions

- What are the differences between copyright and publication?
- What are the differences between copyright, licenses, and fair use?
- How can I share my work but still protect my rights?

Objectives

- Identify and protect your rights as an author.
- Determine how to share permissions to reuse and share your work and the implications.
- Identify when and how to seek permission to reuse works by others.

What Is Copyright?

Copyright is the collection of intellectual property laws that protect creative works by giving creators the legal right to share, reproduce, and redistribute their original works.[1] Content protected by copyright includes written works like essays and scripts, artwork, non-patentable computer programs, sound recordings, choreography, and architectural works.[2]

Copyright bestows the following core rights to authors when they create an original work:

1. The right to make copies;
2. The right to share and distribute the original—and copies;
3. The right to display the work publicly;
4. The right to perform the work publicly;
5. The right to create derivative works based on the original.

In other words, copyright is the *right to make* a *copy and to govern and profit from it* **.** Under these rights,

1. "What is Copyright?," The U.S. Copyright Office, https://www.copyright.gov/what-is-copyright/
2. With some exceptions. For example, single words and short phrases can't be copyrighted, but they might be eligible for trademark (TM) protection if they are used to identify a brand. For example, Nike's "just do it" slogan is a registered trademark.

when you create an original work, you are entitled to share it how and where you wish. If people are willing to pay money for access to the work, you are entitled to receive payment for giving them access. Finally, if someone else wants to share your work, you have the right to give them permission or to prevent them from doing so.

How Does Copyright Work?

Copyright is bestowed to authors automatically. Even if you accidentally shot a video of your hand and part of your knee when you were trying to switch your smartphone camera to the self-facing view, you own the copyright to that video. Similarly, the moment you save the first draft of a manuscript, you own the copyright to your paper.

In other words, you own the copyright to your work with or without using the copyright symbol (©) or registering your work with the U.S. Copyright Office. However, registering a copyright creates a formal record of a copyright "claim," or assertation of ownership. Having that documentation can enhance copyright protection if there is ever a legal dispute.[3] Generally, works published after January 1,1978 will have copyright protection "for the life of the author plus an additional 70 years"[4] and some copyrights are eligible for renewal.[5]

What Are Publishing Contracts?

Once an author's scholarly work (e.g., manuscript, book, article) has been accepted for publication, publishers require the author to sign a **publishing contract**. This contract might also be called an "**author agreement**" or "**copyright transfer agreement**." The publishing contract contains the terms related to copyright, exclusive or non-exclusive rights to distribution, royalties if applicable, and more.

These contracts may include part or whole transfers of copyright to the publishers in exchange for the service of publishing their works. However, such transfers can impact an author's ability to use their own works in the future because they have given up some of their existing rights. For example, you may not be able to reuse a figure previously published in an article, if the rights to that figure now belong to the publisher of the journal.

3. "Circular 1 Copyright Basics," The U.S. Copyright Office, https://www.copyright.gov/circs/circ01.pdf
4. "How Long Does Copyright Protection Last?," The U.S. Copyright Office, https://www.copyright.gov/help/faq/faq-duration.html
5. "17 U.S. Code 304 – Duration of Copyright: Subsisting Copyrights," The Legal Information Institute, https://www.law.cornell.edu/uscode/text/17/304

Fortunately, authors can negotiate to retain more of their rights. A later section in this chapter will cover publishing contract negotiations.

Scenario: Should I pay the $75 copyright fee in ProQuest for my thesis or dissertation?

Disclaimer: The scenario here is relevant for graduate students at Iowa State University. Other institutions may have different setups.

Student C has passed her oral examination and finalized her thesis for graduation. She is submitting her thesis to ProQuest and reaches a "Register U.S. Copyright" screen (See Figure 7.1). The cover page of her thesis contains a copyright statement, so she is uncertain if she needs to file for copyright through ProQuest and pay the $75 fee.

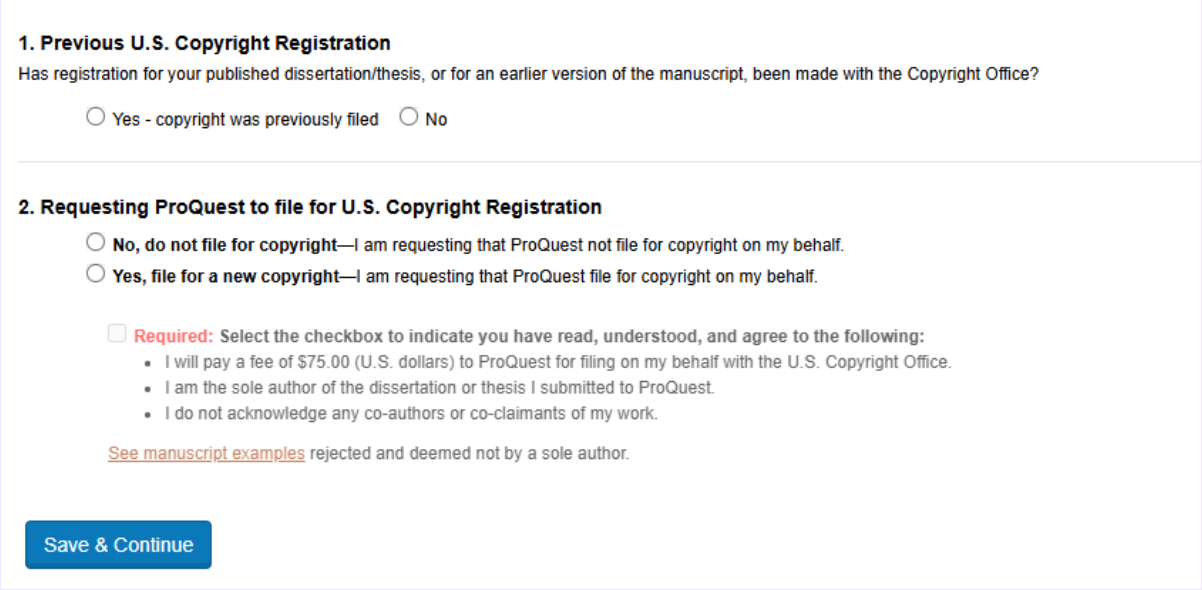


Figure 7.1 *A screenshot of the copyright questions from the ProQuest dashboard.*

To make an appropriate decision, graduate students like Student C can review the following questions and answers:

- **Question**: Do I need to request for ProQuest to file for US copyright registration on my behalf?
- **Answer**: No. You are already the copyright holder, and registration is not required.
- **Question**: Why would I want to register my copyright?
- **Answer**: Registering your copyright gives you access to some additional legal protection. If you need to file a lawsuit for copyright infringement, then a registered copyright is necessary. Discuss with your major professor if registration would be helpful. Some factors to consider include filing a related patent or writing a book based on your thesis or dissertation.
- **Question**: How should I register my copyright?
- **Answer**: You can pay ProQuest to file the copyright for you, or you can file it yourself at lower fee. If you choose to file it yourself, you can register directly with the U.S. Copyright Office. The cost of filing the copyright yourself will be lower.[6]

What Are Publishing Licenses?

While **copyright** provides rights to the creator of a work, a publishing **license** outlines the terms of how other people are allowed to use the licensed copyrighted material. If you publish your manuscripts in journals or books, you are still the copyright holder for your work, unless the copyright was transferred to the publisher, as discussed above. With a publishing license, you may grant your publisher exclusive rights to publish, distribute, or sell your manuscript.

Licenses work within copyright law to set specific use and reuse rights for any pieces of work. Because these are optional modifications, licenses are not automatic. Authors must choose to apply them, or they may be applied during the publication process.

Publishing licenses can be exclusive or non-exclusive. Exclusive licenses restrict who is allowed to do things, such as make copies or provide access to the work. If you sign an exclusive license with your publisher, you cannot then publish any part of the same work with any other publishers. In contrast, non-exclusive licenses clarify that there are no such restrictions. These differences are why licensing terms are governed by legal contracts and deeds that explicitly outline what is allowed and under what conditions.

When preparing to publish, pay attention to terms like copyright, **retained rights**, and permitted uses. Some publishers grant authors limited rights without using a license. Examples of retained rights include the right to use the work in teaching or to include the work in a thesis or dissertation. Examples of common permitted uses include permission to share with colleagues or to archive a copy in an institutional repository. These uses may require including a link and citation to the **officially published** copy provided by the publisher.

When working with publishers, these terms may appear in a publication contract, as covered earlier in this chapter. Traditionally, journal publishers require exclusive licenses which makes them the only party that can legally publish and distribute your article. However, **open access publishers** typically use non-exclusive licenses that allow the article to be distributed through other methods such as author websites, preprint servers, and repositories (see Chapter 4). We will cover the most common non-exclusive licenses in the next section.

Open Access Publishing and Copyright

Traditional publishers often own the right to publish articles after authors sign their publishing contracts.

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6. "Fees," The U.S. Copyright Office, https://www.copyright.gov/about/fees.html

Readers usually read these articles behind a paywall. They have either to gain access through their institutions or pay a fee. In contrast, open access publishing (see Chapter 4) provides readers with free access to the articles so the knowledge can be shared.

However, some publishers may have rules about **green open access**—also called "self-archiving". It is necessary to 1) check the terms of the publishing contract before signing, and 2) negotiate terms to include self-archiving rights if this option is preferred.

Creative Common Licenses

Creative Commons (CC) is an international nonprofit organization that offers licenses that support the sharing of knowledge and creative works. They provide a variety of easy-to-use and understand standardized licenses that authors can apply to their work. These **Creative Common licenses** are popular because they provide an easy and legal way to communicate how your work can be reused.

One of the most common types of CC licenses used in academia is CC BY (Figure 7.2), also known as "Creative Commons Attribution." Works with a CC BY license applied have three simple requirements for reuse:

1. Give appropriate credit (i.e., attribution) to the original creators
2. Provide a link to the license terms
3. Provide an explanation of any changes made to the original work

This CC BY license is common in academia because it preserves and respects authorship but does not require obtaining permission from the copyright holder or paying a fee when reusing the work. It is also the most permissive of the Creative Commons licenses.



Figure 7.2 *Example of a CC BY license.*

On the opposite end of the spectrum is the CC BY-NC-ND or the Creative Commons Attribution-NonCommercial- NoDerivatives license. The CC BY-NC-ND license is the most restrictive, only allowing users to copy and share a work as-is, with no alterations, and only for noncommercial use. Like the CC BY license, the redistributed copies also need to be accompanied by a proper attribution statement, giving credit to the creators and linking to the license terms. This does not mean that no one can ever update or sell

copies of your work if you place a CC BY-NC-ND license on it. Instead, you as the copyright holder would keep these rights yourself, and you would be able to grant these permissions on a case-by-case basis, just as you would if your work remained under all-rights-reserved copyright.

Between CC BY and CC BY-NC-ND, there are several other license options that provide various permissions for users. The CC license chooser tool can help walk you through the types of permissions allowed or restricted by each license type to select one that fits your preferences.

Unintentional Transfer of Licensing Rights with Creative Common NC or ND Restrictions

Openaccess.nl[7] provides a caution to authors who select a Noncommercial or No Derivatives Creative Commons license as part of a standard publishing contract. Read the excerpt below:

> *When publishing open access, authors retain copyright over their work and apply an open license that states the conditions for reuse by others. This is usually a Creative Commons (CC) license. However, when selecting a license with an NC and/or ND restriction, authors commonly (but unknowingly) transfer the exclusive right to manage the license to their publisher. This is stated in the "License to Publish agreement," but not all publishers communicate this clearly to authors (view examples of publisher policies).*
>
> *When a license with an NC and/or ND restriction is used, the right to manage the license includes the right to reuse the publication either commercially or in adapted form (e.g., a translation) and grant third parties the right to do so. Publishers need not and will not consult the author(s) on these matters. Publishers can authorize commercial reuse at their sole discretion and charge third parties for permission to reuse, redistribute, adapt, and/or make the work further known. In this way, the right to commercially reuse a publication or make adaptations becomes an extra revenue stream for publishers. This is contrary to the common assumption that the authors, as copyright owners, will retain these rights."*

7. "Impact on Ownership When Choosing a CC BY-NC or CC BY-NC-ND Creative Common License," open access.nl, June 25, 2024, https://www.openaccess.nl/en/events/impact-on-ownership-when-choosing-a-cc-by-nc-or-cc-by-nc-nd-creative-commons-license

ISU publishing agreement for dissertations, theses, and creative components

At Iowa State University, graduate students who create dissertations, theses, and creative components are required to agree to a publishing agreement that gives the university and university library non-exclusive distribution rights. Because Iowa State University is a land grant university that has an obligation to make all research publicly available, dissertations, theses, and creative components must also be made available within a timely manner.

The publishing agreement states that graduate students retain their copyrights but agree to have their works distributed through the ProQuest Dissertations & Theses Global (PQDT) and the University Library's Digital Repository.

Download and read the Copyright and Open Access Publishing Agreement with Iowa State University.

- PQDT has a non-exclusive license to publish the theses and dissertations and grants free access to subscribing institutions. Readers who are not part of a subscribing institution may need to pay a fee to download a thesis or dissertation.
- The authors of the dissertations and theses can pay a fee to make their files open access in PQDT. As of November 2024, the fee is $95. This is an optional fee and includes ProQuest's service to enhance the discoverability of the files. (See Author Dissertations FAQs: Do you allow Open Access discovery.
- The University Library's Digital Repository provides all dissertations, theses, and creative components as open access. There is no fee associated with this service.

Practice: Identify the copyright policies for a journal in your discipline

Are you ready to investigate the type of copyright agreements and publishing options in your discipline? Follow the instructions below.

1. Go to a journal or publisher in your discipline. For example, American Chemical Society (ACS) Publications. Alternatively, you can do a Google search with the terms "Journal Name + Copyright Agreement."
2. Search for terms like author guidelines, copyright, permissions, publishing policies, copyright transfer, publishing agreement, open access, etc. For example, ACS Publications: Understanding copyright and the Journal Publishing Agreement.
3. Explore the resources to see what type of publishing options are provided to you. For example, ACS Publications has outlined options for traditional and open access publishing.
4. Review this sample of Copyright Transfer Agreement from Wiley. Review the different sections to identify what rights and permitted uses are retained and what rights are transferred to the publisher.

How Do I Negotiate My Publishing Contract?

Imagine you have received news that your manuscript has been accepted for publication in a journal. You will be asked to sign a publishing contract with the publisher. A common mistake graduate students make is to sign the contract with the assumption that it is the standard protocol. While it is a standard protocol to have a contract signed, it is prudent to keep in mind that the first contract you see is likely to be the standard or default contract. If a journal's publishing contract does not allow you to use your work in the ways you would like, you can discuss changing the terms of the contract with the publisher before you sign it.

In the process of negotiating the contract, an **addendum** to the publishing contract can be made to balance the rights between both parties (i.e., the publisher has sufficient rights to distribute or publish) but the authors retain some of their own rights to use their own work in other situations (e.g., including the work in a thesis or dissertation).

🎥Understanding Author Addenda with Professor Michael Carroll

Watch the Understanding Author Addenda with Professor Michael Carroll video to learn how addenda can modify publishing contracts to help authors keep the rights necessary to make their work widely available.[8]

8. Authors Alliance. 2014. "Understanding Author Addenda with Professor Michael Carroll." YouTube. November 11, 2014. https://youtu.be/tUkfNfsGcuo.

Negotiate your rights

It may seem somewhat intimidating to approach a publisher about negotiating your contract but remember: **you are the copyright holder for your work**.

- As the copyright holder, you have the right to negotiate your contract.
- You do not need to transfer all your rights to the publisher you are considering publishing with.
- You may want to include your publication in your dissertation or thesis, so include this right in your contract.
- Download a copy of SPARC Author Addendum to Publication Agreement as a sample of terms you can negotiate.

Tips for Negotiating Your Contract

- **Read your contract carefully!** Pay attention to the language in your contract to identify what rights you are transferring to the publisher and what rights you are retaining as an author. Watch for terms like “retained rights,” “permitted uses,” and “exclusive rights,” as discussed earlier in the chapter.
- **Consider what rights you want to keep.** You do not have to transfer all your rights to the publisher, but you may not need to keep all of them either. Consider what rights you want to keep and negotiate for those specifically. These may include distribution rights, the right to republish figures or data in another work, etc. Negotiating only for the rights you need will make your case more secure than if you are asking for complete retention of your copyright.
- **Check your licensing terms.** If you have selected a CC license or an open access contract, check if the terms of the contract are exclusive or non-exclusive. In cases where a CC BY-NC-ND license is selected when publishing open access, the publisher may provide you with terms that limit you to an exclusive license that you may not want.
- **Save a copy of your contract!** By keeping a copy of your contract, you can ensure that, if the publisher questions your reuse of previously published material later, you can refer to the language of your amended contract to settle any disputes.

Scenario: Publishing a manuscript and using the publication in a thesis or dissertation

Student D has published an article with his major professor. He is now ready to write his dissertation. His major professor wants him to include the article in his dissertation, but they are concerned that it has been published. What do they need to do?

Graduate students are allowed to use their published materials in their dissertation or thesis. However, they need to review their publishing contracts. To include publications in their dissertation/thesis, graduate students must complete the following steps:

1. **Review the publishing guideline or agreement.**
    a. Check the publisher's website for information. Look under sections like "Authors rights" or "Copyright" to see if they have listed guidelines. Sometimes, you can find information under the Frequently Asked Questions.
    b. If they have negotiated the rights in the contract to include it in their dissertation or thesis, they can proceed.
    c. If they did not negotiate the rights when they published the manuscript, they will need to get permission from the publisher to include the publication in the dissertation or thesis. Some publishers specify their conditions for dissertation or thesis on their website. If this information is unavailable on the website, then graduate students need to contact the publisher to request permission.
2. **Identify the required conditions.** Some publishers may not have any conditions while others may require an official statement. Occasionally, publishers may request that the dissertation or thesis is embargoed for a specific timeframe to ensure that readers can only access that publication through a subscription.
    a. Dissertation and theses cannot be altered in any way once the file has been published in ProQuest and the Institutional Repository, so make sure necessary acknowledgments have been included.
    b. If an **embargo period** is required, request one at the time of submitting the dissertation/thesis. ISU Graduate College allows an embargo of six months, 1 year, or two years.
3. **Keep a copy of the permission for future reference.**
    a. If the conditions to include publications in dissertations and theses are on the website, make a copy (e.g., PDF).
    b. If permission is granted via email, save a copy (e.g., PDF).
4. **Use the dissertation or thesis template suggestions to be transparent in the dissertation or thesis.**
    a. Select the Journal Article Template provided by the Center for Communication Excellence, Graduate College.
    b. Include the names and affiliations of all authors.
    c. Consider one of the two recommendations below:
        i. Include a "Modified from" statement. This statement only covers modifications for for-

matting. Content modification is not allowed.

ii. Include a reference to the original source. For example, include a footnote with the recommended citation from the original source or version of record.

Permission to Reuse Image, Figures, and Tables

In the previous subsections, we looked at copyrights and licenses from the perspective of you as an author or creator. In this subsection, we will consider these concepts from the perspective of you as a user. Specifically, we will address when, why, and how to request permission to reuse works by other authors or creators or copyright holders.

In the process of writing scholarly works, it is common to cite or reference the works of others. As seen in Chapters 2, 6, and 9, citing works (e.g., paraphrasing or quoting text), acknowledges the ideas of others and avoids plagiarism, which is a type of research misconduct. This is an acceptable way of reusing text from other sources. Citing also applies to the reuse of your own materials that have been published. For example, you should paraphrase or quote your publication if you are referring to ideas or findings from that source.

Aside from citing text, we sometimes incorporate images, figures, and tables into our works. A misperception is that it is sufficient to provide a reference to the source, similar to paraphrasing or quoting text. However, this use of reference is not adequate for the reuse of images, figures, and tables because of copyright laws and can be subjected to copyright infringement if permission has not been obtained. Images, figures, and tables are considered complete or creative works that are copyrighted in their entirety. Reuse of them is different from the reuse of texts because of the following:

- paraphrasing requires you to synthesize or transform the original the ideas to create new expression of ideas while providing credit to the original source;
- quoting only involves small chunks of texts with proper attribution to emphasize a point. Often, the length of quoted materials is limited to small amounts and may be permissible under fair use, which is covered in the following section.

Images, figures, and tables, however, are usually reproduced in their entirety. You can summarize the information presented within an image or figure, but you cannot “summarize” an image while reproducing it in full. In these cases, it is necessary to review the licensing terms and contact the appropriate copyright holder for permission to reuse their work.

Here are two common considerations:

1. The authors or creators' images, figures, and tables are protected by copyright. Unless these works are in the public domain, reusing them requires permission from the copyright holder.
2. Creators who have published in publications like journals or books may have transferred distribution rights to their publishers. In these cases, the authors and creators cannot give permission because the publishers have control over how the works can be used. Therefore, it is necessary to determine who holds the copyright and obtain permission to reuse; the copyright holder can be either the publishers or creators depending on the publishing agreement.

Scenario: Using images, figures, and tables in a thesis/ dissertation

Disclaimer: The scenario here is relevant for graduate students at Iowa State University. Other institutions may have different requirements. Regardless of whether there is a checklist available, the need to request permission to reuse any copyrighted image, figures, and tables applies for all published works.

Student E has completed her dissertation, and her committee has approved the final version. After uploading her file, she receives a checklist from the Graduate College reviewer which includes an item about obtaining permission for any third-party content. Student E realizes she has included a figure in her work but has not requested permission from the copyright holder. What should she do?

To include images, figures, or tables in their dissertation or thesis, graduate students should complete the following steps:

1. **Research who holds copyright permission. Start with the author and publisher.**
    a. Check if the work is in the public domain or is licensed under Creative Commons or other open access sources. or other open access sources.
    b. Determine if the fair use exception applies.
2. **Submit a request for permission to reuse.**
    a. Keep a copy of the permission for future reference.
    b. If the conditions for including published material in dissertations or theses are on the website, make a copy (e.g., PDF).
    c. If permission is granted via email, save a copy (e.g., PDF).
3. **If permission cannot be obtained, for instance, due to a restricted timeline, consider the following.**
    a. Look for an alternative version from a public domain or open access source, or which has a Creative Common license.
    b. Recreate the figures into your own work.
    c. Recreate the graphs and tables from the raw data while crediting the source of the data.
    d. Leave the image, figure, table out. Instead, reference the source and discuss the interpretation and significance of it in your manuscript.

Additional Resources

- Rachel Brooke and Brianna L. Schofield, (Eds.). *"Third-Party Permissions and How to Clear Them."* Authors Alliance, 2021.
- Stanford University. "How to Request to Use Copyrighted Materials."

What Is Fair Use?

In some cases, you may be allowed to use copyrighted materials without having to request permission

from the authors.[9] This is known as the fair use doctrine. Fair use "promotes freedom of expression by permitting the unlicensed uses of copyright-protected works in certain circumstances… (such as) criticism, comment, news reporting, teaching, scholarship, and research."[10]

You might think, "I'm doing research, which means it's fair use, right?" It depends.

Fair use is determined on a case-by-case basis. There are four factors to be considered when determining fair use. These four factors are:

1. The type and purpose of the use: is it commercial, nonprofit, educational, or a creative transformation?
2. The nature of the copyrighted work and how creative it is, i.e., factual reporting vs. a novel.
3. The amount of the work being used and its substantiality, i.e., if the part being reused is the most important or valuable part.
4. The effect of the use upon the potential market or value of the copyrighted work, and whether it may affect opportunities for sales and distribution.[11]

These four factors are how judges decide if the reuse is fair. Because fair use is established on a case-by-case basis, there is no simple guide to determine what is a fair use and what is considered copyright infringement. Thankfully, tools such as the Fair Use Evaluator) can help guide you through the steps needed to evaluate whether your reuse is fair or not. Documenting your fair use assessment through tools like these and keeping that documentation can be useful, in case your use is called into question later. However, keep in mind that these tools can only provide guidance and not legal advice, and it is your responsibility to reuse content wisely and legally.

Let's look at a common example of fair use in research and academia. If you are writing an essay for a class assignment, including a cited figure or a lengthy quotation may be considered fair use based on the four factors, if you provide a citation to your source. The reasons for this are because the purpose is nonprofit and educational (type and purpose), the work is fairly creative and creating new knowledge (nature), only a small part is being used (amount), and your essay does not compete with the original since only your instructor or TA will read it (market). But if you present the same essay material at a conference or submit it for publication, then **your use has changed and must be re-evaluated**.

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9. Likewise, your readers may also be allowed to use your copyrighted materials without asking for your permission.
10. U.S. Copyright Office Fair Use Index," The U.S. Copyright Office, https://www.copyright.gov/fair-use/
11. A full explanation of these four factors can be found in the US Copyright Office Fair Use Index.

Obtain permissions as best practice

Fair use is determined based on case-by-case. There is not a straightforward formula to determine whether your use of someone's work can be labeled as fair use. While you can evaluate if your use may fall under fair use, the copyright holder may still be able to challenge your assessment in court, and it is up to the judges to decide. Additionally, your use of someone's work may be transformed down the line, and you may be unable to recall the original fair use reasons you applied to the initial works.

For these reasons, it is good practice to obtain permission for any images, figures, and tables from the rightful copyright holder and keep proper documentation.

Conclusion

In academic publishing, authors need to understand how copyright, publishing contracts, and licenses interact. Before you sign a contract, identify the rights you wish to keep as an author and the rights you are willing to give to others. As a user of other copyrighted works, you may need to obtain permission from the authors and creators or publishers if they have not specified what rights they allow users to have. To improve the visibility of your work, consider open access publishing options like those covered in this chapter and in Chapter 4.

Key Points

- Authors of creative works are granted a set of rights as part of the copyright law.
- Some of these rights can be transferred intentionally or unintentionally, when an author signs a publishing agreement.
- Authors can negotiate the terms in a publishing agreement.
- Authors can use Creative Common licenses to give readers permission to reuse their works in specific ways.
- Authors can choose open access publishing options that allow readers to access their works without payment.
- When reusing copyrighted materials, users should identify the reuse terms of the materials and obtain permission as necessary.

Resources

Creative Commons Licenses

- Creative Commons. "Creative Commons." https://creativecommons.org/
- Elder, Abbey. "Creative Commons." Iowa State University Library. Last modified August 20,2025. https://instr.iastate.libguides.com/creativecommons

Open Access Publishing

- Elder, Abbey. "Expanding your Impact with Open Access." Iowa State University Library. Last modified September 3, 2025. https://instr.iastate.libguides.com/authorsrights/openaccess
- Elder, Abbey. "Open Access Publishing: Where to Start." Iowa State University Library. Last modified

September 3, 2025. https://instr.iastate.libguides.com/OApub

- Elder, Abbey. "Self-Archiving Your Work." Iowa State University Library. Last modified August 20,2025. https://instr.iastate.libguides.com/authorsrights/selfarchiving
- Iowa State University Library. " Share Your Work in Our Repository." https://www.lib.iastate.edu/research-and-teach/publish-and-share/share-your-work-our-repository.

Contract Negotiations

- Arizona State University Library. "How to Retain Ownership of Your Copyright When Dealing with Publishers: A Very Short Guide to Negotiation." https://libguides.asu.edu/c.php?g=263877&p=1765373
- University of Michigan Library. "Publishing Contracts: Understanding Your Rights as an Author." https://guides.lib.umich.edu/scholarlypublishing/after-acceptance
- Yowler, Becca. "Copyright & Research." Iowa State University Library. Last modified August 25, 2025. https://instr.iastate.libguides.com/copyrightresearch/research

Fair Use

- U.S. Copyright Office. "US Copyright Office Fair Use Index." https://www.copyright.gov/fair-use/.
- Yowler, Becca. "What is Fair Use?" Iowa State University Library. Last modified August 25, 2025. https://instr.iastate.libguides.com/copyrightresearch/fairuse

Reuse Permission

- Elder, Abbey. "Getting Permission for Reuse." Iowa State University Library. Last modified January 7, 2025. https://instr.iastate.libguides.com/TDrights/permission
- Elder, Abbey. "Reusing Your Own Published Works." Iowa State University Library. Last modified January 7, 2025. https://instr.iastate.libguides.com/TDrights/republishing
- Brooke, Rachel, and Brianna Schofield. *Third-Party Permissions and How to Clear Them*, 2021. https://www.authorsalliance.org/wp-content/uploads/2021/11/Authors-Alliance-Guide-to-Third-Party-Permissions.pdf

8. Authorship: Rights, Responsibilities, and Embargoes

Rights, Responsibilities, and Embargoes

Lily Compton

In the past, individuals undertook solitary research; they conceptualized and conducted the research, analyzed the data, and wrote up the findings independently. Today, more research, especially in Science, Technology, Engineering and Mathematics (STEM) is conducted as part of a team, so assigning authorship involves recognizing the contributors to different aspects of the research. There are two key considerations when assigning authorship: (1) which authors are named and (2) the order in which their names appear. In projects involving multiple collaborators, each person may be responsible for certain task(s). Antes and Maggi sum up this concept well: "The core ethical principle of assigning authorship is fairness in who receives credit for the work. The people who contributed to the work should get credit for it. This seems simply enough, but determining authorship can—and often does—create conflict."[1]

This chapter looks at the different criteria for **authorship**, the rights and responsibilities of authors, the tools used to facilitate documentation and agreements, and guidance to avoid or resolve authorship disputes. It also covers when authors should consider withholding or delaying the release of their work. In this chapter, authors refer to the individuals who are involved in the research and publication process of scholarly work. Some of the common author references include first author or lead author, **coauthor**, and **corresponding author**.

1. Alison L. Antes and Leonard B. Maggi Jr., "How to Conduct Responsible Research: A Guide for Graduate Students," *Current protocols* 1, no.3, (2021): e87. https://doi.org/10.1002/cpz1.87

Glossary

Authorship: The recognition of individual(s) or group(s) that create an idea or develop the publication that disseminates that intellectual or creative work.[2]

Coauthor: Any person who has made a significant contribution to a journal article" and shares responsibility and accountability" for the work.[3]

Corresponding author: The author "who takes primary responsible for communication with the journal during the manuscript submission, peer review, and publication process."[4]

CRediT (Contributor Roles Taxonomy): A fourteen-role taxonomy to describe the main types of contributions in scholarly works.[5]

Embargoes: The period of time during which access to published content is restricted.

First author (**lead author**)**:** The author "who made the most significant intellectual contribution to the work"[6]

tenzing: A web-based app for tracking and generating contributions based on CRediT.[7]

2. "Defining authorship in your research paper: Co-authors, corresponding authors, and affiliation," Taylor & Francis Author Services, https://authorservices.taylorandfrancis.com/editorial-policies/defining-authorship-research-paper/

3. "Defining authorship in your research paper: Co-authors, corresponding authors, and affiliation."

4. "Defining authorship in your research paper: Co-authors, corresponding authors, and affiliation."

5. "Contributor Role Taxonomy (CRediT), National Information Standards Organization, https://credit.niso.org/

6. "What is a Corresponding Author?," Elsevier Author Services, https://scientific-publishing.webshop.elsevier.com/publication-recognition/what-corresponding-author/

7. Martin Kovacs, "tenzing," https://marton-balazs-kovacs.github.io/tenzing/

Overview

Questions

- Who is listed as an author on a manuscript?
- If there is more than one author, who should be listed first?
- What if there are details in my research I cannot reveal?

Objectives

- Identify the criteria for authorship credit and order.
- Determine the rights and responsibilities that come with authorship.
- Identify guidance, strategies, and tools to facilitate authorship discussions.
- Identify the guidance to apply for an embargo.

Authorship Credit, Rights, and Responsibilities in Academic Research

Authorship in academic research refers to the recognition of individuals who have made substantial intellectual contributions to a scientific investigation or scholarly work. Some disciplines in the arts, humanities, and social sciences have more individually authored works while STEM disciplines with long-term projects may have multiple coauthors because of collaborations or long-term experimental projects happen with other groups and organizations.[8]

Authorship Credit vs. Acknowledgment

According to Holcombe,[9] authorship credit is given both to those who write about the research process and those who do the research. Likewise, The Committee on Publication Ethics, or COPE clarifies that it is not just the person who came up with the idea but also the individual(s) "who develop and bring to

8. "Discussion Document: Authorship," COPE Council, https://publicationethics.org/files/COPE_DD_A4_Authorship_SEPT19_SCREEN_AW.pdf

9. Alex Holcombe, "Giving credit where it's due," *American Psychological Association,* September 2021, https://www.apa.org/pubs/journals/resources/publishing-tips/giving-credit

fruition the product that disseminates intellectual or creative works" who should be acknowledged.[10] In other words, authorship recognizes the individuals who have made significant intellectual contributions to scholarly work, encompassing the conception, design, execution, and interpretation of the research.

In some scholarly works, there may be individuals who have contributed to the work, but not to the degree that they qualify for authorship credit. The International Committee of Medical Journal Editors[11] shares some "Examples of activities that alone (without other contributions) do not qualify a contributor for authorship…acquisition of funding; general supervision of a research group or general administrative support; and writing assistance, technical editing, language editing, and proofreading." Some journal policies also limit the number of authors who can be listed on a paper, so individuals with smaller contributions may be excluded from the author byline. Nonetheless, their contributions should still be acknowledged. Authors can include these contributors in the acknowledgments.[12] It is recommended that authors obtain written permission from all acknowledged individuals that they agree to be included.

Authorship Rights

Giving authorship credit for all contributors to intellectual or creative work is important for several reasons. The first reason is to provide academic and professional recognition. This recognition is commonly tied to the career advancement and peer recognition in the authors' respective disciplines or professional communities.[13]

Identifying authorship credit is crucial in maintaining the integrity of intellectual or creative works. Authorship credit is a mechanism that ensures the authors agree to take on the responsibility for the work, maintain the accuracy of the content, and be prepared to answer any questions or address concerns related to the work. The corresponding author for a paper, for example, may have their email listed publicly so they can be contacted about their research by readers. The scope of responsibility an author

10. "Discussion Document: Authorship," 3.
11. "Defining the Role of Authors and Contributors," International Committee of Medical Journal Editors, https://www.icmje.org/recommendations/browse/roles-and-responsibilities/defining-the-role-of-authors-and-contributors.html
12. "2.2 Authorship and Authorship Responsibilities," Council of Science Editors, https://www.councilscienceeditors.org/2-2-authorship-and-authorship-responsibilities
13. "Discussion Document: Authorship," COPE Council, https://publicationethics.org/files/COPE_DD_A4_Authorship_SEPT19_SCREEN_AW.pdf

takes on can cover any part of the process, including idea generation and writing, revision, through final approval of the manuscript.[14]

Individuals who provided significant contributions have the right to claim authorship that comes with a set of rights. For example, graduate students who are part of collaborative research may claim authorship credit with the faculty or principal investigator, depending on the scope of contribution. Additionally, graduate students have the right to be the **first author** in scholarly works created based on their dissertations, theses, or creative components.

Authors will also have the copyright to their published scholarly work unless part or all rights have been transferred to the publishers. Graduate students may wish to retain certain rights to their published works that will allow them to include them in their dissertations, theses, or creative components. (See also Chapter 7 on copyright, licenses, and publishing agreements).

Authorship and GenAI

COPE[15] and key scholarly publishers like Wiley,[16] Elsevier,[17] and Taylor & Francis[18] agree that GenAI cannot be a coauthor because these AI tools cannot meet the authorship criteria, e.g., take responsibility for the accuracy and integrity of the work, or be responsible for the approval of the final version of the work and its submission.

Because GenAI tools generate text based on large language model predictions, "AI bots have no notion of reliability, replicability or 'truth [so] they simply return [information or responses], from the range of facts and statements in their repository…given what they have been trained on" and only produce what is plausible; they cannot responsible for what is true or accurate. They may also generate biased ideas, because their training data may have been limited in scope. Furthermore, there is a high risk of research misconduct, because these tools can misattribute or fabricate text and citations.[19]

While GenAI is not permitted to be listed as an author, COPE, scholarly publishers, and disciplinary organizations provide guidelines and considerations for how GenAI tools may be used in scholarly works. Authors should carefully review these guidelines to identify the allowable scope of GenAI use in their works and if/when they should be disclosed.

14. "Discussion Document: Authorship."

15. "Authorship and AI-Tools," COPE Council, https://publicationethics.org/guidance/cope-position/authorship-and-ai-tools

16. "Best practice guidelines on research integrity and publishing ethics," Wiley Author Services, https://authorservices.wiley.com/ethics-guidelines/index.html

Authorship Responsibilities

Authors have the responsibility to meet the highest ethical standards of scientific inquiry that promotes societal trust and avoids **research misconduct** (See also Chapter 6). Here are some examples of unethical and illegal authorships that can violate ethical standards:

- **Ghost/anonymous authorships:** Authors who have made significant contributions but are intentionally omitted from the author list to hide potential conflicts of interest or unethical practice. (Examples: a hired professional involved with drafting, editing, or analysis; industry with vested interest in product assigning authorship to a professor)
- **Gift/honorary authorships:** Authors who have made no contributions but are added to the author list to receive some benefit. (Examples: a senior researcher's name to increase credibility; a junior researcher's name to repay a favor or kickstart their reputation; reciprocal agreement to mutually boost publication list; family members' names)
- **Paid authorships:** Individuals who have paid money to be included in publications as authors even though they have not contributed to the work. (Examples: authorship sales sites, paper mills, predatory journals may include names of individuals as authors for a price. See also Chapter 4, Avoiding Predatory Publishers.)
- **Coercive authorships:** Supervisors, senior researchers, advisors, or sponsors pressuring students or junior researchers to be added to the author list though they made no significant contributions.

Authors are also responsible for disclosures of potential conflict of interests (e.g., funding sources or regulatory status of drugs or devices), and for additional requirements such as data sharing, permissions, and more.[20] With the advent of GenAI, authors also need to be responsible for their use of GenAI tools and may be required to disclose how these tools were used, if used.

17. "Generative AI policies for journals," Elsevier, https://www.elsevier.com/about/policies-and-standards/generative-ai-policies-for-journals

18. "AI Policy," Taylor & Francis, https://taylorandfrancis.com/our-policies/ai-policy/

19. "Artificial Intelligence and Authorship," COPE Editorial, https://publicationethics.org/news-opinion/artificial-intelligence-and-authorship

20. "2.2 Authorship and Authorship Responsibilities," The Council of Science Editors, https://www.councilscienceeditors.org/2-2-authorship-and-authorship-responsibilities

Authorship Order

There are several considerations to keep in mind when determining authorship order. Helgesson and Eriksson[21] discussed how the ranking order of authorship can differ based on disciplinary norms. In some disciplines, the order of authorship moves from most to least importance while others may be listed in the reverse order or reserve the first and last authors for the most important contributors. Helgesson and Eriksson added that even in fields that have a consensus of order, the practice is not consistent.

The role of a corresponding author could further muddle the ranking order. Commonly, the corresponding author is the person in charge of the manuscript process from submission to post-publication.[22] Some may view this role as the most important. However, Helgesson and Eriksson point out that this position may be given to "the junior scientist in the group so that the others do not have to deal with the tedious administrative task of submitting the paper"[23] while Springer clarified that the "corresponding author does not need to be the first or a senior author."[24] In open access publishing, where authors are responsible for the **APC**, de Castro, et al., have raised concerns about "APC tourism."[25] This phenomenon occurs when the corresponding author is selected based on their ability to pay publishing fees, rather than on scientific merit.

Additionally, the number of corresponding authors may differ depending on publishers. For example, Springer allow one corresponding author who "ensures that the manuscript can progress rapidly through the [submission] process"[26] whereas Frontiers allow up to two corresponding authors.[27]

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21. Gert Helgesson, & Stefan Eriksson, S., Authorship order. *Learned Publishing 32*, no. 2 (2019):106–112, https://doi.org/10.1002/leap.1191

22. "First Author and Corresponding Author Defined," Springer, https://support.springer.com/en/support/solutions/articles/6000214118-first-author-and-corresponding-author-defined

23. Gert Helgesson, & Stefan Eriksson, Authorship order, *Learned Publishing 32*, no. 2 (2019):108, https://doi.org/10.1002/leap.1191

24. "First Author and Corresponding Author Defined," Springer, https://support.springer.com/en/support/solutions/articles/6000214118-first-author-and-corresponding-author-defined

25. Pablo de Castro, Ulrich Herb, Laura Rothfritz, Benedikt W. Schmal, and Joachim Schöpfel, Galvanising the Open Access Community: A Study on the Impact of Plan S. *Zenodo*, October 15, 2024, https://doi.org/10.5281/zenodo.13738479

26. "First Author and Corresponding Author Defined."

27. "Editorial Policies," Frontier Scientific Publishing, https://front-sci.com/page/view/editorial-policies

Because there are different interpretations to the authorship order in each discipline, it is necessary for all contributors to have discussions about the ranking order of authorship early and frequently to ensure that the group can make a collective decision. Editors are not responsible for the ranking order and changes to the order may require additional documentation.[28]

In some cases, it might be necessary to identify the specific contributions made by each individual. Keeping such documentation can be used to determine the authorship order when submitting manuscripts for publication. Documenting contributions is a complicated and flawed process, lacking consistent standards. However, one initiative has gained acceptance among journal publishers. In 2022, the National Information Standards Organization (NISO) officially approved **CRediT** (Contributor Roles Taxonomy) for classifying contributions.[29] CRediT is described in this manner: "The Contributor Roles Taxonomy's 14 roles and best practices represent a simple but comprehensive system that enables the range and nature of contributions to scholarly published output to be captured in a transparent, consistent, and structured format."[30]

This taxonomy explicitly covers scope of responsibility where authors may overlap in tasks or conduct multiple roles. Authors can use this taxonomy to clarify their roles and responsibilities in the beginning and throughout the research and writing process; this strategy can avoid misunderstandings or disagreements and minimize the chances of disputes.

Publishers like Elsevier, Wiley, Taylor & Francis, Frontiers, and PLOS also use CRediT to facilitate the disclosure of CRediT Author Statements. Commonly, CRediT statements can be included before the acknowledgment section of a manuscript.

While using CRediT can facilitate the discussion of roles and responsibilities, documenting the individual contributions can be tedious and arbitrary. In 2020, Holcombe, et al.,[31] introduced ***tenzing***, "a web-based app and R package… [that makes] it easier for researchers on a project to plan and record their planned contributions and to document those contributions in a journal article." They include a spreadsheet tem-

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28. "2.2 Authorship and Authorship Responsibilities," Council of Science Editors, https://www.councilscienceeditors.org/2-2-authorship-and-authorship-responsibilities; "Defining the Role of Authors and Contributors," International Committee of Medical Journal Editors, https://www.icmje.org/recommendations/browse/roles-and-responsibilities/defining-the-role-of-authors-and-contributors.html

29. "Contributor Role Taxonomy (CRediT)," National Information Standards Organization, https://credit.niso.org/

30. "ANSI/NISO Z39.104-2022, CRediT, Contributor Roles Taxonomy," National Information Standards Organization, https://www.niso.org/publications/z39104-2022-credit

31. Alex O. Holcombe, Marton Kovacs, Aust Frederik, and Balazs Aczel, "Documenting contributions to scholarly articles using CRediT and *tenzing*," *PLoS ONE* 15, no. 12 (2020): e0244611. https://doi.org/10.1371/journal.pone.0244611

plate based on CRediT that can be used to record and track each author's contributions from beginning to end. The tool also streamlines the process of preparing author contribution statements as required by some publishers, by generating human-readable reports and machine-readable outputs with a click of a button. (These outputs can be seen at tenzing.)

Author Affiliation

Author affiliation in a published work can provide readers with useful information. The affiliations indicate the place(s) where the authors conducted the research.[32] Authors can also list current affiliation, if that differs from where they conducted their research. For instance, if an author moves to a new institution, their affiliation might reflect where the author was located during the time of manuscript submission or publication rather than the place of research and allows readers to find the authors if they have questions about their work. Publishers may have recommendations on how to indicate affiliation change. For example, Taylor & Francis recommends acknowledging the new affiliation in a note, as they cannot make changes after the manuscript has been accepted.[33]

In cases of collaboration across institutions, authors may list different affiliations; the affiliations can provide credibility and trustworthiness to the research because readers can identify the research environment and institutional oversight. For example, the Oregon State University Library states that author affiliation is typically how a university or research institution can help readers to determine whether an article is scholarly.[34]

Providing author affiliations can also help to promote the authors' institutions. The University Health Network Library states that "many external organizations will identify your publications based only on the listed author names and affiliation" and without the author affiliations, there is a possibility of "not being credited."[35] They also recommend paying attention to the format of writing the author affiliation and illustrate some common errors at their institution. It is prudent for authors to check if their institutions have recommended formats.

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32. "Defining Authorship in Your Research Paper," Taylor & Francis Author Services, https://authorservices.taylorandfrancis.com/editorial-policies/defining-authorship-research-paper/
33. "Defining Authorship in Your Research Paper."
34. "Scholarly Articles: How can I Tell?," Oregon State University Library, https://guides.library.oregonstate.edu/c.php?g=285842&p=1906819
35. "Writing Your Manuscript," University Health Network Library, https://guides.hsict.library.utoronto.ca/c.php?g=707168&p=5160334

Unfortunately, some research institutions have been found to game this practice by misleading readers by misstating author affiliations. Cantanzaro shared findings about some Saudi Arabian institutions that have "encouraged top researchers to change their main affiliations, sometimes for cash" to boost the university rankings.[36] Such misrepresentations are unethical and can be considered research misconduct, since they involve falsifying information (see Chapter 6, Research Integrity and Research Misconduct).

Power dynamics, authorship negotiations, and dispute resolutions

Power differentials can complicate authorship decision-making. Graduate students, postdoctoral scholars, and junior faculty may be pressured into unethical authorships (such as gift or coercive authorships) because they depend on the other party, for various reasons including degree completion or financial support. Macfarlane stated that the "low levels of understandings as to what constitutes a legitimate claim to authorship…can have a particularly significant impact on the development of early researchers".[37] It is prudent for everyone to be better informed about the concept of authorship, the rights and responsibilities of authors, and the institutional policies and resources that can help the to maintain fair treatment for all parties.

Here are three useful strategies to facilitate authorship negotiations:

1. Discuss authorship and expectations at the start of the research project, keeping in mind that contributions and roles may change over the time of the project.
2. Revisit authorship and expectations regularly or during major milestones.
3. Use a tool like CRediT or tenzing to track contributions.

If there are disagreements, consider the following options:

1. Review your contribution tool with your collaborators to correct any potential miscommunications or misunderstandings.
2. Discuss your situation with others outside your project to gain an objective perspective.
3. Approach relevant people, e.g., an ombudsman, a mentor, advocate, or organizational leader.
4. Check out the COPE Council's resources on how to handle authorship disputes.

More resources are listed in 8.7 Resources.

36. Michele Catanzaro, "Saudi Universities Entice Top Scientists to Switch Affiliations—Sometimes with Cash," *nature*, May 5, 2023, https://doi.org/10.1038/d41586-023-01523-x

37. Bruce Macfarlane, "The Ethics of Multiple Authorship: Power, Performativity and the Gift Economy," *Studies in Higher Education* 42 (2015):16, DOI: 10.1080/03075079.2015.1085009.

Embargoes—The Right to Withhold Details

In academia, scholarly works may sometimes be subjected to **embargoes**. Embargoes allow authors to delay their publications for specific reasons. Two important reasons are:

1. Protecting intellectual property, e.g., patent or a contract
2. Meeting sponsor, publisher, or institutional requirements, e.g., a specific timeframe before full text access is granted elsewhere.

When embargoes are placed on scholarly works, readers can still access details like the title, abstract, and citation details, but the full text is not available until the embargo period is over. The length of an embargo will depend on situational factors including the sponsor of the work, publisher or institutional policies, and the timeframe to file for a patent.

Sponsored Research

Some scholarly works cannot be embargoed at all. For example, the US OSTP issued the *Ensuring Free, Immediate, and Equitable Access to Federally Funded Research* "to make publications and their supporting data resulting from federally."[38] This policy takes effect no later than December 31, 2025. Authors receiving federal funding must this requirement.

Other sponsored research at institutions or organizations may involve non-disclosure agreements that restrict the release of confidential or proprietary information. Occasionally, sponsors may approve a version for public access that includes the redaction or removal of some details. For example, sponsored research at Iowa State University never prevents the ability to publish research outcomes. However, sponsors are typically given a brief period to review publications prior to submission for removal of confidential or proprietary information.

Publisher Policies

Most publishers have guidelines about post-publication embargoes. Authors who wish to include their published works in institutional repositories or their program capstone projects—dissertations, theses, or creative components—must check the terms in their publishing contracts (see Chapter 7) and the pub-

38. "Ensuring Free, Immediate, and Equitable Access to Federally Funded Research," Executive Office of the President, Office of Science and Technology Policy, https://bidenwhitehouse.archives.gov/wp-content/uploads/2022/08/08-2022-OSTP-Public-Access-Memo.pdf

lishers' website. Some publishers allow graduate students to reuse their previously published articles in their capstone projects with citations to the original source while other publishers may include an additional embargo before the dissertations, theses, or creative components can be made available in other repositories.

Institutional Policy and Guidelines

Institutions may have additional guidelines that can determine the length of an embargo for different reasons. For example, Iowa State University is a land grant university, which allows the institution "to receive the benefits of the Morrill Acts of 1862 and 1890" (Association of Public & Land Grant Universities, n.d.)[39] with three missions—teaching, research, and extension to benefit Iowa and the world.[40] Because of these missions, all research conducted at Iowa State University should be made available to the public in a timely manner. While embargoes may be allowed, they can only be for a specific length of time. Dissertations, theses, and creative components can include 6-months, 1-year, or 2-year embargoes while creative writing students may apply for an extended embargo.[41] Authors should check with their respective institutions for embargo policy and guidelines.

Patent and Commercialization Timeline

Scholarly work that may involve patents or commercialization often requires a delay before making results public. In the United States, authors have a one-year grace period after public disclosure to file a patent application; however, most other countries require that no public disclosure occurs before filing. Delaying the public release of scholarly work can be critical to the protection of intellectual property. Graduate students working on research with potential patentable or commercial value should consult with their major professor and the university's technology transfer office as early as possible—ideally before any public disclosure—to protect intellectual property rights. Successfully commercializing a product derived from research involves additional steps beyond patenting. Authors interested in the commercialization process should contact their institution's technology transfer office.

39. "Land-Grant University FAQ," Association of Public & Land-Grant Universities, https://www.aplu.org/about-us/history-of-aplu/what-is-a-land-grant-university/

40. "Iowa State University Part of Land- Grant Impacts Website Launch," Iowa State University College of Agriculture and Life Sciences, March 3, 2015, https://www.cals.iastate.edu/news/2015/iowa-state-university-part-land-grant-impacts-website-launch

41. "Thesis/Dissertation," Iowa State University Graduate College, https://www.grad-college.iastate.edu/student/Thesis-Dissertation

Authorship and publication expectations for Iowa State University graduate students

Here are some policies and resources that can help Iowa State University graduate students navigate the authorship and publication expectations for their dissertations, theses, or creative components.

- Authorship policy: The OVPR oversees this policy at Iowa State University. This policy covers the expectations, attributions, and violations.
- Student & major professor checklist: Graduate students should work closely with their major professors on topics related to their scholarly work, including dissertations, theses, and creative components. The Graduate College provides this checklist to facilitate the discussion of expectations including the right of authorship, the ordering of authors, acceptable publishing venues, and more.
- Generative AI in research: Generative AI cannot be listed as an author. While these tools have a capacity to assist in the research process, any use of these tools must be effective, efficient, and ethical to ensure that research findings are not compromised. The use of these tools for dissertations, theses, and creative components should follow guidelines provided by relevant units on campus. Graduate students should also review guidelines from publishers, funding agencies, and professional societies in their disciplines/fields. It may be prudent to discuss any potential uses with major professors and coauthors.
- Shared consent forms: At the discretion of their department and supervisor, graduate students are allowed to include coauthored publications in their theses or dissertations. If the coauthor(s) include other graduate students who may include the same publication in their own theses or dissertations, a copy of the shared consent form needs to be attached. Two versions of the form are available; the first is by percentage of contribution and the second is by CRediT (Contributor Roles Taxonomy).
- Availability to public: Because Iowa State University is a land grant university that has an obligation to make all research publicly available, dissertations, theses, and creative components must also be made available within a timely manner. Therefore, graduate students' dissertations, theses, and creative components must also comply with this expectation. All dissertations, theses, and creative components are made publicly available through Iowa State University Digital Repository and ProQuest.
- Embargoes (withholding access): Graduate students should discuss the choices of topics that will not hinder their program completion timeline with their major professors. In some cases, a temporary embargo can be used to temporarily delay the publication of students' works; however, a permanent embargo is not permitted.
- Guidelines for sponsored research and intellectual property research (under the Available to Public tab): In cases where graduate students' scholarly work is related to sponsored research or intellectual property research that includes confidential or proprietary information, the Graduate College provides guidelines for dissertations, theses, and creative components that will include a modified version for public access. This modified version meets the expectations for the institution's land grant mission to make all research public and also meets the Iowa State digital accessibility policy.
- Office of Innovation Commercialization: If there are potential patents or commercial value in the research, check with this office as soon as possible and preferably before any public disclosures, including at conference presentations and oral examinations.

Additional Resources

- Graduate College's thesis/dissertation (Policies and Guidelines)
- Center for Communication Excellence (Thesis/Dissertation Toolkits)
- Office of Innovation Commercialization (Patents)
- Iowa State I-Corps program (Commercializing Research)

Key Points

- Authorship comes with rights and responsibilities. Only significant contributors should be given authorship credit.
- Adding names of people who did not meet the criteria of authorship is illegal and unethical and could result in research misconduct.
- Keep track of contributors and their tasks using tools like CRediT or tenzing. The documentation can be used in negotiating authorship order, resolving authorship disputes, and more.
- Embargoes can be used to delay the release of scholarly works. Some reasons for embargoes include requirements of sponsored research, publishers, institutional guidelines, or patent application.

Resources

Authorship Contribution Tools

- Holcombe, Alex. "Authorship: Giving Credit Where It Is Due." American Psychological Association, 2021. https://www.apa.org/pubs/journals/resources/publishing-tips/giving-credit
- Holcombe, Alex, Marton Kovacs, Felix Aust, and Balazs Aczel. "Documenting contributions to scholarly articles using CRediT and tenzing." *PLOS ONE* 15, no. 12 (2020): e0244611. https://doi.org/10.1371/journal.pone.0244611
- Iowa State University Library. "Share Your Work in Our Repository." https://www.lib.iastate.edu/research-and-teach/publish-and-share/share-your-work-our-repository.
- Kovacs, Marton, Alex Holcombe, Felix Aust, and Balazs Aczel. "Tenzing and the importance of tool development for research efficiency." *Information Services & Use* 41, no–9 (2021):123-130. https://doi.org/10.3233/ISU-210109

Authorship Guides

- American Journal Experts. "Ghost Authorship, Gift Authorship, Guest Authorship—3 Practices to Avoid." https://www.aje.com/arc/ghost-authorship-gift-authorship-guest-authorship/.
- Antes, Alison L., and L. Britt Maggi Jr. "How to Conduct Responsible Research: A Guide for Graduate Students." *Current protocols* 1, no. 3 (2021): e87. https://doi.org/10.1002/cpz1.87.
- Arizona State University Library. "A Very Short Guide to Negotiation." https://libguides.asu.edu/c.php?g=263877&p=1765373.
- Cooke, Steven J., Nathan Young, Mark R. Donaldson, Erin A. Nyboer, Dominique G. Roche, Christine L. Madliger, Robert J. Lennox, J.M. Chapman, Zachary Faulkes, and Joseph Bennett. "Ten Strategies for Avoiding and Overcoming Authorship Conflicts in Academic Publishing." *FACETS* 6 (2021): 1753-1770. https://doi.org/10.1139/facets-2021-0103
- Haas, M. R. C., Lorelei A. Maggio, Bridget C. O'Brien, and Anthony R. Artino Jr. "Strategies for Navigating Authorship." *Journal of Graduate Medical Education* 16, no. 1(2024): 84–85. https://doi.org/10.4300/JGME-D-23-00932.1
- O'Donnell, Megan. "Understanding Predatory Publishers." Iowa State University Library. Last modified September 12, 2025. https://instr.iastate.libguides.com/predatory
- University of Michigan Library. "Publishing Contracts: Understanding Your Rights as an Author." https://guides.lib.umich.edu/scholarlypublishing/after-acceptance.

Fair Use

- U.S. Copyright Office. "U.S. Copyright Office Fair Use Index." https://www.copyright.gov/fair-use/.
- Yowler, Becca. "What is Fair Use?" Iowa State University Library. Last modified August 25, 2025. https://instr.iastate.libguides.com/copyrightresearch/fairuse.

9. Plagiarism

Kristin Terrill

Glossary

Fixed work: A durable form in which creative output can be seen, heard, or perceived by others.

Intertextuality: Drawing additional meaning from outside texts.

Plagiarism: Violations of the assumption that a text is written by, and reflects the original ideas of, the named authors.

Similarity: Text within a given document that matches other text in a reference database.

Overview

Questions

- What is and is not plagiarism?
- How can plagiarism be avoided?
- How can problematic content in writing be identified?

Objectives

- Define plagiarism.
- Identify plagiaristic and non-plagiaristic writing practices.
- Identify the uses and limitations of text matching software for detecting plagiaristic content.

What Is Plagiarism?

Readers assume that academic texts are written by, and reflect the original ideas of, the named authors.

Violations of this assumption are considered plagiarism. **Plagiarism** encompasses any misrepresentation of originality, which is different from copyright infringement. Copyright infringement concerns only unlicensed copying of **fixed works**, while plagiarism extends to the ideas expressed by authors. Misattribution and misrepresentation of the work of others can also be considered plagiarism.

It is unethical to intentionally engage in plagiarism. Scholars have agreed-upon conventions of attribution to clearly demarcate content they did not originate when engaging with content written by others, such as quoted, paraphrased, and summarized text. Plagiarism accusations can be very damaging to a student's or scholar's academic reputation, so it is essential to understand what constitutes plagiarism and how to avoid engaging in it.

What Is Not Plagiarism

Quoting

Quotes are visually offset from the main text to indicate that the text has been copied from another source. Short quotes are offset by quotation marks. Here is an example of quoted text: "The role of language in perception is striking because of the opposing tendencies implicit in the nature of visual perception and language."[1] This quotation is enclosed with double quotation marks to indicate where the copied text begins and ends. It also includes an in-text citation to the publication where the quoted text was copied from. In-text citations take different forms. They are connectable to a list of full references elsewhere in (typically at the end of) a paper or chapter. The full citation provides detailed information about the source text to enable readers to retrieve it.

Long quotations—forty to one hundred words or more, depending on the style guide—can be demarcated as paragraphs-within-paragraphs called block quotes. Block quotes start on a new line and are, usually, fully indented relative to the body paragraphs:

> *To-morrow, and to-morrow, and to-morrow,*
> *Creeps in this petty pace from day to day*
> *To the last syllable of recorded time*
> *And all our yesterdays have lighted fools*
> *The way to dusty death. Out, out, brief candle!*
> *Life's but a walking shadow, a poor player,*
> *That struts and frets his hour upon the stage,*
> *And then is heard no more: it is a tale*

1. L. S. Vygotsky, Mind in Society (Harvard University Press, 1978), 33.

Told by an idiot, full of sound and fury,
Signifying nothing.[2]

The exact punctuation, typographical, and layout conventions for quotes and block quotes vary, depending on the style guide. It is important to pay close attention to the conventions used by your publisher, because failing to follow them can prevent readers from differentiating quoted text from original text. Failure to clearly differentiate quoted text is a form of plagiarism.

Properly Attributing Paraphrased and Summarized Content

Paraphrasing and summarizing both refer to representing someone else's ideas in the author's own words. The difference between paraphrasing and summarizing rests in the amount of text that is represented. A summary is a short explanation of the main ideas presented in a much longer text. An example of a summary is the paragraph on the back of a book that highlights key details about the book's plot. A paraphrase is a portion of text approximately equivalent in length to the amount of text presented in the original work. Like a quotation, a paraphrase provides the same amount of information, but unlike a quotation, a paraphrase does not exactly copy the text from the original.

Like quotations, summary and paraphrase are considered forms of plagiarism when lacking correct attribution. For both summaries and paraphrases, attribution involves the use of a citation, in the same sentence where the paraphrase or summary is presented, and a full citation in the reference section.

When to quote, paraphrase, and summarize

Novice writers tend to over-rely on direct quotation out of a lack of confidence in their own ideas or interpretation of the source text. For academic writing, limit the use of direct quotes to situations where the exact wording used in the original text is of interest to your reader. For instance, if you aim to critique the rhetorical approach taken by the source's author, a direct quote can exemplify such a problem. It is also advisable to use direct quotes when the exact words used to express the idea are, themselves, part of the idea, as in literary prose and poetry.

As a reader, it is imperative that you maintain awareness of the originality of content you are reading. In conventional research articles, the beginning and closing—introduction, discussion, and conclusion—sections almost always include ideas from other publications. In a word, they are **intertextual**,

2. Shakespeare, *The Tragedy of Macbeth*, 2021, The Arden Shakespeare.

since they include references to outside texts. These references may take the form of direct quotations, paraphrasing, or summarizing. If you come across an idea, referenced in a more recent publication, that informs your literature review, be sure to provide attribution to the original publication in which that idea was presented. Do not quote a quotation! Use the provided in-text citation and the References list, or Bibliography, to identify the original source, then get access to it using a database or ILL. Having read the original source will help you better understand the complexity of the ideas, critique other scholars' interpretations of them, and integrate them into your own scholarship.

Plagiarism Detection

Tools Overview

There is no comprehensive way to automatically detect plagiarism. Software developers, such as TurnItIn, have developed tools that identify **similarity**, i.e., text within a given document that matches other text in a reference database. These tools have been used in some schools and universities to detect plagiarism in students' work, including theses and dissertations. Some publishers also use them to detect similarities in submitted manuscripts. Because these tools can be used by powerful gatekeepers to police written content, software developers also market the tools to students and authors, recommending that they pre-check their own work before submitting it.

Setup

The Iowa State University OVPR provides iThenticate licenses to Iowa State University graduate students by request. You will need to request an iThenticate license from the OVPR[3] Read the User Policy carefully, then complete the license request form for graduate students. You will receive an email with instructions for activating your license.

Similarity detectors are very useful tools, since plagiarists often copy text from source materials directly into their manuscripts. Similarity detectors highlight the copied text and provide a link to the original source. They also calculate the overall percentage of content in a file that is similar to content in the database. Content such as quotations and bibliography entries are similar to pre-existing content by design; therefore, settings in well-developed similarity detectors can be adjusted to omit such content

3. If the link does not work, navigate to the OVPR home page and enter "plagiarism checker software" in their search tool.

from their reports. The information similarity detectors provide can alert instructors and publishers to potential academic misconduct. However, they do have some important limitations.

One limitation of these tools is the comprehensiveness of their databases. Clearly, an unscrupulous author could get away with plagiarism if the source text was not included in the similarity detector's database. Another limitation is that the similarity detector cannot reliably differentiate between similarity that is plagiaristic and similarity that is acceptable. For instance, it is common for scholars to repurpose content from their doctoral dissertation as material for research articles and books. It is also accepted practice in some disciplines for authors to copy extensive portions of literature reviews and methods from previously published articles, with the rationale that the results of the research constitute the valuable, original contribution. Finally, similarity detectors are not capable of detecting uncited paraphrases or other unattributed use of others' ideas.

If you use a similarity detector for any reason, whether as a teacher, author, or journal editor, it is critical to be aware of the limitations of these tools. Users must be responsible for applying critical thinking to the results of similarity analyses. This responsibility entails knowledge of the tool and the contexts in which the focal manuscript and any similar sources from the database belong. High stakes decisions should rest on more than mere similarity.

How to Use iThenticate

Folders and Folder Settings

iThenticate offers a file management system (see Figure 9.1) similar to other online writing analysis tools, such as Grammarly. Users can store multiple files online using their iThenticate account. Files can be organized into folders, shared with other account holders, and deleted.[4] Document information can also be updated.

4. Refer to the developer's documentation to learn about file deletion, such as whether files added to the database are retained after being deleted from the user's file list.

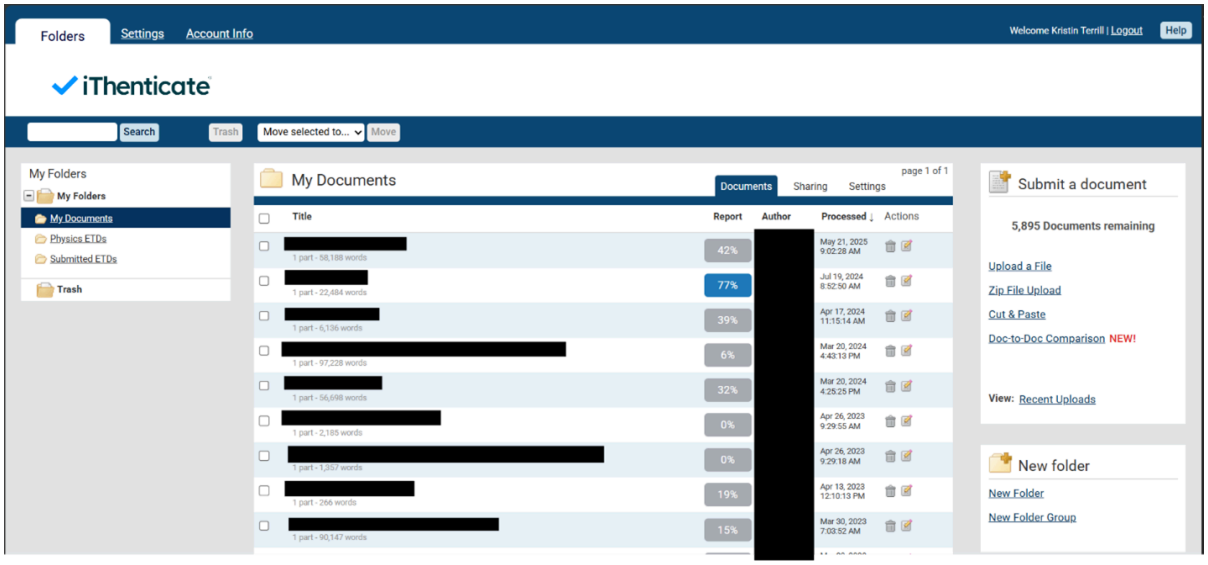


Figure 9.1 *iThenticate Main Page*

Folder settings can be used to customize similarity reports (see Figure 9.2). For example, it might be useful to filter out certain websites, such as the Iowa State University Repository, if it is known that part or all of a document has previously been published on that site.

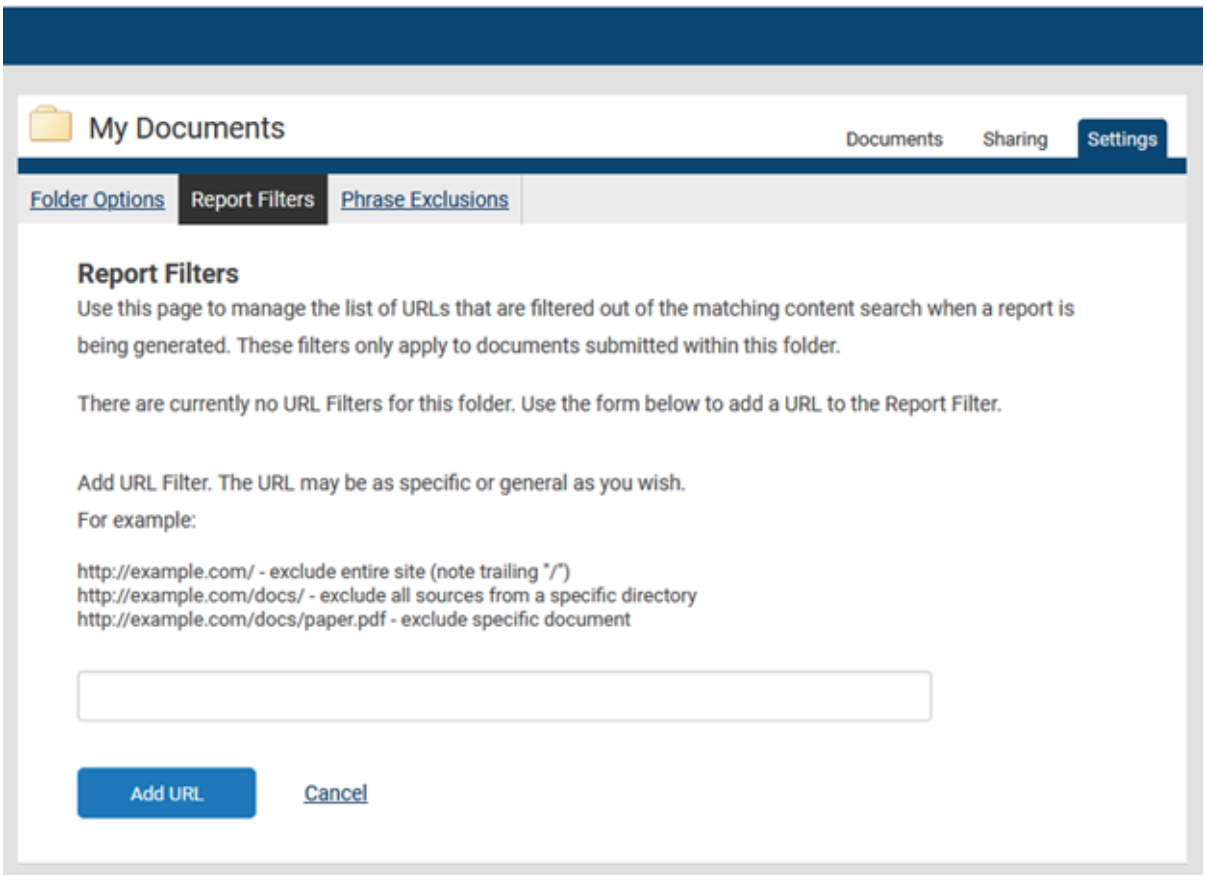


Figure 9.2 *Folder Settings: Report Filters*

Folder settings can also be used to filter phrases from a similarity analysis. For instance, boilerplate text, such as that which appears on ISU thesis and dissertation title pages, can be filtered out to prevent iThenticate from including it in the similarity analysis. (See Figure 9.3)

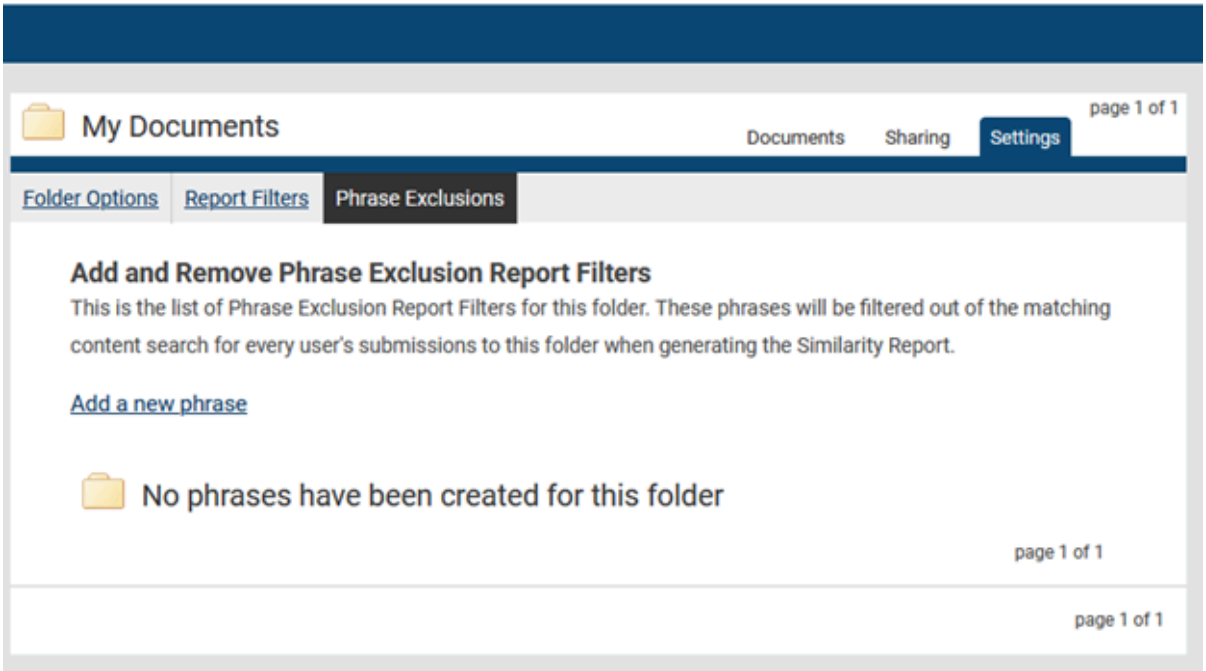


Figure 9.3 *Folder Settings: Phrase Exclusions*

Uploading Files

There are several ways of adding new files to an iThenticate folder: files can be uploaded individually, multiple files can be uploaded as a ZIP file, and text can be pasted into a text entry field. Figure 9.4, Figure 9.5, and Figure 9.6 show the form used for uploading an individual file.

When uploading or creating new documents, users have the option of adding them to the Document Repository. This repository is specific to Iowa State University; documents added to the repository are then available as comparison texts for future ISU document submissions. This function permits users to check for plagiarism and self-plagiarism against unpublished documents used within the institution, such as course papers.

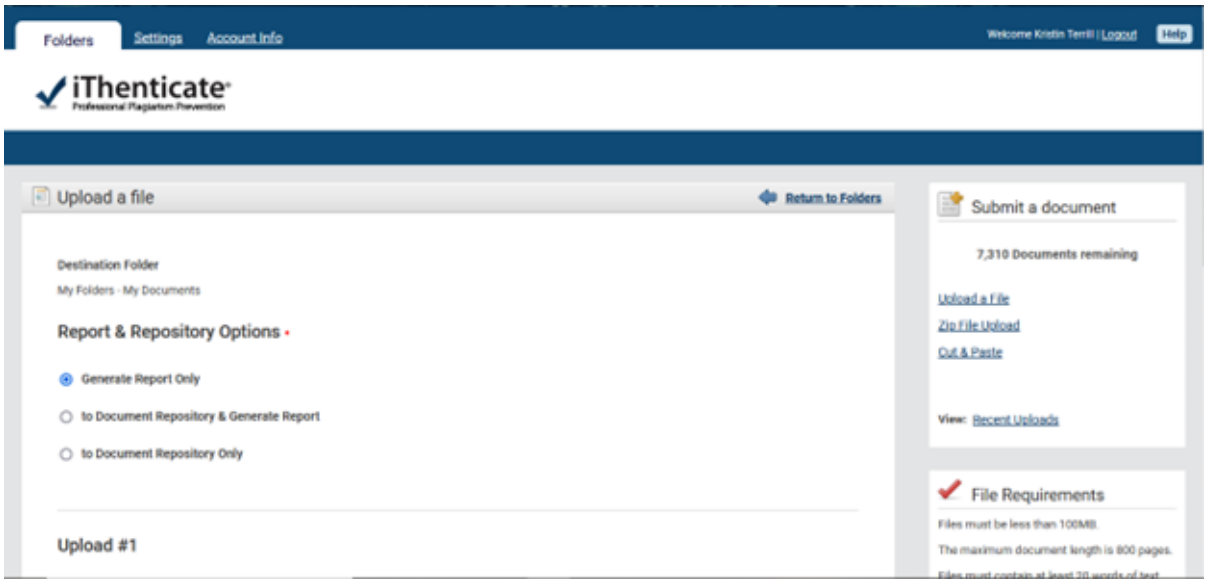


Figure 9.4 *Upload a File (a)*

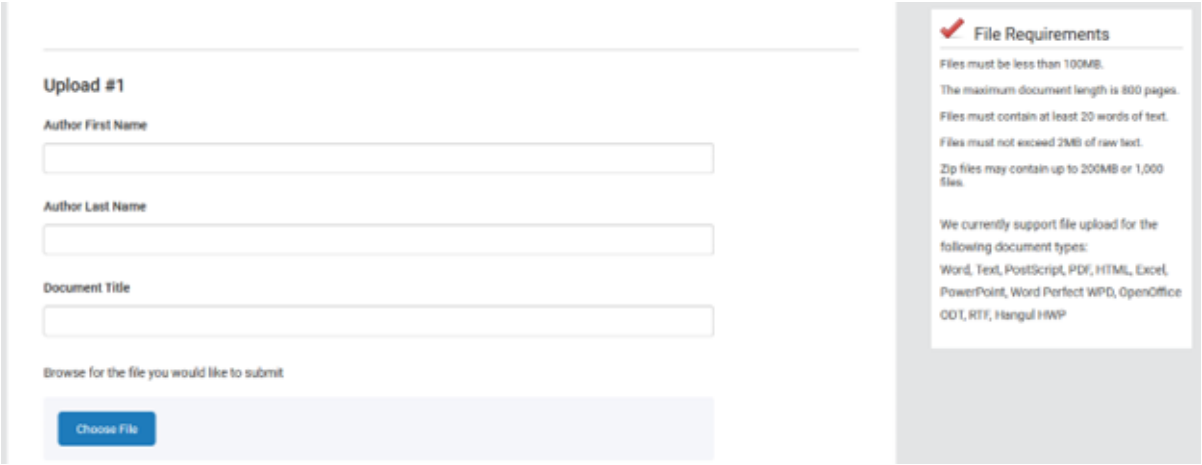


Figure 9.5 *Upload a File (b)*

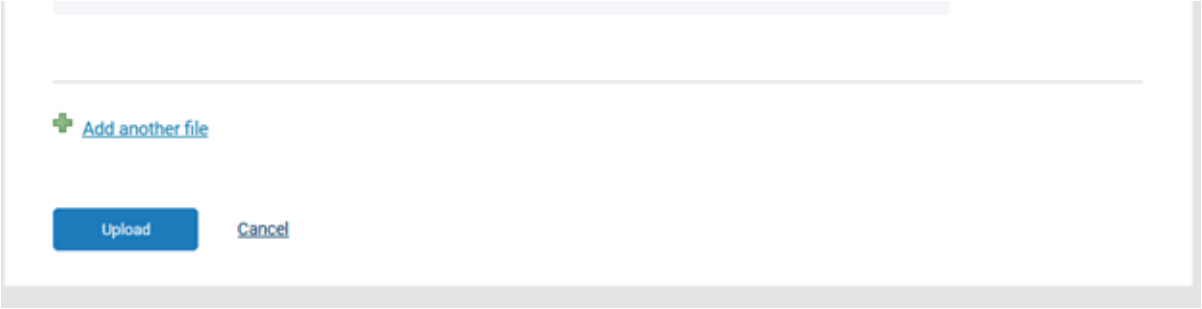


Figure 9.6 *Upload a File (c)*

Scenario: Early thesis draft

Master's student Yasmín has completed a draft of her thesis introduction and literature review. Before she sends it to her major professor for comments, she wants to use iThenticate to ensure that all her quotations are properly enclosed in quotation marks and cited. She opens the "Upload a file" tool, but she is confused about what to choose in the Report & Repository Options.

Solution: There are three options under Report & Repository in the iThenticate "Upload a file" tool.

- **Generate Report Only:** The uploaded file is scanned and similarity is detected against any other documents in the database, including within the Iowa State University iThenticate repository. The uploaded file is not added to the repository.
- **To Document Repository & Generate Report:** The uploaded file is scanned and similarity is detected against any other documents in the database, including within the Iowa State University iThenticate repository. The uploaded file is added to the repository.
- **To Document Repository Only:** The uploaded file is not scanned but is added to the repository.

Yasmín should select **Generate Report Only**. She should not add her early thesis draft to the repository, since she will likely want to use iThenticate later to generate a report for her final draft. If she chooses to add it to the document repository now, any future reports will erroneously flag the revised introduction and literature review as similar text because it will compare them to the draft version. Yasmín should also be careful not to overuse the license—the OVPR limits users to only four reports per project.

After a document is uploaded, iThenticate begins to analyze it and generate a report. This process can take several minutes. Once complete, the icon in the Report column on the home screen will change from "Pending" to a percentage (see Figure 9.1). This percentage reflects the overall similarity score for the document, or the percentage of text in the document that is deemed similar to text found in the iThenticate database. To review the details of the similarity score, click the percent icon. This opens the similarity analysis (Figure 9.7–Figure 9.13).

The similarity analysis provides details on the similarities found between the document and other documents in the repository. The text of the document is shown along with a numbered list of documents from the database containing similar text. Changing the mode (see Figure 9.8) allows the user to interact with different aspects of the report.

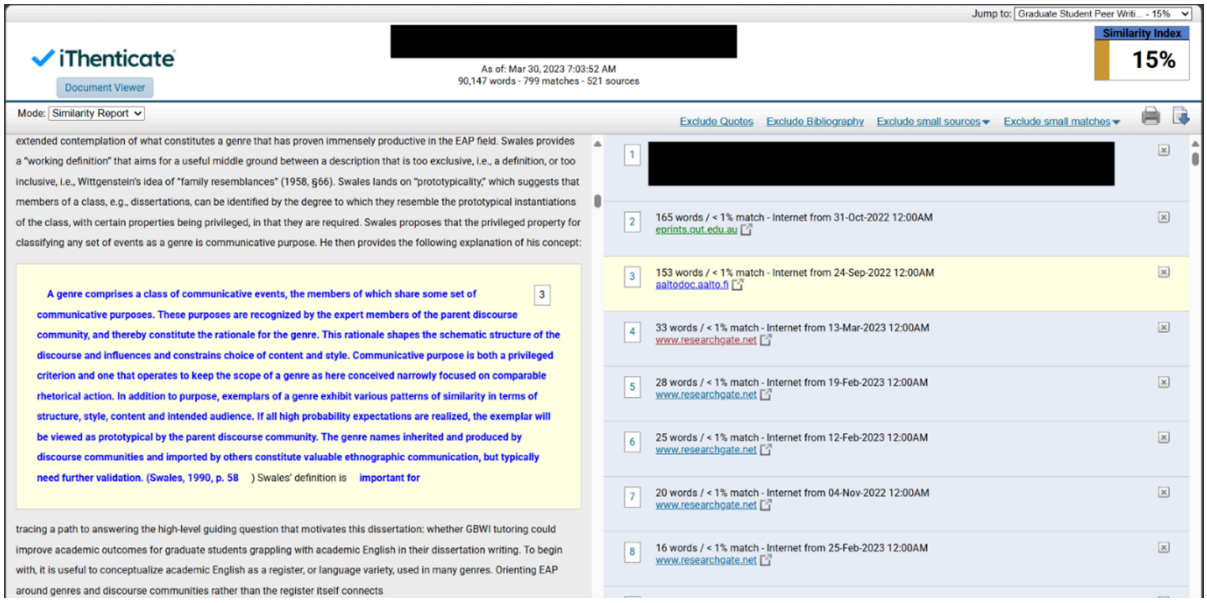


Figure 9.7 *iThenticate Similarity Analysis: Mode = Similarity Report*

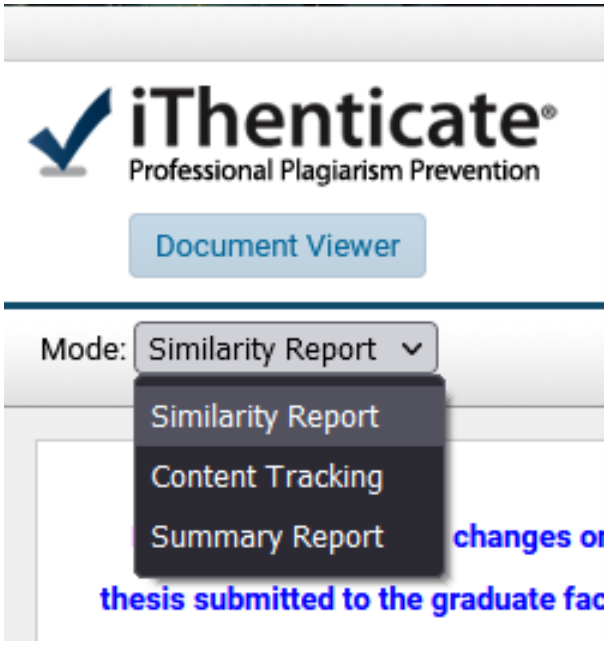


Figure 9.8 *Mode menu*

The similarity analysis also allows the user to adjust the similarity detection parameters. "Exclude Quotes" and "Exclude Bibliography" function as toggles that prevent identification of quoted text or bibliography entries from being compared with database document text. "Exclude small sources" allows the user to limit the size of database documents; for instance, setting the word count above 1,000 could filter out sources containing only abstracts. This could be useful for checking a journal article that has

been previously submitted as a conference paper. “Exclude small matches” can be used to limit the word count of a match. Setting this parameter above five words could reduce false positives related to formulaic language.

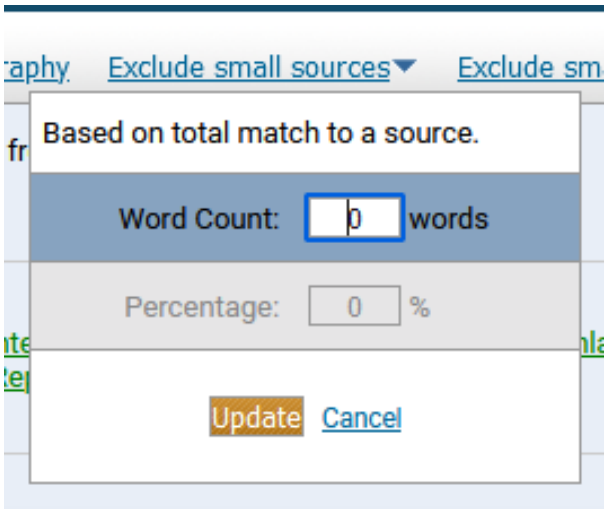


Figure 9.9 *Match settings, exclude small sources*

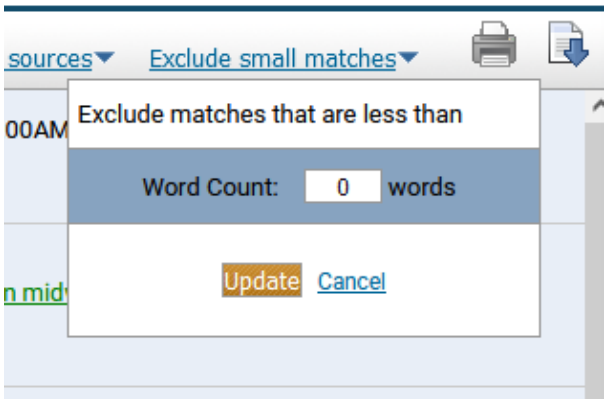


Figure 9.10 *Match settings, exclude small matches*

Similarity Report

In Similarity Report mode (Figure 9.7), the text of the document is shown in the left panel, while the list of documents containing similar text appears in the right panel. The text in the left panel is formatted in color to indicate which text is similar to that found in listed documents. Clicking the number of a document in the right panel causes the viewer to automatically scroll to the part of the document with similar text. Clicking this area in the left panel opens a side-by-side comparison between the uploaded document and the similar document from the repository. (see Figure 9.11). Clicking the link or the icon in the right panel opens the original text of the similar document. The “next match” controls allow the

user to navigate between non-contiguous parts of the document where the text is similar. To close the side-by-side comparison, click the icon in the right panel.



Figure 9.11 *Side-by-side compare*

Content Tracking

The Content Tracking mode (Figure 9.12) allows the user to limit the analysis to just one database document at a time. Click the radio button next to the database document to view the document with text formatting indicative of similar text. As in Similarity Report mode, the user can click the formatted text area in the left column to open a side-by-side comparison view.



Figure 9.12 *iThenticate Similarity Analysis: Mode = Content Tracking*

Summary Report

In Summary Report mode (Figure 9.13), the list of documents containing similar texts appears at the top of the screen, with the formatted text of the document appearing below. This mode does not allow the same degree of interactivity as the other two modes.

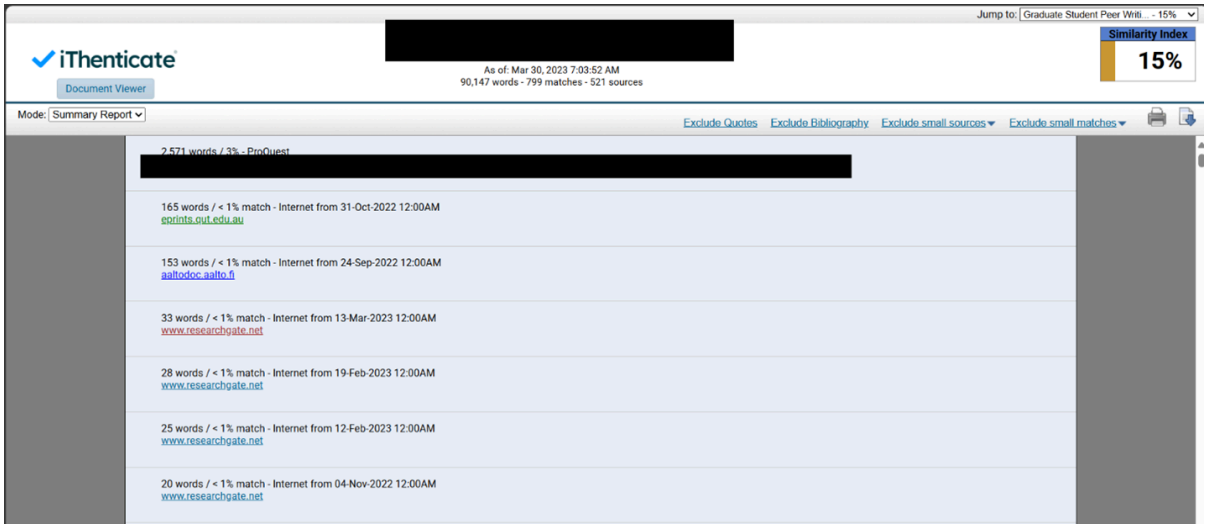


Figure 9.13 *iThenticate Similarity Analysis: Mode = Summary Report*

Document Viewer

The default view for reviewing the similarity analysis is text-only; however, it is possible to view the content as it appears in a PDF document. To see this view, click the "Document Viewer" button under the iThenticate logo (Figure 9.14).

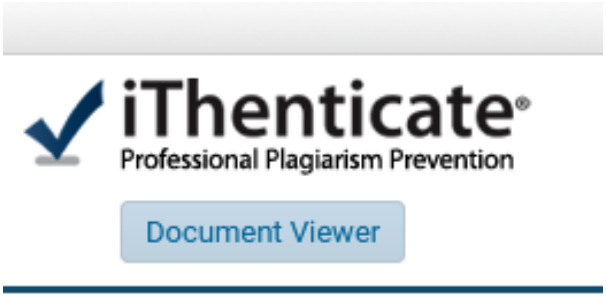


Figure 9.14 *Screenshot of iThenticate interface, Document Viewer button*

In Document View, the interface appears as the published document. The Match Overview panel on the right enables navigation to parts of the document where text is similar to that found in the database (see Figure 9.15).

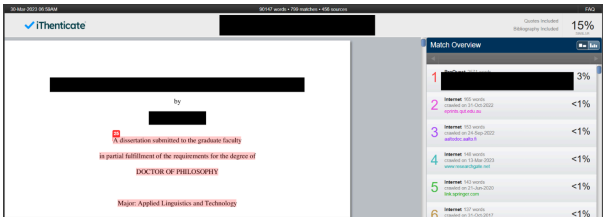


Figure 9.15 *Document Viewer mode*

To return to the text-only view, click the "Text-Only Report" button on the bottom-right of the screen (Figure 9.16).

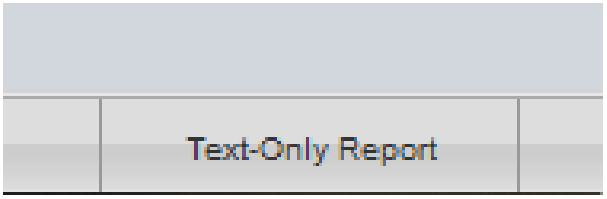


Figure 9.16 *Return to text-only mode*

Summary

Plagiarism is a violation of the assumption that a text is written by, and reflects the original ideas of, the named authors. Plagiarism implies the appropriation of ideas or expression originating from another person, but the concept is inclusive of unethical reuse of text by the same person (self-plagiarism). In some cases, use of machine-generated text, such as generative AI, without clear disclosure can be considered a form of plagiarism. Plagiarism can be unintentional, especially for novice writers who are unfamiliar with the norms and writing practices of their disciplinary community. It is important to understand how to use quotations, paraphrase, and summary to engage the prior contributions of other scholars in new, original publications. Additionally, it is critical to practice responsible attribution when engaging with prior scholarship in your writing. More guidance on attribution is provided in Chapter 2.

Although it is not possible to automatically detect plagiarism, technologies that identify and quantify similarity have proven to be highly useful for educators and publishers in detecting certain kinds of plagiarism. These tools have important limitations that all users, including teachers, authors, and publishers, must be aware of. One popular tool with a large database of comparison texts is iThenticate. Since some institutions provide access to iThenticate licenses, this guide provides a basic introduction to the use and design of that tool.

Key Points

- Plagiarism can be exact words or ideas.
- There is no agreed upon number of sequential words that constitutes plagiarism.
- Exact sequences of words can be quoted with quotation marks or block quotes.
- Paraphrased and summarized content still needs to be cited.
- Text matching software can flag suspected plagiarism, but it cannot detect all forms of plagiarism.

PART III

Technology

10. Applications for Writing

Kristin Terrill

Glossary

Attachment: A file transmitted via an email message.

Auto-correct: A software utility that automatically corrects misspelled words and inaccurate orthography and punctuation.

Checker: A software utility that identifies errors and suggests corrections.

Cloud: A server users can access through the internet.

File: Unitary collections of data that can be accessed and modified.

Nonprinting character: A character that does not appear on the printed version of a document.

Version: A retrievable instance of a file.

Word processor: Software for composing and formatting written documents.

Overview

Questions

- How can computer programs help me improve my writing and writing process?
- What are the differences between available writing applications?
- How can I make good use of available writing applications?

Objectives

- Recognize the features and use the functions of word processors.
- Manage files effectively to avoid loss of data and progress.
- Use supplemental applications to enhance writing skills.

Overview

Most people who have advanced to graduate study are comfortable using a **word processor** like Microsoft Word, Google Docs, or Libre Office Writer to draft essays and reports. Word processors can be installed programs (e.g., Word and Writer) or be web-based (e.g., Docs and Word for the Web [formerly called Word Web App]). Chapter 11 and Chapter 12 discuss the text formatting functions of these applications, but users should also be aware of their functionality for drafting and writing. In this chapter, basic functionalities common across word processors are described, along with good practices for using word processors in academic writing processes. Additionally, applications that help with writing, that are not word processors, are introduced.

Proofing Tools

Current word processing software integrates robust proofing functionality, including spell **checkers** and grammar checkers, dictionary and thesaurus tools, and language translation.

Spell checkers are features that identify misspelled words and suggest corrections. One limitation of spell checkers is that they can overlook words that exist in their dictionary but are incorrect in context. For instance, some writers replace a desired word with a correctly spelled homophone (e.g., their/there), and rudimentary spell checkers may not flag them.

Grammar checkers offer more robust proofing. Rather than simply comparing each word to a list of acceptable words, grammar checkers account for grammatical constraints, such as part of speech, and

even account for the probability of a word or punctuation mark appearing in a certain context. While grammar checkers tend to offer more nuanced suggestions than spell checkers, some users find them overly prescriptive.

Some word processors integrate **auto-correct**, a feature that automatically corrects misspelled words and inaccurate orthography and punctuation. Advanced word processors also offer enhanced interactions, such as allowing users to right-click a word or phrase to initiate a definition or synonym lookup or a web search.

To get the most out of these features, it is important to learn about the applications' custom settings. Word's spell checker supports eighty languages,[1] while Google supports over 100,[2] depending on which software you are using and how you are using it. **Cloud**-based word processors, such as Docs and Word for the Web, may automatically select a language based on the user's account settings or where the user's IP address is registered. When using an application installed on your own computer, the application may access system settings to determine the spell checker language. If the proofing tools are not working properly, a language setting may be to blame. Well-supported languages, such as English, Spanish, and Chinese, have multiple dialects supported, so users will need to select the most appropriate dialect for their document.

Viewing and Editing Modes

Understanding the various viewing and editing modes available in these programs will help you get more benefit from the functions of word processors. The list below summarizes viewing options.

Views

- **Full screen**: Full screen views remove most or all of the available menus from view. These views can be helpful for users with writer's block who need to eliminate distractions. If a word processor document is being displayed as part of a presentation, the full screen view can help direct the audience's attention to the content of the document.
- **Print**: This view depicts an area with the dimensions of a sheet of paper, showing approximately where the content will appear on the printed page. Pagination in this view can be inaccurate, espe-

1. ROGNIER, BRYAN (SEPTEMBER 30, 2024). "OFFICE 2024 FOR CONSUMERS AVAILABLE OCTOBER 1". *MICROSOFT*. RETRIEVED OCTOBER 9, 2024.
2. "Google Translate," In Wikipedia, The Free Encyclopedia, accessed 19:09, June 10, 2024, https://en.wikipedia.org/w/index.php?title=Google_Translate&oldid=1225769561.

cially when nonprinting characters are visible.

- **Print preview**: When setting up printer settings, this view shows how the printer will output the file. Pagination in this view is typically more accurate than the print view in the main document editor. Document content cannot be changed in the print preview.
- **Web**: This view shows how the document content would look after being converted to a web page. It ignores page setup settings (as detailed under Page Attributes in Chapter 14) such as margins and page size, since these are not applicable in the web format.

Layout

- **Rulers**: Rulers are interactive graphics in the word processor interface that indicate the length of the printed page and its elements. The rulers also function as alternative controls with which users can adjust the size of the page margins and paragraph indentation. User-added tab stops are shown on the horizontal ruler.
- **Nonprinting characters**: Spaces, tabs, and line returns are called **nonprinting characters**, since they appear as white space on the printed page. By default, nonprinting characters are invisible in word processor interfaces, but they can be made visible to help with layout editing. This mode also shows page and section breaks and may indicate paragraphs that have line and page break attributes applied.
- **Gridlines**: This feature depicts a grid on the printable area, i.e., everything within the margins. This may be useful for users designing documents with graphic elements that need to be precisely positioned.
- **Outline**: This view depicts the whole document as a hierarchical list of paragraphs. In this view, any paragraph can be shifted to a higher or lower level within the hierarchy. Users who need to create a Table of Contents will find this view very helpful.

Accessibility

- **Zoom**: The zoom tool allows users to adjust the size of the page that appears on their screen. Not only can this make the content easier to read; it can also be useful for layout editing, allowing users to see whole pages instead of just a portion of each page.
- **Assistive devices**: Some word processors include built-in screen readers and other assistive tools to make content accessible. These tools work best when document content adheres to digital accessibility standards.

Editing

- **Normal**: In normal editing mode, users can add and delete content to a document.
- **Change visualization**: In this mode, known as "track changes," "record changes," or "suggesting," users can add and delete content, but these changes are visually depicted with character attributes, such as font color and underline or strikethrough. Some word processors allow users to adjust the amount of detail provided in these change visualizations.
- **Read-only**: In this mode, users cannot add or delete content.

Changing the viewing and editing modes enables you to learn about, and take advantage of, the many useful functions of word processors.

File Management and Version Management

As computer programs, word processors deal with **files**, or unitary collections of data that can be accessed and modified. The kinds of files that can be accessed with word processors are called document files. Generally, when accessing a file with a word processor, users can make permanent changes to the file. The nature of computer files raises various liabilities when it comes to lengthy and heavily revised documents like research articles, theses, and dissertations. In this section, we will provide some risk mitigation strategies.

Risk: File loss. The loss of a file can be devastating to writers who have invested precious time and energy into writing a document. File loss can occur when a computer where a file is stored gets damaged in some way. Even normal operations can sometimes destroy files. The best way to lower the risk of file loss is to store copies of files in multiple places. This practice is known as "backing up." Below, two different ways of backing up are presented.

- **Cloud back-up:** Currently, the most popular back-up method is saving in the cloud, i.e., uploading a file to a server that the user can access through the internet. The Google Docs word processor is web-based, so backing up Docs files involves the reverse process of downloading a file after editing it, thus creating a copy in the user's hard drive. Popular cloud services, such as Microsoft's OneDrive, Box, and Google Drive, allow users to automatically synchronize their hard drive with the cloud server.
- **Hardware back-up:** The traditional method for back-up is using an external storage device, such as a USB flash drive or external hard drive. Backing up files on external storage requires users to take an extra step of copying the file after saving it. This can be done within the word processor itself or with the computer's file management utility. Hardware storage has many vulnerabilities: hardware can be easily lost or damaged; users can forget to save their work at the end of a work session;

and some institutions have begun banning external hardware, such as USB inputs. Overall, hardware back-up is not as secure or reliable as cloud back-up, and most institutions now provide students and employees with excellent cloud storage resources.

Using email for cloud back-up

One rudimentary approach to cloud back-up is to attach a copy of the file in an email message, which can be saved as a draft or sent to oneself or a collaborator. This method is not recommended, however, since files backed up in this way are hard to find and not very secure.

If some emergency, such as a lost password, prevents you from using more reliable cloud back-up, this method can serve as a stopgap. Otherwise, do not make a regular practice of this.

Today's computers, which connect automatically to available wireless internet networks, seem to eliminate the need for manual file back-up by connecting to web utilities, such as Google Drive, Box, or Microsoft OneDrive, that back up files automatically and invisibly. Anyone who has ever lost a file will, nevertheless, understand the value of extra attention to backing up. Since backing up a file means making a copy, it is best to provide information about that copy in the file information; for instance, file names can be modified to note the date that file was backed up and the name of the user who created the back-up. Each saved instance of a file is known as a version.

Risk: Progress loss. Another potential risk with files is lost progress, which can occur when a user makes changes to a file, but those changes are not present the next time the file is accessed. This can happen when a user fails to save their file after working on it or when a user opens a back-up file instead of their main working file.

Risk: Parallel progress. A variation of progress loss, parallel progress stems from multiple collaborators editing different copies of a file simultaneously. This risk almost always involves email. When collaborators share files as email **attachments,** i.e. files transmitted via email messages, each collaborator has their own file. To correct the problem of parallel progress, some word processors include features that allow users to combine similar files, thereby merging the changes into a new, unified file. However, these tools have their faults and, at best, require attentive and meticulous effort to use effectively. A better way to mitigate this risk is to collaborate in cloud-based word processors that allow multiple users to change the same file simultaneously. These, of course, require internet access. In situations where continuous internet access is not available, collaborators should communicate explicitly about how they plan to handle parallel progress.

Scenario: Major professor comments

Kathleen clicks Send with a mix of exhaustion and relief. After a marathon weekend of binge-writing, her dissertation Results chapter is drafted and attached to an email on its way to her major professor's inbox. The next day, she reopens the dissertation file and gets back to revising her literature review chapter, responding to the preliminary exam feedback from her committee members.

Two weeks later, she gets a response from her major professor, who attached the draft file with extensive comments on the results chapter. Kathleen gets started immediately, revising almost every paragraph of her results to address the constructive comments. That night, she clicks Save As to move the dissertation manuscript from her Downloads folder back into her Dissertation folder.

Three months later, during her dissertation defense, a committee member asks why Kathleen never made the requested revisions to her literature review. She clearly remembers making them, and explains this to the committee member. However, those changes were not in the submitted manuscript, so the committee member adds a condition to her pass result to make sure they are added back to the final manuscript before she can graduate.

Unfortunately, because Kathleen replaced the file that had the literature revisions with the version her major professor had sent back to her, those revisions are long gone, and Kathleen has to revise the literature review chapter again from her own memory.

Below, we recommend some good practices for file management and version management:

- Set up file syncing with your cloud storage;
- Collaborate online;
- Avoid downloading files and sending work-in-progress files as email attachments.

Kristin's extra-super paranoid file management tips for high stakes files (like theses and dissertations)

- At the end of each work session, save a duplicate back-up copy of the file with the date in the file name. If you are short on storage space, move old back-up files to a USB flash drive.
- If the main working file is lost, or if progress is lost, start a new working file by making a copy of the most recent back-up.
- Discourage collaborators from downloading files.
- If a collaborator is unable to work with the online file, re-name unmerged files with the collaborator's name and the version date.
- When collaborating, encourage all collaborators to edit the file in the change visualization mode, as detailed under Viewing and Editing Modes.
- Integrate all collaborators' suggestions, changes, etc., into the main working file before making new changes.

Creating Files of Other Types

Documents intended for a wide audience of non-collaborating readers should be exported from an editable file type to a read-only type. The standard file type for read-only documents is PDF. Word, Docs, and Libre Office Writer have built-in PDF converters. Developers may use different terminology, such as "Save as/Save a Copy," "Download as," or "Export" for converting a document to a PDF. These functions may also support converting to other editable file types; for instance, you can download a Google Doc as a Word file type.

When you create a copy of a document formatted as a different file type, it is possible that the look and functionality of the document will change through the conversion. As you gain familiarity with your word processor, take the time to explore the interface that manages file type conversion (for instance, the "Save As…" dialogue window). There may be many settings adjustments you can make to enhance the quality of your PDF.

- Fonts: In PDF files, the fonts can be either referenced or embedded. Referenced fonts may appear different when the file is opened on a different computer, while files with embedded fonts will look the same on all computers.
- Nonprinting information: Much of the data in a document file is functional rather than visual. For instance, headings allow users to easily navigate around electronic documents. This nonprinting information can be transferred to the PDF in some cases, making the resulting file larger.
- PDF/A: This option refers to the PDF/A standard, which is optimized for long-term archiving of PDF

files. If the word processor offers the option of converting to PDF/A, then the output file will have fonts and other critical file information embedded. **This option is best for documents that will be archived, such as theses and dissertations.** The embedding enables the file to be opened by any machine or program and displayed with its intended design and functionality.

Non-word Processor Writing Applications

Grammarly

As stated earlier, most word processor applications include basic proofing tools that check spelling and grammar. These tools are reliable for identifying typographical errors and a variety of common grammar issues, but their limitations have motivated the development of more robust applications. Grammarly[3] is a popular application that provides more comprehensive feedback on writing. Whereas traditional spell checkers and grammar checkers operate based on hard-coded dictionaries and rules, Grammarly combines these resources with probability-based checks. Grammarly's feedback takes common usage into account, making it more nuanced than basic checkers. Because Grammarly feedback integrates both probability-based and rule-based recommendations, it can sometimes be inaccurate.

Grammarly is available as a stand-alone, web-based application and as a downloadable extension. To use the web-based application, users log into their account, create a new Grammarly file, then enter text into the web interface. Grammarly generates feedback on the entered text. Users can adjust their preferences, such as selecting certain styles, levels of formality, and tone. To use the downloadable extensions, users select their operating system, then download and install the extension. The extension enables Grammarly feedback on text across multiple applications, including within a word processor. Grammarly has free and premium versions; some institutions provide access to premium licenses to employees and students, so writers who want to use Grammarly should find out if this perk is available to them.

Research Writing Tutor

The Research Writing Tutor (RWT) is a specialized tool designed to assist graduate students with research writing.[4] The RWT includes comprehensive explanations and examples of rhetorical moves and

3. "Grammarly," Accessed January 31, 2025, https://www.grammarly.com/grammar-check.

4. Elena Cotos, "Computer-assisted research writing in the disciplines." In *Adaptive Educational Technologies for Literacy Instruction, ed. S. A. Crossley & D. S. McNamara,* (Routledge, 2016).

strategies in various academic disciplines. It also gives high level feedback on the rhetorical effectiveness of research article drafts. The RWT works by comparing a user's text to a set of pre-analyzed examples from published research articles, then provides feedback on how the user's text reflects conventions of research writing within a selected discipline. The RWT is web-based; it cannot be downloaded or installed on a user's computer. Iowa State University students and staff can access the RWT for free, but it is not available to the public.

Academic Phrasebank

The Academic Phrasebank[5] is a database of compiled phrases from published research articles. It is accessed through the University of Manchester website. This resource does not provide automated feedback on users' text inputs. Instead, it lists a set of rhetorical goals that are common to research writing, and provides formulaic language related to those goals. Writers can use these formulaic phrases without risking plagiarism, since they are generic and not associated with any particular author. Using formulaic phrases can enhance the clarity and tone of academic writing. Although automated feedback tools, like Grammarly, can provide assistance with phrasing, those tools may not reflect the author's rhetorical intentions. While the Academic Phrasebank lacks the convenience that Grammarly offers, it presents authors with the chance to thoughtfully and intentionally select appropriate phraseology for their writing.

Summary

Word processor software applications represent an incredible technological advance compared to earlier technologies. Emerging technologies continue to change the way writers approach the tasks of writing. Having read this chapter, you will now be able to recognize and experiment with useful features of word processors and related applications that will help make your writing process more effective, efficient, and secure.

5. "Academic Phrasebank," The University of Manchester, last modified 2023, https://www.phrasebank.manchester.ac.uk/.

Key points

- Word processors have many helpful features that differentiate them from analog tools, like typewriters.
- Word processors interact with other applications, including file managers and cloud-based storage systems.
- Word processors are one of many available tool types that can be integrated into a writing process to improve efficiency and writing quality.

11. Applications for Formatting

Kristin Terrill

Glossary

Accessibility tags: A markup protocol that makes PDF content interpretable by assistive devices, such as screen readers. Accessibility tags specify document features such as content type and relationality to help make PDFs align with the four principles of digital accessibility: perceivability, operability, understandability, and robustness.[1]

Comprehensive TeX Archive Network (CTAN): An online repository of LaTeX packages that users can import into their documents.

Open-source: Code that is made freely available for possible modification and redistribution; also, a site of ideological positioning related to the ethics of computer code production and distribution.

Operable (digital accessibility): Content that can be accessed and used with different devices, such as mouse or keyboard; content that users can navigate by using headings and menus.[2]

Optical character recognition (OCR): Automated conversion of images of text, such as a scanned document, into digitally encoded text.

Perceivable (digital accessibility): Content that can be perceived in different modes, such as non-text content with text alternatives, closed captions presenting a transcript of recorded speech, and sign language interpretation of audio content.[3]

Portable document format (PDF): A file format developed by Adobe to encode documents that appear the same across various applications and operating systems used to access them. PDFs have been standardized as ISO 32000 since 2008.

Robust (digital accessibility): Content that is compatible with the range of devices used to access it, such as operating systems, web browsers, and assistive devices.[4]

Understandable (digital accessibility): Content with an identified language, in which uncommon or specialized terminology, abbreviations, and phraseology are defined.[5]

Overview

Questions

- What tools can help me format my academic manuscript for publication?
- What are the advantages and disadvantages of applications like Word, LaTeX, and Acrobat Pro DC?

Objectives

- Identify the characteristics and uses of different formatting tools.
- Determine the best tool for certain tasks.

Overview

In the last chapter we introduced **word processors**, file managers, automated feedback tools, and databases that provide essential functionality for writing. This chapter, and the remaining chapters in this part of the handbook, all address a parallel aspect of document production: formatting. Formatting refers to the appearance and functionality of content in a document. Formatting is interdependent with the medium (e.g., print vs. electronic), genre (e.g., article vs. book), and purpose (e.g., early feedback vs. broad dissemination).

New scholars preparing to publish their research are bound to face strict formatting requirements at some point. Whether submitting a research article to a journal or providing committee members with reading copies of a thesis or dissertation, it is essential to be able to format your scholarship following the precise, sophisticated standards required.

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1. "PDF techniques for WCAG 2.0." W3C Working Group Notes, W3C Worldwide Web Consortium, accessed on 29 May 2025, https://www.w3.org/TR/WCAG20-TECHS/pdf.
2. "Accessibility principles," W3C Worldwide Web Consortium, Web Accessibility Initiative (WAI), accessed on 29 May 2025, https://www.w3.org/WAI/fundamentals/accessibility-principles/.
3. W3C Worldwide Web Consortium, "Accessibility principles."
4. W3C Worldwide Web Consortium, "Accessibility principles."
5. W3C Worldwide Web Consortium, "Accessibility principles."

Three applications for formatting are surveyed in this chapter: Microsoft Word, LaTeX, and Adobe Acrobat Pro DC. Note that Google Docs and Libre Office Writer are not discussed. Those tools do have formatting capabilities; however, they are generally not as robust or versatile as the others. If you prefer to compose (write) in Docs or Writer, it is a good idea to switch over to Word or LaTeX once your draft gets to the point where you begin to split your document into subsections, insert graphics and tables, and add source references. The sophisticated formatting functionality of Word and LaTeX, paired with their superior ability to export to different file types, make these applications the best choice for preparing documents for publication.

Word

Overview

Microsoft Word is primarily a word processor, but it has powerful formatting capabilities that make it more versatile for preparing publishable documents, compared to word processors like Google Docs and Libre Office Writer. Word's dual functionality as a writing and formatting tool partly explains its immense popularity. However, many users do find that Word's all-things-to-all-people design makes it hard to learn and frustrating to use. It is hoped that this handbook will help make sense of this software, especially considering that it is used by professionals in almost every career path imaginable.

Features & Uses

- **Digital accessibility:** Word has a good reputation for facilitating the production of digitally accessible documents. It has a built-in accessibility checker that provides step-by-step guidance to add accessibility features, including helping readers navigate through documents and understand document content. Chapter 12 covers adding navigation by using Word's Heading styles. Chapter 13 covers adding alternative text (alt-text) descriptions to graphic content to make images accessible for screen reader users. Chapter 14 explains how to format tables with appropriate **accessibility tags**, again, for users who use a screen reader. These features are, increasingly, required for documents that will be electronically archived, including graduate theses and dissertations.
- **Citations & bibliography:** Word offers a few ways to incorporate citations and bibliographies with ease and accuracy. It includes a built-in citation manager that can be used to compile a bibliography following many standard styles, e.g., APA, MLA, Chicago, and IEEE. Word also allows users to install plug-ins for popular citation managers, including Zotero, EndNote, RefWorks, and others. These plug-ins are not perfect, but they can still save quite a lot of time, especially if you plan to write multiple papers that cite the same sources.
- **Math:** Word does not have the excellent reputation that LaTeX has for integrating math into documents. It does have an Insert Equation feature that is serviceable, especially for documents that

have only a few simple equations. When inserting an equation, there is an option to select LaTeX as an alternative to Unicode (see figure 1).

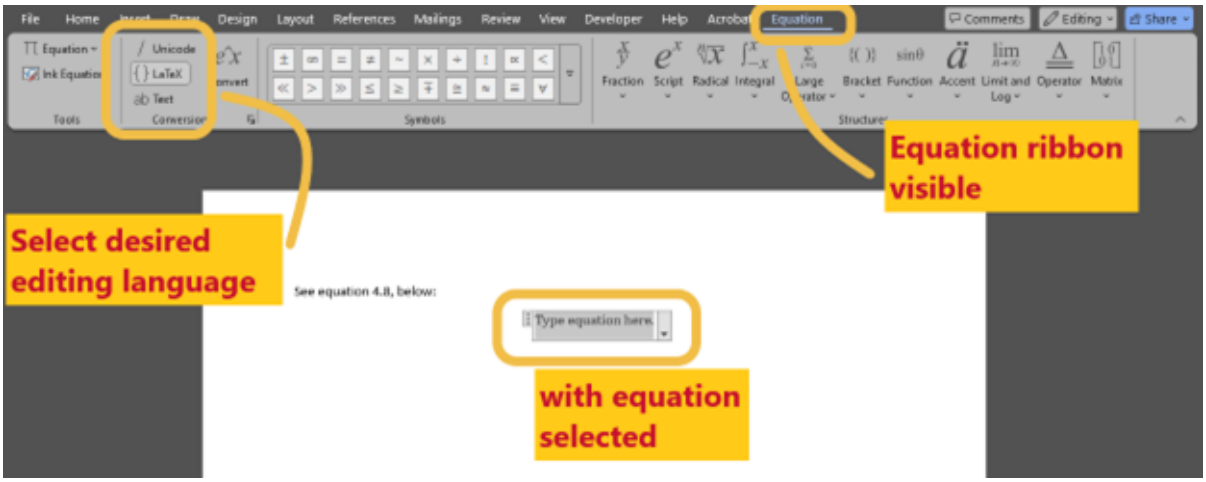


Figure 11.1 *Selecting LaTeX for Equation Editing in Word*

- **Integrations:** Word allows users to integrate content and functionality from other programs. The Insert Object command presents additional integrations. Add-ins are another way for users to select integrations from third-party developers that meet their specific needs. User-developers can also create their own add-ins for custom functionality. Some relevant add-ins for academic writers include MathType for equations and Chem4Word. Some add-ins cost money, either as a one-time purchase or a subscription.

With these integrations, users can add more complex content, including embedded files and cross-references to external files. Above, you read that **citation manager** add-ins, like Zotero and EndNote, can be used to compile a bibliography. These dynamic bibliographies can then be automatically revised to reflect changes to bibliographic records in the citation manager. Similarly, an embedded Excel chart can automatically update when data in the source file changes.

A cautionary note: Integrations tend to be less well-supported than out-of-the-box features. It may be difficult to find documentation or help for problems that you experience with add-ins. If you enjoy problem-solving with computers, this can be an interesting challenge, but if you are technophobic or just impatient with non-user-friendly features, it might be better to avoid using them.

Another cautionary note: Content you create with add-ins may not be digitally accessible. For instance, while it is possible to add alt-text (see Accessibility in Chapter 13) to an embedded Excel chart, the alt-text may not export along with the image if you save the file as a PDF.

- **Support & documentation:** One of the biggest advantages of using Word is its extensive documenta-

tion and support. Related to its popularity across user types, labor sectors, and geographic regions, Word is supported by ample documentation produced by Microsoft as well as by thousands of experts and users. This documentation comes in many formats, including print, websites, help files, and video tutorials. Support is also easy to access. Users with active licenses can access support directly from Microsoft, but information technology (IT) professionals, editors, writing consultants, teachers, and librarians are also good sources of support for this common software.

LaTeX

Overview

LaTeX is a coding language for preparing documents for publication. It is widely used for academic writing, especially in fields that rely on non-alphabetic notation, such as mathematics, statistics, physics, chemistry, engineering, and computer science. Unlike Word, LaTeX is not a software product. It is an open-source system that allows users to write and construct their own structures, which compile into document file types, such as.html or.pdf. LaTeX users can install LaTeX directly onto their own computers or use an online development environment, such as Overleaf.[6] The main code includes several basic document types that can be customized, either by writing code from scratch or using code from other developers, i.e., importing packages. The **Comprehensive TeX Archive Network (CTAN)** is an online repository of LaTeX packages that users can import into their documents.

Features & Uses

- **Digital accessibility:** A limitation of LaTeX, which affects students preparing electronic theses and dissertations, is that it may not export PDFs that meet the WCAG 2.0 standards for accessibility.[7] In PDFs, digital accessibility is achieved through the use of accessibility tags, a kind of markup that facilitates information retrieval by assistive devices, such as screen readers. At the time of this writing, the LaTeX Project, a centralized collective of LaTeX developers, is working diligently to develop a codebase that enables integration of accessibility tags when LaTeX documents are exported to PDF format. While their achievements are promising, these developments have not been fully operationalized. LaTeX users may opt to compile an untagged PDF, then remediate it with Adobe Acrobat, as detailed under Acrobat Pro DC.

6. "Overleaf for universities: Simplify academic writing and collaboration," Overleaf, accessed on 29 May 2025, https://www.overleaf.com/for/universities.

7. W3C Worldwide Web Consortium, "PDF techniques for WCAG 2.0."

- **Citations & bibliography:** A variety of bibliography management techniques have been developed for LaTeX documents. Overleaf recommends three packages and provides instructions on how to implement them: bibtex, natbib, and biblatex.[8] These packages enable users to insert dynamic in-text citations to source documents and generate a full bibliography comprised of cited texts. Users can also switch among generic and specific citation styles (e.g., APA, MLA, IEEE, etc.) automatically. The biblatex package even includes customized styles for certain journals, including Nature and Science. Bibliographic details about the sources can be entered manually, imported to the document as a file, or uploaded from a separate reference manager, such as Zotero or Mendeley.
- **Math:** Where LaTeX outshines other formatting tools most brightly is with math and other non-alphabetic notation systems. There are LaTeX commands for over 20,000 symbols,[9] and users can include any unicode symbol (over 500,000 characters). Users adept with the coding language find integrating notation to be streamlined, compared with other word processors.
- **Integrations:** Functionality from other software can be integrated into LaTeX. Since it is open-source, users can devise their own processes or import an existing package to make their LaTeX project incorporate content or functionality from another tool, such as Zotero.

  Many users appreciate the Knitr package, which allows for inserting R code directly into a LaTeX project.[10] Such code can be executed when the document is compiled into a PDF or html file. In short, this allows users to embed active code within a document, streamlining the workflow to avoid running R code in a separate program to generate a table or figure that would then be inserted manually into the LaTeX file.

  Cautionary notes: the same limitations that may apply to Word add-ins—not always being well-documented or well-supported, and not necessarily producing digitally accessible content—also must be considered with LaTeX packages. The "keep it simple, stupid," or "KISS principle" is a standby for programmers and coders across languages and platforms for good reason—the more complex a program is, the more chances there are for it not to work properly.
- **Support & documentation:** Being open-source, documentation and support for LaTeX is as variable as the packages community members have developed for it. CTAN's package upload form encourages developers to provide certain types of documentation and support, including contact information for the developer. There is no single source of support for LaTeX; however, online message boards, such as Stack Overflow and Reddit, host lively and collegial spaces where users can post

8. "Bibliography management in LaTeX," Overleaf Knowledge Base, Overleaf, accessed on 29 May 2025, https://www.overleaf.com/learn/latex/Bibliography_management_in_LaTeX.
9. "The comprehensive LaTeX symbol list," S. Pakin, CTAN, accessed on 29 May 2025, https://mirrors.rit.edu/CTAN/info/symbols/comprehensive/symbols-a4.pdf.
10. "Knitr," Overleaf Knowledge Base, Overleaf, accessed on 29 May 2025, https://www.overleaf.com/learn/latex/Knitr.

questions and request feedback on their code. LaTeX documentation and support tend to assume that readers have advanced technical knowledge of both computer programming and digital typesetting; compared with Word's documentation, it is much less beginner-friendly. Thus, novice users may find Overleaf's technical support to be worth the subscription cost.

Acrobat Pro DC

Overview

Acrobat Pro DC is a PDF editing software developed by Adobe. The PDF file format was originally developed by Adobe, and Acrobat Pro DC is their current subscription-based PDF-editing product (DC stands for document cloud, referring to Adobe's cloud storage service for documents). Acrobat's functionality includes converting other file types, including documents, presentations, and image files, to PDF and modifying content within PDFs. Since 2008, Acrobat has implemented optical character recognition (OCR) technology to digitize text in image files, allowing scanned documents to be machine-readable. Acrobat is a versatile tool with broad applications in many industries; below, some features and uses relevant to academic writing—theses and dissertations, in particular—are described.

Features & Uses

- **Digital accessibility:** Adobe's PDF file format has been formally standardized as International Organization for Standardization (ISO) 32000. Another ISO standard, ISO-14289-1, lists enhanced specifications for digitally accessible (compatible with WCAG 2.2) PDFs. Acrobat can be used to modify a PDF to adhere to these standard specifications, including adding alt-text descriptions to figures, adding operability to tables, creating hierarchical bookmark navigation, and adding file metadata, such as title and author. Importantly, Word's accessibility features and PDF export protocols can be used to create digitally accessible PDFs without additional modification in Acrobat; this functionality is currently in development for LaTeX. Therefore, LaTeX users may need to use Acrobat to finish their PDFs after their manuscripts are compiled if their target publisher or archive requires accessible files. Acrobat's automatic tagger can be used to facilitate this process; however, it is known to be glitchy and might require users to reconfigure their LaTeX code before it works properly.
- **Document composition and editing:** Editing document content in Acrobat can be tedious and frustrating, but in some cases less so than re-compiling the document. For example, if the source file is unavailable or if the PDF has been remediated after it was compiled, it may be simpler to make minor edits directly in Acrobat. Users can add or delete text, and adjust basic format attributes, like bold, underline, and italics; spacing, alignment, and list attributes. Content can be repositioned on the page, and users can make some page-level modifications, such as adding a header, footer, or watermark.

- **Support & documentation:** Like Word, Acrobat is a commercial product that comes with professionally produced documentation. Community-sourced support and documentation is less available for Acrobat than for Word. Acrobat's documentation can be difficult to implement; like its user interface, it tends to be highly technical and abstract, necessitating specialist knowledge.

Summary

Academic writing is characterized not only by its specialized language and subject matter, but also by meaningful formatting that reflects how content is structured. Most word processors provide format functionality similar to Word's. Using a word processor is, by and large, the easiest way to prepare an academic document for publication or inclusion in an archive. Word processors accommodate all kinds of academic content, including math and other non-alphabetic notation systems, and they also excel at exporting standardized, accessible PDF files. Nevertheless, some academics prefer to use LaTeX to draft manuscripts, and they may need to use Acrobat to add digital accessibility features while LaTeX developers improve that tool's functionality to export accessible PDFs.

Key Points

- Word and LaTeX are different types of tools, but have similar functionality.
- LaTeX is primarily used in disciplines that focus on math or use other kinds of specialized typography.
- Acrobat Pro DC can be used to edit and remediate PDF files.

12. Formatting Text

Kristin Terrill

Glossary

Attributes: Visual and functional features of digital text.

Digital text: Written language encoded digitally.

Landscape: Page orientation where the short edges of the page are the sides and the long edges are the top and bottom.

Paragraph: A) A portion of text that is visually compartmentalized. B) An assemblage of sentences that all relate to a common topic. C) In electronic document formatting, a string of characters preceding a hard line break.

Portrait: Page orientation where the long edges of the page are the sides and the short edges are the top and bottom.

Style: A set of pre-defined attributes that can be applied to content within a document.

Overview

Questions

- How can I efficiently apply many format requirements to my academic manuscript?
- How can I use format attributes to convey the organization of my manuscript?
- What features of a word processor can help make formatting easier?

Objectives

- Recall the affordances of digital text.
- Recognize the attributes that can be applied at the page, paragraph, and character level.
- Use styles to quickly and consistently apply text attributes.
- Recognize the semantic meaning of conventional styles, such as headings and block quotes.

Introduction

This chapter explains how text can be formatted using a word processor. Technical and typographic explanations are provided to help you gain confidence in preparing your written content for distribution and publication. The chapter begins by exploring the special affordances of digital text, then relates those affordances to real-world functions of text and typography. Detailed explanations for how to format text in a word processor are provided, along with typographical and layout concepts. You will learn the vocabulary of formatting writing and how to use many of the advanced tools in your word processor, as well as how to recognize how aspects of formatting interact at the character, paragraph, and page levels. You will also learn about shortcuts that could save you hours, if not days, of meticulous reformatting.

Text and Its Affordances

Conveying Information Electronically

Digital text is a key concept for this chapter, and worth taking a bit of time to define. Text itself can be a vague category, since some theorists consider speech and graphics to be text, not just writing. In this chapter, *text* refers to written language, and *digital text* refers to written language that is encoded digitally. Importantly, digital text does not refer to "text as image," for instance, a screenshot with text in it or a scanned image of text.

Significant features of digital text are:

- It is easy to replicate; digital text can be selected and copied.
- It is easy to edit; digital text can be inserted, deleted, and replaced.
- It can be formatted; attributes can be applied and removed.
- It is machine-readable; digital text can be accessed by programs, such as text-to-speech converters, that automatically format it for various purposes.

These features are interrelated. The encoding of digital text is what enables the other features. These features may be intuitively obvious to readers who have used computers habitually for reading and writing. Nevertheless, it is essential to acknowledge that digital text is mediated through computer programs in unique ways that are not applicable to other kinds of digital content, such as images.

Relating Information Logically

Whether a written document is digital or physical, readers need to understand how parts of the document are related. You are most likely already familiar with conventional, visual ways of indicating relationships between parts of documents. For instance, the title of a text can often be identified by distinct formatting and its position relative to the body, or main content.

Paragraphs are portions of text that are visually compartmentalized. Conceptually, a paragraph is an assemblage of sentences that all relate to a common topic. Visually, paragraphs may be represented by an indented first line, additional space above or below the paragraph, or a combination of these attributes. Readers expect to be able to understand where a paragraph begins and ends merely by noticing these visual cues as well as by reading the entire paragraph and inferring the common idea that links the sentences contained within. Moreover, well-organized documents ought to enable the reader to discern differences in ideas across paragraphs.

Beyond titles and paragraphs, academic writing often includes sophisticated relational elements, like headings and lists. Academic documents may also contain orienting information, such as page numbers. Graphic elements, such as tables, figures, and schemas, may be presented among the paragraphs or separately. Additionally, texts can include special content, such as equations, computer program listings, block quotes, notes, and references. Electronic texts used in academic research frequently include interactive elements as well, such as links.

Text alone does not convey the complex relationships among the various types of textual elements included in most academic writing. Imagine if the document you are currently reading were simply a continuous stream of undifferentiated text, with no line breaks at the ends of paragraphs, headings appearing between sentences with no punctuation, and page numbers randomly appearing between words.

How would you make sense of what you read? To provide readers with necessary cues about the relationships between elements in documents, additional meaning must be provided, and this is where formatting comes in. Formatting provides the cues to differentiate textual elements, to discern where each element begins and ends, and to connect related elements across parts of the document. Before exploring formatting at a more detailed level, we will consider a crucially important way of establishing organization and relationships in academic writing: hierarchical outlining.

On Outlining

Overview of Outlines

Academic writing is known for being highly structured and conventionally organized. At some point in your education, you may have been taught to make an outline of a document as a pre-writing activity or as a strategy for taking notes about something you were assigned to read. An outline of a document is a structured list of the topics addressed in that document. Additionally, outlines use subordination to convey hierarchical relationships among topics. Outlines are useful in writing because they help writers establish the scope of the writing project and present information in a logically organized way. They are useful in reading because they help reinforce the main ideas.

Structure of Outlines and Headings

The structure of academic writing is made explicit through hierarchical headings. Headings are textual elements placed between body paragraphs. Whereas individual paragraphs typically focus on one idea, the ideas enclosed within paragraphs are also related by themes, which can be conveyed through headings. A helpful heuristic for writers incorporating headings into their document would be to include a heading for each item they would include in an outline of the document. Obversely, a reader ought to be able to glean the main themes in a document simply by glancing at the headings. In other words, effective headings function as an outline of the document, with the paragraphs between headings elaborating and detailing the topics.

In academic research articles, it is conventional to include high level headings for article sections, such as Introduction, Methods, Results, and Discussion or Conclusions. In fact, this is so conventional that scholars use the initialism IMRD/C to refer to empirical research articles with this structure. Sections are often subdivided into more specific topics. Methods sections, for instance, may include subsections identifying materials, equipment, population samples, procedures, and other topics related to how the empirical research was conducted.

When creating outlines and headings, keep in mind that there are logical conventions that enhance the usefulness, usability, and interpretability of the information. In short, if you follow the rules below, your outline will make sense.

Logical Rules for Outlines and Headings

Rule 1. Headings are Hierarchical

In academic writing, headings follow a hierarchical structure. This means that headings are associated with different levels of specificity. Heading levels correspond to numeric values, with higher values indicating more specificity. Thus, level 1 headings are the most general. General headings divide documents into broad sections.

Rule 2. Levels are Consistent Across Sections

Within a document, more than one section may be subdivided. As such, headings for subdivisions should be parallel across sections. Do not skip levels. If Heading 1 is used to designate major sections within a document, then Heading 2 should be used for subsections, and heading 3 should be used for sub-sub-sections. Heading 3 should not be used to designate subsections of a major section (see Table 12.1).

Table 12.1 Examples of incorrect and correct outline levels

Incorrect	Correct
Level 1 Heading ***Level 3 Heading*** Body paragraph Body paragraph ***Level 3 Heading*** Body paragraph Body paragraph **Level 1 Heading** *Level 4 heading* Body paragraph Body paragraph *Level 4 Heading* Body paragraph Body paragraph	**Level 1 Heading** **Level 2 Heading** Body paragraph Body paragraph **Level 2 Heading** Body paragraphBody paragraph **Level 1 Heading** **Level 2 Heading** Body paragraph Body paragraph **Level 2 Heading** Body paragraph Body paragraph

Rule 3. All Content Is Subordinated

For any sections that are subdivided, all content within that section must be contained within a subdivision. Some style guides require short, free-floating text at the beginning of a section that has subsections in order to introduce the subsections and avoid "stacked headings (i.e., consecutive headings with no interstitial body text). In the table below, the example on the left illustrates introductory text at the

beginning of the section. Logically, this makes the first paragraph a mismatch, but convention implies that the un-subordinated paragraph introduces the paragraphs that are subordinated within lower level headings.

If the first body paragraph in a subdivided section is introductory, it may be customary to subordinate it within an "Introduction" heading. If "Introduction" is used as a heading for a higher level section, then "Overview" can be used as a synonym, or you could be more specific and use "[TOPIC] Overview" as the heading for the introductory content. Similarly, at the end of a section, "Conclusion," "Summary," or "[TOPIC] Summary" can be used as headings to demarcate final content. Additionally, if a section does include an introductory subsection, it should include a conclusive subsection (see Table 12.2)

Table 12.2 Examples of content subordination styles

Unsubordinated Introductory Content	Fully Subordinated Content
Level 1 Heading Body paragraph **Level 2 heading** Body paragraph Body paragraph **Level 2 Heading** Body paragraph Body paragraph	**Level 1 Heading** **Level 2 heading** Body paragraph **Level 2 heading** Body paragraph Body paragraph **Level 2 Heading** Body paragraph Body paragraph

Rule 4. Subdivided Sections Contain at Least Two Subsections

If a section includes a subordinate heading, then there must be at least two subsections with headings within that section. If a section contains only one subsection, then the heading for the subsection can be integrated into the heading for the main section (see Table 12.3).

Table 12.3 Examples of incorrect and correct subdivision

Incorrect	Correct	Correct
Level 1 Heading **Level 2 Heading** Body paragraph **Level 1 Heading** **Level 2 Heading** Body paragraph	**Level 1 Heading** **Level 2 Heading** Body paragraph **Level 2 Heading** Body paragraph Body paragraph	**Level 1 Heading** Body paragraph **Level 1 Heading** Body paragraph

Technically, there is no upper limit to the number of subsections that can be included in a section, but you will likely observe that three to five is most common. If a section has more than seven subsections, consider whether these could be grouped under an intermediate heading level to help readers understand the relationship among the subsections. If no such grouping is readily apparent, a summary of the subheadings in a list or graphic could help readers consolidate the high level concept.

Rule 5. Subheadings Within Sections Are Grammatically Parallel

Because headings can be conceived as items in a list, they should exhibit parallelism in grammar. If a subheading within a section is a noun phrase, then all subheadings within that section should be noun phrases. Following this convention will help ensure that subdivisions are truly equivalent, helping your reader understand the relationship among subsections. It will give your writing a polished, professional tone.

Outlines Summary

Outlines help writers and readers understand logical relationships among parts of texts. Outlines are related to headings, in that both briefly present the main topics of texts in a hierarchical structure. In fact, it should be possible to generate an outline by selecting all the headings in a text. If page numbers were provided, such an outline would also function as a table of contents, and in fact this is exactly how tables of contents are automatically created for digital documents. Following logical rules for outlines and headings enhances the readability, usability, and accessibility of long texts. It is a good practice that will certainly help you become a better writer overall.

Format Attributes and Style

Character Attributes

Attributes refer to visual and functional features of digital text. Attributes can apply to text at different levels; in this section character, paragraph, and page attributes are described. Character attributes are any attributes that can be applied to single characters. Thus, strings of text within paragraphs can hold different character attributes.

The most common character attributes are bold, italic, and underline, which can be applied in even the most basic text editors. In formal academic writing, these attributes are typically applied as follows:

- Bold is used to draw attention to important text. Bold is most often used as a means of foregrounding functional types of text, such as headings and captions. It may be used rhetorically to emphasize particular text within body paragraphs. This usage is common in highly concise texts, such as grant applications.

- Italics are used to foreground text specifically referencing a particular referent. Italics may be used for book or journal titles, under certain style conventions, such as APA. In academic writing, use of italics to indicate emphasis is less common than in literary or journalistic genres. Additionally, italics can indicate that a foreign language word is in use or denote "words as words,"[1] (i.e., words that are being presented as a word or term, rather than functioning normally within a sentence).
    - Example (italics for a foreign word): Kelsey looked back over her shoulder at the *cromlech* before stepping into the tour bus.
    - Example (italics for a word as word): The word *bank* can mean either a business that holds people's money or the land abutting a river.
- Underlines were historically used similarly to bold and italics, to draw emphasis and demarcate special kinds of content, such as publication titles. However, in the digital era, these uses are considered deprecated. Only hyperlinked text should be formatted with underline.

In most digital text editing applications, many more character attribute options are available. Word processors like Microsoft Word and Google Docs offer a vast array of character attributes. You are probably familiar with attributes like font, font size, and font color. Beyond aesthetics, fonts can also convey different meanings to readers. Academic writing is usually formatted in common fonts, like Times New Roman, Arial, Calibri, and Computer Modern (the default LaTeX font). These fonts have minimal decorative features and can be easily modified with standard character attributes. There are also fonts designed for accessibility.[2] Some readers have strong negative feelings about certain fonts, especially Comic Sans and Papyrus. The entrepreneur Sarah LaFleur once said, "Your clothes should be the least interesting thing about you."[3] While you may not agree about clothing, this sentiment is certainly applicable to fonts used for academic writing, which can assert your professionalism through its conventionality and neutrality. Journals often specify a particular font to be used for submissions.

Additionally, character attributes include specialized features, including strikethrough and double strikethrough, subscript and superscript, background color and border, small caps (uppercase characters the height of lowercase), all caps, and hidden (see Table 12.4 for examples). These specialized character attributes can be applied for specific purposes in academic writing, e.g., subscript numbers in chemical formulas and superscript numbers for in-text citations. Some attributes can be applied but not seen.

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1. From this text, you can see that quotation marks are another good way to denote "words as words." Some very complete style guides prescribe either quotation marks or italics, but in the absence of explicit guidance, follow your intuition.
2. David A. Amdur, *Typographic Design in the Digital Studio: Design Concepts*, (Thomson/Delmar Learning, (2007).
3. Elizabeth Segran, "This women's clothing brand is made for professional women who hate to shop," *Fastcompany.com*, March 31, 2016.

These hidden attributes can be useful, for example, used to conceal a section break in the middle of a paragraph, thereby avoiding an incongruous line break. Word allows users to adjust advanced character attributes, including kerning, spacing, and ligatures, among others. These can be useful customizations for graphic designers, but for academic writing the default settings for advanced attributes are best.

Table 12.4 Examples of character attributes

Attribute	Example
Bold	**The quick red fox jumps over the lazy brown dog.**
Italics	*The quick red fox jumps over the lazy brown dog.*
Underline	The quick red fox jumps over the lazy brown dog.
Strikethrough	~~The quick red fox jumps over the lazy brown dog.~~
Subscript	The fox$_{\text{quick, red}}$ jumps over the dog$_{\text{lazy, brown}}$.
Superscript	The quick red$^{\text{fox}}$ jumps over the lazy brown$^{\text{dog}}$.
Background color	The quick red fox jumps over the lazy brown dog.
Border	The quick red fox jumps over the lazy brown dog.
Small caps	THE QUICK RED FOX JUMPS OVER THE LAZY BROWN DOG.
All caps	THE QUICK RED FOX JUMPS OVER THE LAZY BROWN DOG.

Character attributes help readers interpret the text at the word and sentence level. They allow writers to communicate complex information with ease. However, unprincipled use of character attributes is likely to confuse readers. Unconventional font color, inconsistent font size, and unprincipled application of strikethrough or small caps may imply carelessness in the writing, which damages the credibility of the text itself. Avoid ornamental use of character attributes, and if you have a novel way of using a character attribute to convey meaning, be sure to provide an explicit explanation at the first instance.

Hyperlinked Text

Hyperlinked text refers to any electronic text that users can click to access other content. Hyperlinks commonly open browsers and navigate to websites, but they can also open an email client, navigate to other parts of a file, or open other files. It is conventional to format hyperlinks with both a contrasting font color and an underline. The color of the hyperlink will change color after a user has clicked it, typically from blue to purple. These special attributes help users know that they can interact with the hyperlink. It is important to avoid using blue, purple, and underline attributes for non-hyperlink text, since users will

likely assume that the text is hyperlinked. Word and other popular writing applications provide built-in hypertext styles, so it is not necessary to manually format hyperlinks with these attributes.

Word cleverly recognizes text patterns like email addresses and URLs (i.e., website addresses), and automatically formats them as hypertext. This automatic formatting is convenient, but not accessible. Assistive devices, like screen readers, will read the entire URL aloud, which is not helpful to the user.[4] A more accessible way to integrate hyperlinks into digital documents is to type a description of the hyperlink that tells the user what the hyperlink does. Then select the text and use the Link button on the Insert tab on the ribbon to provide the destination information for the hyperlink. The text displayed on the screen, and read aloud by an assistive device, is called **hypertext**. Avoid generic, vague hypertext, such as "click here." Users generally know that they can click hypertext; what they need to know is why they should.

Paragraph Attributes

If you have ever used Word to prepare a written assignment, you are probably familiar with some paragraph attributes. Written assignments at U.S. universities should be typed, and teachers typically specify parameters for some character and paragraph attributes, such as font size and paragraph spacing. This is just the tip of the iceberg, however. As a graduate student, you will be expected to create longer, more complex texts that must adhere to precise format requirements established by institutions and publishers. To be successful, you will need to understand advanced paragraph attributes.

A note about definitions. As stated above, paragraphs are visually compartmentalized portions of text comprised of conceptually related sentences. From a formatting perspective, however, a broader definition is needed. In document formatting, a paragraph is defined as a string of characters preceding a hard line break. By turning on the Show/hide feature in Word, you can visually see the paragraphs in a document, since hard line breaks are denoted with the pilcrow (i.e., paragraph symbol: ¶). Note that there is no printable content to the right of the pilcrow.

4. DOI links in reference lists are an exception to this rule.

Spreadsheet cell analogy

If you are familiar with spreadsheet software, it can be useful to imagine a document as a spreadsheet with only one column; paragraphs, then, are analogous to cells, and hard line breaks, which are inserted into documents with the Enter key, are analogous to the cell boundary. As with spreadsheet cells, each paragraph can hold a variable amount of content, they appear in sequence, and attributes can be applied to the entire unit. Thus, paragraph attributes apply to the whole string, not just to selected characters within the string. Using this definition, it is easier to understand why authors need to establish paragraph attributes for headings, references, and other kinds of content that do not consist of groups of related sentences.

Since we are now considering paragraphs as containers for document content, we can understand how paragraph attributes ascribe dimensions to these containers. Broadly, paragraph attributes concern the horizontal and vertical dimensions of paragraphs. Paragraph attributes in the horizontal dimension include alignment, justification, indentation, and tabs.

Alignment refers to the point on the horizontal axis at which the paragraph is anchored. Left-aligned paragraphs extend to the right from an anchor point on the left; right-aligned paragraphs extend to the left from an anchor point on the right, and center-aligned paragraphs extend to the left and right from an anchor point in the center. If you were to place a ruler vertically to the left of one line of a left-aligned paragraph, all the lines in that paragraph would touch the ruler, but if you were to move the ruler to the right edge, some lines would not reach the ruler, while others would extend past it. In typesetting, this is known as a “ragged right” edge. Similarly, right-aligned paragraphs have a ragged left edge, and center-aligned paragraphs have ragged right and left edges.

Justification adds a control to remove the ragged edge from paragraphs. In justified paragraphs, each line except the last one is the same length. If you were to place a ruler vertically to either the right or left side of the paragraph, each line would touch the ruler and not extend past it. Justification is typically used in typeset publications, such as magazines, journals, and books. Word and LaTeX both include justification as a paragraph attribute; however, justification often makes digital text hard to read, especially for users with low vision. Therefore, avoid justifying paragraphs unless justification is required.

While paragraph alignment is used to control the horizontal shape of paragraphs, a different attribute is used to control their position. This is **indentation**. Indents can be set to the left and right of a paragraph, establishing limits for both line length and distance from the page margins. Note that margins are a page-level attribute, while indentation is a paragraph level attribute. Indentation is always relative to page margins. Thus, if a paragraph has a 0.5" left indent on a page that has a 0.5" margin, the left edge of the paragraph will be 1" from the edge of the page. Meanwhile, if a paragraph has a –0.5" left indent on a page that has a 0.5" margin, the left edge of the paragraph will be flush with the edge of the

page. Indentation can be applied to an entire paragraph and to individual lines within a paragraph. A **first line indent** applies to just the first line of a paragraph; if you have ever composed an essay for a class, chances are you were instructed to indent the first line of each body paragraph. Many professional publications also adopt this convention. By contrast, a **hanging indent** applies to every line except the first. Hanging indents are used when the first line of a paragraph needs to be emphasized; this is commonly seen in alphabetized reference lists or tables of contents. Note that a negative first line indent has the same shaping effect as a positive hanging indent; however, they should not be used interchangeably, since all indents are relative to page margins. Thus, a negative first line indent would cause the first line of the paragraph to overlap the page margin, which is typically not desired.

The last paragraph attribute that can be applied to control horizontal paragraph features is **tab stops**. Tab stops can be used to add blank space within lines of a paragraph. Most Word users are comfortable using the tab key to manually offset the first line of a paragraph 0.5" from the margin. You now know that you can apply first line indent as a paragraph attribute to achieve the same appearance. For body paragraphs, it is better to use the first line indent attribute than the tab, since pressing the tab key adds a nonprinting character to the paragraph (you can see the arrow when Show/hide is enabled), and this character remains in the paragraph, even if you change your mind about wanting a first line indent. In Word, the default paragraph style has tab stops every 0.5", so intuitively, we think of tabs as being 0.5". In fact, tabs can insert variable amounts of space, as you will see below. This is part of why tabs are not ideal for adding first line indents. However, tabs can be very useful for formatting content other than body paragraphs, such as labeled equations.

Generally, Word does not allow for multiple paragraphs on the same line. Some users circumvent this limitation by using borderless tables or page columns. These approaches should be avoided. Using tables to control the positions of in-line information, known as “layout tables,” is not digitally accessible, since the information placed within the layout table is not clearly labeled with a column header. Adding page columns for just one paragraph necessitates inserting multiple section breaks on a single page, which can later create errors in page headers and footers. Tabs are the simplest and best way, in Word, to separate content horizontally. Microsoft provides excellent documentation on setting and changing tab stops. Briefly, tab stops are a paragraph attribute that can be added, deleted, and adjusted in the paragraph settings. They are directional, meaning that they determine the alignment of the text inserted at each tab stop (left, right, or centered). Adding a tab stop removes the 0.5" default tab stops within that paragraph.

Practice: Insert a labeled equation

Unlike figure and table captions, equation captions conventionally appear on the same line as an equation (i.e., not in a separate paragraph). However, Word's caption inserter only allows captions to be positioned above or below the captioned object. Tabs can be used to position equation labels consistently. To position an equation label to the right of an equation in Word:

1. Turn on Show/hide on the Home tab on the ribbon and enable the "Ruler" in the View group.
2. Add three blank, "Normal" style paragraphs.
3. With your cursor positioned in the second blank paragraph, open the Paragraph Options dialogue.
4. Click Tabs to open the tabs dialogue.
5. Enter 3.25 in the Tab stops: field, then click the Center (alignment) radio button, then click the + button.
6. Enter 6.5 in the Tab stops: field, then click the Right (alignment) radio button, then click the + button.
7. Click OK to close the dialogue. There should now be two tab stop indicators visible on the horizontal ruler: at 3.25", the tab stop appears as an up-arrow; at 6.5" it appears as a right-elbow arrow.
8. Use the tab key to position the cursor at the 3.25" tab stop. Insert your equation; it will center around the tab stop.
9. Then select the equation by clicking the vertical ellipsis button to the left of the equation editing tool. In the References tab, click Insert caption.
10. In the Caption dialogue, select Equation as the caption label, and then click OK.
11. The caption will appear above or below the equation. Use the cursor to select the caption text (but not the pilcrow to the right!) and cut it to the clipboard. Note that the equation number has extra-dark shading when the text is selected, indicating that it is a dynamic field.
12. Position the cursor to the right of the equation, press the tab button, then paste the equation caption. If the equation shifts to the left when you press tab, position the cursor to the left of the equation and press tab again to reposition it at the center.

Now, you should have a center-aligned equation on the same line as a right-aligned, dynamic caption.

Now that you are familiar with horizontal paragraph attributes, we will shift our attention to the vertical dimension. The primary paragraph attribute that controls the vertical elements of the paragraph is **spacing**. As mentioned above, most Word users are comfortable using the double-space attribute for body paragraphs, since this is often a stated requirement for typed homework. Paragraph spacing concerns three aspects: the space before (above) and after (below) the paragraph and the line spacing within the paragraph. Novice Word users typically use the Enter key on the keyboard to add space between paragraphs. However, this approach often leads to frustration when the blocks of empty paragraphs create unwanted gaps around page breaks. It is much better to use paragraph attributes to precisely set the amount of space desired before and after a paragraph. Note that space before and after is measured in **points**, a unit of measure in typesetting equivalent to 1/72". Line spacing, by contrast, is set as a multiple of the font size. Space after before and after a paragraph is additive. So, for example, if a heading with 12

pt. before comes after a double-spaced body paragraph, there will be 24 pt. between the two paragraphs. Word also allows users to disable space between paragraphs of the same style. This is useful for lists; it allows for lists to resemble body paragraphs with less space between items than before and after the list.

The last set of paragraph attributes we will cover in this book is line and page breaks. These attributes are managed in separate tab on the paragraph options dialogue. Each option in the Line and Page Breaks tab can be useful in certain circumstances, but they can also cause frustration, especially when users are unaware of them. The first pagination attribute is **widow/orphan control**, which is usually enabled by default. This attribute prevents a page break from splitting a paragraph with only one line above or below the break. You may have experienced Word jumping your paragraph up or down while you edited text near a page break; this is usually due to widow/orphan control being enabled. It can be distracting to try to type while the paragraph is bouncing around on the screen, but resist the temptation to reposition the paragraph by adding empty paragraphs above it; this will only cause more formatting problems later.

The next pagination control is **Keep with next**. This attribute is applied to heading styles by default. It causes the paragraph (or at least the last one or two lines of the paragraph) to appear on the same page as whatever follows it. The pagination control, **Keep lines together,** causes the entire paragraph to appear on the following page if even one line extends onto the next page. As you can infer, the "keep lines together" attribute can create large gaps at the bottom of a page, especially if both "keep with next" and "keep lines together" are enabled. If you see such a large gap, and there are no empty paragraphs, select the paragraphs at the top of the following page and disable these pagination controls to fill the space at the end of the preceding page.

The last pagination control is **Page break before**, which causes the paragraph to start at the top of a page, no matter what. This can be useful for long documents divided into chapters, since chapters usually start on a new page. Users unaware that "page break before" is applied to a paragraph may experience frustration, especially since Word will not display a page break, even when show/hide is enabled. The Line and Page Breaks tab also allows users to apply exceptions to special formatting and to control how paragraph text wraps around objects. We will not discuss those features here, but Microsoft provides excellent documentation of their use.

Practice: Paragraph attributes

Create a new Word file, and paste a few paragraphs into it. Turn on show/hide to see where each paragraph begins and ends. Then, select one of the paragraphs and open the advanced paragraph format dialogue. Starting with the **Indents and Spacing** tab, adjust each attribute individually. See how each change affects the overall shape of the paragraph. Experiment with the drop-down menus and the check boxes. Try inputting negative numbers in the text boxes. Once you feel confident with indents and spacing, add some heading text between paragraphs. Open the **Line and Page Breaks** tab. To observe the effects of the line and page breaks attributes, the content in the file must exceed one page.

Page Attributes

Overview

Page attributes apply at a higher structural level than character and paragraph attributes. Page attributes include the page dimensions, margin size, header and footer content, columns, line numbers, and page color. Page dimensions provide height and width parameters for content. Historically, they have been analogous to standard paper sizes, since it was assumed that most documents authored on word processors would eventually be printed. Nowadays, file sharing through web applications has diminished people's reliance on printers, but it is still conventional to use standard paper sizes as the page size for everything from classroom assignments to journal article submissions and job applications.

Margins

Margins are the area near the edge of a page where there is no content. The main reason for margins is to prevent content from disappearing over the edge of a page, in case the paper is misaligned in the printer. This is not the only reason, however. Readers are used to margins and expect to see them framing what they read. Conventional margins are 1" on all four sides of the page. The top and left margins are exactly 1", while the right and bottom margins can appear a bit larger when the amount of content does not completely fill the printable area (i.e., the area within the margins). The page margin establishes the reference point for indentation, a paragraph level attribute. Thus, a paragraph with a 0.5" left indent on a page with a 1" margin will have its left edge 1.5" from the page edge.

Headers and Footers

Another page-level format attribute is headers and footers. Headers and footers contain orienting information about the document, such as the title, publication, and page number. Content in the headers and footers is not meant to be read as a continuous part of the main document content. Page numbers and running heads should be located only within headers or footers. Header and footer content may be posi-

tioned within the 1" top or bottom margin. There should also be some space between header and footer content and the main document content to help readers avoid reading it as continuous. When authoring a document, it is essential to use the header/footer editor rather than adjusting the page margins. In Word, use the Header or Footer buttons in the Insert tab, then select Edit Header/Footer to access the header/footer editor (see Figure 12.1).

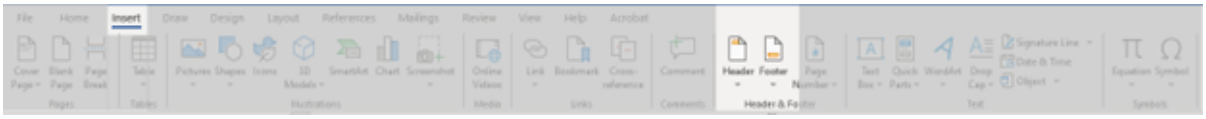


Figure 12.1 *Open Header/Footer in Word*

With the Header & Footer open, you can type into the header and footer areas, but not into the main area of the document. Similarly, when Header & Footer is inactive, the header and footer content cannot be selected or edited. In this way, the header and footer comprise a distinct layer of the document file. Headers and footers are consistent within each document section. Some customization is provided, such as "Different First Page," which can be used to format a title page without a page number, and "Different Odd & Even Pages," which is useful for documents that will eventually be bound as a book (see Figure 12.1). The Header & Footer dialog in Word provides many additional tools for customizing these layers.

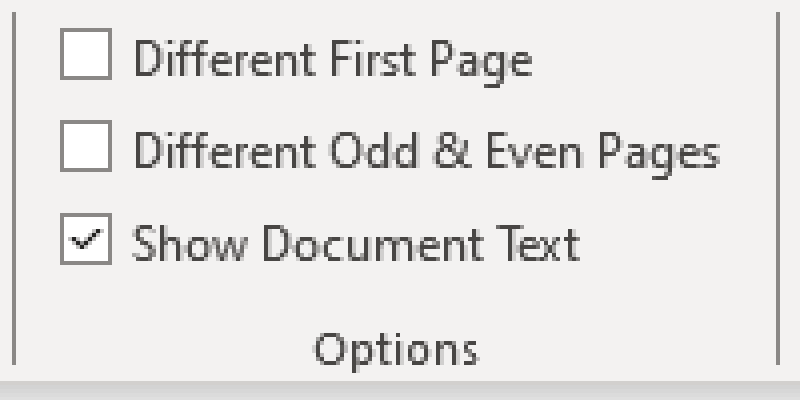


Figure 12.2 *Custom options for header repetition*

Wrapped content (i.e., content that can be repositioned by clicking and dragging [see Chapter 13, Arrangement]) can be inserted into the header or footer, then moved into any position on the page. This functionality is useful for positioning a page number along the short edge of a **landscape**-oriented page that will appear in a **portrait**-oriented book. It can, however, be confusing to see content outside of the header and footer area that cannot be selected or edited. When Header & Footer is inactive, the header and footer content appear faded; this is one way of checking whether content is in the Header & Footer layer.

Orientation

Page orientation refers to the direction of text and graphics relative to the page. In **portrait** orientation, the long edges of the page are the sides, while the short edges are the top and bottom. Most documents and books use portrait orientation. In **landscape** orientation, the sides are the short edges of the page and the top and bottom are the long edges. This orientation is often used for pages that contain wide tables, graphs, and illustrations. The header and footer are always located at the top and bottom of the page, whether the orientation is landscape or portrait.

Sections

In Word, page-level attributes are consistent within each document section. Any change to a page-level attribute will automatically be applied to all pages in the same section. Therefore, to alter the page-level attributes for just some pages within a document, new sections must be created. This can be done with the Breaks commands in the Layout tab of the ribbon (see Figure 12.3). Section breaks can be continuous, next page, or next even or odd page. Section breaks can lead to problems that are difficult to troubleshoot. Section breaks are not visible when Show/Hide is disabled, and they can be invisible even when Show/Hide is enabled.

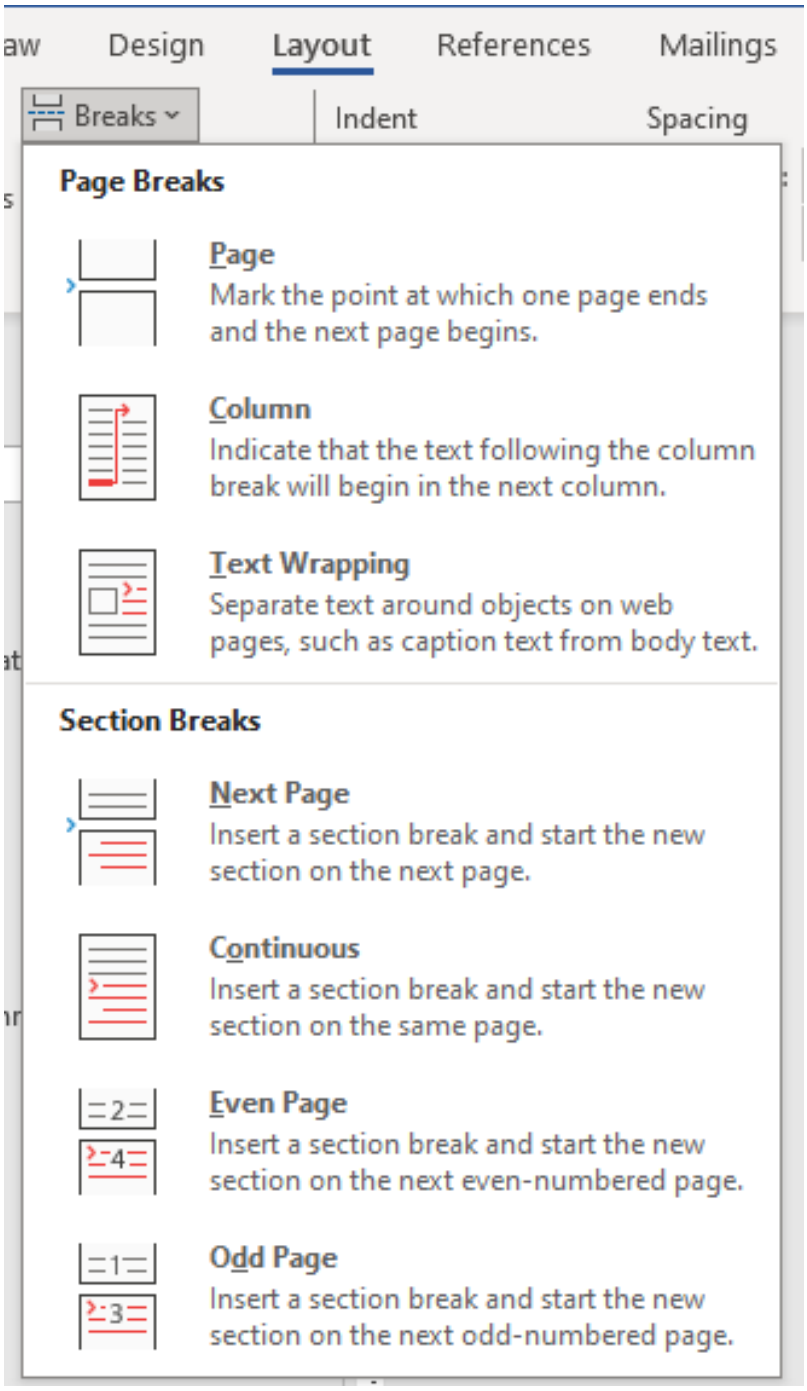


Figure 12.3 *Breaks menu in the Layout tab*

Headers, footers, and sections

When a new section is created, the header and footer for the new section are linked to the header and footer of the previous section by default. Changes made to headers and footers of linked sections apply across those sections. This means that headers and footers do not need to be re-constructed every time a new document section is created. However, if the header or footer of the new section needs to be different from the previous, then the sections need to be un-linked.

- In the Header & Footer tab, there is a toggle button for this, labeled "Link to Previous."
- Headers and footers can be re-linked with previous section after being un-linked. Re-linking the header and footer applies the header/footer from the previous section to the latter section.
- When a continuous section break is inserted in the middle of a page, the header and footer of that page are formatted following the page attributes for the latter section.
- When multiple continuous section breaks are inserted within a single page, each section has its own header and footer, though only the header/footer for the last section on that page are visible.
- In the Header & Footer menu, the Previous and Next buttons can be used to navigate among document sections and find section breaks. Additionally, when the Header & Footer layer is active, those sections are labeled with section numbers. This can be very useful for finding section breaks in multi-section documents.

Default Attributes and Normal Style

Now that you are up to speed about format attributes at various levels, it is time to consider how they all fit together. Most novice users of Word and other word processing applications apply attributes one-by-one, customizing sections of text according to their intuition. This way of formatting is fine for learning about what each attribute does individually, but it is not a sustainable strategy for formatting a large, important document. For one thing, it is almost impossible to be consistent when formatting each chunk of text individually; there are simply too many attributes to remember. Furthermore, it is slow and tedious once the novelty of the technology wears off.

Savvy users rely on **styles** to expediently and consistently apply format attributes to their text. A style is a set of pre-defined attributes that can be applied to content within a document. The default Word file template contains an array of styles. If the attributes applied to the built-in styles in Word files do not suit your needs, they are simple to modify. Users can also create new styles to suit the needs of specific documents. Modifying a style automatically applies the modification to all text in the file with that style applied. This is one of the best features of styles: they make it simple to reformat a document without needing to painstakingly apply changes to each instance of that type of text.

Themes

Do you dislike the attributes in the default styles? The default Word file template also comes with a large assortment of themes, which are like meta-styles for the entire document. Themes are a higher level of pre-defined settings. Themes encompass sets of font families for built-in styles. Additionally, themes include curated color menus, graphic design effects, and even paragraph spacing. Avoid experimenting with themes if you are using an institutionally-provided template, since you may not be able to re-trace the changes that you made.

One special built-in style is the "Normal" style. You can also think of this as a default style. No text in a word processor file is free of attributes. Normal style is a set of basic attributes, and most other styles in the style gallery are variations of this style. While it is fine to use the Normal style for things like paragraphs, be careful about modifying it, since any changes you make to Normal style attributes will be applied to all styles in the document that are based on Normal style. Thus, if you add a first line indent, all headings, captions, table text, etc. will get a first line indent. Body Text style should be applied to body paragraphs, rather than the Normal style, since modifications to the Body Text style will not affect most other styles.

Scenario: Sending the dissertation to the committee

Richard has finished compiling his doctoral dissertation and is ready to send the file to his committee members in advance of his final oral exam in three weeks. He prepares the email, attaches his manuscript as a PDF, and with butterflies in his stomach, clicks Send. Less than an hour later, one of the committee members replies back asking him to reformat it as single-spaced so they can print it with fewer sheets of paper. Three minutes later, another committee member emails to request a copy with size 16 font so they can more easily read their printed copy.

Luckily, Richard had used his institution's dissertation template to prepare the final version of his manuscript. He saves two new copies of the Word file with the names of each committee member in the file name. For the first, he modifies the Body Text style to be single-spaced. For the second, he modifies the Normal style to be 16 point font. He uses Word's PDF converter to create PDF files for each committee member and replies to their emails in under thirty minutes.

Recommended Styles for Research Publishing

Body Style

Body style refers to the style used for paragraphs. Character attributes for body paragraphs should be as close to the default style as possible. The default style, called “Normal” in Word, uses a standard, proportional font, such as Calibri or Aptos. The font size for Normal style is typically 11pt. or 12pt. Body style should be easy to read, without distracting visual features. Distinctive, ornamental, and stylized fonts are avoided for body styles, since they can draw attention away from the written content. For academic writing, the default fonts in popular word processing software are a good choice. If you plan to publish the paper, the publisher may require that the submission use a certain font.

Basic body style should not use any additive character attributes, such as bold, italic, underline, etc. These attributes are reserved for when words and phrases within body paragraphs need extra emphasis. For example, bold is often added to specialized vocabulary in textbooks to help learners pay attention to key terms and phrases. Italics may also be used to set off a term, or to denote the use of foreign words and phrases to help readers notice that those words are linguistically distinct. Italics are also used, especially in literary texts, to place rhetorical emphasis on certain words and phrases. You can consider this use of italics as analogous to loud, clear speech.

As with character attributes, paragraph attributes for body style should be plain. Line spacing is usually either single or double. Body paragraphs should be visually differentiated from one another and this is achieved with a first line indent, additional space before the paragraph, or both. Body paragraphs are either left-aligned or justified; they do not have left- or right-indents applied, except on the first line. Guidelines for paragraph attributes are often provided in assignment sheets, for course papers, and submission instructions, for publications.

Importantly, all body paragraphs in a text should have the same font and paragraph attributes. This is most easily achieved by creating or modifying a body style in the word processor. Microsoft, Google, and Overleaf[5] (font and paragraph) provide useful documentation on how to set up styles. Once a style is set up, applying it to text is simpler than adding each attribute one-by-one, and there is no need to memorize all the attributes that define that style. Another advantage is that you can easily change the attributes for all body paragraphs throughout the document simply by modifying the style. For example, you can use double-spaced paragraphs while composing a text, and change to single-spaced before you submit it for publication. Another important thing to keep in mind is that body paragraphs set the tone for other styles

5. Overleaf is a LaTeX editor, not a word processor, so the procedure for setting up styles in that application involves coding. For more, see Chapter 11.

in the document. Other types of content are distinguished by limited modifications to this style. The next several sections describe how certain kinds of text commonly seen in academic writing are conventionally formatted.

Heading Styles

Grammatically, headings are often phrases, not clauses; they can be as short as a single word. Punctuation is used sparingly in headings. Visually, headings are almost always identified by special format attributes that differentiate them from body paragraphs. Bold is the most common attribute used to differentiate heading text from body text. Other distinguishing attributes for headings include font size, italics, case, alignment, and indentation. Avoid using underlining to visually differentiate headings, since users might mistake them for hyperlinks. A horizontal line can be used instead of the underline attribute to provide a visual barrier between sections of text.

When sections are subdivided into subsections, different levels of headings are employed to convey that the subsections collectively make up the higher level section. Therefore, it is critical to use distinct format attributes to differentiate among heading levels. In highly structured documents, writers may use decimal numbering or a combination of numerals and letters to convey this hierarchy, as exemplified in Table 12.5.

Table 12.5 Differentiating heading styles by format attributes and decimal numbering

Differentiation by Format Attributes	Differentiation by Decimal Numbering
MAJOR SECTION HEADING—FIRST SECTION (bold + centered + uppercase) **Subsection Heading—First Topic** (bold + left-aligned) **Sub-subsection Heading—First Subtopic** (bold + left-aligned + indented 0.5") **Sub-subsection Heading—Second Subtopic** **Subsection Heading—Second Topic** **Sub-subsection Heading—First Subtopic** **Sub-subsection Heading—Second Subtopic** **MAJOR SECTION HEADING—SECOND SECTION** **Subsection Heading—First Topic** **Sub-subsection Heading—First Subtopic** **Sub-subsection Heading—Second Subtopic** **Subsection Heading—Second Topic** **Sub-subsection Heading—First Subtopic** **Sub-subsection Heading—Second Subtopic**	1. Major Section Heading—First Section 1.1. Subsection Heading—First Topic 1.1.1. Sub-subsection Heading—First Subtopic 1.1.2. Sub-subsection Heading—Second Subtopic 1.2. Subsection Heading—Second Topic 1.2.1. Sub-subsection Heading—First Subtopic 1.2.2. Sub-subsection Heading—Second Topic 2. Major Section Heading—Second Section 2.1. Subsection Heading—First Topic

Differentiation by Format Attributes	Differentiation by Decimal Numbering
	2.1.1. Sub-subsection Heading—First Subtopic 2.1.2. Sub-subsection Heading—Second Subtopic 2.2. Subsection Heading—Second Topic 2.2.1. Sub-subsection Heading—First Subtopic 2.2.2. Sub-subsection Heading—Second Topic

Caption Styles

Captions are short texts that explain or describe graphic content, such as figures and tables. Especially when graphics are presented within the main part of the text, interspersed among body paragraphs, it is important to use format attributes to distinguish captions from body text. Publishers and style guides provide useful, specific instructions for formatting figure and table captions. These usually include requirements for placing captions relative to the graphic itself (above or below). The character attributes—font size, bold, and italics—can be used to consistently set off the label and number of the caption from the descriptive content, as required in APA 7th edition.

In contrast to headings, which use format attributes to add emphasis and prominence, caption attributes may visually de-emphasize caption text, compared to body paragraphs. Captions may have smaller font size and italics, and they may be condensed by using single-spacing with additional space after. This diminutive appearance reflects that caption text merely presents or explains the graphic. The primary meaning is conveyed through the graphic itself, while interpretation and analysis of the graphic is provided in body paragraphs.

Numbering Tables and Figures

In academic writing, captions usually begin with a label, such as “Table” or “Figure” and a number. Each label carries its own number sequence, so the number 1 can be used for both Table 1 and Figure 1. For texts with numbered headings, such as theses and dissertations that have numbered chapters, it is common to include the highest-level heading number (i.e., chapter number), in the table or figure number. Separators may be periods, dashes, or colons. Table 12.6 illustrates how to combine heading numbers with sequential figure and table numbers.

Both Word and LaTeX include dynamic caption features. These features allow users to create captions

that automatically re-sequence numbering when content within the file is rearranged, and to create cross-references to captioned content that automatically update when the caption number changes. Large writing projects, such as journal articles, theses, and dissertations, typically include many captioned graphics and undergo multiple draft revisions. Both of these factors strongly justify the use of dynamic captions throughout the drafting process. The automatic re-numbering and cross-reference-updating functionality can save hours of tedious editing. In other words, make it a habit to create a dynamic caption anytime you insert a new table or figure into a document you are authoring.

Table 12.6 Combining heading numbers with table and figure numbers

	Label	Heading Number	Separator	Sequential Number
Example 1.1	Table	6	–	1
Example 1.2	Table	6	–	2
Example 2.1	Figure	6	–	1
Example 2.2	Figure	6	–	2

Reference Styles

As explained in Chapter 2, academia is rife with citation styles. Citation style guidelines are not limited to the content of the in-text citation and items in the bibliography; they typically prescribe format attributes, too. Paragraph attributes that may be prescribed for references include alignment, line spacing, numbering, and pagination controls, such as "keep lines together." Character attributes may include adding visual attributes to hypertext, such as a different font color and underline. Character attributes may also include bold for author names, or italics for journal titles.

A paragraph attribute that is commonly applied to reference lists is a hanging indent. In contrast to a first line indent, where only the first line of a paragraph is offset to the right of the left margin, with a hanging indent every line below the first line is offset to the right, while only the first line is flush with the left margin. Hanging indents enhance the usability of reference lists by emphasizing the initial information, typically a sequential number or author name. This helps readers quickly find the reference they are looking for. Authors often try to format references with a hanging indent by using line breaks and tab characters, as shown in Table 12.7. However, both Word and LaTeX allow users to apply a hanging indent as a paragraph attribute. Using this attribute is both easier and more accurate than manually adding line breaks and tabs.

Table 12.7 Examples of reference format

	Reference Examples
Properly formatted with hanging indent:	Lowry, O. H., Rosebrough, N. J., Farr, A. L., & Randall, R. J. (1951). Protein measurement with the Folin phenol reagent. J biol Chem, 193(1), 265-275.¶
Improperly formatted with line breaks and tabs:	Lowry, O. H., Rosebrough, N. J., Farr, A. L., & Randall, R. J. (1951). Protein measurement¶ → with the Folin phenol reagent. J biol Chem, 193(1), 265-275.

Block Quotes

Block quotes are recommended for long quotes. Length thresholds vary by style guide. In academic documents, block quotes are usually distinguished from body text with paragraph attributes. Specifically, they are usually fully indented (not just the first line). Additionally, they may be single-spaced with twelve points before and after. Block quotes should have widow/orphan control applied so that at least two lines of the block quote appear on each page when the block quote spans a page break.

Because block quotes are presented as discrete paragraphs, they do not begin or end with quotation marks. Additionally, the block quote ends with punctuation before the in-text citation, and there is no punctuation after the in-text citation (for in-line quotations not set off as block quotes, punctuation is provided only after the in-text citation). It is, therefore, essential to format block quotes consistently, to ensure that readers do not misinterpret the content as original. Improperly formatted block quotes can constitute a form of plagiarism.

See the example block quote below:

> *Ask an intelligent man who is not a scholar what space and time are, and he will perhaps answer as follows. If we imagine all physical things, all stars, all light taken out of the universe, what then remains is something like a giant vessel without walls called "space." With respect to what is happening in the world, it plays the same role as the stage in a theater performance. In this space, in this vessel without walls, there is an eternally uniformly occurring tick-tock that, however, only ghosts, but those everywhere can hear; that is "time." Most natural scientists, up to the present, had this conception about the essence of space and time, even though they did not phrase it in such naive terms as we just did for the sake of simplicity.*
>
> *Albert Einstein, "The Principal Ideas of the Theory of Relativity," 1916*

Word styles includes a Quote style that is center-aligned with colored font and italics. This style is not appropriate for an academic document, but the style can be modified with conventional block quote attributes (left-aligned, roman text, black color). If your document must adhere to a particular style guide, such as MLA or APA, follow the style guide's suggestions for formatting block quotes.

Document reproductions

Academic documents may include reproductions of other, related documents. For instance, surveys may be reproduced as appendices to journal articles as evidence to support the validity of a research method, or as an instrument other researchers can use to replicate the study. Authors may need to reproduce administrative documents, such as institutional review board (IRB) approval letters and participant consent agreements, as appendices to theses and dissertations.

Unfortunately, there is not one simple or straightforward way to achieve this; if it is sufficient to merely cross-reference to the supplemental document, this is likely the easiest option.

- Inserting a reproduction as an image or embedded file is not a recommended practice, since this type of content is not digitally accessible.
- A better approach is to copy the text and images from the supplemental document into the main file. However, even if the supplemental document was created in the same platform as the document in which it is to be reproduced, it is often not a simple matter to paste the content of the supplemental document into the new one. Inserting content from another file can lead to clashing attributes at the paragraph and page levels. Additionally, graphic content can be displaced when pasting into a new file. These issues necessitate careful work reformatting the copied content.
- If inserting and reformatting the content of the supplemental document is not feasible, consider appending it to the final PDF or providing the supplemental document as a separate file.

Summary

Formatting a long, complex document can be daunting, but taking advantage of advanced word processor functions will improve the overall presentation of your academic writing, in addition to saving you hours of effort and frustration. Remember, there is abundant documentation available for free regarding Word and LaTeX. Now that you have enhanced your conceptual awareness of how these tools work, help can be as close-at-hand as an internet search. You may also return to this chapter over time, as you progress in your academic and professional career.

Key Points

- Electronic files offer many affordances for presenting text.
- Word processors offer extensive functionality for formatting text.
- Effective text formatting improves the appearance, readability, and accessibility of documents.
- Text formatting encompasses multiple levels, including page, paragraph, and character.
- Styles can be used to format long documents easily and accurately.

13. Formatting Figures

Kristin Terrill

Glossary

Alt-text: Alternative text descriptions for graphic content that enable assistive devices to describe the content to the user.

Anchor point: A nonprinting indicator that pairs a text-wrapped image to a nearby paragraph.

Bookmark: A hidden reference applied to text that can be embedded in a cross-reference to enable easy navigation.

Data visualization: Graphic representations of data that aid in meaningful interpretation and analysis.

Figure: Any non-tabular graphic content that provides complementary information related to the text content.

Image: Digital objects, such as image files, that comprise figure content.

In-line: A method for positioning a graphic on a page, so it behaves like a text character. In-line graphics typically appear in a separate paragraph from the surrounding text, but like text characters, they can be inserted within a paragraph containing other text.

Text wrapping: A method for positioning a graphic on a page, so text can appear in a column alongside the graphic, or even overlap the graphic. Synonymous with “floating” content.

Overview

Questions

- What is the definition of a figure?
- How can I integrate a figure into my academic document?
- What options are available for customizing the appearance of my figure in a word processor?
- How can I make my figures accessible to users with assistive devices?

Objectives

- Differentiate figures from other graphics.
- Use functions of word processors to optimize figures for readability and accessibility.
- Add captions to figures and use cross-references to refer to figures in body text.

Introduction

This chapter provides guidance on how to format **figures**, i.e., non-tabular complementary graphic content, as components of informational texts. Figures can refer to graphics, such as illustrations and photographs, charts and other data visualizations, diagrams, art and reproductions, and text boxes. Throughout this chapter, "figure" denotes the graphic content, while "image" refers to the digital object, such as an image file, being formatted.

This chapter focuses on ways of formatting images inserted into research articles, theses, or dissertations. Instructions and examples come from Word. Other word processors handle figures similarly, but the interface may differ. See Word Processors in Chapter 10.

Figure Attributes

Attribute Menus in Word

Figure **attributes** can be adjusted using the appropriate tab on the ribbon. Word offers multiple tool commands for figure formatting:

- SmartArt Design/SmartArt Format
- Chart Design/Chart Format
- Shape Format

- Picture Format
- Graphics Format
- WordArt
- Diagram

Different image types have their own format options, but they share some universal attributes, including size, arrangement, styles, and accessibility.

Size

Image size encompasses two dimensions: height and width. Height refers to the distance from the top to the bottom of the image, while width refers to the distance from the left to right of the image. Images with clear or white space above and below the visible content will appear smaller than the image dimensions suggest.

Re-sizing images with the height and width dimensions will enlarge or shrink the content. Enlarging and shrinking content can cause a mismatch of image resolution. Enlarging can cause blurriness or pixelation, which will make the image less coherent. Re-sizing only the height or width of an image will distort the dimensions of the content. To avoid such distortion, select the “Lock aspect ratio” control (if this control is not shown in the tool dialog, it can be selected in the expanded Size dialogue. See Figure 13.1). Images can also be resized with the Crop tool, which erases the outer edges of the image while conserving the size of the retained content.

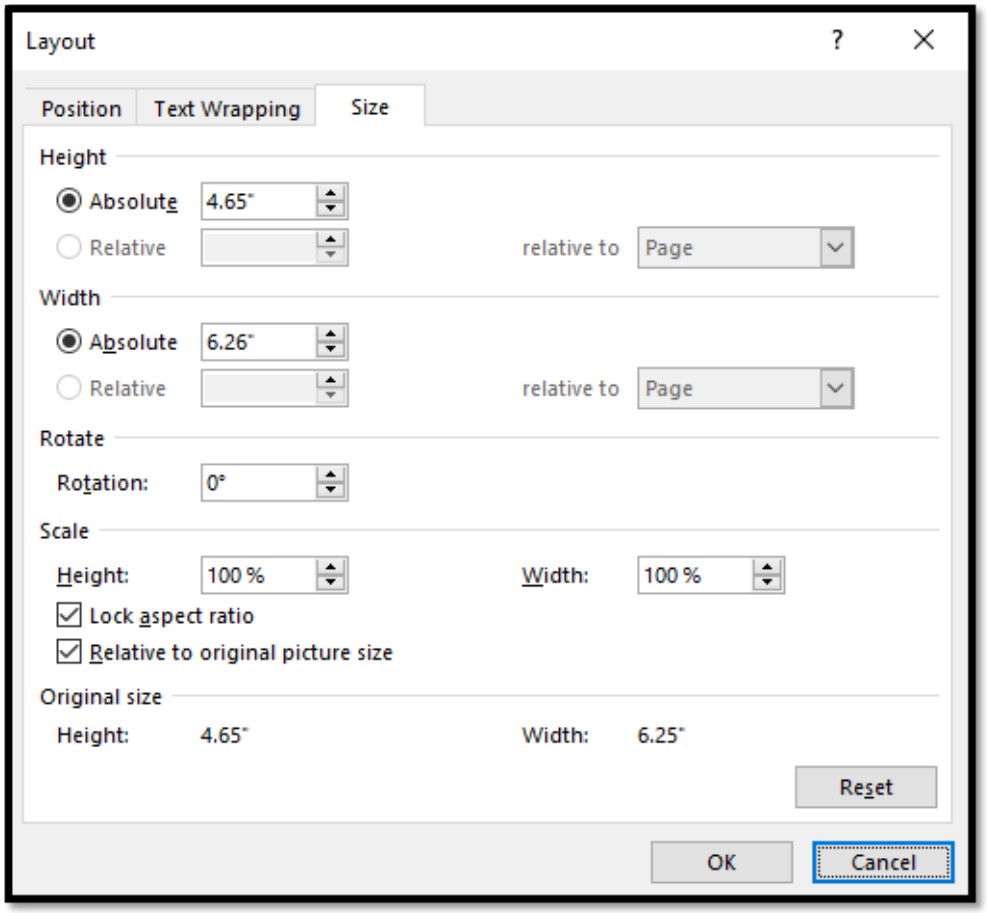


Figure 13.1 *Expanded size dialog in Word*

Figures wider than the page margin can overlap the margin, or even the edge of the page, opposite the alignment direction. In other words, a left-aligned image can overlap the right margin; right-aligned images can overlap the left margin, and center-aligned images can overlap both margins. This can be corrected by adjusting the image width dimension to fit within the page margins.

Arrangement

Arrangement tools include options for text wrapping and in-line positioning, ordering layers of overlapping images, image alignment, image rotation, and grouping.

Text wrapping and in-line positioning are discussed below.

Ordering layers refers to establishing the order of overlapping images. The Bring Forward control reveals more of the selected image, thus obscuring parts of other images in the stack. The Send Backward control obscures part of the selected image, thus revealing parts of other images in the stack. The Selection

Pane lists overlapping items in order, allowing the user to select objects that are completely obscured by other objects.

Alignment refers to the position of an image, relative to other document content. Options for aligning images depend on whether the image is text-wrapped or in-line. Alignment can be relative to text, page margins, or page boundaries. Gridlines and alignment guides allow for precise image alignment. The Group command can be used to maintain the relative position of two or more objects, allowing for efficient repositioning of the set; images joined in a group can be un-grouped as needed. Rotate can be used to turn an image 90° clockwise or counter clockwise or to reverse the image vertically or horizontally. Some image types are given a rotation arrow (see Figure 13.2) which enables rotation to any angle, not just 90° increments.

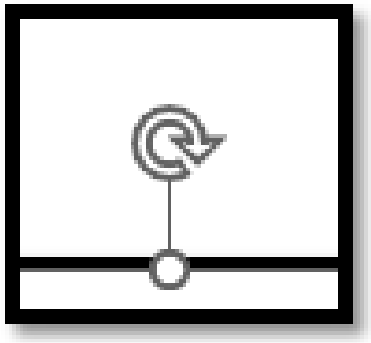


Figure 13.2 *Rotation arrow*

Styles

Styles can be used to visually contextualize an image. Plain and stylized borders can provide attractive boundaries between an image and the surrounding whitespace. Word offers a gallery of pre-designed styles. Users can also design custom borders using conventional line attributes, including color and weight (line thickness); visual effects to add three-dimensional illusion, and SmartArt designs to illustrate meaningful relationships among multiple images.

Accessibility

Word provides several accessibility features. Most importantly, users can add alternative text descriptions (**alt-text**) to figures. Alt-text makes image content accessible to assistive devices, such as screen readers. Word now automatically adds alt-text, but the AI-generated description is prone to oversimplification, so it is better to manually enter descriptive alt-text for images. Some image types also support basic image editing, including Recolor and Remove Background. These tools are useful for testing how images might appear to readers with disabilities related to color perception. Recolor can reveal inade-

quate color contrast.[1] Recolor and Remove Background are less precise than a contrast checker (e.g., WebAIM[2]), but they can help the designer understand how insufficient color contrast impedes readers' perception of images.

Alt-text for charts

It is possible to import charts from Excel into Word "as charts." This allows the user to continue editing the chart within the Word document. Charts have distinct tool ribbons that support changing the chart's colors, style, and even chart type. Although this feature can save time, reducing the need to change from Word to Excel and back, it is not recommended for any file that will ultimately be exported to PDF format. The reason is that charts "as charts" are not recognized as figures in the PDF. Charts are visible on the PDF on the screen and on the print-out, but those images are invisible to screen readers and even accessibility checkers. The alt-text does not appear in the PDF file. Editing charts in Excel, then saving them as images, is more accessible than importing charts to Word.

Integrating Figures into Body Text

Figures are usually presented near in-text references to them. In many books and magazines images are integrated into complex layouts, with text to the left or right of the image, or even overlapping the image. In research genres, however, such complex layouts are uncommon. Figures are typically inserted between body paragraphs with whitespace above and below to separate the figure and caption from the body text.

Text wrapping is the term used to describe images placed next to, or overlapping with, body text. In a word processor, text wrapping allows the author to click and drag the image to reposition it on the page. By contrast, in-line figure placement relies on page and paragraph format attributes for placement. Text wrapping and in-line positioning are considered graphic attributes. They can be applied to any kind of graphic inserted in a document, including tables and figures.

1. "Success Criterion 1.4.3: Contrast (Minimum) (Level AA)," WAI Web Accessibility Initiative, accessed on 14 February, 2025, https://www.w3.org/WAI/WCAG21/Understanding/contrast-minimum.html; "Success Criterion 1.4.11: Non-text contrast (Level AA)," WAI Web Accessibility Initiative, accessed on 14 February, 2025, https://www.w3.org/WAI/WCAG21/Understanding/non-text-contrast.
2. "Contrast Checker," WebAIM Web Accessibility in Mind, accessed on February 14, 2025, https://webaim.org/resources/contrastchecker/.

Although text wrapping offers an intuitively appealing way of positioning a figure in a document, it is also much more complicated than in-line positioning, especially for multi-page documents. In 2016, the Tumblr user laurelhach posted a humorous observation about how it can feel to reposition a text-wrapped image in Word, triggering multiple format disruptions (see Figure 13.3). This is because text-wrapped images are positioned relative to both page and paragraph level attributes with an anchor point.[3] Moreover, the anchor point is not a fixed distance from the dimensions of the figure. The complexity of image position is determined by multiple interdependent, and invisible, attributes which cause unpredictable results when images are repositioned by click-and-drag.

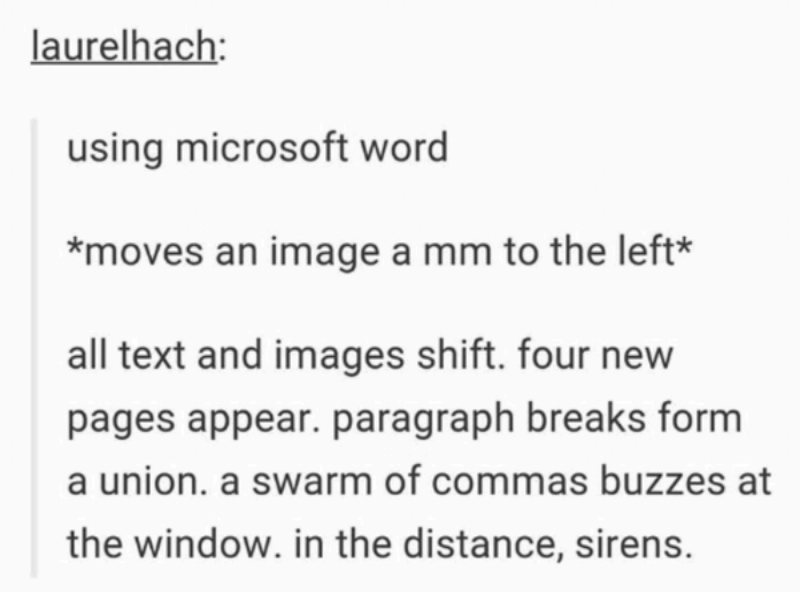


Figure 13.3 *Tumblr post on repositioning text-wrapped figures in Word*

Meanwhile, in-line images have no anchor point; they behave just like text characters. **In-line** images can be repositioned by applying paragraph attributes to the image, just as with text. In-line figures can be aligned left, right, or center, like paragraphs. The alignment is relative to the page margins. In-line images are typically the only object in a paragraph, with text paragraphs before and after the paragraph containing the image. However, it is possible to insert an in-line figure within a paragraph containing text.

3. "Understanding images: Part 3—anchoring," Theresa Estrada, Microsoft 365 Blog, accessed on 14 February, 2025, https://www.microsoft.com/en-us/microsoft-365/blog/2011/06/09/understanding-images-part-3-anchoring.

Figure Numbering and Captions

In academic genres, readers expect graphics to be contextualized with a caption. Captions contain the following three elements:

- Label
- Number
- Description

The **label** states the kind of content. Figures and tables are the most common. Manuscripts may also contain equations, proofs, algorithms, or listings (computer code). It is not common to apply precise terms for figures in the caption label. For instance, illustrations, diagrams, charts, and other kinds of figures should all be labeled as, "Figure."

The **number** follows the label. Each label has its own sequence, so figure numbers should not increment if another graphic type, such as a table, appears between them. Figure numbers can be formatted to restart at the beginning of a new chapter. Captions with chapter number format always restart for each chapter.

The **description** follows the number. The description usually identifies the aspect, or aspects, of the graphic most important to the reader. Caption descriptions should not be redundant with the body text that discusses the figure, nor with the alt-text. Whereas alt-text describes the visual information within the figure, caption descriptions are more interpretive, providing guidance on what the figure reveals about the research topic.

If possible, include textual elements in the caption, rather than adding text within the image, since assistive devices can read caption text, but not text integrated into an image. Even when text in a figure is machine-readable, as with text boxes, it is likely to confuse assistive device users who cannot see the figure.

Conventionally, figure captions are placed below figures (contrast tables, which conventionally have captions above them). However, recently the American Psychological Association changed their style book to require figure captions above the figure with a soft line break between the label/number and the description. Use your publication's recommended style manual for guidance on figure caption placement.

Practice: Insert a Figure Caption in Word

Word and other word processors include functions that enable automatic navigation from an in-text reference to the content that is referenced. To use this in Word, insert a caption using the caption tool:

1. Select the captionable content.
2. On either the figure tool ribbon or the references tool ribbon, select Insert Caption.
3. Select the desired label. Default labels are Figure and Table. Custom labels can be added by the user.
4. Type the caption description, and select the desired placement.
5. The caption will appear close to the figure. A hidden bookmark will be embedded in the caption number.
6. In the body paragraph, place the insertion point where the in-text reference will go. Open the References ribbon and select Insert cross-reference.
7. Select "Figures" from the Reference Type list, then select the appropriate figure from the figure list. Open the Include menu and select Only label and number. Click OK. The cross-reference will appear in the text.

Inserting cross-references with these tools takes longer than simply typing the same information, but offers numerous advantages to readers and authors. For readers, they make digital text more navigable: readers can simply click the in-text reference to navigate to the referenced content. More importantly, inserted captions and cross-references can easily be updated when content is inserted, deleted, and rearranged during revision. Inserted captions are sequenced, and re-sequenced, automatically. This reduces errors, such as skipped or repeated caption numbers.

To update captions and cross-references in Word, select the full content of the file. The keyboard shortcut for this is Ctrl/Cmd + A. Then press F9 (Fn + F9 on a Mac). This function updates all bookmarks and cross-references from beginning to end. Use the F9 action twice to ensure that cross-references reflect updated caption numbers.

Inserted captions also enable automatic generation of a List of Figures, which may be required for a thesis or dissertation. Page numbers on automatically generated lists of figures also update automatically when the F9 function is used.

Separated Graphic Content

Figures may be integrated among body paragraphs, near an in-text reference to the figure. Alternately, they can be provided separately. Some journals instruct authors to upload figure files separately and may request a particular file format, such as .eps or .tiff. Others request submissions with figures in place. Similarly, institutions may provide instructions for figure placement. Tables and figures are often pre-

sented in a dedicated section at the end of a chapter or manuscript. A separate Tables and Figures section should be placed after the references, works cited, or bibliography, and before any appendices to the chapter. It is also common to include supplemental figures and tables that are relevant to the chapter content but not referenced in-text. Whether figures are presented throughout the article/chapter or at the end, they should be properly captioned and have alt-text.

Summary

Figures include any non-tabular graphic content in a document. Word and other word processors are not as effective for designing graphic content as other software, such as Adobe InDesign or even Microsoft PowerPoint. Nevertheless, they do provide some rudimentary image manipulation features to help integrate figures into the text. Figure attributes that can usually be adjusted include size, arrangement, and style, as well as accessibility features. These tools help authors provide informative content with a professional, polished appearance.

It is important to provide readers with adequate context, explanation, and interpretation of figures. Authors can present figures in the context of body paragraphs, explain them in captions, and make them accessible with alt-text. Thoughtful integration of figures adds credibility to a research publication when figures are effectively formatted.

Key Points

- Figures are any graphic, other than a table. Figures can be drawings, diagrams, photographs, or charts.
- Figures can be positioned in-line with text or with text wrapping. In-line arrangement is much easier to work with and prevents unwanted repositioning of other content in the manuscript.
- Figures can be made accessible to assistive devices by adding alternate text (alt-text) descriptions.
- Word processors provide numerous tools for customizing the appearance of figures.
- In academic writing, figures are typically given a numbered caption with a detailed description.

14. Formatting Tables

Kristin Terrill

Glossary

Bookmark: A hidden reference code associated with text, which can be embedded in a cross-reference to enable easy navigation.

Column: The vertical dimension of a table.

Column width: Distance from the left to right of a column. All cells in a column have the same column width.

Header (table): The label provided in the top row of a table, describing the category of information in that column.

Machine-readable: Text that can be interpreted by programs, such as text-to-speech converters.

Row: The horizontal dimension of a table.

Row height: Distance from the top to bottom of a row. All cells in a row have the same row height.

Table: A way of presenting information that indicates relationships among items across categories.

Tagging: Structural information encoded in electronic formats.

Overview

Questions

- How can I present information in a table?
- How can I customize and adjust my table to make it appear the way I want?
- What are some accessibility concerns with tables?

Objectives

- Recognize the anatomy of a table.
- Apply table attributes to make tables readable and accessible.
- Add captions to tables and use cross-references to refer to tables in body text.

Introduction

Tables are graphics that visually present information in a way that indicates a relationship among items across categories. In academic writing, tables generally present the results of data analysis; they can also be used to summarize a literature synthesis, expand on a concept, or present details about research setup. Tables provide a concise way of presenting data in a meaning-rich context, enabling cross-association of data points with two categories and comparing data values across categories.

The scope of this chapter encompasses formatting tables within a scholarly manuscript. Readers are encouraged to learn more about when to use, and how to design, tables.[1] Tables that are well designed and well formatted help make academic writing clear and understandable. Formatting topics covered in this chapter include:

- Table anatomy
- Table attributes
- Integrating tables into body text

1. We recommended the following resources Wickham, H. (2014). Tidy data. Journal of Statistical Software, 59, 1-23. https://doi.org/10.18637/jss.v059.i10; Hoffman, J. P. (2017). Principles of Data Management and Presentation. University of California Press. https://doi.org/10.1525/9780520964327; Thakur, A.J. (2022). Data Presentation: Use of Tables and Graphics. In: Tapping the Power of PowerPoint for Medical Posters and Presentations. Springer, Singapore. https://doi.org/10.1007/978-981-19-1816-2_8.

- Table numbering and captions
- Table accessibility
- Anatomy of a table

Tables are made up of cells arranged in a grid that contain information or data. Vertical **columns** intersect with horizontal **rows**, which affords the ability to suggest relationships between the categories that define columns and row. Table 14.1 exemplifies a simple table. The columns indicate variables that were studied; the rows identify observations that were conducted.[2] Intuitively, readers understand that the cell where a certain row and column intersect contains the value of one variable in one observation. In Table 14.1, the price per pound (column) of pears (row) was $1.20. Tables also have a caption (sometimes called a title) and can have footnotes.

Table 14.1 Example Table: Fruit Accounting

Fruit	Cost per Pound	Price per Pound	Total Pounds Sold
Apple	$.43	$.90	30
Pear	$.88	$1.20	24
Grape	$.50	$.70	33

Table Attributes

Inserting a Table in Word

There are a variety of ways to insert a table. Many users copy cells from a spreadsheet to paste into a document as a table. This method is not recommended, since the copied cells may contain formatting data from Excel that needs to be reinterpreted in Word (it is slightly messy). An easy way to create a table from spreadsheet cells is to

1. Copy the cells in the spreadsheet to the clipboard.
2. Use the Insert Table function on Word's Insert ribbon.
3. Select the desired number of rows and columns.
4. Once the table is inserted, paste "text only" into the top left cell of the blank table.

2. Hadley Wickham, "Tidy Data," Journal of Statistical Software, 59, no. 10 (2014): 1-23, https://doi.org/10.18637/jss.v059.i10.

This will populate the table with just the cell values, not their format attributes.

If you do not already have the data laid out in a spreadsheet, the best way to create a table is from scratch, in the document. In Word, you can do this by following steps 2–3, above, then manually type the table content. From that point, you can begin formatting the table.

If you already know which journal you will submit your manuscript to, review their Author Guide to learn about their table formatting requirements. Many journals follow standards from popular style guides; others have in-house format requirements. If your manuscript is for a thesis or dissertation, follow your supervisor's instructions.

Word has two attribute menus for tables: Table Design and Table Layout. Design is related to the look and feel of the table, while layout has to do with structure and dimensions. Below, these two attribute sets are elaborated.

Table Design Tab

Table Style Options

The vaguely titled "Table Style Options" group consists of a list of table parts: Header Row, First Column, Total Row, Last Column, Banded Rows, and Banded Columns. Each part has a checkbox next to it (see Figure 14.1). Checking a box adds an accessibility tag to the respective part of the table (see Table Accessibility).

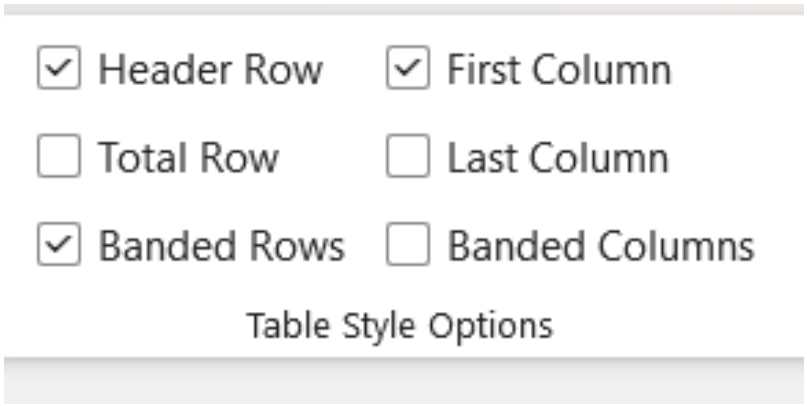


Figure 14.1 *Word's Table Style Options group in the Table Design ribbon*

Table Styles

The name of this tool group is similar to "Table Style Options," but rather than adding accessibility tags, these tools apply a pre-set style to the table. As with text styles and figure styles, table styles are a set

of pre-selected attributes that can be simultaneously applied to any table with a single mouse click. And, as with text and figure styles, when the style itself is modified, all tables in the document that are formatted with that style will be automatically updated to reflect the modifications. Users can create their own styles, which is a time-saver, especially if a manuscript is withdrawn from a journal to be submitted to a different journal with distinct table formatting requirements.

Shading

Shading (found in the Table Styles group) has to do with the background color of table cells. Shading can help enhance readability of a table, especially if rows or columns are narrow. If using shading, ensure there is sufficient color contrast between the text color and the shading color.[3]

Borders

Borders are lines separating cells. Border attributes include the presence of borders on any side of a cell, line style (e.g., solid, dashes, or dots), line thickness, and line color. As with text, borders should have sufficient color contrast, relative to the cell shading.

Table Layout Tab

Gridlines and Nonprinting Characters

Without borders, there is nothing to indicate cell dimensions on a table. The Table Layout tab has a View Gridlines command that makes the cell boundaries visible in the Print and Web views (see Chapter 10, Viewing and Editing Modes), but not in the Print Preview.

Additionally, when Show/Hide is turned on, on the Home ribbon, a nonprinting character is visible within each table cell. This character looks like a small square. It indicates the end of that cell's content. Paragraph attributes (see Chapter 12, Paragraph Attributes) can be applied to text in table cells; the nonprinting characters indicate the alignment and indentation of each cell's content.

Cell Size

The dimensions of a table cell include **row height** and **column width**. These dimensions can be manually adjusted using the tools in the cell size group. Both dimensions can be adjusted, either by typing in a

3. "Success Criterion 1.4.3: Contrast (Minimum) (Level AA)," WAI Web Accessibility Initiative, accessed on 14 February, 2025, https://www.w3.org/WAI/WCAG21/Understanding/contrast-minimum.html; "Success Criterion 1.4.11: Non-text contrast (Level AA)," WAI Web Accessibility Initiative, accessed on 14 February, 2025, https://www.w3.org/WAI/WCAG21/Understanding/non-text-contrast.

value and unit or using the spinner, i.e., up/down arrows, to the right of the dimension input. To equalize the height or width of multiple rows or columns, select those rows or columns, then click Distribute Rows or Distribute Columns.

AutoFit

One of the best-kept secrets in Word is the AutoFit tool. It is best to use this after completely entering content into the table. The tool automatically adjusts column width and row height to optimize for proportionality, as well as minimizing line breaks in the middle of words. AutoFit lists two dimensions:

- Content: adjusts column width and row height so that cells have approximately equal number of text lines across rows. This AutoFit can help decrease the height of a table.
- Width: adjusts column widths to fill, without exceeding, the width between the page margins.

The last choice, Fixed Column Width, turns AutoFit off, disabling automatic adjustments.

Alignment

Cell content can be aligned, much like paragraph content. In table cells, alignment along the vertical axis can also be adjusted: content can be positioned from the top, middle, or bottom of the cell. Typically, top row content is positioned at the bottom of the cells, and left column content is left-aligned. **Header** content in cells to the right of the first row are typically center-aligned. Cells with numeric content are often center- or right-aligned. These suggestions are not applicable to all content, and variations may be seen in various disciplines, journals, and cultures. When in doubt, check the cell alignment used on published tables in your discipline's top journals.

Table Numbering and Captions

In academic genres, readers expect tables to be contextualized with a caption. Captions contain the following three elements:

- Label
- Number
- Description

The label states the kind of content. Figures and tables are the most common. Manuscripts may also contain equations, proofs, algorithms, or listings (computer code).

The number follows the label. Each label has its own sequence, so table numbers should not increment

if another graphic type, such as a figure, appears between them. Documents with multiple chapters, such as theses and dissertations, may restart numbering sequences for each chapter. Captions with chapter number format (see Chapter 12, Caption Styles) always restart numbering sequences for each chapter.

The description follows the number. The description usually identifies the aspect, or aspects, of the table most important to the reader. Caption descriptions should not be redundant with the body text that discusses the table.

Conventionally, table captions are placed above tables (contrast figures, which conventionally have captions below them). Use your publication's recommended style manual for guidance on figure caption placement.

Practice: Insert a Table Caption in Word

Word and other word processors include functions that enable automatic navigation from an in-text reference to the content that is referenced, including to inserted captions. To use this in Word, insert a caption using the caption tool:

1. Select the captionable content.
2. On the References ribbon, select Insert Caption.
3. Select the desired label. Default labels are Figure and Table. Custom labels can be added by the user.
4. Type the caption description, and select the desired placement.
5. The caption will appear close to the table. A hidden **bookmark** is embedded in the caption number.
6. In the body paragraph, place the insertion point where the in-text reference will go. Open the References ribbon and select Insert cross-reference.
7. Select Tables from the Reference Type list, then select the appropriate table from the "For which caption" list. Open the "Insert reference to:" menu and select "Only label and number." Click OK. The cross-reference will appear in the text.

Cross-references inserted with these tools take longer than simply typing the same information, but they offer numerous advantages to readers and authors. For readers, they make the text more navigable. Readers can simply click the in-text reference to navigate to the referenced content. More importantly, inserted captions and cross-references can easily be updated when content is inserted, deleted, and rearranged during revision. Inserted captions are sequenced, and re-sequenced, automatically. This reduces errors, such as skipped or repeated caption numbers.

To update captions and cross-references in Word, select the full content of the file. The keyboard shortcut for this is Ctrl/Cmd + A. Then press F9 (Fn + F9 on a Mac). This function updates all bookmarks and

cross-references from beginning to end. Use the F9 action twice to ensure that cross-references reflect updated caption numbers.

Inserted captions also enable automatic generation of a List of Tables, which may be required for a thesis or dissertation. Page numbers on automatically generated lists of tables also update automatically when the F9 function is used.

Table Accessibility

Unlike figures, tables are machine-readable, so assistive devices, like screen readers, can present the content in audio format. However, that alone does not render the table accessible, since the visual arrangement of information is lost. To address this limitation, **tagging** (see Chapter 15, Electronic Format Accessibility) is used to encode structural information in electronic formats. Tagging is not visible to the naked eye; it does not change the visible content or the design of the table. There are a few different tags that need to be applied to tables:

- The table tag is applied to the whole table;
- The header row tag is applied to the first row;
- The first column tag is applied to the left-most column;
- The table data tag is applied to all other cells in the table.

Applying tags to these table parts solves the problem of a screen reader merely reading the table content from left to right, top to bottom. It enables users to navigate through the table to isolate specific data of interest to them. From this, it follows that a table cannot be accessible without categorical labels in the header row and the first column. Table 14.2 illustrates how, in a properly tagged table, data cells are clearly identifiable as the intersection of the column and row. Wickham explains that this convention is even more effective when experimental results are consistently reported with variables as column headers and observations as row headers.[4]

Table 14.2 Example tagged table

First Column	Header Column 1	Header Column 2
First Row Header	Table Data: Row 1, Column 1	Table Data: Row 1, Column 2
Second Row Header	Table Data: Row 2, Column 1	Table Data: Row 2, Column 2

4. Wickham, “Tidy Data.”

Tables can be tagged in Word using the Table Style Options on the Table Design tool ribbon (see Figure 14.2). Selecting Header Row and First Column in the Table Style Options tool group will add these tags to the table. When the document is exported to PDF format, those tags will be retained.

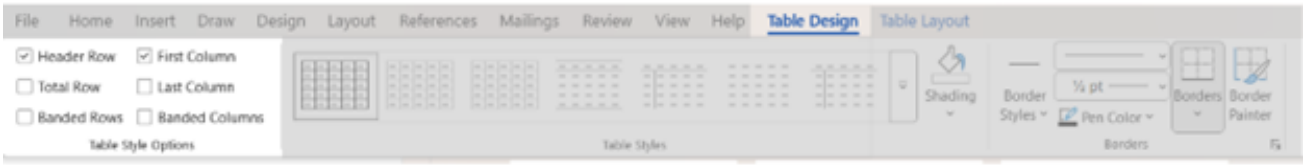


Figure 14.2 *Selection of header row and first column in the Table Style Options tool group*

Adobe Acrobat can also be used to add accessibility tags to tables. The University of Oregon's Accessible PDF Tables guide provides excellent step-by-step instructions.[5]

Adding table tags is relatively simple to do, and it makes a big difference to readers using assistive devices. Nevertheless, there remain several pitfalls to be aware of:

- Tables inserted as images cannot be tagged.
- Complex tables with merged cells are very complicated to tag[6] and it must be done in Acrobat; Word has no native functionality for tagging complex tables. It is very common and conventional to merge cells in academic tables, but "conventional" does not imply "accessible."
- Some tagging packages have been developed for LaTeX. Be aware that compatibility may be limited with some packages and templates. STET the footnote.[7]
- In PDF format, multi-page tables are treated as two distinct tables. Therefore, the header row must appear on each page for the continued part of the table to be tagged and accessible.
- A table consisting of a single column should be formatted as a list.
- Tables should not be used for layout—this practice is simply not digitally accessible.[8] Instead, design figures in a drawing application, then insert the image into the document.

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5. "Accessible PDF Tables," Digital Accessibility @ OU, University of Oregon, accessed on 18 February 2025, https://web.archive.org/web/20250208165732/https://digitalaccessibility.uoregon.edu/guidelines/pdftables.
6. ibid.
7. "An introduction to tagged PDF files: Internals and the challenges of accessibility," Overleaf, accessed on 19 February, 2025, https://www.overleaf.com/learn/latex/An_introduction_to_tagged_PDF_files%3A_internals_and_the_challenges_of_accessibility.

Summary

Tables are popular in academic writing because they allow authors to present complex relational information in a concise way. The complexity of the information demands thoughtful design and formatting by the author. Tables that follow conventions and make use of technological affordances, such as tagging, are easily read and understood. This chapter explained the elements of table format, table captioning, and digital accessibility for tables. This will help new scholars prepare meaningful tables for publishable manuscripts, theses, and dissertations.

Key Points

- Tables present information in a visual, relational format characterized by rows and columns.
- Tables can be added and edited in word processor applications.
- Format attributes for tables can make the presentation clear and elegant.
- Tables with designated header rows are accessible to users with assistive devices.
- In academic writing, tables are typically given a numbered caption with a detailed description.

8. "Creating accessible tables: Layout Tables," Web Accessibility in Mind, WebAIM, accessed on 19 February, 2025, https://webaim.org/techniques/tables/.

15. Final Formatting

Kristin Terrill

Glossary

Artifact: Decorative or extraneous content that can be ignored by assistive devices; also known as “hidden” content in HTML and CSS terminology.

Bookmark: A hidden reference code associated with text, which can be embedded in a cross-reference to enable easy navigation.

Overview

Questions

- What makes an electronic document accessible?
- How can I format my long manuscript efficiently?

Objectives

- Incorporate accessibility features into electronic format documents.
- Use built-in features to format manuscripts accurately, accessibly, and consistently.
- Use accessibility checkers to identify content that may not be accessible.

Introduction

Formatting a lengthy, high stakes document is a complex task that is often treated as an afterthought. Naturally, the content of academic writing is an author’s primary concern. In academic communication, content is typically much more substantial and original than formatting, so it warrants more time and effort. Nevertheless, it is still necessary to present your content meaningfully, following disciplinary con-

ventions. The previous three chapters have detailed how to format common academic content: text, figures, and tables. By now, you should feel confident that you can use your tools to format the components of your manuscript, but you might still be apprehensive about formatting the entire manuscript. This chapter covers best practices for efficiently formatting long academic manuscripts to meet requirements for publishers and institutional repositories.

Electronic Format Accessibility

Tagging refers to encoding structural information in electronic formats. In academia, the standard format for documents is PDF, which supports tagging. Tags can, and should, be applied to all document content, with special tags for:

- Headings
- Body paragraphs
- Lists
- Headers and footers
- Captions
- Links and cross-references
- Footnotes and endnotes
- Alt-text

It is a good practice to build in accessibility from the beginning. Using the built-in styles (especially for headings, lists, and captions) as the manuscript content is composed, can help save time later when preparing the manuscript for publication. Remember that visual attributes of any text style can be adjusted by updating the style attributes; these changes are automatically applied to that style of text throughout the manuscript. Similarly, when inserting graphic content—figures and tables—add accessibility features, such as alt-text and table tags, as you go, to save time later.

So far, we have focused on digital accessibility through ensuring the visual information is translatable for assistive devices. It is also important to hide less relevant information from assistive devices. Less relevant information includes content in page headers and footers and decorative graphics. Academic manuscripts usually have a running head—shortened version of the manuscript title—and page numbers in the page header. This information is easily ignored by sighted readers; however, assistive devices need a cue to ignore meaningless or redundant content. Word processors handle header and footer content as a distinct document part, which is automatically marked as an **artifact** (i.e., ignorable for assistive devices) when the file is converted to PDF format. Avoid adding relevant content, such as footnotes, in the header or footer of a document, as it will not be accessible to assistive device users. Images that serve only

a decorative function should also be marked as artifacts in the alt-text editor. Decorative graphics are vanishingly rare in academic genres. Relevant images should never be marked as artifacts, or as "decorative."

Applications for Document Accessibility

Word

Word and other word processors can build in digital accessibility from the beginning. These tools add accessibility features either by default or with some minimal input from the author. Although many institutions provide free or discounted licenses to student and postdocs, its price may be prohibitive for many new scholars. Libre Office Writer is a good free alternative to Microsoft Word, and has comparable functionality. Google Docs has less functionality for advanced formatting.

Acrobat DC Pro

Adobe' PDF editing software is the most robust tool available for adding accessibility features to PDFs. Acrobat's price may be prohibitive, and institutional licenses for Adobe products are less common, but campus libraries and computer labs may have this software installed. Public libraries may be another good resource to provide access to this software. Another limitation of Acrobat is that its accessibility tools are not intuitive for users. Fortunately, free articles and video tutorials for building PDF accessibility are available on the web.

Format Editing from Top to Bottom

When your manuscript has been written and revised, it is time to finalize the format. Academic documents tend to be much longer than typical student assignments. Articles can range from 5 to dozens of pages in length with multiple heading levels. Theses and dissertations tend to be even longer, from 40 to 200 pages or more. Spot-checking formatting is not efficient for long documents; it is much better to start at the beginning and work continuously to the end. This method avoids re-doing work if a format revision causes later content to move around. This is especially relevant for any formatting that affects pagination.

It is also a good idea to focus on one element at a time. For instance, authors may start with one pass through the document to work on page-level formatting: margins, headers and footers, orientation, and page/section breaks. The next pass can focus on organization and structure. The next pass can focus on figures and tables, captions, and cross-references. On the next pass, check all in-text citations and source references for accuracy. The final pass can use the print preview, or an exported PDF, to ensure

the final output is attractive, free from errors, and contains no extraneous content, such as comments, tracked changes, and blank pages.

Accessibility Checker

For publishable manuscripts, authors are strongly advised to run the final file through an accessibility checker. Word's accessibility checker is thorough and easy to use. For PDFs, Acrobat's accessibility checker is excellent, but those without access to Acrobat can download good PDF accessibility checkers for free.

Accessibility checkers of all kinds have limited accuracy. Be aware that they may fail to catch problems with improperly tagged content, since it is effectively invisible to them. Nevertheless, they are good for catching major accessibility problems and informing the author about what is needed. Some of the most important things to check in academic writing are:

- Title in document properties: The manuscript title should be added to the file properties. This can be done in the File/Info menu in Word or the Menu/Document properties menu in Acrobat.
- Heading **bookmarks**: These appear on the navigation menu when the PDF is opened in any viewer. If they do not appear, it could be due to the headings being formatted manually, rather than with a Heading style. If heading styles were used, the cause could be the options selected when the document was exported to PDF.
- Figure alt-text: These are harder to check for in a web-based PDF viewer, such as Chrome or Edge. Acrobat shows figure alt-text as "mouse over" text; alt-text also shows in the document tags. If alt-text was inserted in Word, but does not show up in the PDF, it could be due to the image file format. Alt-text for charts and some other image types do not convert to PDF.
- Table reading order: This can only be seen in the document tags, but a PDF accessibility checker will throw an alert if they are missing.

All these issues can be corrected in Word or Acrobat. LaTeX users are at something of a disadvantage when it comes to PDF accessibility, since the PDF tagging functionality is new and may not be compatible with older templates and packages. Adding tags and accessibility features in Acrobat is much easier than converting the LaTeX file to a word processor file type, then into a PDF. New scholars without access to Acrobat should consult their supervisor or mentor for options.

Summary

Formatting a long, high stakes document to ensure it meets standards for academic communication can be daunting, especially since electronic formats raise expectations for document functionality. Strate-

gically formatting documents using the tips provided in this chapter can improve the overall document quality and cut down on re-work.

- Build in accessibility from the beginning:
  - Use styles, rather than manually adding attributes, to achieve consistent format.
  - Use document parts to de-emphasize less content-oriented information, such as running heads and page numbers.
- Use the best tools:
  - Word processors like Word and Writer offer robust functionality for advanced formatting and document accessibility, including the ability to export tagged PDF files.
  - Acrobat DC Pro, the PDF editing software, can be used to add accessibility features to PDFs created in other ways.
- Format from top to bottom:
  - Always start at the beginning of the document when formatting, rather than patch-fixing.
  - Format documents in multiple passes, focusing on just one or two elements for each pass.
- Use an Accessibility Checker
  - Word, Writer, and Acrobat all have internal accessibility checkers to alert authors to potential accessibility problems

These tips will help authors feel more confident about their document formatting and save time in correcting issues that may be identified at a later stage, such as pre-publication or after submitting a thesis or dissertation to an institutional repository.

Key Points

- Formatting a long, high stakes document, such as a research article, thesis, and dissertation takes time.
- Formatting strategically with computer applications can save time and improve the accuracy and accessibility of the final manuscript.
- Accessibility features expand the audience for your work and make it easier for readers to understand.

Glossary

Abstract

A section at the beginning of scholarly articles that provides a summary of the contents.

Accepted manuscript (post-print)

The final peer-reviewed scholarly manuscript accepted by a publisher. Accepted manuscripts contain the same information as the final published form but lack copyediting, typesetting and formatting.

Accessibility tags

A markup protocol that makes PDF content interpretable by assistive devices, such as screen readers. Accessibility tags specify document features such as content type and relationality to help make PDFs align with the four principles of digital accessibility: perceivability, operability, understandability, and robustness.[1]

Addendum

A supplementary document that modifies or clarifies existing terms and conditions in an existing publishing contract or adds new terms to the contract.

AI search tools

Online tools that use AI technology to find relevant materials, usually scholarly articles, in response to

1. "PDF techniques for WCAG 2.0." W3C Working Group Notes, W3C Worldwide Web Consortium, accessed on 29 May 2025, https://www.w3.org/TR/WCAG20-TECHS/pdf.

a human-supplied prompt. Some tools can also generate summaries or charts about their results. The features and the quality of the generated output varies from tool to tool.

Alignment

The point on the horizontal axis at which the paragraph is anchored.

Alt-text

Alternative text descriptions for graphic content that enable assistive devices to describe the content to the user.

Altmetrics

Alternative research impact metrics that use the number of views and downloads a work has received as well as press coverage and social media "buzz" rather than using more traditional measures of research impact (see definition).

Anchor point

A nonprinting indicator that pairs a text-wrapped image to a nearby paragraph.

Article processing charge (APC)

A fee charged to authors by publishers to make publications open access. These fees typically replace journal subscriptions, which are paid by libraries, and are different from other charges a publisher might levy on authors such as page charges, color charges, and submission charges.

Artifact

Decorative or extraneous content that can be ignored by assistive devices; also known as "hidden" content in HTML and CSS terminology.

Artificial intelligence (AI)

Artificial intelligence is a general term for machines and programs that can "reason, learn, and act in such a way that would normally require human intelligence or that involves data whose scale exceeds what humans can analyze."

Attachment

A file transmitted via an email message.

Attributes

Visual and functional features of digital text.

Authorship

The recognition of individual(s) or group(s) that create an idea or develop the publication that disseminates that intellectual or creative work.[2]

Auto-correct

A software utility that automatically corrects misspelled words and inaccurate orthography and punctuation.

Bookmark

A hidden reference applied to text that can be embedded in a cross-reference to enable easy navigation.

Boolean operators

Commands that are used to expand or limit search results within databases.

Checker

A software utility that identifies errors and suggests corrections.

Citation chaining

The act of following citations—either forward or backward—to locate additional relevant sources, to track how an idea or concept has changed over time, or to identify related topics and literature.

Citation manager (reference manager, bibliographic management software)

Software and services that manage information source metadata and integrate with writing applications to make citations easy to add, format, and update.

Cloud

A server users can access through the internet.

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2. "Defining authorship in your research paper: Co-authors, corresponding authors, and affiliation," Taylor & Francis Author Services, https://authorservices.taylorandfrancis.com/editorial-policies/defining-authorship-research-paper/

Coauthor

Any person who has made a significant contribution to a journal article" and shares responsibility and accountability" for the work.[3]

Column

The vertical dimension of a table.

Column width

Distance from the left to right of a column. All cells in a column have the same column width.

Comprehensive TeX Archive Network (CTAN)

An online repository of LaTeX packages that users can import into their documents.

Conclusion

A section within scholarly works that offers a detailed explanation of the paper's findings and conclusions.

Copyright

A set of rights a creator of a work is entitled to by law. Copyright covers tangible works of creative expression such as writing, drawing, music, and even architecture. The main rights a copyright holder has are control over reproduction (copy, reprint), distribution (how it is accessed), public display and performance (where it can be played, and who can see it) and derivative works (spin-offs, translations). The copyright holder also has the right to transfer these rights, in whole or in part, to someone else.

Corresponding author

The author "who takes primary responsible for communication with the journal during the manuscript submission, peer review, and publication process."[4]

Creative Common licenses

A set of standardized copyright license options that authors can apply to their work to set predetermined

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3. "Defining authorship in your research paper: Co-authors, corresponding authors, and affiliation."

4. "Defining authorship in your research paper: Co-authors, corresponding authors, and affiliation."

terms regarding how their work may be shared and reused. For downstream users, these licenses make it clear what permissions the authors have granted, and therefore, what users can do with the works.

CRediT (Contributor Roles Taxonomy)

A fourteen-role taxonomy to describe the main types of contributions in scholarly works.[5]

Data management

Steps and procedures used to organize, document, account for, and secure your digital data. Citations are a form of data that needs to be managed well for a successful literature review

Data visualization

Graphic representations of data that aid in meaningful interpretation and analysis.

Database

A collection of digital, structured data that can be searched and accessed.

Digital object identifier (DOI)

A unique string of numbers and letters assigned to a digital object, such as a journal article or dataset. Unlike other URLs, DOIs are registered with a broker system that keeps the location of the object updated so it can always be found.

Digital text

Written language encoded digitally.

Editorial style guide

Guidelines and rules for the writing and formatting of documents to maintain uniformity across materials.

Embargo period

A predetermined amount of time during which someone, typically a publisher, has exclusive rights to dis-

5. "Contributor Role Taxonomy (CRediT), National Information Standards Organization, https://credit.niso.org/

tribute a work. For journal articles this means only the publisher can provide legal access to the work during the embargo period.

Embargoes

The period of time during which access to published content is restricted.

Exempt research

Human subject research that is subjected to fewer regulatory requirements compared to non-Exempt Research

Field searching

A database advanced search feature that allows you to target specific parts of an item record to pinpoint your search and narrow your results. For example, the title field or the author field.

Figure

Any non-tabular graphic content that provides complementary information related to the text content.

File

Unitary collections of data that can be accessed and modified.

First author (lead author)

The author "who made the most significant intellectual contribution to the work"[6]

first line indent

Indentation applied to only the first line of a paragraph.

Fixed work

A durable form in which creative output can be seen, heard, or perceived by others.

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6. "What is a Corresponding Author?," Elsevier Author Services, https://scientific-publishing.webshop.elsevier.com/publication-recognition/what-corresponding-author/

Generative Artificial Intelligence (Gen AI)

A type of artificial intelligence that uses large training datasets to create, generate, new content based on its training data.

Gray literature

Literature created and distributed outside of a publishing industry. Gray literature includes government documents, reports, blogs, theses, dissertations, pamphlets, newsletters and much more. Both print and digital materials can be gray literature.

hanging indent

Indentation applied to every line of a paragraph except the first line.

Header (table)

The label provided in the top row of a table, describing the category of information in that column.

hypertext

Text displayed on the screen, and read aloud by an assistive device.

Image

Digital objects, such as image files, that comprise figure content.

In-line

A method for positioning a graphic on a page, so it behaves like a text character. In-line graphics typically appear in a separate paragraph from the surrounding text, but like text characters, they can be inserted within a paragraph containing other text.

indentation

Control to align the horizontal shape of paragraphs.

Institutional repository

an online, typically open access, collection of research and scholarship that awas produced at one institution. Universities, research institutes, and government agencies are examples of entities that provide this service.

Institutional Review Board (IRB)

"Federally mandated committee that ensures that 1) the rights, well-being, and safety of human subjects in research are protected; and 2) that [institutional] research is compliant with applicable federal and state regulations as well as [institutional] policies and guidelines."

Interlibrary loan (ILL)

A service that allows you to borrow an item owned by another library, typically free of charge.

Intertextuality

Drawing additional meaning from outside texts.

Introduction

A section within scholarly works that provides context for the research and claims of the work within that field of study.

Item record

Information about an item (e.g., a book, scholarly article, DVD, etc.) within a collection (e.g., a scholarly literature database, a library, etc.) that allows for the identification, location, circulation, and general management of the item. For example, a library book record would include information about the item's title, author, and location within the library.

Justification

A control to remove the ragged edge from paragraphs.

Keep lines together

Paragraph attribute causing the paragraph to appear on the following page if even one line extends onto the next page.

Keep with next

Paragraph attribute to appear on the same page as whatever follows it.

Landscape

Page orientation where the short edges of the page are the sides and the long edges are the top and bottom.

Licenses

Terms, either negotiated or applied broadly (see Creative Commons licenses), which dictate how audiences and readers can use an authors' materials. Licenses typically include specifications for who, what, and how long permissions are provided for the reuse of a work.

Literature

A subset of written material addressing a particular topic. Often used informally to refer to all scholarly work on a particular subject i.e., "I'll check the literature."

Machine-readable

Text that can be interpreted by programs, such as text-to-speech converters.

Manuscript

In the context of scholarly publishing, a manuscript refers to the text submitted for review and publication. In a more general sense, it refers to unpublished text of any kind.

Metadata

Often called "data about data," metadata is data that describes something such as person, place, thing, or event. In the context of citations, the author(s), article title, journal title, date published, keywords, page numbers, and abstract are all metadata that describe a journal article.

Methods

A section within scholarly articles that describes the specific processes and procedures used for the research project or experiment.

Monograph

A focused, lengthy, and in-depth scholarly publication that is typically authored by a single person. Monographs are often published as books due to their length. Monographs can be published by retail or scholarly publishers.

Nesting Boolean operators

Using parentheses with Boolean operators to affect the order in which they are executed within the search string.

Nonprinting character

A character that does not appear on the printed version of a document.

Online social networking (social networking)

The process of connecting with other people through online tools and messages.

Open access

Online scholarly publications that are free of most licensing and copyright restrictions, which makes them free to read, download, reuse, and redistribute.

Open access publishing

Model of publication that allows readers to freely access, use, download, reuse, and redistribute specific online scholarly publications.

Open-source

Code that is made freely available for possible modification and redistribution; also, a site of ideological positioning related to the ethics of computer code production and distribution.

Operable (digital accessibility)

Content that can be accessed and used with different devices, such as mouse or keyboard; content that users can navigate by using headings and menus.[7]

Optical character recognition (OCR)

Automated conversion of images of text, such as a scanned document, into digitally encoded text.

Page break before

Paragraph attribute causing the paragraph to start at the top of a page.

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7. "Accessibility principles," W3C Worldwide Web Consortium, Web Accessibility Initiative (WAI), accessed on 29 May 2025, https://www.w3.org/WAI/fundamentals/accessibility-principles/.

Paragraph

A) A portion of text that is visually compartmentalized. B) an assemblage of sentences that all relate to a common topic. C) In electronic document formatting, a string of characters preceding a hard line break.

Peer review

The evaluation of a manuscript submitted to a journal or publisher by one or more independent researchers (sometimes called referees) within the same field to determine whether it is worthy of publication. Referees evaluate the manuscripts on their contribution to the field and the accuracy of the contents.

Perceivable (digital accessibility)

Content that can be perceived in different modes, such as non-text content with text alternatives, closed captions presenting a transcript of recorded speech, and sign language interpretation of audio content.[8]

Persistent identifier (PID)

A digital reference to an object, person, or organization which remains consistent despite changes to where the information is digitally stored. A DOI is a type of PID that is used for "digital objects" such as journal articles, digital images, and datasets.

Phrase searching

The use of quotation marks around two or more words to indicate that they should be treated as a single keyword.

Plagiarism

Violations of the assumption that a text is written by, and reflects the original ideas of, the named authors.

points

A unit of measure in typesetting equivalent to 1/72' inches.

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8. W3C Worldwide Web Consortium, "Accessibility principles."

Portable document format (PDF)

A file format developed by Adobe to encode documents that appear the same across various applications and operating systems used to access them. PDFs have been standardized as ISO 32000 since 2008.

Portrait

Page orientation where the long edges of the page are the sides and the short edges are the top and bottom.

Predatory publisher

An opportunistic publisher that exploits the academic need to publish. Predatory publishers may violate codes of ethics, do not follow industry best practices, or may simply be incompetent.

Preprint server

An online, open access collection of draft papers, e.g., preprints. Preprint servers are typically discipline-specific and run by non-profits, universities, or scholarly publishers.

Preprint server (preprint repository)

A free online collection of gray literature. There are preprint servers that serve specific countries, regions, and disciplines as well as multidisciplinary and general-purpose servers. Wikipedia has a list of over seventy different preprint repositories that you can explore to find one relevant to your area of study.

Preprints

An early draft of a complete scholarly paper. Preprints are typically copies of a manuscript that is later submitted to a publisher.

References (Reference Section, Bibliography, Works Cited)

A section within scholarly works that provides a list of sources the author(s) used.

Research ethics

Moral principles for conducting research that define acceptable and unacceptable behavior in one's area of practice. Research ethics can be defined and informed by personal, cultural, and disciplinary perspectives as well as local laws and policies.

Research impact (scholarly impact)

Observable changes that happened because of a piece of specific research or scholarship. Impact can happen within the research community and beyond it by influencing government, culture, industry, or research practices.

Research integrity

"Active adherence to the ethical principles and professional standards essential for the responsible practice of research"

Research metrics

Measurements that attempt to quantify the research impact (see definition) of typical products of scholarly work.

Research misconduct

"Fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results"

Results

A section within scholarly papers that details what the author(s) found and typically has several figures (such as charts and graphs) to highlight specific data or results.

Retail publishing (trade publishing)

The industry that produces written materials for a broad audience. Types of publications it produces include newspapers, magazines, and books (fiction and non-fiction, cookbooks, puzzle books, children's books, etc.).

Retained rights

The rights (e.g., rights to use the work in teaching or include the work in a thesis or dissertation) retained by an author after signing a publishing contract.

Retraction

The formal process of removing a publication from the scholarly record. Retractions can occur due to mistakes (e.g., data or calculation errors) but removal due to violations of research ethics and integrity are the most common (e.g., plagiarism, intentional manipulation, etc.).

Robust (digital accessibility)

Content that is compatible with the range of devices used to access it, such as operating systems, web browsers, and assistive devices.[9]

Row

The horizontal dimension of a table.

Row height

Distance from the top to bottom of a row. All cells in a row have the same row height.

Scholarly publications (scholarly literature)

Literature written for a specialty audience that presents research results such as journal articles, conference proceedings, books, and book chapters

Scholarly publishing (scientific, research, or academic publishing)

An industry that focuses on exchange of research and scholarship through a formal system of communication. Individual publications are records of knowledge-making and accomplishment, and function as part of an ecosystem of related knowledge through formal citation. The most common types of publications are journal articles, books, book chapters, and conference proceedings.

Search string

A search formed from letters, numbers, and symbols used to find specific information. Search strings used within scholarly literature databases combine keywords with Boolean operators and other symbols to search efficiently and precisely.

Serials

Information sources that are released in parts and usually in sequence. Newspapers, magazines, journals, podcasts, and TV shows are all considered serials.

Similarity

Text within a given document that matches other text in a reference database.

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9. W3C Worldwide Web Consortium, "Accessibility principles."

spacing

Paragraph attribute that controls the vertical elements of the paragraph.

Style

A set of pre-defined attributes that can be applied to content within a document

Subject librarian

A librarian at an academic library who specializes in a specific field, topic, major, or discipline. They help select the databases the library offers, have a strong understanding of the specialized search features within those databases, and offer consultations to provide help with selecting which database to search, how to create search strings, and more.

Subject term thesaurus

A complete and searchable list of the controlled set of terms unique to each database that are the official ways of talking about topics within that database or catalog. Entries within this thesaurus will show you related terms and other useful information that can help your searches.

Subject terms

Words located in the subject field of an item's record within a database or catalog. These words are part of a very specific and controlled set of terms unique to each database and are the official ways of talking about topics within that database or catalog. These words are sometimes found in a database's subject term thesaurus.

tab stops

The last paragraph attribute that can be applied to control horizontal paragraph features.

Table

A way of presenting information that indicates relationships among items across categories.

Tagging

Structural information encoded in electronic formats.

tenzing

A web-based app for tracking and generating contributions based on CRediT.[10]

Text wrapping

A method for positioning a graphic on a page, so text can appear in a column alongside the graphic, or even overlap the graphic. Synonymous with “floating” content.

Trustworthy research

Research that has earned a high degree of confidence by the public and society by demonstrating research integrity, adherence to ethical standards, and rigorous professional practice.

Understandable (digital accessibility)

Content with an identified language, in which uncommon or specialized terminology, abbreviations, and phraseology are defined.[11]

Version

A retrievable instance of a file.

widow/orphan control

Paragraph attribute preventing a page break from splitting a paragraph with only one line above or below the break.

Word processor

Software for composing and formatting written documents.

10. Martin Kovacs, “tenzing,” https://marton-balazs-kovacs.github.io/tenzing/

11. W3C Worldwide Web Consortium, “Accessibility principles.”

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