Science Societies

How to conduct a literature review

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Graduate school provides opportunities for students both in the classroom and beyond. Taking courses, conducting research, and writing papers are the most common tasks each graduate student is expected to accomplish. However, graduate school comes with its own set of challenges and hurdles. For example, writing a literature review can be an exhaustive process if you have limited experience. Excellent performance in your course work does not necessarily mean you will be the best at searching, interpreting, and writing about existing literature. A literature review is essential when composing a technical article, meta-analysis, review article, or a thesis. It informs the reader of what is known about the topic and what remains to be investigated by others in a given field. Therefore, to make your literature more interesting and readable, it needs to be carefully planned and presented, so the research adds value to your area of interest.

A literature review is a large task that should not be left until the last minute. Creating and following smaller goals and deadlines can help to make this process less overwhelming. For example, setting a goal to read at least two to three articles every day could provide relief from burnout that might occur if you are close to your deadline and have to read 10 articles a day. Keep in mind that it is not about the quantity of articles read but rather the quality and relevance to your topic. The ability to concisely and tactfully condense previous work will help to continue the progress made in your research topic.

When conducting a literature review, consider the following tips:

Identifying the Hypothesis/Objective

At the beginning, you may find yourself clueless about where to begin. A good first step is to understand the purpose of a literature review and how it is “generally”

structured, which can vary quite a bit depending on your institution, adviser, intended publication place (i.e., journal, proceedings, report, thesis, etc.), and area of research. After you have looked at other literature reviews and their structure (as examples), your first step is to decide and/or discover the essence of your research topic. Narrowing down the impact of your project to specific points is necessary because a broad topic cannot be covered concisely. Getting to the point can be difficult for some students, but boiling it down to several key points is important for finding articles to read.

Finding Literature

Hundreds and even thousands of papers are available at the click of a mouse, but it is difficult to find papers relevant to your objective(s)/research question(s) without spending hours scrolling through search results. Registering for alerts on Google Scholar, ResearchGate, or other websites to send you emails when articles with specific keywords of your interest are published can be a helpful tool. By registering for these services, the articles come to you, improving your ability to stay on top of the literature. When you find an article relevant to your literature review, save it in a place where you will be able to easily access later. Using a standard method for titling your article archive can make referencing in the future much easier. An example of this would be using the order of author(s) last name(s), year, and title. After saving the document, print it out for easier note taking and highlighting; this works well for us although your best method may differ from ours. After reading the article, it is highly suggested that you compose a summary for reference when you are writing the literature review. Some graduate students find it helpful to have a Word document noting the title and author(s) along with a summary paragraph (i.e., key takeaways, important quotes, or other sources to look into at a later time).

After you have collected the relevant information, you may want to keep an organized print record of articles. Some students suggest using a binder with dividers to organize sources (i.e., organized by author's last name, topic, or year). A large amount of work is required up front to establish your organization system, but this will make it easier for you to go back to an article and reference it in the future. Online resources, such as Zotero, Endnote, or Mendeley, allow you to save articles for easy access and citation tracking. A major advantage to using one of these online sources is the tracking of references used in your literature review. When compiling your reference list, this can be handy and save you time due to the direct links to articles from your word-processing software (e.g., Word) and the ability to select citation style options accordingly. While no perfect method for organizing information for a literature review exists, maintaining consistency and figuring out what works best for you are important for a successful start.

Searching Tools

Knowing how to efficiently and effectively utilize search engines and databases to successfully acquire the information relevant to your topic can be difficult. A normal first step is to start off a literature search using Google Scholar although it is important to recognize many search engines and databases can be used to enrich your search. Some recognized databases of peer-reviewed scientific literature within agronomy, crop science, and soil science include: CAB Abstracts & Global Health, Web of Science, Scopus, Agricola, etc. The majority of these databases provide direct access to the article's abstracts (for first screening) and bibliographies (good strategy for finding new/related articles to your subject) as well as other notes such as "cited by" options (where more recent papers have cited previous work). Another tool available is "save your search(es)," which allows you to re-run previous searches at later times to

identify recent publications, saving time by helping you to track what you have looked for already. Be aware that some search engines and databases have the option of grouping synonyms/related terms together with the connector “OR,” in this way creating a pool of results. Each of these larger pools can sequentially add terms together, using “AND” for narrowing down or refining the search.

University libraries offer a variety of resources for searching for information through internal databases, access to external databases, print resources, and a variety of other services. In some cases, workshops are available to teach students how to use available resources. Utilizing workshops and talking to others can help to improve your searching and writing skills, making your literature a great resource for others to use in the future.

Reading Articles

After you have found relevant articles, reading the entire article can be time consuming. Start by reading the abstract and potentially the results section to see if it is useful to your literature review topic. Otherwise, you can save it to revisit later. If you find the abstract and results matching with your objective, seek both old and recent literature contained in the article. Always keep your research objective in mind and consider only the literature that connects well to your question(s)/objective(s). Your literature should act as a bridge from existing knowledge to your proposed work. Literature that agrees with your interpretation and results as an evidence for what your research has found is likely easier to find. But, if articles with differing results exist, acknowledge them and provide possible explanations for the disagreement. When reading, find sections where authors acknowledge what remains unknown or missing from the research record.

Starting to Write

First, start with an outline for your literature review. Begin by laying out the major components of a literature review (i.e., introduction, body, and conclusion) and include titles of major sections you want to include (e.g., soil effects, crop effects, climate effects, etc.). After outlining your structure (i.e., major sections, main ideas, etc.), decide where to place the articles from your literature search. Thoughtfully place your articles throughout the body of the literature review so that each major topic has a complete background and solid support.

Make sure your literature review is distinct to your style and how you want to address your area of research. Be creative! No perfect method exists for how to write a literature review. You can use any layout you want and have the ability to decide the direction and key points a reader will take away. The goal of a literature review is to tell an introductory story of your research area and to conclude by telling the reader how your research will add and continue the story. The goal of a literature review is to tell an introductory story of your research area and to conclude by telling the reader how your research will add and continue the story.

When reviewing literature, remember you are presenting the opinions and ideas of other researchers/writers. Presenting literature accurately and within the correct context is important to building the credibility for executing your research. Discussing an article with others can help you to understand if you are interpreting the results in the correct frame of reference. Giving credit to sources for ideas and previous work is an important part of conducting a literature review. Make sure to keep track of articles you have cited and that your citations in your bibliography are correct.

Do not forget that main advisers and/or advisory committee members are expected to have more writing, search, and structural organization experience than you. Use their advice and guidance throughout the literature review process. Knowing when to seek

help or ideas from others is important to creating a successful literature review.

A literature review will grow and evolve throughout your academic career. Don't let this document intimidate you, work a little each day to grow your repertoire of articles and knowledge about your area of research. Go into writing this document with the understanding you will not be able to finish it in a day or even a week but will be continually revisiting and building it over time. Don't forget that almost every graduate student has to complete one! Work with other colleagues/students to keep each other accountable to making progress with writing by sharing/exchanging your experiences.

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