جامعة الملك عبدالله
للعلوم والتقنية
King Abdullah University of
Science and Technology

Learn How to Read Scientific Papers

English Language and Communication Program

Contents

Updated March 2024 by Andrea Devlin

The length of time and level of effort needed to read a paper depends on:

- on your knowledge/experience of the field and the related literature
- how closely the paper is related to your topic and its importance in the field
- the reason why you are reading the paper and the information you want to extract

First steps in reading papers

Reading papers is especially difficult in the early stages of your academic career. Firstly, everything mentioned in the paper will probably be unfamiliar to you.

Secondly, papers tend to use more formal language and new words and phrases that can be hard to understand, even if you have excellent English reading and writing skills.

Finally, a good understanding of related research is needed to fully understand a paper.

Updated March 2024 by Andrea Devlin

Some tips if you encounter these issues:

- don't try to understand everything in a paper the first time you read it
- on first read, quickly skim the paper to find new words, concepts, or techniques that you are unfamiliar with
- carry out web searches to find definitions for these new words or understand the basics of new concepts or techniques
- return to the paper and skim the text again, to identify the main research problem, aims/objectives, methods used, results, and conclusions
- accept that you will encounter new words and concepts often, but you will soon become an expert in your field by reading papers
- as your confidence builds, don't let one or two unfamiliar words or concepts immediately stop you from reading; try making an educated guess or continue to read and then find our more later
- schedule time to find related reviews, textbooks, or more detailed information on new words/concepts/ideas that you encounter in papers to improve your knowledge of the field
- acknowledge you will need to read papers several times to fully understand the text, and that you will need to revisit papers again once your knowledge of the field of research improves

Updated March 2024 by Andrea Devlin

Developing a picture of how closely papers are related to your topic and their importance in the field

First, let's consider why we need to read other papers. We are not trying to identify which research paper is "the best" or "superior" or award a "pass" or "fail" grade.

All research published in related journals has already provided a significant contribution to the field, no matter how large or small that contribution may be.

Key questions you can ask as you become more confident with reading papers:

- what key problem/research gap did the paper address?
- what methods did the paper use?
- what were the main findings of the paper?
- what limitations did the authors mention?

As an early career researcher, you will need to read (and discuss) a lot of papers to build a solid understanding of the history and key developments in your field.

You also need to identify the novelty, key contributions, and limitations of each paper, as well as forming an idea of where that work is located within the field both historically and contextually to assess the significance of the paper.

Updated March 2024 by Andrea Devlin

As your reading continues, you can start to think about where each paper is located in terms of:

- the history of your field —e.g., is this paper very old, very new, or less recent? Was the paper published before or after other papers you've read?

- the development of your field — e.g., is this an important older paper that formed the basis of the field, less recent work that has now been surpassed by newer research, or very new work/state-of-the-art research?

- novelty — e.g., does this paper adopt an entirely new approach or use methods that are well-established in the field?

- status — is this paper a "landmark" in your field?

- multidisciplinary — does the paper focus on one discipline (e.g. pure mathematics) or is it multidisciplinary (crossing several topics like pure math, biology, and computing)?

- type of contribution — e.g., does the paper close a large research gap with a new approach or model, provide data that confirm or conflicts with other papers, or apply old methods to new topics/problems/populations?

- patterns of citation — e.g., is this paper cited by no/some/all other papers in your field, and how important do other researchers think the paper is?

Once you have started to build up a solid understanding of the words, techniques, key concepts in your field, as well as an expanding picture of the history and key developments in your field, then you can start to begin read and discuss papers more critically.

Questions you can ask when you carry out more detailed reads

As you become more familiar with the field of research and more confident with reading papers, you can begin to more critically evaluate the information presented within each paper.

These are some questions you can think about as you read and revisit papers. Some of your supervisors may arrange journal club sessions, so these questions may help you to prepare for those discussions.

Introduction

- Does the literature review/introduction section flow from information that is well known to the specific details of the research problem?

- What specific research gap did the authors investigate?

- How important is this research gap in the field of research?

- Is the research gap/problem clearly identified?

- Is it clear why this problem is important to other researchers, society, someone?

- Do the authors cite all of the relevant literature?

- What were the specific aims/objectives of the paper, and did the authors achieve their aims?

- Were the aims realistic and achievable?

Methods

- What methods did the authors use?

- Are these new or old methods?

- Did the author use the most appropriate methods and samples to investigate the research problem?

- Could the authors have used other methods or samples and, if so, did they justify why they chose the methods/sampled they used?

- Could you repeat the study based on the information provided in the methods or supplementary information? If not, what information did the authors fail to provide?

- Are the sampling methods, statistical methods, analysis, and methods of data presentation appropriate, relevant, and well justified?

Results

- What are the key results of the paper?

- Are the key results easy to understand and explained well?

- Are the figures and tables clear, easy to understand, and relevant to the paper's findings?

- Can you interpret the figures/tables without reading the text?

Discussion

- What are the authors' key conclusions/contributions to the field of research, and how does this paper relate to other work in the same field?

- Do the authors discuss how their results confirm, agree with, or dispute previous research?

- If the results conflict with other papers, do the authors make suggestions to explain why this might have happened or provide suggestions for other research?

- Do the authors state any limitations of their research, and do they provide relevant suggestions to overcome those limitations?

- Do the authors forget to mention any limitations? Why are these issues relevant and how could they be addressed?

- Are the authors' suggestions for future work relevant and appropriate? Do you have other ideas for future work?

- Do the authors state their conclusions with caution, or do they overinterpret the data and draw conclusions that are not supported by the paper or literature?

Overall impression

- Do the title and abstract adequately reflect the rest of the paper, or are they overstating the findings?

- Does the abstract give a clear overview of the research gap, samples/methods, key results, and main conclusions?

- How important/novel is this paper to the field of research?

- Does this paper confirm or disagree with other studies, or is it pushing the boundaries of new knowledge?

- Is the paper easy to read and understand, or what could the authors have done better?

- Is any important information missing? Are you left confused or need to "guess" something about any part of the paper?

- What would you change or improve about the paper?

- Will this paper affect how you conduct your own research?

- Are you confident or doubtful about the study's findings? Is more research needed to confirm the findings?

- Are you impressed by the research in the paper? Why?

Updated March 2024 by Andrea Devlin

Selection of relevant papers

Notes on literature searches

When trying to find papers related to your work, don't automatically read the full text of every paper to see if the paper is relevant.

Instead, you can quickly scan and select the papers relevant to your topic, and then save a smaller group of relevant papers for a more detailed review later.

Make sure to chat with your supervisor and labmates to make sure you are using the relevant databases for your field.

Quickly scan the titles and abstracts of the papers retrieved by your search:

- Does the title contain keywords closely related to your field of research?
- If unclear, quickly scan the abstract to assess if the paper is relevant or not
- Select/save all papers that may potentially be related to your topic for closer evaluation
- There is no need to read papers that are clearly not related to your search terms
- Look in reference list of relevant papers for other related papers that your initial search missed

Updated March 2024 by Andrea Devlin

Notes on scanning the names of journals

- Your search should identify work in journals or journals published by publishers (e.g., Nature, IEEE, PLoS), conferences, or societies you are already familiar with (or will become familiar with as your research progresses)

- If work is published in a predatory journal [1, 2], carefully consider if the findings of the paper are relevant/appropriate

- Genuine authors can be tricked into submitting to predatory journals, so this does not mean every paper published in a predatory journal or conference is fake or unreliable. However, you should be more cautious when interpreting papers published in predatory journals.

References

1. Elmore SA, Weston EH. Predatory Journals: What They Are and How to Avoid Them. Toxicol Pathol. 2020 Jun;48(4):607-610. doi: 10.1177/0192623320920209. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7237319/
2. https://thinkchecksubmit.org/