

The Art of Reading a Research Paper

원문: <http://www.editage.co.kr/resources/article8.html>

From a literature search, you realize that close to 100 research papers need to be read if you are to get started. While this may be a wee bit frightening at first, it is manageable. The trick to reading a large number of research papers and picking out information relevant to you lies in knowing what to read. Although many researchers are aware about the importance of reading a research paper, very few are able to read a research paper effectively and use the information to their advantage.

If you have read this far, your natural guess would be that this is the article you have been waiting for—an article that tells you about reading your research paper effectively. This brings us to the task of understanding how best you can manage reading those 100 research papers on your desk and still find time to pursue your research. For starters, you could decide on the articles that matter to you, by reading the paragraph that tells you what the article is about—the Abstract.

Read the Abstract to know the research paper

- Does it tell you what the work is about?
- Does it address the main methods used in the study?
- Does it provide a well defined conclusion to the study?

If your answer to these concerns is a resounding YES but you decide that the main article would not interest you, then Hooray!! You may safely tuck the article back to the shelves and store it for a later reference. However, if you find yourself being drawn to the content of the abstract, it's time you got introduced to the research research paper through the introduction section!

Read the Introduction to understand the fundamentals:

The broad purpose of the introduction section is to introduce you to the research topic; create awareness about references and earlier reviews that form the basis of the

work; summarize the main result of the investigation in a simplified form.

In most cases, graduate students and researchers tend to skip the introduction. The common belief about reading the introduction to a research paper is that it is in a sense a repetition of the abstract.

There is a difference. Firstly, the introduction makes a mention of references to earlier scientific literature, which the abstract does not. The references mentioned in the introductory passages are special in a way—they review the concept under investigation. This aspect is of great value to researchers because it provides them with the foundation for a better understanding of the fundamental theories that surround the subject of investigation. Secondly, the results are explained briefly in the introduction section while the abstract confines the result to no more than a statement. The explanation of the results, in a manner more detailed than the abstract, would help you understand the aim of the research and appreciate its outcome. Thus, paying attention to the results expressed in the introductory section helps you focus and understand the remaining sections of the research paper.

Having read the introduction, it might seem that there is little or nothing difficult about the research paper. Not yet, until you arrive at the section that is filled with data—Results. But, don't worry. If you still think it's too early to look at results in their quantitative and qualitative forms, there is one section you can directly move to—Discussion.

Read the Discussion to know the significance of the research

While many purists may consider reading the discussion section before the results as against the general norm, it is a good way to finish reading your paper as soon as possible. Guess you didn't know this, but here is why

- The discussion is a summary of the results obtained and its significance.
- It presents the principles and the relationships behind the findings documented in the results section of the paper.
- It summarizes the evidence drawn from each conclusion that is made.
- It discusses the implications of the research and provides a window to future directions of progress.
- As the discussion is a summary of the results and their significance, it describes all the results, from the perspective of their significance to the experiment.

This aspect of the discussion is of immense value to you as a reader because you now

become fully aware of (1) the results and (2) the reason why the experiment was done, the way it was done.

A wholesome understanding of the discussion reduces the necessity to sail through all the data that was generated in order to arrive at the conclusions about the significance of the research. This by and large saves you time and energy that would otherwise have been spent in analyzing the data.

Comprehending the Results

The results are the main reason why the research paper is there, wherever it is. They support the foundation of a hypothesis, just as pillars support a house. Given that the results are important, how do you go about understanding them?

A golden rule while dealing with the results is—Don't RUSH!!

Reading the results of a paper is akin to sipping a cup of hot coffee, except that your first cup of coffee would be long empty, even before you get to understand the data well.

Reading the results section would be smooth sailing if you

Pay attention to the subheadings in the results section: The subheading in the results section is a one line statement about the main result, which is described in that section.

Read the results piece by piece: If there are many results, study each result individually. Do not proceed to the next finding, unless you understand the first. This is important because all results are interlinked under a common theme. In all probability, if you do not understand the first concept, you may very well forget about making sense of the rest of the paper.

Pay attention to graphs and figures: The reason why it takes a lot longer to understand the results is the accompanying baggage that comes in the form of data and figures. The figures and graphs must always be regarded as the genuine evidence of the research that has been described in the research paper.

A good way to deal with the data is to study graphs and figures on the basis of the respective subheading that you are reading. This is easier said than done. In order to save space, many figures and tables are either included in the supplementary information or in some page after the main result has been described. Therefore, it would be most effective if you put in some effort to collect all the figures and tables described, in one place and spend considerable time in understanding the results.

This job is not as difficult as it seems. As you have read the discussion section of the

aper, you have a fair idea about what the results mean. This gives you the advantage of understanding the data much faster than you would have if you were to study the results section first. This knowledge would suffice if you are just looking at satisfying your curiosity to widen your awareness in a topic that is related to your research interest.

However, if you are planning to pursue research in similar lines or reproducing the effort, there is one last section you need to take a good look at—Materials and Methods.

Reading the Materials and Methods

Although in some journals the materials and methods section follows the introduction, it is worthwhile that you do not pick up that section immediately.

This section essentially talks about the procedures used to carry out the experiment and the materials used in the process. The amount of sense that this section of the article makes to you is inversely proportional to your professional standing. If you are reading this section as a graduate student, you are bly advised to take up this holy cause of understanding the materials and methods.

The reasons that your advisor is going to give you (which will take the form of questions, he or she asks you during the weekly lab meet!) are

- It introduces you to the techniques that have been used in the experiment.
- It provides information on materials that may be useful in the work that you are carrying out.
- You are expected to know this—after all you are a graduate student!!

So much for being a graduate. This situation however changes once you climb the rungs of the academic ladder. So much so, that by the time you become a professor at a university, you couldn't care less about the methods, unless it affects your research greatly. But, the one parameter that remains constant while reading the aper is to read the materials and methods toward the end of your reading exercise. In order to appreciate or criticize the methodology of the experiment, it is important that you grasp the essence of the results conveyed by the aper. A blind reading of the materials and methods would not help you place the methods in context with the results that have been obtained. An understanding of the results in an experiment helps you to assess whether

- The methods described were effective in obtaining the desired results

- The experiments could have been performed in a better way
- The description of the materials used and the methods employed is consistent with the description of the results in the paper

Certainly, such objective analysis of the materials and methods would be possible only within the larger framework of the results and their implications. Having said so much about going through a paper, the one truth that stands out is this—a paper is only as interesting as the reader thinks it to be.

While reading a paper

DO

- Read the abstract. It helps you decide how meaningful the article is to you.
- Concentrate on the references in the introduction. They are your passport to understanding the concept better.
- Read the discussion after reading the introduction. It helps you understand the results and the reason why the experiment was conducted in the first place.
- Pay close attention to the future directions and implications of the study. It helps you think in new directions of research.
- Pay attention to the subheadings in the results section—they are the results themselves.
- Read the results step by step.
- Have ready access to data pertaining to the subsection of the results that you are reading.
- Read the materials and methods, after you have understood the implications of the research.

DON'T

- Skip the introduction. It provides the background for your reading.
- Read the materials and methods immediately after the introduction. It will make sense once you understand the results.

- Rush through the discussion. The slower it is read, the easier it is to cope with the results.
- Rush through the results. They are the reason for the paper to get published.
- Skip the materials and methods if you find the paper to be of great relevance to your work.