

**Lecture Four: How to Read and Understand a Scientific Article**

Reading a scientific article is a complex task. The *worst* way to approach this task is to treat it like the reading of a textbook—reading from title to literature cited, digesting every word along the way without any reflection or criticism. Rather, you should begin by skimming the article to identify its structure and features. As you read, look for the author's main points. Generate questions before, during, and after reading. Draw inferences based on your own experiences and knowledge. And to really improve understanding and recall, take notes as you read.

**1. Skim the article and identify its structure:**

Most journals use a conventional IMRD structure: An abstract followed by Introduction, Methods, Results, and Discussion. Each of these sections normally contains easily recognized conventional features, and if you read with an anticipation of these features, you will read an article more quickly and comprehend more.

***Features of Abstracts***

Abstracts usually contain four kinds of information:

- Purpose or rationale of study (why they did it)
- Methodology (how they did it)
- Results (what they found)
- Conclusion (what it means)

Most scientists read the abstract first. Others—especially experts in the field—skip right from the title to the visuals because the visuals, in many cases, tell the reader what kinds of experiments were done and what results were obtained. You should probably begin reading a paper by reading the abstract carefully and noting the four kinds of information outlined above. Then move first to the visuals and then to the rest of the paper.

***Features of Introductions***

Introductions serve two purposes: creating readers' interest in the subject and providing them with enough information to understand the article. Generally, introductions accomplish this by leading readers from broad information (what is *known* about the topic) to more specific information (what is *not known*) to a focal point (what *question* the authors asked and answered). Thus, authors describe previous work that led to current understanding of the topic (the broad) and then situate their work (the specific) within the field.

***Features of Methods***

The Methods section tells the reader what experiments were done to answer the question stated in the Introduction. Methods are often difficult to read because of technical language and a level of detail sufficient for another trained scientist to repeat the experiments. However, you can more fully understand the design of the experiments and evaluate their validity by reading the Methods section carefully.

***Features of Results and Discussion***

The Results section contains results—a statement of what was found, and reference to the data shown in visuals (figures and tables). Normally, authors do not include information that would need to be referenced, such as comparison to others’ results. Instead, that material is placed in the Discussion—placing the work in context of the broader field. The Discussion also functions to provide a clear answer to the question posed in the Introduction and to explain how the results support that conclusion.

### ***Atypical Structure***

Some articles you read will deviate from the conventional content of IMRD sections. For instance, Letters to *Nature* appear to begin with an abstract, followed by the body of the article. Upon reading, however, you will see that the “abstract” is a summary of the work filled with extensive introduction (for the purpose of catching the attention of a wide audience), and the next paragraph begins a description of the experiments.

Therefore, when you begin to read an article for the first time, skim the article to analyze the document as a whole. Are the sections labeled with headings that identify the structure? If not, note what the structure is. Decide which sections contain the material most essential to your understanding of the article. Then decide the order in which you will read the sections.

### ***2. Distinguish main points :***

Because articles contain so much information, it may be difficult to distinguish the *main points* of an article from the *subordinate points*. Fortunately, there are many indicators of the author’s main points:

#### ***Document level***

- Title
- Abstract
- Keywords
- visuals (especially figure and table titles)
- first sentence or the last 1-2 sentences of the Introduction

#### ***Paragraph level: words or phrases to look for***

- *surprising*
- *unexpected*
- *in contrast with previous work*
- *has seldom been addressed*
- *we hypothesize that*
- *we propose*
- *we introduce*
- *we develop*
- *the data suggest*