How to Write a Technical Theory Section

Where does it fit? – The technical theory section is most often included in the introduction or methods section, though it can also be found in results and discussion section(s) or as a stand alone section as appropriate. This section may also be omitted if the audience assumed to be conversant in the topic. To determine where it fits, if at all, consider the purpose of this section. The technical theory section presents information that will be useful for the reader to understand the context of a topic, which can aid in the interpretation of other information presented in the manuscript, such as results, discussion of results, or methods to be employed. Some readers may choose to skip over this section when reading, but adding it ensures that the reader and writer have established a common knowledge base from which they can discuss and interpret the other ideas.

Before Writing – First, determine the intended audience for your document and the technical background they already possess to readily interpret your document. Second, determine the technical theory required to interpret your document. Third, compare the technical theory that is required with what the reader will have available. Fourth, make a list of the different theories that should and should not be included in the document. Theory that should not be included is theory that every reader will already possess. Theory that should maybe be included is theory that the average reader will have but some may not or theory where it is important to clarify nomenclature. Theory that should definitely be included is theory that the average reader will not have.

While Writing – The technical theory section is a clear description of the theory necessary to interpret other ideas conveyed in the document. Using the list of theories created prior to writing, determine which should be included and the detail to which they should be explained. Theories that only need cursory explanation can often be summarized. Or the section can simply refer the reader to another publication to gain the information. Ideas that are difficult to convey can be enhanced with the use of equations and/or figures as appropriate. The goal is to provide a sufficient explanation that will provide all your readers with a common knowledge base.

- All equations should be numbered and referred to in the text by their number
- Word and LaTeX have powerful equation editors that can be used to produce almost any equation.
- The definitions of symbols used in the equations must be defined either in the text near the equation or in a nomenclature section. For example

> The force at the wheels of a car are related to the torque of the engine by the Equation 3, where T is the engine torque, GR is the overall gear ratio, R_{wheel} is the radius of the rear tires and ε_d is the mechanical efficiency of the drive train.

$$F_W = \frac{T\ GR\ \epsilon_d}{R_{wheel}} \qquad (3)$$

After Writing – Consider the following questions after completing a draft of the technical theory, and use these considerations to revise and improve the writing.

- Does the technical theory section meet the needs of the target audience? Does development of the theory begin with basic concepts and fundamental laws that establishes a common base for all readers to build upon? Is the level of detail appropriate for the intended audience.
- Are all the variables and parameters reprensented using widely accepted and consistent symbols and notational systems? Are definitions of all the variables and parameters given in the text or in the nomenclature? Are mathematical operations represented correctly, consistently and clearly?
- Are tables and figures used to simplify and effectively communitcate information as needed?