

Technical Manuscript Writing for Doctoral Candidates

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Module 8. Equations

Like the modules on Figures and References, this module is divided into two parts. The first part is on content, helping to answer questions such as, “Which equations should I include?” The second part is on formatting the equations.

I. Including Equations in Technical Papers

Equations should be included in technical papers in several situations

- a model or theory is being developed
- data is being compared to a theory or empirical formula

The inclusion of equations should further the understanding of the topic. One should not include equations that are not used in the manuscript.

Derivations can be included in technical papers. However, it is expected that not every step in the derivation will be included. Instead, one may include some text describing the missing steps. For example, one might say, “Substitution of equation (2) into equation (4) and subsequent rearrangement for X yields” before providing the next equation. Make sure to include the important equations. Where possible, give physical explanations for each term in the equation. Lengthy derivations of previously published models should not be included.

Derivations can be included in supplementary information, as is done in Xiong *et al.*¹ or in an appendix as is done in Baig *et al.*²

II. Formatting Equations in Technical Papers

There are a few simple formatting rules for equations.

- Equations should be numbered.
- Equations should be either indented or centered. Examine how the equations appear in the journal and format your manuscript in an analogous manner.
- Every variable that appears in the an equation should be defined. Even though everyone knows that *T* represents temperature, the first time you use it, you should define it.
- The first time a variable is used in a paper, it should be defined. If it appears in the text, it is defined there. If it appears in an equation, it is defined immediately after the equation.
- The font, size and style (e.g., italics, bold, underline) of a variable in an equation should be held constant through-out the manuscript. The same font, size and style should be used when the variable appears in the text, equation, table and Figure legend, Figure axis or Figure caption.

Example 1. Equations in a Theoretical Manuscript

[Wang *et al.*, *Phys. Rev. E* **81** 061204 (2010)]

We now examine the equations of the theoretical manuscript³ that we have been following all semester.

Example 2. Figures in an Experimental Manuscript

[Liu *et al.*, *Chem. Eng. J.* **151** pp. 235-240 (2009)]

We now examine the equations of the experimental manuscript⁴ that we have been following all semester.

References

- (1) Xiong, R.; Odbadrakh, K.; Michalkova, A.; Luna, J. P.; Petrova, T.; Keffer, D. J.; Nicholson, D. M.; Fuentes-Cabrera, M. A.; Lewis, J. P.; Leszczynski, J. *Sensor Actuat B-Chem* **2010**, *148*, 459-468.
- (2) Keffer, D. J.; Baig, C.; Adhangale, P.; Edwards, B. J. *J. Non-Newtonian Fluid Mech.* **2008**, *152*, 129-139.
- (3) Wang, Q. F.; Keffer, D. J.; Nicholson, D. M.; Thomas, J. B. *Phys. Rev. E* **2010**, *81*, 061204.
- (4) Liu, H. N.; Qing, B. J.; Ye, X. S.; Li, Q.; Lee, K. T.; Wu, Z. J. *Chem. Eng. J.* **2009**, *151*, 235-240.