CEE 697w – Advanced Topics in Water Quality and Process Engineering

Notes on the role of refereed literature

Writing your own journal articles and reading or critiquing those written by others are essential activities of a modern experimental researcher.

Preparation of Journal Publications

At some universities, accepted or published research papers (e.g., minimum: one for an MS, two for a PhD) are required prior to awarding a degree. This is not a formal institutional requirement at UMass, however, publication of thesis/dissertation results is considered a necessary part of the research process. In addition, many students have the opportunity to present their work at regional and national conferences (e.g., AWWA annual conference). Oral presentations and written papers are an excellent way of raising one's profile in the environmental engineering field. These are usually published in full-length or abstract-form as conference proceedings. Most of these papers are also submitted to an archival journal[1]. Some opportunities for publication are summarized in Tables 1 and 2, below.

Journal and proceedings publications are commonly prepared as collaborative efforts between the student and his/her research advisor. The most common pathway is for publications to be initially written by the graduate student or post-doc after development of an outline with the research advisor. Successive drafts and re-drafts usually follow as the advisor and student work toward a clear and polished product. In this case the student is often listed a first author and the advisor is the second author. Most students will devote a substantial amount of time to this effort prior to leaving the University. Careful structuring of the thesis/dissertation can facilitate the simultaneous preparation of research papers.

Questions to be addressed in preparing a journal article:

1. What are the major contributions of your work?
    a. Is it a practical engineering finding that can be implemented in the near future?
    b. Is it a more fundamental study that provides direction to other researchers?
    c. Is it an assessment that helps in evaluating impacts on human or environmental health?
2. How do these contributions build upon what has already been published?
3. What is the key background literature; what was known, and what was unknown prior to your work?
4. How did you make your contributions (e.g., what were your experimental methods and design)?
5. What were you unable to determine or accomplish, and what are the next steps in your area of investigation?

[1] This is important, because conference proceedings may not be widely available, but archival journal generally are.

Important decisions regarding the publication:

1. Should this be a full journal article or a shorter "technical note" or "short communication"?
2. Where should it be submitted, and what are the specific journal requirements?

Table 1. Important Archival Research Journals in Water Quality and Process Engineering

Journal Name	Comments
Applied and Environmental Microbiology	The premier journal on microbiological science underlying bioprocesses – published by the Am Soc for Microbiology
Aqua	Substantial European readership, becoming more important in the water field
ASCE Journal of the Environmental Engineering Division	Very high quality, many modeling papers
Environmental Science and Technology	Best journal for environmental chemistry
Environmental Technology Letters	
International Journal of Environmental Analytical Chemistry	Lower quality on average, but some good stuff
Journal of the American Water Works Association	Good, but small number of research articles; high visibility in the US drinking water field
Journal of the New England Water Works Association	Average quality, lower than J. AWWA, also smaller readership, but well known in Northeast US
Ozone Science & Engineering	Lower quality on average, focuses on ozone and related oxidation
Water Environment Research	Excellent for wastewater process and water quality assessment
Water Research	Good quality, wide readership in US & Europe

Table 2. Important Research Proceedings in Water Quality and Process Engineering

Conference Proceedings	Comments
American Chemical Society Conference	Meetings held 2x per year (Spring & late summer), Environmental Chemistry Division is most appropriate, extended abstracts instead of full papers, some sessions are published as books
AWWA Annual Conference	Once per year in June, very good for meeting major figures in US water treatment, Universities forum for student presentations
International Ozone Association Conferences	World congress every 2 years, regional conference more often
New England Water Works Association	Annual conference in New England, student session
Water Environment Federation Technical Conference (WEFTEC)	Once per year in October, very good for meeting major figures in US wastewater treatment, many student presentations
Water Quality Technology Conference	Once per year in early November, sponsored by AWWA water quality division, more focused on research than AWWA annual conference
Water Science & Technology	International Conferences

General Notes On Presentation Of Scientific Studies

Scientific Writing

Direct your writing to the level of a colleague familiar with environmental engineering, but not familiar with the specific technique or process you are discussing. Be precise in your choice of words. Be efficient in your writing, and don't include extraneous material that is unnecessary for the intended purpose. Be careful about making subjective statements or using ambiguous adjectives and adverbs (e.g., good, poor, fair, well).

Organize you paragraphs or sections in a logical fashion. Think about the objective of each paragraph. Compare what you have written with the paragraph-level heading. Is there a consistent and coherent theme? Be sure that the sentences in a given paragraph work toward achieving its objective. Paragraphs containing fewer than 3 sentences generally represent incomplete thoughts. They should either be developed more fully or merged with other paragraphs.

Grammar and syntax are extremely important. In some cases, scientific writing carries special expectations and requirements. Avoid using the active voice with an inanimate object as the subject. For example, don't write, *pH electrodes monitored hydrogen ion activity*. In fact, pH electrodes cannot "do" anything by themselves. You should write, *pH electrodes were used [by you] to monitor hydrogen ion activity*. This latter phrase uses the passive voice and has "you" as the implied subject. Do not begin a sentence with a numeral or an abbreviation. If you must start a sentence with a number, spell it out (e.g., "Five milliliters were added to the ……"). Be attentive to typical grammatical errors:

- Subject:verb agreement (see if the sentence still sounds correct when you remove prepositional phrases and modifiers)
- Proper use of pronouns (ask yourself what each pronoun refers to)
- Proper choice of homophones (affect & effect; principal & principle)

There is often confusion over the usage of *affect* versus *effect*. When you require one of these to serve as a verb, you will most likely want to use *affect*. *Affect* means to produce an effect upon. *Influence* is an appropriate synonym for *affect* when used this way. For example you might write, "changing pH will ***affect*** the production of trihalomethanes". When used as a noun, you will probably want *effect*. An *effect* is something that follows an antecedent, as a cause and *effect*. For example you might write, "the ***effect*** of pH on trihalomethane formation is substantial".

Data Presentation

Use graphs to present data, unless the precise values of the data are important. In general, data from which graphs are prepared need not be presented. However, to facilitate analysis of the data, you should include all data in a series of tables. Much or all of this should be placed in an appendix if the actual numbers are not extensively referenced in your text.

Standard, "xy" graphs should be used whenever possible. The choice of linear, semi-log or full-log will depend on the nature of the data. All linear graphs showing concentrations or doses should start at zero in both "x" and "y". Do not succumb to the temptation of spreading out the data across the entire graph, and in doing so set the origin by the lowest concentration or dose (although some graphics software will "want" you to do it this way). If one of the variables or treatments is not a continuous numerical variable or if in some other way does not lend itself to numerical representation (e.g., a sampling location in a treatment plant), you may use a bar graph to present the data. Be sure to include all important conditions in the legend or on the face of the graph. Also, remember that the independent variable is usually plotted on the x-axis, and the dependent variable falls on the y-axis.

Be certain that graphics can be fully understood by the reader. For example, graphs with multiple lines need to be designed in a way that the meaning of each line is clear. Often this is done though the use of arrows and captions or unique line styles (e.g., dotted, dashed, colors) and a legend. It is not permissible to blame your graphics software/printer if your graphics are ambiguous. Even the most uncooperative computer can be simply turned off in favor of graph paper, a pencil and a ruler. The origin and meaning of all columns and rows in tables should be understandable by the reader. Don't be afraid to use footnotes to help with this.

Resources

There are many excellent books on elements of style that pertain to thesis/dissertation writing.

General Style

1. The Chicago Manual of Style
2. The Allyn & Bacon Handbook, by Rosen & Behrens, Allyn & Bacon, 1992
3. McGraw-Hill Handbook of English, 4th edition, 1978

Scientific Style

1. ACS Style Guide, American Chemical Society 1986
2. Writing for Communication in Science and Medicine, by Lynch and Chapman, Van Nostrand & Reinhold, 1980

Scientific Publications

1. Hofmann, Angelika H., Scientific Writing and Communication. Oxford University Press, 2010
2. Gustavii, Bjorn, How to Write and Illustrate a Scientific Paper, Cambridge University Press, 2nd edition, 2008
3. Cargill, Margaret & O'Connor, Patrick, Writing Scientific Research Articles: Strategy and Steps, Wiley-Blackwell, 2009.
4. Coghill, Anne M. & Garson, Lorrin R., The ACS Style Guide: Effective Communication of Scientific Information, 3rd Edition, ACS, 2006
5. Writing Research Papers, by James D. Lester, Addison Wesley Longman, Inc., 9th ed. 1999.

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