Research-Based Scientific Writing Assessment Rubric

This rubric is based on the Duke Univ. BioTap Biology Thesis Assessment Protocol. It was modified to include the scientific writing characteristics and abilities emphasized in the CBS Writing-Enriched Curriculum writing plan and to be consistent with the goals of a WI directed research experience. Students and mentors are encouraged to use this rubric to frame discussions around scientific writing. Guidelines for WI paper preparation are included at the end of this document.

**Characteristics of the Introduction:**
- Describes what is known about the topic, and
- Identifies the specific gaps in knowledge that the student’s project intends to address, and
- Includes a research question or the goals of the project, and
- May also include a hypothesis (if applicable) and
- Makes an argument for the broader significance of his/her research when addressing these gaps.

**Characteristics of the Materials & Methods:**
- Provides sufficient details so that readers can judge the appropriateness of the experimental methods, and
- Would allow someone in the field to repeat the student’s experiment, and
- References when appropriate; describes protocol modifications when appropriate

**Characteristics of Results:**
- The results section should develop a narrative describing the scientific process (questions, findings, interpretation)
- Paragraphs within the results section describe the experimental rationale, approach and findings, with specific reference to a table or figure. (What is the question, what was done to answer it, what was found)
- Interprets the results of each experiment within the specific scientific context constructed in the Introduction (in relation to a hypothesis, if applicable). (What it means)
- Appropriate choices should be made regarding how to display data (when to use a figure, what kind of figure to use, and how to organize evidence within the figure or table), and
- The visual elements of all tables and figures should be thoughtfully prepared (as if they were destined for manuscript submission--not simply copied from excel) clear and easy to read or interpret, and
- The legends should provide a clear description (reader roadmap) of each table or figure and not duplicate information that is in the materials and methods. Figure legend text should not draw conclusions about the figure contents, although titles might.
- Figures, and tables should include appropriately descriptive titles (modeled after the literature).
Characteristics of Discussion:

- The discussion briefly highlights major findings, acknowledging complexities of the data, as well as inconsistencies, limitations and alternative explanations.
- The discussion explicitly relates the implications of their research findings (results) within the scientific context constructed in the Introduction. The narrative should draw connections between the student’s research findings and other published work.
- The implications of negative results should be discussed.
- The discussion highlights how the project could lead to future research within the field, and/or suggests additional experiments/alternative approaches*.
- If a student has inconclusive or incomplete results, the discussion should focus on the limitation of the results and possible explanations.

* Projects with largely inconclusive or incomplete results should focus on the latter.

Characteristics of the References:

- Scholarly sources are used to support claims.
- The citation format should be consistent (chose the format from a respected journal in your field and use its format both for the in text citations and the literature cited list)

Overall Writing Quality: Is the writing at an appropriate level for the target audience of upper division undergraduates and faculty in the general field of biological sciences? Does it demonstrate the characteristics of strong scientific writing outlined in the CBS Writing Enriched Curriculum Writing Plan? Is it modeled after scientific literature?

- Arguments or descriptions are direct and to the point, employing few unnecessary words
- Wording is unambiguous
- Scientific terminology is used appropriately, with specific terms defined as needed
- The author does not assume an expert level of knowledge of the reader
- The paper is free of distracting mechanical writing errors (grammar, spelling, punctuation, scientific conventions such as italicizing species names, etc.)
- Sections of the paper contain appropriate information (e.g. possible implications of the results are in the discussion section, not the results section)
- Information in each section is cohesive and logically organized
To meet the University of Minnesota WI requirement:

- Writing must be comprehensively integrated into the course; **writing should be assigned and discussed between student and advisor throughout the semester.**

- Writing is a significant part of the course work. Students must complete the equivalent of **10-15 pages of polished writing (at least 2500 words)**, beyond informal writing. This page minimum applies to final drafts only, and can be broken into several shorter assignments. This writing should be in one or more genres appropriate to the discipline and, for WI directed research in CBS, at a level appropriate for a capstone (4000-level course) experience.

- **Explicit writing instruction must be integral to the course, and represent a significant, recurring activity.** Writing a research paper does not satisfy the WI requirement. Discipline-specific instruction is a key component. Students and mentors are expected to discuss scientific writing models, disciplinary formats, patterns of common errors in scientific writing etc. Mentors should be aware that, while CBS students have many opportunities to write lab reports, most are unlikely to have had prior experience writing a scholarly data-based research paper.

- **Writing is learned through revision.** Instructors should provide substantial feedback on student writing, and allow revision in response to that feedback. Continuous focused feedback on subsections of a research paper, building systematically over the course of the semester is encouraged, as is a variety of modes and purposes of feedback.
  - Note: Feedback provided on drafts should NOT include a lot of copy-editing. Instead, mentors should provide the bulk of their feedback on content, context, literature sources and interpreting/discussing data and add comments on patterns of recurring problems with format, grammar, usage, etc. Using language from the CBS faculty-defined scientific writing characteristics and abilities is encouraged.

- **Writing assignments must represent at least a third of the students’ final course grade;** students cannot pass a WI course if they fail the writing component.
Format for CBS WI Papers

• Most CBS WI directed research papers are written in the format of a scientific journal article, but with an expanded literature review and Introduction. **The focus on literature review is critical if research projects are limited in scope and/or did not yield expected results.** A strong literature review allows students to meet the University requirements, even if much of their experimental work is unsuccessful.

• To teach students about disciplinary expectations, students are encouraged to follow the “Instructions to Authors” for the journal of their choice with regard to organization, style, use of abbreviations, and manner of referencing literature.

• Design of figures and tables would preferably be in graduate thesis format – each on its own page following the text that references it, or at the end of the document—as in a submitted manuscript. **Figures and tables should not be embedded within the text of the final paper.**

• Directed research papers should be double-spaced with 1-inch margins. Students should not include excessive gaps between sections.

**Papers will typically include:**

- Title page (**including word count**)
- Abstract
- Introduction
- Materials and Methods
- Results
- Tables, figures, and table/figure legends
- Discussion
- Literature Cited