Guidelines for STEM Honors Theses

Your Honors Thesis should be regarded as a scientific paper that represents the culmination of at least two semesters of your research efforts at Southern Miss and should be a document of pride for you, your advisor and your department. Since your thesis will be deposited in the Aquila Digital Community, where it will be viewed by a large number of scholars from around the globe who are interested in your work, you should approach the writing of your thesis with utmost care and produce a document that is free of orthographic and grammatical errors. Be prepared for multiple rounds of corrections and editing before the final product meets the expectations of your advisor and chair/director, and is ready for submission to the Honors College (HC) for final approval.

Following are a few guidelines that are intended to help you produce a thesis of high quality. Your research mentor, possibly with the help of an experienced graduate student or postdoctoral fellow, will guide you through your research endeavors and will ensure that the scope of your Honors research project meets the standards in your discipline. Consult the timeline you and your advisor developed in HON 301 as a reminder of the milestones and deliverables you have established for your project and for the successful completion of your thesis document.

Getting Started

- You should have a good idea of the appropriate thesis format(s) in your discipline from your work in HON 301. However, you may want to re-familiarize yourself with the format of recent Southern Miss Honors theses.
- Look over the thesis timeline that you and your advisor prepared in HON 301. Prepare a detailed outline of the material you want to cover in the different thesis sections, thinking about how each item relates to your research question and hypothesis(es). This is important because your actual approaches and, therefore, results may be different than you had originally assumed.
- Organize the material you will include and decide how to best present your findings, consulting your advisor if unclear.
    - Prepare draft Figures and Tables of your relevant data (see below for more detail).
- Start to write the section that is easiest for you.
    - Recommendation: start with Results, because contents of this section will guide those of all other sections (e.g. Materials and Methods).
- Consult the practical tips on thesis writing here

Thesis Format (Style)

- Follow HC requirements for basic formatting (pagination, margins, spacing, font size etc.).
- Remaining sections and style depend on your discipline and your advisor's preference. Consult your advisor about the preferred or required style!
    - Example: the American Chemical Society (ACS) Style Guide (available through Cook Library) may be required for some students. Others may write and cite references in a journal format (e.g. Journal of Biological Chemistry).
    - For general guidelines in a multitude of styles click here).

Thesis Length

- There is no prescribed length; most theses have 20 - 40 pages of text.
    - Variations in overall length may be due to very long or short Methods sections, varying number of figures and tables, etc.
    - You may want to include large data sets (e.g. clones, PCR primers, NMR spectra) that are supporting your main findings in appendix(ices).

Thesis Organization

Abstract

- Concise summary of project goals, major approaches used and findings.
- Typically, 200-400 words long.
    - Most difficult section to write; recommendation: leave for last.

Introduction

- Introduces your project to the reader and places it into the proper context.
- General overview (NOT a review!) of state of knowledge in your field → specific open questions/lack of knowledge addressed by your project → What is your research question, how will you answer it.

Literature Review

- Detailed description and critical evaluation (i.e. a review!) of prior published work that is pertinent to your research project.
    - Organize into headings for different sub-topics that are relevant to your study.
    - Do not only read review articles; read and include the relevant original studies.

Materials and Methods

- Description of how YOU performed all experimental procedures.
    - Include reagents (including amounts), reaction conditions, instruments, biological samples and strains, if applicable.
    - May refer to previously published procedures (needs citation) but be specific and indicate which are your modifications.
- Provide sufficient detail so other scientists can reproduce your experiments.
- Organize different methods under broader headings and sub-headings.
- List equipment models and reagents with manufacturer.
    - Example: T4 DNA ligase (New England Biolabs, Ipswich, MA)
- Describe contents of reagents and concentrations of chemical ingredients.
    - Examples: TE buffer (10 mM Tris-HCl [pH 8], 1 mM EDTA); 0.05% Tween; 5 μg/ml DNA

Results

- Describe in detail the findings of your study.
- Include all RELEVANT results (≠ALL results!). Your advisor will provide guidance.
    - "Failed" experiments may provide great insight and may warrant inclusion in your thesis.
- Organize your relevant findings to support the "story" your thesis will tell.
    - Do not simply follow the temporal order in which you performed your experiments and in which they are documented in your lab notebook.

    - Think about which experiments logically follow the ones you just described and will allow the reader to see the thread of your investigation.
- Decide on the most appropriate way to display (figure [chart, graph, image, diagram], table) or describe (in the text) your data.
- Insert figures and tables in the appropriate positions (when first mentioned) in the body of the text.

  Tables
    - Display arrays of data in columns and rows.
    - Numbered consecutively (Table 1, 2 3...) with descriptive title above; referred to by their number in the text.
    - Table footnotes are brief (e.g. to explain abbreviations, statistics, exceptions).

  Figures
    - Can be graphs, diagrams, charts, images that must be annotated (arrows, molecular weight markers, axes labeled, units clearly indicated, etc.) for the reader to find the relevant information.
      - Figures are not needed for very simple results (e.g. one or two data points) that can easily be described in the text.
    - Numbered consecutively and referred to by their number in the text.
    - Have figure legends below that consist of:
      - A brief, descriptive title that summarizes what is shown.
      - A brief summary of the experiment that produced the data.
      - Explanations of annotation marks and abbreviations.
      - If appropriate, brief information of statistical treatments (number of samples, meaning of error bars, etc.)

Discussion and Conclusion(s)

- Interpret your results (incl. limitations) and discuss their broader implications.
    - How have your results advanced the field?
    - How are your results different from previously published ones?
    - How have your results challenged current paradigms?
    - Do not re-hash your results!
    - Avoid statements that reflect your personal bias (e.g. "I did not like what the author of this publication said.").
- Suggest follow-up work and explain how it will connect to and enhance your study.

References or Bibliography

- List ALL published literature sources you have used in your thesis.
- Citations must follow the format discussed with the advisor.
- Consult the USM library for a reference management software package like Endnote (online-only version is free; $115 for student version), Mendeley (free) or Zotero (free) to organize your references and enter them into the text.
- Cross-check the list with your citations in the text to ensure completeness.

Writing Style and Tips

- Let published literature in your discipline guide your writing.

- Keep your sentences short and to the point; use the correct scientific terms and avoid lab jargon.
- Link ideas and points you make through transition words like therefore, thus, however, instead, in addition, although, despite, finally, etc.
- Refer to previously published (peer-reviewed) findings in present tense (e.g. "The earth <u>is</u> a sphere.") and use past tense to describe your own results.
- Consult your advisor about whether you should use first (I, we) and active voice, or third person passive voice to describe your results.
- Emphasize important information in the text by a more detailed description than used for less important data, and by strategic placement of that information.
- Define all abbreviations (except commonly accepted ones like DNA, RNA etc.) the first time you use them in the text.
- Apply capitalization consistently throughout your thesis document.
- Do not begin a sentence with an abbreviation or number.
- Do not write decimal numbers without the zero (i.e., 0.987, not .987).
- Leave one space between number and units (i.e., 1.5 mM, not 1.5mM).
- Do not use word contractions such as isn't, won't or, worst of all, ain't.
- Italicize names of biological species, with the genus name capitalized and the species designation in lower case letters (e.g. *Homo sapiens*, *Escherichia coli*).
- Thoroughly edit your document and make use of spell and grammar checkers. Carefully read through and edit, if necessary, your thesis before submitting your final draft to your advisor.