Senior Thesis Template

CALS Honors in Research Program

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Note: The exact content, format, and length of each section will vary between students and PIs. This document seeks to provide a general description of the expected content and appropriate format.

TITLE

List of authors (student, PI, graduate student(s) or postdoc(s) who provided direct mentoring)

Affiliations of authors (department and college where research was carried out, student’s degree program, major, and college)

ABSTRACT (approximately one-half page)

Succinct summary of the project, including:

1-2 sentences of background (why we did it)

3-4 sentences of the materials and methods (what we did and how we did it)

3-4 sentences of key results (what we saw)

1-2 sentences of conclusions (what it means)

INTRODUCTION (approximately three pages)

1 paragraph with a high-level statement of the problem, challenge, or opportunity at the level of society or the broad field in which you are working (why should a random person care about this topic)
2-3 paragraphs with increasingly specific descriptions of the population, problem, situation, or opportunity and the need for this project (why should someone in your field of research care about this problem)

3-5 paragraphs of what is already known, in the published literature of your field, and what gaps in knowledge or thorny unresolved problems remain at present (why did you need to carry out this project)

1 short paragraph stating the overall objectives and specific aims of your study

MATERIALS & METHODS (approximately four pages)

Use titles for the following subheadings that are specific to your project

Materials used in your project (approximately one-half page)

Describe the population of animals, cell line, survey, existing data set, or whatever resource as used to carry out your experiment(s). For example, if you used mice, tell us what line(s) of mice were used, why they were chosen, where they were sourced, and a bit about how they were housed, fed, and treated. If another resource was used, like a cell line or public database, go through the same exercise of explaining what resource was used, why you chose it, how you acquired it, and so on.

First method/procedure/approach used for first specific aim (approximately one-half page)

Describe the set or type of procedures or interventions that you used, or the first set of steps in your experimental procedure, why you chose this method or approach, and how you did it. Don’t regurgitate your entire lab notebook here but provide enough detail that someone like a grad student or postdoc in your lab or a similar lab can understand what you did and how you did it. Also, tell us what variables or traits or outputs you measured, and how and when you measured them.

Second method/procedure/approach used for first specific aim (if needed)

Same as above, if you proceeded to a second step or method or procedure that is somewhat independent (not just a continuation of the first)

Third method/procedure/approach used for first specific aim (if needed)
Same as above

First method/procedure/approach used for second specific aim (if needed)

Same as above

Second method/procedure/approach used for second specific aim (if needed)

Same as above

Third method/procedure/approach used for second specific aim (if needed)

Same as above, and repeat as needed for additional procedures or specific aims

Statistical analysis (approximately one-half page)

Describe how you handled your data, including any specific edits you applied to the experimental resources or the data you collected. For example, if one of your mice died and had to be excluded from the analysis, tell us about it. Or if you were trying to measure time to pregnancy in your mice and you couldn’t use data from mice that remained non-pregnant after six weeks elapsed, tell us about it. Or if your assay is sometimes unpredictable and you and your PI decided to exclude outlier data points that were more than +/- four standard deviations from the mean, explain that process. Then describe the statistical analysis you carried out. What were the dependent variables? What potential explanatory variables did you consider? Did you make any adjustments to your data, such as controlling for sex or age of the mouse. How did you test the significance level of any differences you observed? What P-values did you consider as significant or suggestive? Did you need to transform data to a log scale due to non-normality? And so on.

RESULTS (approximately two pages of text, and a total of four or five pages with tables and figures)

Tell us about the key results you observed in your project. Provide a brief preamble, then show us your first table or figure, and (in the text) explain how the reader should interpret the table or figure, and highlight the key results or observations (e.g., those that were statistically significant). Do not regurgitate all the numbers from your table in the text! Assume that each paragraph (or two) is complementary to the corresponding table or figure – the text and table/figure
should work together to comprise an easily interpreted package, and one shouldn’t be a repeat of the other.

If you have multiple specific aims and/or multiple experiments to report, you should use subheadings to divide the Results section into more easily digestible pieces. For example, some readers may care about only one experiment, and you want them to be able to find it quickly. Or if they are looking at a specific table or figure, you want to make it relatively easy to find the corresponding text, without re-reading the entire Results section.

**DISCUSSION** (approximately three pages)

This is where you interpret your results or provide your best guess(es) regarding their interpretation. Don’t repeat the Results section, but rather tell us what the results mean. You don’t need to be exhaustive in the discussion, by which I mean that every result mentioned in the previous section doesn’t have to be explained in detail here. But your key results, such as those that were statistically significant, those that confirmed the hypothesis or expectation you had going into the study, and (especially) those that were surprises and/or contradicted your expectations should be explained here. And make sure your explanations and interpretations are supported, or refuted, by the existing scientific literature. For example, if one of your key findings is supported by a related study published in 2019 but contradictory to two other studies published in 2018 and 2020, point that out, and provide any theories you and your PI might have about what those authors did differently and/or why their results differed. This is also the place where you can talk about any major challenges you encountered and any problems you were unable to resolve. For example, if the assay you chose gave some results that are inconclusive, say something about what the next researcher might do to avoid this problem or achieve more conclusive results.

Start the Discussion section, and spend most of this section, talking about specific results from your project and how they compare or contrast with other recent studies in the literature. But start to generalize in the last couple paragraphs and tell us what your results mean in the broader sense. Tell us something about what implications these results might have in a practical or clinical setting, for example, and what remaining steps or knowledge are needed in order to get from the current state of knowledge to a deliverable product or procedure. And make some suggestions about follow-up studies that might confirm your results or resolve lingering questions.
CONCLUSIONS (approximately one-half page)

This is your wrap-up or take-home message. Keep it at a relatively high level, so don’t repeat specific numbers from your results or get too far down into the weeds. Just pretend you have to explain the Discussion section to someone, but you only have 30 seconds to do it. Or imagine your project is being featured on the evening news (yes, I realize you probably don’t watch the evening news 😊), and you only have 30 to 60 seconds to tell the audience why you did the project, what you did, what you learned, and why it matters.

ACKNOWLEDGEMENTS (approximately one-quarter page)

This is where you thank everyone who made it possible, starting with the funding source (e.g., Hilldale Award), any grad students, postdocs, technicians, or other lab-mates who helped you (assuming they are not already listed on the title page as co-authors), and any organization or company that may have provided services or resources. For example, if you carried out your data collection at the UW Arboretum, or if you used some equipment or space in another PI’s lab to carry out a specific assay, this is where you should thank those people.

REFERENCES (as much space as needed)

Pretty self-explanatory, but make sure you double-check that all references cited in the text are listed here, and vice-versa.

SUPPLEMENTAL MATERIALS (if appropriate)

You may or may not want a supplemental section, but this is the place (either physically or electronically) where you can provide any additional tables, figures, data files, or other materials that may be of interest to a certain subset of readers.