

Entomology and Nematology Undergraduate Research Guide

Dr. Rebecca Baldwin

Congratulations on your position as an undergraduate researcher. This guide is to help you organize your time to make the most of your research experience. Your goals should be to present your project at the University of Florida Undergraduate Research Symposium and, under the guidance of your supervisor, to get your paper published. Keep those goals in mind as you work in the lab each day. The research symposium is held in late March each year, so stay in touch with your principle investigator and advisor so you are prepared to present your research. The Entomology and Nematology Department has a large printer available to print your research poster. Please make an appointment two weeks before the presentation with Jane Medley (medley@ufl.edu) in the graphics office to layout the 36" x 48" poster design and have it printed. For poster templates and samples, please visit <http://www.scholars.ufl.edu/undergraduate-research-symposium.aspx>. Remember that publication should be your end goal. Your research supervisor is investing time and resources for your project, so they will be included with you as an author on the publication. If you are receiving course credit for this research experience, be sure to complete the ENY 4911 form and submit it before the end of drop/add to Dr. Baldwin or Ms. Ruth Brumbaugh, http://entnemdept.ifas.ufl.edu/academics/syllabi/ENY4911_SS2014_Staff.pdf.

Lab Notebook

As you begin your research experience, you need to take detailed notes. From your first meeting with the principle investigator, be sure to make notes of the conversation, the advice for getting started, resources mentioned, the names of other students and graduate students you may be collaborating with, lab locations, etc. You should get a notebook, like a composition notebook, that is dedicated for this purpose. This notebook will be your research journal. Be sure to put your name and contact information on the notebook, and take your notes in pencil. This may seem strange, but in a laboratory environment, your notebook will be in close proximity to liquids that will make the ink run, so keep a pencil handy.

You should have an entry for each day you are working on your project. It is perfectly acceptable to sketch out ideas and list recipes of diets and solutions used in your work. You think you will remember these details, but they can be easily forgotten if you do not write them down. If your supervisor asks you how you made a calculation or how you mixed a solution, you will have the information right where you need it.

When performing research, it is important to be consistent, so remember to take notes and be consistent with your procedures. You should also take photos of your experiment and the equipment you use. These will help you remember details later on, and may add a nice detail to your publication or poster. Have someone take your photo as you perform your experiment so you have that documentation of your research.



As you investigate your research topic, you will want to make a library of resources. As a UF student, you have access to many science journals free of charge. Be sure to be logged into the UF VPN or the UF Library system, <http://uflib.ufl.edu/>, as you are searching. When you find a good reference, take a look at the sources cited to lead you to other resources on that topic. From these references, you can see how others performed their research, how they collected and analyzed their data, and where that data was published. You will gain insight on your research by reading what others have done. Also, pay attention to different ways the authors present their results so you can model your result presentation on previous publications. Good publications that present research data in a way you find easy to understand may be used as guides when you try to write about your own research

1. Materials and Methods

The methods section of your research will be where you begin your writing. From your research notebook entries, you will write out a narrative of the materials and methods for your research. This should be written in the past tense, even if you have not yet completed that part of your research. For a style guide that will guide you on scientific abbreviations, please visit <http://www.entsoc.org/pubs/publish/style>. You should begin writing your methods section the first week of your research experience, and should add to it each week. Once you have this section in draft form, be sure to send a copy to your principle investigator.

Insects – Define what your research organism is, how they are sorted and counted, what the gender and life stage is, how they are handled, and where they were obtained. Rearing details may be important if you are working on an insect that has not been reared before. Citing references on how others have reared your insect may be sufficient in most cases.

Treatments – Detail the chemicals you are using, what the concentration is and how you mixed them. (In your notebook, sketch out how you perform your serial dilutions.) For a video of how to perform a serial dilution to get your needed concentrations for your trials, please visit http://www.youtube.com/watch?v=j4CDcdl_qVA.

Bioassay – Discuss how you combine the insect and treatment to evaluate the performance of the treatment. How are you measuring the results? You should list the response variables here. (Note: When you analyze your data and make the graphs, these will be on the Y axis.)

Answer the following questions.

- How is this an experiment?
- What is the control?
- What is a replicate, and how many replicates do you need to perform?
- What is your experimental design? (Note, many experiments use a randomized complete block design.)

2. Data Collection and Analysis

The second section you will write will be your results section. You should be sure to always keep a back-up copy of all your data. Set up your Gator Cloud account at <http://www.it.ufl.edu/gatorcloud/>. Make your data folder sharable with your principle investigator through Sharepoint Online, <http://www.it.ufl.edu/gatorcloud/>. You may need to explain how this system works to your principle investigator and send your data by e-mail if they do not have access to Sharepoint Online. You should have your notes in your lab notebook, and should also keep a spreadsheet of your data. Visit <http://apps.ufl.edu> to gain access to spreadsheet software as well as statistical software. These are free for UF students. When creating your spreadsheet, you should create columns for each factor of your experiment. For example, you may have a column for gender, age, size, concentration, exposure time, and % mortality. On your poster and in your publication, your data will be presented in a series of graphs and tables.

Speak with your principal investigator to see how they would like the data analyzed. Depending on your project, you may need to schedule an appointment with a statistician. Be sure you can communicate your experimental design, the main effects you are testing and your data collection techniques before scheduling your appointment. You should also invite your principle investigator to attend the session with you. The form for scheduling an appointment can be found at http://ifasstat.ifas.ufl.edu/consultingunit/q_test.shtml. Some experiments will require some basic information like percent mortality, or average time until mortality, but other experiments will require a more detailed analysis. A common analysis for entomology research is the ANOVA, analysis of variance. When looking at two sources of variation, you would perform a two-way ANOVA. You typically use a P-value of .05% showing a 95% certainty that your data demonstrated a change based on your experimental effects and not on chance alone.

3. Discussion

The third section of your research report will be your discussion section. This is the area where you discuss how your data compares with the published data from other researchers. What is the story of your research? What does it add to the body of science? During this section, you will need to have new references. You will not want to repeat references you may have used in your introduction. Your discussion should end with the objectives you wanted to show. These objectives may change as you perform your research, so they can be updated as needed.

4. Introduction and Abstract

This introduction section should provide a good rationale for why your study was important and introduce what you plan to do. This portion of the paper is where you provide relevant background information on the subject, so you will need a list of quality research articles that relate to your experiment. The introduction includes everything a person needs to know in order to understand the research. You may use the UF library services mentioned previously, or try Google Scholar.

The abstract is a brief overview of the entire paper. It basically consists of one to three introductory sentences, a sentence stating your objectives, several sentences discussing

your materials and methods, a short statement of your results then a concluding statement. Although this is one of the first sections in your research report, it is easiest to write this section last, after all of the other sections have been completed.

Completing your paper

Once you have completed the sections of your paper and have it in a journal format (see the ESA Style Guide), submit it to your research supervisor for edits and approval. Once you have a finalized version, your paper can be submitted to a journal for publication. Follow the journal instructions for formatting your graphs, tables and images. Each table and image will need a caption. The publication charges are typically covered by the principal investigator, and the principle investigator should be the contact person for the publication.

Good luck with your research experience.