Academic Manual 2015

University of Florida
Student Science Training Program

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Center for Precollegiate Education & Training,
University of Florida

Formatting

12 point Times New Roman Font, text aligned to justified, and double spaced required. Do not "add space" before or after paragraphs. One inch margins (top, bottom, left, and right). Page numbers required (Title Page is Page 1). No running headers.

Paper Assembly

All research papers are assembled in a specified order for ease of locating information by readers and publishers. Your research paper will be assembled as follows:

- Title Page
- Abstract and Keywords
- Introduction
- Methods
- Results
- Discussion/Conclusion
- Acknowledgements
- Literature Cited
- Tables
- Figures
-

Each section begins with the section name (12 point Times New Roman, text centered aligned, bolded, and italics). The Title Page does not include a heading. Subheadings (12 point New Times Roman, text left aligned, bolded) within each section are recommended to delineate similar topics/methods/etc. Subheadings should reoccur throughout the paper so the reader may follow an individual topic from the introduction to the methods to results to discussion.

Title Page

Each paper must include a Title Page formatted as follows:

TITLE (all caps, 12 point font, center aligned)

Name

Email

High School

Collaborators (in order of their contribution to your learning)

Departmental Affiliation of Collaborators (if different departmental affiliations, use superscripts)

Research Institution

Study Group Leaders Name

Date Submitted

The title should be brief, but informative, hinting at the issue you studied/addressed/had an interested outcome. Use common names instead of scientific names, if appropriate. Scientific names may also be provided if needed for clarification. Remember to use proper conventions for scientific names.

Abstract

The abstract is a summary of your work. It conveys the most important point(s) and outcomes(s). Most readers will decide to read (or not read) your research based upon the abstract.

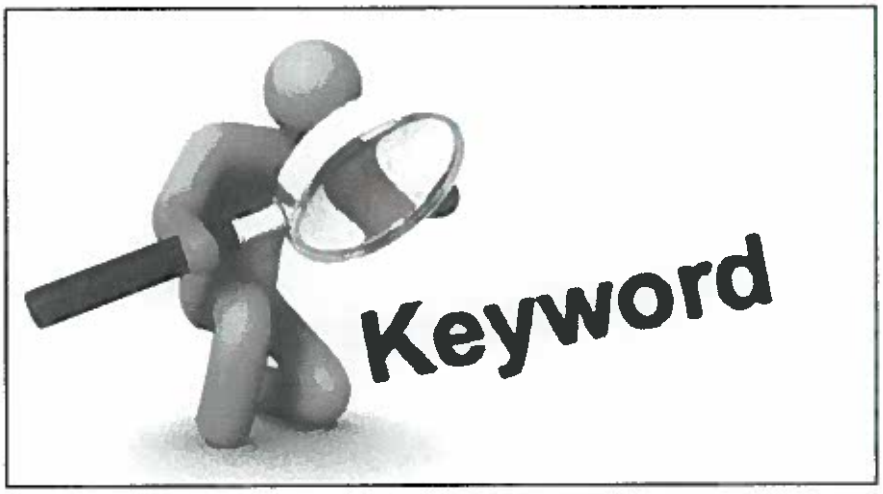
The abstract included in the research paper is formatted differently from the Research Abstract requirement which must also be submitted. See Abstract Format and Guidelines for details on the Research Abstract. The abstract included in the research paper is 250 words, but does not include cited references. No biographical information should be included on the abstract page of the research paper.

The abstract should clearly state the experimental hypothesis (if applicable) or purpose of the work, the most relevant research procedures for the stated hypothesis or purpose, and the most important results/discussion and conclusion(s).

The abstract is written last.

Keywords

Below the Abstract provide five to seven keywords or two to three short phrases which define the work. The key words are different than your title. In scientific databases, keywords help retrieve relevant articles in literature searches. If a search were conducted using your keywords, your paper should be retrieved, therefore keywords should be specific and unique. See peer reviewed scientific journals for examples.



Introduction

Start a new page after your Abstract and Keywords. Write in full paragraphs.

The introduction should bring the reader up to speed on the topic you are studying. Describe the significance of your research and why it's important by reviewing relevant literature and our current knowledge of the problem you are investigating. Introductions typically begin with a broad overview of the topic giving context to your study followed by a narrowing focus to your specific research project. Introductions must be supported by the scientific literature and include thorough citations (see Citations Section below).

The introduction may answers questions such as the following:

- What motivated the study?
- Why is studying this topic important?
- What other studies have been conducted on this topic?
- What do we already know about this topic/
- How has our knowledge of the topic changed over time?

The introduction should lead the reader to the purpose of the research. After reading your introduction, it should be clear why you have asked the research question and, if applicable, made the hypothesis set forth. The introduction must include the **purpose of the study**. The research purpose tells the reader what you hope to accomplish through the study of the selected topic.

Depending upon your field of study, hypotheses may be presented next. As we will learn during SSTP, there are variations to the **Scientific Method** and not all are hypothesis driven. When presenting a hypothesis, be clear and concise. Multiple hypotheses may need to be presented for such clarity. In such cases, you may choose to delineate each hypothesis by numbering or placing each next to a bullet point.

The presentation of the purpose and hypothesis should conclude the introduction.

Suggestions for writing your introductions

Write the introduction at the level which other researchers in your broad field would understand the information. For example, a research paper on fish migration patterns should be able to be understood by the broader ecology community, not just other fish biologist.

Avoid the use of quotes. For the research topics presented in SSTP, no one should be in a field where the use of quotes or retyping entire segments of literature is a standard practice.

Be careful and mindful about plagiarism. Different standards of plagiarism exist throughout different cultures. For the US scientific community, any direct copying of another person's intellectual property is plagiarism. Changing a word or two in a sentence is still copying. Presenting someone else's work or ideas without proper citations is plagiarism. Plagiarism is unethical and unprofessional. It is suggested to take notes and resynthesize the material in its entirety into your own words, remembering to give credit to the original sources through citations.

The introduction is not an anthology of all the work ever done on your topic, although scientists new to a research field may find it helpful to write these longer literature reviews. Many SSTP participants may also write a literature review for inclusion in an IB extended essay (if allowed by your school and lab) or other high school academic requirement. (if allowed by your school and lab). If you choose to write a literature review, please keep in mind that the literature review will need to edit down to a research paper introduction before submitting it to your study group leader.

Citations

Be sure to include adequate and appropriate citations as all of your statements must be verifiable. References need to be from peer-reviewed publications in the primary literature (that is, from scientific journals; not websites like Wikipedia or a lab manual). If your statement is common knowledge in the field and uncontroversial, then you may cite a reference material (e.g., a review article or textbook).

Do not quote directly from the articles. Paraphrase and summarize. Do not plagiarize, plagiarism is unprofessional and unethical.

You also don't want your in-text citations to take away from the flow of reading your paper. If you're citing the same paper for a whole paragraph, just include the citation at the beginning or the end (but be sure to be consistent throughout your paper).

When in doubt, use your best judgment.

Some general rules:

- If there are more than two authors, use "*et al.*" which is a fancy way of saying "& co" ("& company"). It's Latin, so italicized, and an abbreviation.
- If there are exactly two authors, separate last names with "&" if cited parenthetically and "and" if cited in the text.
    - Albert and Alberta (1925) found that it is great to be a Florida Gator.
    - It is great to be a Florida Gator (Albert & Alberta 1925).
- When citing multiple articles in the same parenthetical citation, papers should be in chronological order by publication year, then alphabetical order by first author last name.
- Cite the scientific paper directly after you make reference to it

Here are some examples demonstrating proper in-text citation conventions in the biological sciences (taken from He & Silliman 2015):

> It is known that due to cold climates and short growing seasons at higher latitudes, soil nutrient availability and plant root nutrient uptake (as well as plant photosynthetic carbon gain) decrease with increasing latitude (Reich & Oleksyn 2004). To what extent might latitudinal gradients explain site–site variation in the impact of eutrophication? Three meta-analyses (Elser et al. 2007; LeBauer & Treseder 2008; Xia & Wan 2008) have explored this question, but have focused on only plants, despite the fact that nutrient enrichment, by altering plant quality, has long been known to affect herbivory (Price 1991).

Methods

Write in full paragraphs. DO NOT include a list of materials. Describe the experimental design clearly and logically. The methods are written in past tense, unless the experiment has not yet been conducted. The author may use active or passive voice; follow the convention of your area of science. If using active voice be mindful of the overuse of "I."

Review the methods sections of common peer reviewed journals in your field. Model your methods section after these established conventions.

Suggestions for writing your methods clearly and concisely

The methods do not necessarily need to be described chronologically as the experiments were conducted. Instead group elements of the experimental design under cohesive subheadings.

State the statistical tests in the methods.

Remember to include relevant specifics such as weights, temperatures, durations, volumes, and concentrations. Provide enough information for the reader to evaluate how well the experimental design tests the hypothesis or meets the research objective and for a future researcher to repeat the experiment.

Avoid describing details which only have meaning to you. For example, "Sample 1, Sample 2, and Sample 3 were exposed to Test A light." provides details only meaningful to the author. In contrast, "The 50 mL dilution, 100 mL dilution, and 200 mL dilution were exposed to a full sunlight for 1 hour." provides information the reader may evaluate and future researchers may repeat.

Be mindful of the level of description for specific methods. For example, "Samples were dried at 40°C for 72 hours." is enough detail for an experienced researcher to repeat this step. Compared to this sentence which includes too much detail, "Turn on the drying oven, adjust the knob to 40°C, wait 4 hours for the drying oven to reach and maintain drying temperature, open the drying oven door, place samples in the drying oven, close the drying oven door and ensure a good seal to minimize heat loss, and set the timer for 72 hours."

Do not "cut and paste" methods from a text book or laboratory manual. Instead use a cited reference to refer back to the source of the method and include specifics for your experiment, such as the volume, concentration, specific vector, or organism studied.

Diagrams (which are considered Figures) for novel or uncommon apparatuses or procedures may be included.

Results

Write in full paragraphs. There should be a one-to-one relationship between methods and results. Each method should have a result and there should not be any results for which there was not a method. The results are written in the past tense. The author may use active or passive voice; follow the convention of your area of science.

If all methods have not yet been tested, then simply state anticipated test dates. Preliminary data may also be included. Anticipated data may be described. For example, "It is anticipated that the sweet pea germination study will result in growth rates similar to those of the lima bean study." Never make up data.

You should simply report your results here – trends, confidence intervals, etc. **DO NOT DISCUSS YOUR RESULTS** – that is what your discussion is for. When summarizing your results be sure to refer to your tables and/or figures appropriately. Be as specific but as descriptive and interesting as possible. It's best to keep references to tables and figures parenthetical. See scientific papers in your field for examples. Get more guidance from your lab.

If you don't have any results, which is entirely possible, hypothesize one what you would expect here, reporting anticipated results.

Suggestions for writing your results

Report the results in the same order as the methods and use the same subheadings for easy flow.

The results are "just the facts." Avoid interpreting or analyzing the results in this section. Do not refer back to the literature in the results section (save for the discussion).

Avoid listing raw data and do not write out every result; instead report magnitude, directionality, and significant differences. For example, "Control group individuals were 30% larger than individuals adhering to the calorie restricted diet." Use figures and tables to organize the data logically (see Tables and Figures Section below). Refer to the figures and tables in the text.

Report statistical results parenthetically (test name, p-value) in conjunction with the biological, physical, or chemical results they support. For examples, "Males averaged 10.6 cm taller than females in the senior year class of chemistry students (two-sample t-test, t-5.78, 33 df, $p<0.001$; Fig 1)." Avoid whole sentences to reporting statistical analysis outcomes.

Report the units of all measurements. Keep units consistent. Write the unit of measurement after the numerical value(s). For example, "lengths of 5, 10, 15, and 20 m" or "no differences were observed between 2, 4, 6, and 8 min of incubation."

Avoid the overuse of the word "significant".

Discussion and Conclusion

Write in full paragraphs. State if the data supported the hypothesis or meet the objective of the research; support and explain with examples from the results. Active voice is preferred, but follow the convention of your area of science and avoid the over use of "I."

In the discussion/conclusion section, provide an interpretation of your results and give support to all of your conclusions. All significant findings should be included. Explore the theoretical and/or practical implications of your findings. If possible, relate your results to earlier findings. Explain future research and any modifications that could be done to the experiment to aid future findings.

If your data hasn't been collected yet, you may discuss possible/anticipated results. These should be presented in prose.

Suggestions for writing your discussion

Acknowledge any anomalous data or deviations from what you expected. While research error or equipment malfunctions may be a source these results, explore other reasons the results were different than anticipated. It is also okay to acknowledge that you may have done something differently. Propose future work. You do not need to account for all the data in the discussion.

Use reference citations when referring to other work.

Avoid the overuse of "proved", "disproved", "truth", "correct", and "incorrect". Instead use "supported", "indicated", or "suggested".

Show the reader the evidence. How did you get from point A to point B in your discussion or conclusion?

Avoid restating the results. It is okay to remind the reader; for example "The decrease in BMI of the calorie restricted group indicates a diet alone may be enough for some people to lose weight which contradicts previous studies where exercise was concluded to be the primary source of weight loss (Smith and Roberts, 2008; Jones, 2010; and Small, 2013)."

Example of Results vs. Discussion

Results: Soaking seeds had an effect on the germination rate of lima beans (Fig 1). The germination rate of seeds soaked in room temperature water for three days was the highest (92%) which was twice the germination rate of seeds soaked for 1 day; and three times that of the seeds soaked for 5 days and the control group which were not soaked.

Discussion: The results of the lima bean germination experiment (Fig. 1) suggest that the optimal duration for soaking seeds is 3 days. This group showed the highest cumulative germination (92%), with longer (5 d) or shorter (1 d) exposures resulting in fewer seeds germinating. *From here the author may talk about biologically why the three day treatment was the optimal soaking duration and/or how this experiment has applications beyond research, such as in farming. New hypothesis and further work may also be discussed.*

Acknowledgments

Here you thank those who assisted you in your research, helped you in lab, trained you, and gave feedback on earlier drafts of your research paper. If you're here on financial aid, please indicate source of aid. Also indicate source of funding for your research study. Begin this on a new page.

Works Cited

Begin this on a new page. We encourage you to use RefWorks, which you will be familiarized with after your library orientation on the first Monday of the program. Otherwise, if you have any questions, see below for examples, look for citations in scientific papers in your field, or ask. Indent each line after first line of each citation. Your citations should be in alphabetical order by first author's last name.

One Author

Last name, First initial. Second initial. Year published. Title. Journal Title **volume number**:pages.

Price, P.W. (1991). The plant vigor hypothesis and herbivore attack. *Oikos*, **62**, 244–251.

Two to Six Authors

Last name, First initial. Second initial., Last name, First initial. Second initial. Year published. Title. Journal title **volume number**:papes.

He, Q. & Silliman, B.R. (2015). Biogeographic consequences of nutrient enrichment for plant-herbivore interactions in coastal wetlands. *Ecology Letters* **18**: 462-471.

LeBauer, D.S. & Treseder, K.K. (2008). Nitrogen limitation of net primary productivity in terrestrial ecosystems is globally distributed.*Ecology*, **89**, 371–379.

Reich, P.B. & Oleksyn, J. (2004). Global patterns of plant leaf N and P in relation to temperature and latitude. *Proc. Natl Acad. Sci. USA*.**101**, 11001–11006.

Schuur, E., Mayor, J., Mack, M., Osenberg, C., & Silliman, B. (2011). General Ecology Laboratory Manual. *PCB 4043*(Fall 2011).

Xia, J. & Wan, S. (2008). Global response patterns of terrestrial plant species to nitrogen addition. *New Phytol.*, **179**, 428–439.

Seven or More Authors

List first six authors (see above), then *et al.* before publication year.

Elser, J.J., Bracken, M.E., Cleland, E.E., Gruner, D.S., Harpole, W.S., Hillebrand, H. *et al.* (2007). Global analysis of nitrogen and phosphorus limitation of primary producers in freshwater, marine and terrestrial ecosystems. *Ecol Lett.*, **10**, 1135–1142.

Tables & Figures

Each of these gets its own page, presented in order in which they appear in your text (Table 1, Table 2, Figure 1, Figure 2, e.g.). Each table and figure should include a brief but informative caption using complete sentences. Each caption should have sufficient information so that someone could more or less understand your table and/or figure without necessarily reading your text. Table captions should be before the table; figure captions should be below the figure. Figure captions should explain what is plotted and should include statistical analysis.

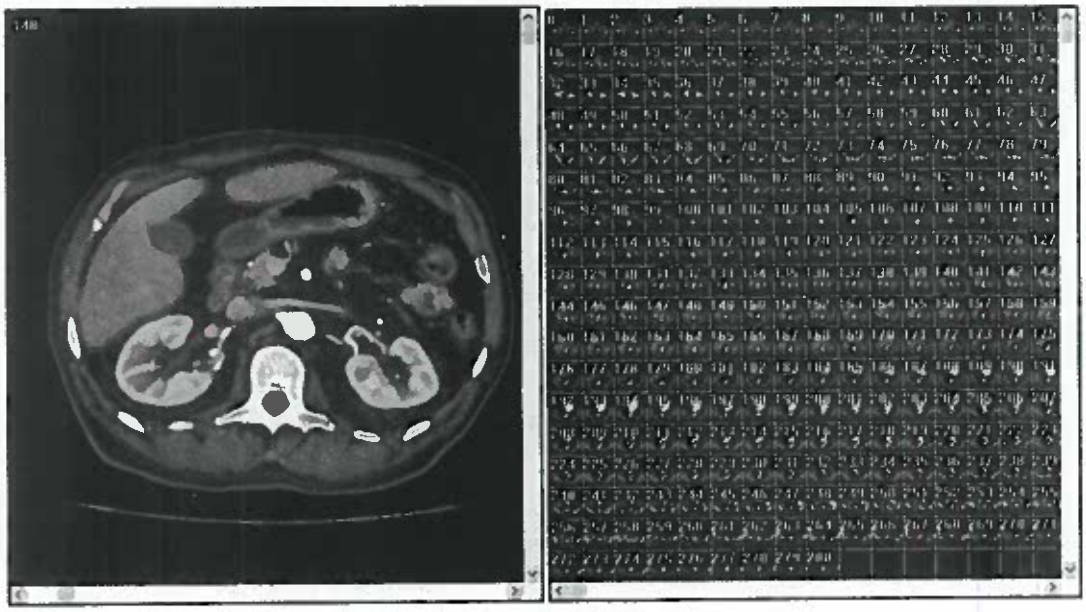


Figure 1: Screenshot from 3-D Doctor of the segmentations of a pediatric patient's internal organ from computed tomography scans.

These are figures form Sean McKenna 2007 UF SSTP Research Paper. He used 3-D Doctor to calculate the volumes of pediatric patients' internal organs to determine the optimal radiation dosage necessary to get clear images from CT scans.

Sample Title Page

YOUR REALLY AWESOME & INFORMATIVE

BUT BRIEF TITLE

A research paper submitted in partial fulfillment of the requirements for completion of the University of Florida Student Science Training Program

Albert E. Gator

Your Email

Your High School

Research advisors: (probably grad student, lab host)

(Departmental Affiliation)

University of Florida

Counselor: (First Name Last Name)

Center for Precollegiate Education & Training

University of Florida

Submitted: (day Month year)

Useful Resources

The Science of Scientific Writing

http://www.americanscientist.org/issues/feature/the-science-of-scientific-writing/1

Commonly Misused Words

http://web.mit.edu/jrickert/www/writedoc.html

Writing Hints

http://people.biology.ufl.edu/osenberg/courses/pcb4044/2001spring/lab/writinghints.pdf

Writing Research Papers in Experimental Biosciences

http://www.ruf.rice.edu/~bioslabs/tools/report/reportform.html

Writing Good Software Engineering Research Papers

http://www.cs.cmu.edu/~Compose/shaw-icse03.pdf

Engineering Report Writing

https://www.ocf.berkeley.edu/~anandk/math191/Technical%20Writing.pdf

Stand Alone Abstract

Table of Contents

Due Dates

Abstract Draft (Bring Hard Copy to Study Group Leader) – Sunday, July 19, 2015

Abstract Final (Bring Hard Copy to Study Group Leader) – Wednesday, July 22, 2015

Guidelines

An abstract is a brief, comprehensive summary of the contents of the article; it allows readers to survey the contents of an article quickly, and like a title, is used by abstracting and information services to index and retrieve articles.

The final research paper will include an abstract (double spaced and same format as the final paper). Additionally, students will submit a standalone abstract which **MUST** be formatted according to the Sample Abstract. The maximum length of the abstract is 250 words, and is typically one or two paragraphs. The standalone abstract and reference list must fit on one single page.

The standalone abstract is single spaced. The reference list is also single-spaced, arranged in alphabetical order and double-spaced between entries. Your reference list may include up to three reviewed articles from current journal literature. Students are encouraged to use the reference format most readily accepted by his or her field of student (for example, APA Style).

Qualities of a Good Abstract

Here is a list of thing that makes a good abstract:

- It reflects the purpose and content of the manuscript correctly. Do not include information that does not appear in the body of the paper. Comparing an abstract with an outline of the paper's headings is a useful way to verify the accuracy of an abstract.

- It defines all abbreviations and acronyms. Spell out names of tests and drugs (use generic names for drugs). Define unique terms. Paraphrase rather than quote. Include names of authors and dates of publication in citations of other publications (and give a full bibliographic citation in the abstract's reference list). Include key words for indexing purposes.

- It makes each sentence maximally informative, especially the lead sentence. Be as brief as possible.

- It reports rather than evaluates. Do not add to or comment on what is in the body of the manuscript.

- It contains clear and vigorous prose. Use verbs rather than the noun equivalents and active rather than passive voice. Use the present tense to describe results with continuing applicability or conclusions drawn. Use the past tense to describe specific variables manipulated or tests applied.

Sample Abstract

Name: Student, Sandra K.
High School: Rydell High School, Gainesville, FL 34786
Research Advisor: Dr. Monty A. Taylor, University of Florida, Gainesville
Research Site: Department of Molecular Biology and Microbiology, University of Florida, Gainesville

Title: Angiotensin II-NADPH oxidase-derived superoxide mediates diabetes-attenuated cell excitability of aortic baroreceptor neurons.

Body: Overactivation of hyperpolarization-activated cyclic nucleotide-gated (HCN) channels is involved in diabetes-depressed excitability of aortic baroreceptor neurons in nodose ganglia. This involvement links to the autonomic dysfunction associated with high morbidity and mortality in diabetic patients. The present study examined the effects of an angiotensin II type I receptor (AT(1)R) antagonist (losartan), a NADPH oxidase inhibitor (apocynin), and a superoxide dismutase mimetic (tempol) on the enhanced HCN currents and attenuated cell excitability in diabetic nodose neurons. In sham and streptozotocin-induced type 1 diabetic rats, HCN currents and cell excitability of aortic baroreceptor neurons were recorded by the whole cell patch-clamp technique. The angiotensin II level in nodose ganglia from diabetic rats was higher than that from sham rats (101.6 ± 4.8 vs. 38.9 ± 4.2 pg/mg protein, $p<0.05$). Single-cell RT-PCR, western blot, immunofluorescence staining, and chemiluminescence data showed that mRNA and protein expression of AT1R, protein expression of NADPH oxidase components, and superoxide production in nodose neurons were increased in diabetic rats as compared with those from sham rats. HCN current density was higher and cell excitability was lower in aortic baroreceptor neurons from diabetic rats than that from sham rats. Losartan (1 μM), apocynin (100 μM), and tempol (1 mM) normalized the enhanced HCN current density and increased the cell excitability in the aortic baroreceptor neurons of diabetic rats. These findings suggest that endogenous angiotensin II-NADPH oxidase-superoxide signaling contributes to the enhanced HCN currents and the depressed cell excitation in the aortic baroreceptor neurons of diabetic rats.

Reference List

Baudin, B. (2008, July 06). Proteomics of human umbilical vein endothelial cells. Retrieved June 26, 2008,
from Proteomics of Human Umbilical Vein Endothelial Cells

Varagie, J., Trask, A.J., Jessup, J.A., Chappell, M.C., & Ferrario, C.M. (2008). New angiotensins. J Mol Med. 86, 663-671.

Zelazko, M., Chrzanowska, J., & Polanowski, A. (2008). Pancreatic proteolytic enzymes of ostrich purified on
immobilized protein inhibitors. Characterization of a new form of chymotrypsin (Chtr1). Department of Animal Products Technology and Quality Management, Wrocław University of Environmental and Life Science, C.K. Norwida. 25/27, 50-375.

*** Do not re-type the words in bold italics.***