OPTION II: Experiment-Based Research Project

Overview
The Science Research Project option allows you to choose a topic of interest to you that can be approached in a scientific way. This option combines academic research with the hands-on application of a project. This option includes four separate but interrelated elements: a research paper, a project, an oral presentation, and a process log.

If you elect to do an experiment based research project you must use scientific methods to answer a question or test a hypothesis. If your interest is in a direct field of science it is highly recommended that you secure an advisor from the science department. An advisor outside of the science department that is well versed in your subject matter and willing to make sure you are adhering to scientific methods can be used.

Research Journal

1. A Research Journal is a systematic record, usually written, that is kept by a researcher for the purpose of observing and reflecting on phenomena relevant to the research study. This method is used to document spontaneously occurring events or those connected with the day to day experience of the researcher. You will maintain an electronic research journal that documents your research project in detail, i.e., day-to-day or week-to-week procedures, treatments, observations, etc. Note the research journal is a major component of the course grade.

   Example:
   8/2/21 09:00-12:00
   Worked at the UWSP library researching Ranoidea caerulea habitat. Read and took notes from:
   https://nas.er.usgs.gov/queries/factsheet.aspx?SpeciesID=2276
   Website had information on non-aquatic species prevalence of non-native amphibians such as the White's Tree Frogs. Basic information for the United States on the species. Minor help in the total research project, other sources will be more useful for the overall project.

   9/7/21 21:00-22:30
   Checked on frogs in the lab today. Performed routine maintenance on tanks, weighed and measured animals and recorded in data table 3.4 of journal. #01 has gained a substantial amount of weight but #03 receiving the same treatment has not seen a similar increase in mass. I suspect there is a parasite potentially introduced from the food source as I had to supplement the supplier due to shipping issues.

2. You may keep this log on a computer and print out the pages or you may keep a written log. If written, periodic uploads of progress will be required.

3. When you meet with your advisor in September, your advisor will check over your log to see what additional progress you have made by that date.

4. You will turn in your log along with your journal publication and project evidence on **Tuesday, November 22.** Failure to keep and turn in a Research Journal log will result in a one-step reduction in your grade (e.g. from an A to an A-).

Journal Publication

After selecting a topic of interest, and conducting some preliminary research, you will narrow the subject to a specific issue or question that you will research. The research paper presents the findings of that research. ***Please note that the paper is not a description of the project, nor is it simply a collection of information.*** It begins with a focus question or hypothesis that is then supported by the body of the paper. The following guidelines apply to the journal publication:

1. The publication must be based on research and results of your chosen topic. The process of your project may be a minor part of the research paper, ***however the total paper is not a description of your project.***

2. A minimum of four scholarly resources must be used and cited. You must also include one mentor interview as a resource. Only academically sound resources are acceptable. Encyclopedias and "wikis" (either hard copy or computer/Internet based) are not appropriate resources at this level. You are strongly advised to consult with your advisor early in the process to ensure that resources are acceptable.**Internet Sources**: Peer-reviewed academic journal articles that are accessed online will satisfy this requirement if they are full-text. Abstracts or summaries will not count. Make sure you clear use with your advisor just to be sure.

3. Research must be documented through the use of an annotated bibliography (minimum of 4 annotations).

4. Progress meeting with your advisor should occur on or before **September 16, 2022 –** at that time, your annotated bibliography and research notes are due. Your advisor will also review your process log at this time. The log and notes should demonstrate that substantial research has been completed. Regular consultation with your advisor throughout the fall semester is highly recommended.

5. Before you actually begin to write your paper, you are required to develop a working outline. You must meet with your advisor to review/discuss your outline before beginning to actually write the research paper. Bring both your outline and your annotated bibliography to this meeting. The deadline for this meeting is no later than **September 30, 2022 .**

6. The minimum length is eight (8) pages, double-spaced, one-inch margins, using Times New Roman 12 point font, author-date in paper citations - CSE style. Graphs, charts, tables, illustrations, etc. are not included in the minimum length

(and must be included as appendices if used). For details on layout and documentation see; **Purdue OWL**. Link to the Council of Science Editors, UW Madison Writing Center, and Scientific Style and Format Online, are all available as well as a hard copy in the biology room. A title page, outline, works-cited page, and annotated bibliography are required, but are not included in the page minimum

7. A transcript of at least one mentor interview must be used as a source, properly cited, and included as an appendix to the research paper. Your transcript should demonstrate that you conducted a substantial interview (minimum 10 questions). Include the questions asked and the mentor's responses. Also include information regarding the academic qualifications of your mentor.

8. You are highly encouraged to consult regularly with your advisor regarding the progress of your paper. Your advisor is there to assist you, but will not be tracking you down. This is a student directed learning experience; therefore you will need to take the initiative to schedule consultations with your advisor. You are responsible for meeting all deadlines; your advisor will not be reminding you. The completed paper and all experimental results are due to your adviser on **Tuesday, November 22nd, 2022** this will count for the largest portion of the total grade. **50 points will be deducted for each day the paper is late.**

Journal Publication Format

Develop a publication (Abstract, Introduction, Methods and Materials, Results, Discussion, and Literature Cited) for your research project appropriate for a biology education journal or magazine. Please use the following format for the research publication:

1. Abstract – The abstract succinctly and accurately summarizes a publication so that readers can easily evaluate the usefulness of the paper. Normally one to two paragraphs in length, an abstract should include the purpose, methods, findings, conclusions, and recommendations of the research while following the chronology of the paper;

2. Introduction – The Introduction establishes the scope, context, and significance of the research being conducted by summarizing current understanding and background information about the topic, by stating the purpose of the work in the form of the research problem supported by a hypothesis or a set of questions, by explaining briefly the methodological approach used to examine the research problem, highlighting the potential outcomes your study can reveal, and by outlining the remaining structure and organization of the paper (parts of your research proposal may be used in the Introduction and Methods and Materials).

3. Thesis Statement – The thesis statement usually appears at the end of the introductory paragraph of a paper, and it offers a concise summary of the main purpose of the research paper;

4. Method and Materials – This section is a clear and precise description of how an experiment was done, and the rationale for why specific experimental

procedures were chosen. Methods and Materials should describe the materials used in the study, explain how the materials were prepared for the study, describe the research protocol, explain how measurements were made and what calculations were performed, and state which statistical tests were done to analyze the data;

5. Results – The results section is where you report the findings of your study based upon the methodology you applied to gather information. The results section should state the findings of the research arranged in a logical sequence without bias or interpretation. The Results section should be organized around Tables and/or Figures that should be sequenced to present your key findings in a logical order;

6. Discussion – The purpose of the Discussion is to state your interpretations and opinions, explain the implications of your findings, and make suggestions for future research. Its main function is to answer the questions posed in the Introduction, explain how the results support the answers and, how the answers fit in with existing knowledge on the topic. The Discussion is considered the heart of the paper. Organize the Discussion from the specific to the general: your findings to the literature, to theory, to practice. Begin by re-stating the hypothesis you were testing and answering the questions posed in the introduction. Discuss any unexpected findings. When discussing an unexpected finding, begin the paragraph with the finding and then describe it. Identify potential limitations and weaknesses and comment on the relative importance of these to your interpretation of the results and how they may affect the validity of the findings. Provide recommendations (no more than two) for further research.

7. Literature Cited – Here you should provide an alphabetical listing of all the published work you actually cited in the text of the paper. This does not mean every article you found in your research**; only include the works you actually cited in the text of your paper.**

Oral Presentation

You will present <u>what you did</u> and <u>what you learned</u> to an audience of underclassmen, faculty and parents.

1. Your presentation is required to last 12 to 15 minutes. You should provide a clear explanation of your project and your research. Evaluation criteria include the degree to which you demonstrate understanding of the material, completeness, and whether the presentation reflects a semester of work.

2. Your presentation will be followed by 5 minutes of questions from the evaluators and the audience. Your ability to answer these questions will be included in the grade.

3. Use of visual aids will also be part of the presentation grade. Visual aids will be evaluated based on quality, clarity, appearance, usefulness and the degree to which they enhance your presentation. A powerpoint presentation is recommended but not required. Poster style visual aids may be electronic or printed, but must follow size requirements of no smaller than 3'x4' (trifold) and no larger than 4'x8' if not electronic. See samples for more information on creating a poster presentation.

4. If you will use a powerpoint presentation or need other technology you must let your advisor know. Be sure it is tested in your presentation room by **December 7, 2022** Presentations will be given on **Friday, December 9, 2022.**

5. The presentation and how you respond to questions is a part of your total grade.

*******You are strongly encouraged to practice your presentations ahead of time, refining your speaking skills and assuring that your presentation fits within the time limit. You are also encouraged to dress professionally.

***While you are working on your project and your research, think in terms of your oral presentation: How will I explain this to an audience? Do I need to videotape or photograph any of the process? What visual and/or physical data will I need to show?

Evaluation

Your research paper, inference data, analysis and presentation will be evaluated by a committee of three faculty members including your advisor. Your actual project will be evaluated by your advisor alone. Criteria for evaluating the project vary depending on the nature of the project and must be established by you and advisor. You will also be assessed points to reflect your responsibility, attitude, progress, and contact with your advisor.