

Experimental Design Project Spring 2023

Students will design and carry out their own semester long project. Possible projects should fall under the main themes within BIO 181 – Ecology, Evolution, and Biodiversity. Students will need to provide their own materials, but are not expected to design experiments that require extensive purchases.

You can use the following resource, *How Science Works*, to build your experimental design project over time:

<https://undsci.berkeley.edu/interactive/#/intro/1>

Choose “Standard” and then “Intro”

Important Due Dates:

- **Topic choice Sept. Jan. 30-Feb. 3 (Discuss in Lab 2 Week 1 and part of Post-Lab).**
- Submit your completed initial experimental design - Lab 2-week 2 Pre-Lab **Feb. 6-10.**
- Final proposal and design to your TA - Lab 2 week 2 Post-Lab **Feb. 8-12** (finalize and turn in within 48 hours of lab where your initial idea will be peer reviewed incorporate feedback).
- TAs return graded Final Projects/approval **by the next week – Feb. 13-17**, so students can gather materials. Students need to start ASAP. TA Approval is important for safety and experimental design soundness/rigor. *Unapproved Projects will not be graded.*
- Set up and start data collection **Feb. 20-24 or Feb. 27-Mar. 3.** You will need to consider what to do over Spring break (work this into your plan). Plan on 4-5 weeks of data collection.
- Progress Report - Methods Section and Initial data tables(s)/graph(s). **Apr. 10-14.**
- *5-10 minute* Recorded Presentation (Zoom or other platform) to your TA of the Abstract, Introduction, Methods, Results, Discussion, Conclusion and References sections **Apr. 24th 11:509PM (same due date for ALL students). *Must include audio and video, visuals in a ppt or other presentation medium and refer to at least 2 primary literature sources. Include url link and passcode on title slide for your presentation.***

Possible Project Topics – Some ideas to get you started: (you will need to take Spring weather conditions into account in selecting and designing your experiment)

- I. Plant Experiments (in nature or growing in containers indoors and/or outdoors)
 - A. Monitor the growth and development (leaves and flowers) of a species under different growing conditions (alter soil type, nutrients, soil additives, light, water/rain, indoors vs outdoors, location...).
 - B. Monitor the growth and development of 2 or 3 species under the same growing conditions (trees, shrubs, perennials, annuals, seeds...).
 - C. Competition/inhibition between plants (with seeds/seedlings chemical and/or density studies over time)
 - D. Effects of chemical runoff (such as salts, detergents...) on seedling growth, lawns, soil biota.

II. Animal Experiments (invertebrates and vertebrates) - *no animals should be harmed or fed inappropriate foods or chemicals, should not touch wild or domestic animals.*

A. Behavior

1. Observations of behaviors between same species or different species.
 - a. This can also be from wildlife webcams at zoos, nature preserves, etc. (you will have to design your own observation protocols).

B. Feeding

1. Foraging and food consumption patterns at different times of the day, temperatures, light, weather...
2. Food type, food preference or/or presentation
3. Natural deterrents or attractants

C. Invertebrate experiments

- a. Aquaria or terrariums
- b. Field studies, e.g., snails, earthworms, aquatic organisms

III. Plant/Animal/Fungal interactions

- A. Monitor plant and animal interactions (visits, pollination, consumption, housing (nests), # of species, activity...)
- B. Monitor fungal and animal interactions (visits, consumption, # of species...)
- C. Assess proximity of plant and fungal growth

IV. Fungal Observations

- A. Assess diversity over time
- B. Growth (monitor growth and equate to rainfall/water, temperature...)
- C. Equate to rainfall/moisture
- D. Lichen observations growth locations (growth forms, height on surfaces, sun, shade, north/south/east/west sides of trees, proximity to road, businesses, pollution...)
- E. Fungal growth on food sources (be careful these are not consumed and kept in a safe location).

V. Habitat Comparison

- A. Compare the flora and/or fauna at 2 or 3 different locations and/or under different conditions.
- B. Compare organisms found in different habitats (forest, fields, lawns, streambeds, rural vs urban, soil types, streambed, disturbed/construction areas, response to weather conditions...)

Data collection tips:

Keep in mind the need for replicates and the amount of data collection needed for a robust study when planning your experiments. Think of what you can realistically quantify in your experiment

Always note temperature, weather conditions, time of day, date and sampling location as you plan your experiment. Keep everything consistent. For example, if studying behavior, always

record measurements at the same time of the day unless time of the day is a treatment. Be consistent with appropriate length of time for observations. Follow all of the experimental design and process of science knowledge you gain in lab and in class.

Library Tutorial: *Use the Library Tutorial Assignment due during Lab 2 Week 2 to search for primary and secondary literature sources related to your chosen experimental design topic. These references can help you design your experiment and/or interpret your results. You should use at least 2 primary literature sources in discussing the background of your project and/or results in the final presentation.*