

Senior Research Project in Biology

Senior Research Projects will fulfill the senior studies requirement, or capstone, for the Biology major. In addition, a senior research project fulfills the FFC "Experiential Learning" requirement. Senior Research Projects *are not* the same as senior theses, as they do not require a thesis committee and generally require less writing, though often require as much research.

The senior research project typically starts during the summer before the senior year and continues for two credits of BIOL 493 in the senior year. Such timing must be agreed upon by the overseeing research advisor and the department chair (or if the advisor is also the department chair, then by another senior member of the department). One credit of BIOL 493 is typically 160 hours over a semester.

In the event that completion of a senior research project is not possible, a discussion between the research advisor and the student will occur before the withdrawal deadline from the BIOL 493 credit so that the student may successfully withdraw and register to take a senior seminar in the next semester.

To successfully complete the senior research project, the following items (the independent research paper and the oral presentation) must be completed with the research advisor's satisfaction.

1. Independent Research Paper

Submit an independent research report to your research advisor:

- a. An introduction that sufficiently describes the background, gap in literature, and aims of the research.
- b. A methods section with enough detail that an undergraduate familiar with the techniques could reproduce.
- c. A results section that describes at least one research objective, experiment to test that aim, an expected result or experimental rationale, a result, and a conclusion from that result.
- d. At least one stand-alone figure that can be understood without reference to the text.
- e. A discussion section that connects the evidence presented in results with the research conclusion, in context of the broader field. This should also describe the experimental limitations and sources of error, and multiple possible interpretations of the results, if appropriate.
- f. A future directions section that proposes new research based on the results of the independent work.
- g. References from peer-reviewed scientific journals in the correct style (decided with your research advisor).

- h. Publication of the article in an undergraduate journal is encouraged although not required (e.g. Eukaryon).

2. Oral Presentation

Present a public oral presentation on the research. This can be a poster presentation or seminar-style presentation with slides, or an undergraduate symposium (e.g. the student symposium) or a regional/national research conference. The required elements of a public presentation are the same as the elements described above for the independent research paper, but are made appropriate for that medium. The student must also be prepared to adequately address questions from the public.

3. Completion

In all cases, the research advisor evaluates whether the oral presentation and research paper meet all the criteria described above. If a student fails to meet the criteria (does not complete a research paper and oral presentation), they will not receive a passing grade for BIOL 493 and the work will not count towards the senior capstone.

FAQs

How many experiments are necessary for a Senior Research Project?

Research progresses in different ways in different areas of biology. In some cases, a senior research project might be based upon a single main result, whereas in other cases, several related experiments may contribute to the conclusions of the project. Students and research advisors should plan the scope of the laboratory work carefully to ensure that enough time is allowed to write and present the project.

How long is a Senior Research Project written paper?

There is no set answer. *Unlike a thesis*, which may comprise as few as 30 or as many as 80 or more pages of text, references, figures, and tables, a *senior research project* is intended to be more streamlined, and closer to the length of a journal article or a senior seminar paper in a course. A written work should always be only as long as is necessary to communicate what the author intends. It will be essential for you to start writing early and to practice good time management as the writing *often takes more time than most students anticipate*. Look to the writing assignment above to guide your paper and discuss an appropriate writing and revision schedule with your research advisor.

Where can I give my required Oral Presentation?

There are many venue options for a public oral presentation of the research project. Ideally, the public presentation will occur during the spring semester at Student Symposium or during the fall semester at the Glassman Symposium. Students and their research advisors can also schedule an alternate venue for the public presentation such as a national or regional research conference in your field. Please note that the deadlines to sign up for these presentations are often months before the date of the talk.

What is a Senior Research Project Advisor and how do I obtain one?

A senior research project requires one Lake Forest College Biology faculty member to serve as the project advisor. On rare occasions, a faculty member from another major could serve as an advisor, contingent on approval by Biology department. The advisor's primary role is to mentor the student in conducting the research, analyzing the results, and producing the oral presentation and research paper. Although faculty members are *not* obligated to serve as project advisors, many are willing to take on the role of advisor when they are confident in the student's ability to successfully complete the project. Potential advisors may consider the student's academic record, previous laboratory experience, and strength of the research plan, as well as by student progress at a variety of deadlines.

A senior research project also might originate from research conducted off campus, such as from the laboratory of an RFU faculty member. In these cases, the off-campus research advisor *cannot* serve as the official senior research project advisor. Instead, a Lake Forest College faculty member must serve as the project advisor.

How do I ensure that my Senior Research Project is on track? What happens if I have not made enough progress?

To ensure that senior research project students are on track to graduate, the student's advisor should formally evaluate the progress in the fall semester and determine whether the project should move forward. In the absence of sufficient progress, the project advisor will recommend that the project be discontinued and that the student sign up for a spring semester senior seminar to fulfill the senior studies requirement.

When does the Senior Research Project need to be finished?

The Biology department has a deadline three weeks prior to the last day of classes to turn in completed drafts of their senior research project paper to their research advisors. However, some advisors will expect a completed draft before this time, or a series of drafts of sections of the written document to determine sufficient progress is being made prior to the program's deadline. The oral presentation is often delivered earlier and depends on the forum that the student and advisor have agreed upon.

Can I earn honors in the major after successfully completing a Senior Research Project?

No. College rules state that honors in the major will be awarded to students who complete a senior *thesis* and also attain a GPA of 3.5 or higher in the major. Senior research projects are not eligible for this honor.

I am a double major in BIOL and NEUR. Will a senior research project done in a biology lab satisfy the senior studies requirements in both majors?

Yes, but the full summer followed by two 493 credits must be completed, one as BIOL 493 and one as NEUR 493. If at the end of the fall semester, the decision is to discontinue the senior research project, then you *must complete senior seminars in both BIOL and NEUR* to complete both majors, which, it should be noted, may be difficult to schedule and complete.