

## Goldwater Scholarship Research Essay Instructions<sup>1</sup>

The Research Essay is one area of the application where you will be able to demonstrate these characteristics. The strongest Research Essays students submit are based on a prior research project. Your essay should include a description of the issue or problem, a discussion of the research methodology, and discussion of your findings. When writing an essay on a past research experience, it is important that you clearly state what YOUR contributions to the project were and indicate what specific skills/expertise you developed. To demonstrate that you "think like a scientist," you might, as an example, describe future work your data suggests or work that still needs to be done to complete the current project.

If you have not been involved in a research project, you can develop your Research Essay on a "proposed" research project. In this case, you will want to put forward a possible research problem, discuss an idea for a research project that could have a significant impact on the issue or problem, describe the methodology that you would use and discuss anticipated results. Again, the reviewers will be reading your nomination materials attempting to determine the likelihood that you will pursue a research career. It is again in your interest to work to convince the reviewers that you have the characteristics that are needed to become a research scientist, mathematician or engineer.

**Research Essay Formatting Guidelines:** Research Essays should be single spaced and use 12 point Arial font. Margins should be 1 inch on all sides. Page length, including bibliographic information and references, must not exceed 3 pages. The essay must include your name and the name of your academic institution in the header at the top of each page. The student's name and institution should be in ("inside") the one inch margin. The Research Essay may be formatted in either one or two columns on a page. As appropriate, utilize graphs, tables, and figures in the essay to explain or clarify results. Figure and caption options may use 10 point Arial font. If mathematical equations are used in your Research Essay, LaTeX or other document preparation software may be used to properly format the equations.

Approximately the first page should be devoted to describing the project and essential methodology while the second page should be devoted to the results including the data collected and to an analysis of the results including the data and the significance of the findings.

If the research project is underway but not completed the first page of the essay should be similar to what is described above for a completed project. The second page should discuss the work that has been completed followed by what data have been collected and what will be collected. The final part should discuss how these data will be analyzed.

Nominees not having completed or initiated a research project should select a topic about which they are passionate and describe the project and the method of conducting the research. The scientific question to be addressed by the research should be clearly defined and the description of the research to be done should specify how the work will answer this question.

---

<sup>1</sup> Adapted from 2012 NAFA article by former Goldwater Foundation President W. Franklin (Frank) Gilmore and John A. Lanning



For additional instructions, which supersedes any information provided here, please visit:

<https://goldwater.scholarsapply.org/application-tips/>

*The next two pages have been taken directly from the Goldwater Scholarship website.*

### **Formatting Guidelines:**

Research Essays should be single-spaced and use 12-point Arial font, with 1-inch margins on all sides. Page length, including bibliographic information, must not exceed 3 pages. The essay must include your name and the name of your academic institution in the header at the top of each page. Format your Research Essay in either one or two columns on a page. As appropriate, utilize graphs, tables, and figures in the essay to explain or clarify results. Figures, table captions and bibliographic citations may use 10-point Arial font. Research essays that use mathematical expressions may use LaTeX or other document preparation software to enable proper formatting. Save your Research Essay as a PDF file. Although the upload site accepts JPG and PNG file formats, PDF files are preferred.

### **COVID-19 Considerations:**

The Foundation is acutely aware that COVID-19 has delayed, canceled, or severely restricted many traditional research experiences. In the past, research essays were often based on these experiences. Rather than viewing the situation brought about by COVID-19 as a setback, the Foundation sees this as an opportunity that enables students to understand that research does not just exist within a traditional research laboratory but encompasses all the steps that create and disseminate new knowledge.

Faculty and students are encouraged to think broadly and look for collaborative work that might include in-depth literature reviews, analysis of existing data sets, computation studies, among others. Additionally, the research essay might propose a new experiment that tackles an important and interesting question in your field of interest to you. We also anticipate that there will be students who use this opportunity to pursue independent research e.g., a student who is developing a data-driven website that tracks global COVID cases to study the impact of travel restrictions or the student who is investigating the efficacy of novel cleaning methods for N95 masks. Regardless of type, all of the above essay types can and should include a description of the work's motivation, experimental design, data analysis and outcomes, as well as bibliographic information.

Whether the work is based on prior research or is a proposal, it is important that your essay clearly describes 1) your contribution or expected contribution to the work, 2) the skills you brought to the work from prior research or course experiences, and 3) the skills you have or expect to obtain from participation in the project. As such, your research essay needs to be more than just a technical paper. The additional information that is sought aids Goldwater Scholarship reviewers to evaluate your potential for becoming a research scientist, engineer, or mathematician. Where appropriate, you are encouraged to use the word "I" as opposed to the word "we" in your essay to help elucidate your specific role in the work.



## The Essay:

The Research Essay provides the Foundation with particularly important insights into your motivation, background, experience, skills, and interest in pursuing a research career. This does not mean that you should simply state that you have these characteristics but that you demonstrate them through your work.

While the disciplinary reviewers who will be reviewing your essay and application will be broadly familiar with work in your discipline, it is unlikely the reviewers will be experts in your particular sub-field. Furthermore, if your application needs to undergo a secondary review, the review may be done by an individual from another discipline. Write your research essay and other materials for individuals who are broadly trained in the sciences, engineering and mathematics, not for subject matter experts.

Do not repurpose a “slightly expanded” abstract as your Research Essay. While your Research Essay might come from an abstract you have written earlier, the Research Essay needs to be much more. In addition to describing a research question, methodology, analysis and results, the Research Essay should clearly describe how you were involved in the work and what specific contributions you made to the work. Future directions for the work or a new research initiative built on skills learned should be included.

Use space judiciously. Balance the various elements of your essay so that no one section dominates the essay. Reviewers find a short opening paragraph that provides a “broader picture” that explains the importance of your research and your motivation for doing the work to be helpful. Again, when describing the project, be certain to talk about your specific contributions to the work and the skills you acquired.

It is also helpful for you to demonstrate that you “think like a scientist.” If you are describing a research project that you conducted, consider discussing additional work that you might do or, if you have completed the entire project, describe a new project that might be undertaken. In the latter case, explain how the skills you learned while working on your project will set the stage for a successful new work.

Regardless of research essay type, include a bibliography that uses up-to-date, refereed journal articles. Use diagrams and figures, as appropriate, but not at the expense of a quality narrative.

Finally, while you must write the Research Essay, you can work with your faculty and research mentor(s) to ensure your Research Essay is scientifically accurate, uses appropriate scientific format, and provides an appropriate balance among the various elements that make up the Essay. Always anticipate the need to write multiple drafts, reviewed by your faculty mentor and, when possible, by a non-expert in the field. Write, rewrite, and then rewrite again your research essay. Your readers have a limited time to read the essay so you want to make certain your essay makes your points clearly and succinctly.

## Confidentiality of the Work:

Information disclosed in your research essay is held in confidence. All Foundation reviewers sign a Confidentiality and Conflict of Interest Agreement.

