NSF GRFP

A workshop by Helen Xu and Deanna Montgomery

What is the NSF GRFP?

The GRFP is a five-year fellowship with three years of support for graduate students in NSF-supported science, technology, engineering, and mathematics disciplines.

Deadlines:

Computer and Information Science and Engineering: October 19, 2021

Engineering: October 21, 2021

References: October 29, 2021

https://nsfgrfp.org/applicants/important-dates/

| **Overview** | Personal Statement | Research Statement | Conclusion |

Eligibility

To be eligible, you must:

- Be a US citizen, US national, or permanent resident.

- Intend to pursue a research-based Master's or PhD program in a GRFP-supported field.

- Have completed no more than one academic year of full-time graduate study OR earned a previous master's degree.

- Graduate students are limited to only one application to the GRFP, submitted either in the first or second year of study.

https://nsfgrfp.org/applicants/applicant-eligibility/

Overview	Personal Statement	Research Statement	Conclusion

Application Components

Personal Information

Education

Work and Other Experience

Electronic Transcripts

Proposed Field(s) of Study

Proposed Graduate Study / Graduate School Information

Relevant Background and Future Goals Statement

Graduate Research Plan Statement

Today's focus

https://www.nsfgrfp.org/applicants/application_components/

| **Overview** | Personal Statement | Research Statement | Conclusion |

Example Fields of Study

Chemistry

Computer and Information Sciences & Engineering ➡

Engineering

Geosciences

Computer Science

- Algorithms and Theoretical Foundations
- Artificial Intellegence
- Bioinformatics and other informatics
- Communication and Information Theory
- Computational Science and Engineering
- Computationally Intensive Research
- Computer Architecture

https://www.nsfgrfp.org/applicants/application_components/field_of_study

Overview	Personal Statement	Research Statement	Conclusion

Evaluation Criteria from NSF

Intellectual Merit: the potential for your research to advance knowledge.

Broader Impacts: the potential for your research to benefit society and contribute to the achievement of specific, desired societal outcomes.

"Intellectual Merit and Broader Impacts **must be addressed individually under separate headings in both Personal and Research Plan statements** to provide reviewers with the information necessary to evaluate the application with respect to both Criteria. Applications in which Intellectual Merit and Broader Impacts are not addressed separately under separate headings will be returned without review." - GRFP Solicitation

Overview	Personal Statement	Research Statement	Conclusion

Evaluation Criteria have Specific Meanings

Don't assume your intuition about what "intellectual merit" or "broader impact" mean is correct! Use the NSF provided definitions (found in the solicitation).

Intellectual Merit
- Advance knowledge and understanding within its own field or across different fields
- To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts
- Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale?
- Mechanism to assess success?

Broader Impact
- Advance understanding while promoting teaching, training, and learning
- Broaden participation of under-represented groups
- Enhance infrastructure for research and education
- Broaden dissemination to enhance scientific and technological understanding
- Benefits to society

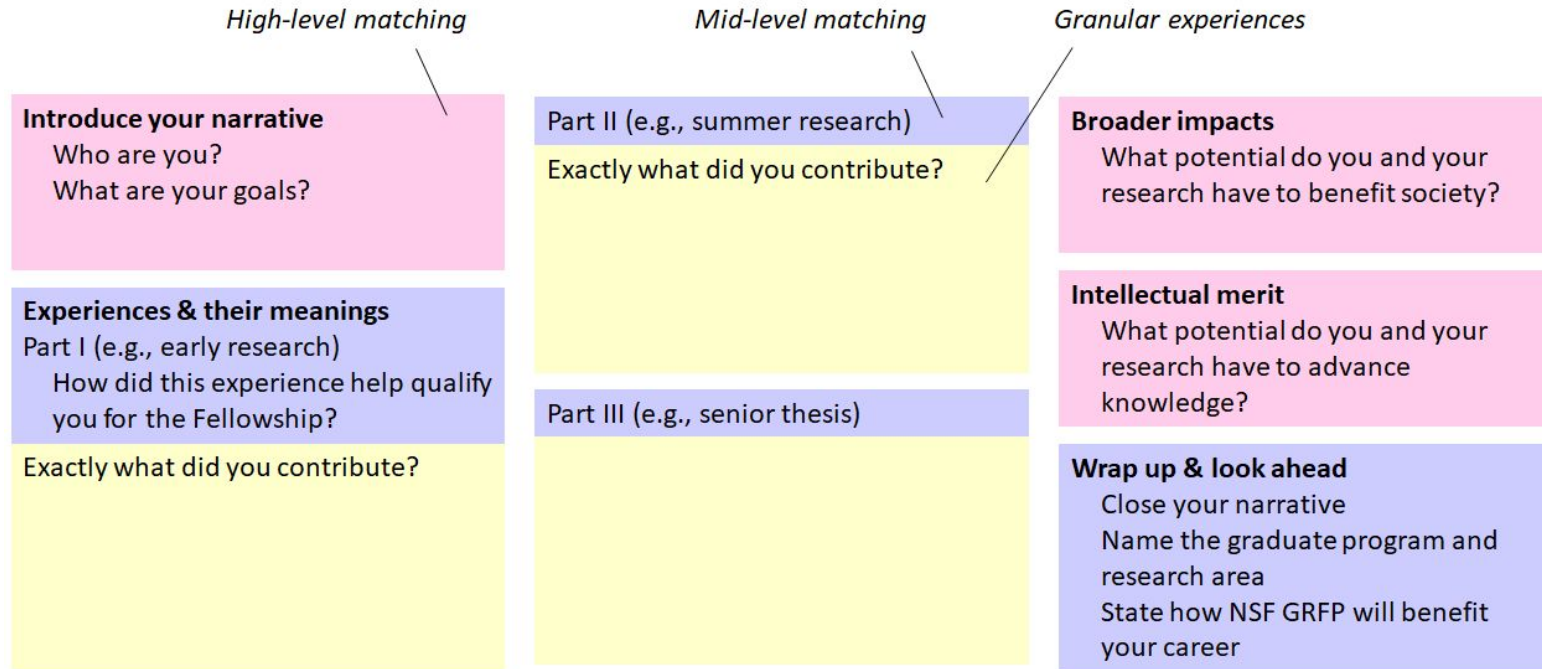| **Overview**	Personal Statement	Research Statement	Conclusion

Personal Statements

Personal Statement (3 pages)

Describe your **personal, educational, and/or professional experiences** that motivate your decision to pursue advanced study in science, technology, engineering or mathematics (STEM). Include specific examples of **any research and/or professional activities** in which you have participated. Present a concise description of the activities, **highlight the results and discuss how these activities have prepared you to seek a graduate degree.** Specify your role in the activity including the extent to which you worked independently and/or as part of a team. **Describe the contributions of your activity to advancing knowledge in STEM fields** as well as **the potential for broader impacts** (See Solicitation, Section VI, for more information about Broader Impacts).
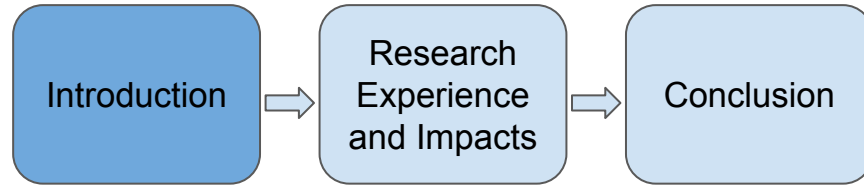
Overview	Personal Statement	Research Statement	Conclusion

Personal Statement Structure

High-level matching   Mid-level matching   Granular experiences

Introduce your narrative
Who are you?
What are your goals?

Experiences & their meanings
Part I (e.g., early research)
How did this experience help qualify you for the Fellowship?
Exactly what did you contribute?

Part II (e.g., summer research)
Exactly what did you contribute?

Part III (e.g., senior thesis)

Broader impacts
What potential do you and your research have to benefit society?

Intellectual merit
What potential do you and your research have to advance knowledge?

Wrap up & look ahead
Close your narrative
Name the graduate program and research area
State how NSF GRFP will benefit your career

https://mitcommlab.mit.edu/eecs/commkit/nsf-personal-statement/

| Overview | Personal Statement | Research Statement | Conclusion |

Personal Statement Structure

Introduction → Research Experience and Impacts → Conclusion

Create a **personal narrative** that you will support throughout the statement with your experiences. This is the magic connective tissue that makes your experiences feel cohesive and shows your path towards graduate school.

What are your high-level goals and motivations? **Summarize** how have your past experiences led to your current interests.

Overview	**Personal Statement**	Research Statement	Conclusion

Personal Statement Structure

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┌─────────────┐     ┌─────────────┐     ┌─────────────┐
│             │     │  Research   │     │             │
│ Introduction│ ──> │ Experience  │ ──> │ Conclusion  │
│             │     │ and Impacts │     │             │
└─────────────┘     └─────────────┘     └─────────────┘
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The main part of the statement: approximately two pages. This is the "what" of your personal statement.

Depth over breadth: choose up to 3 experiences that you want to discuss in detail.

Criteria: highlight broader impacts and intellectual merits throughout.

Choosing Experiences to Include

Introduction	→	Research Experience and Impacts	→	Conclusion

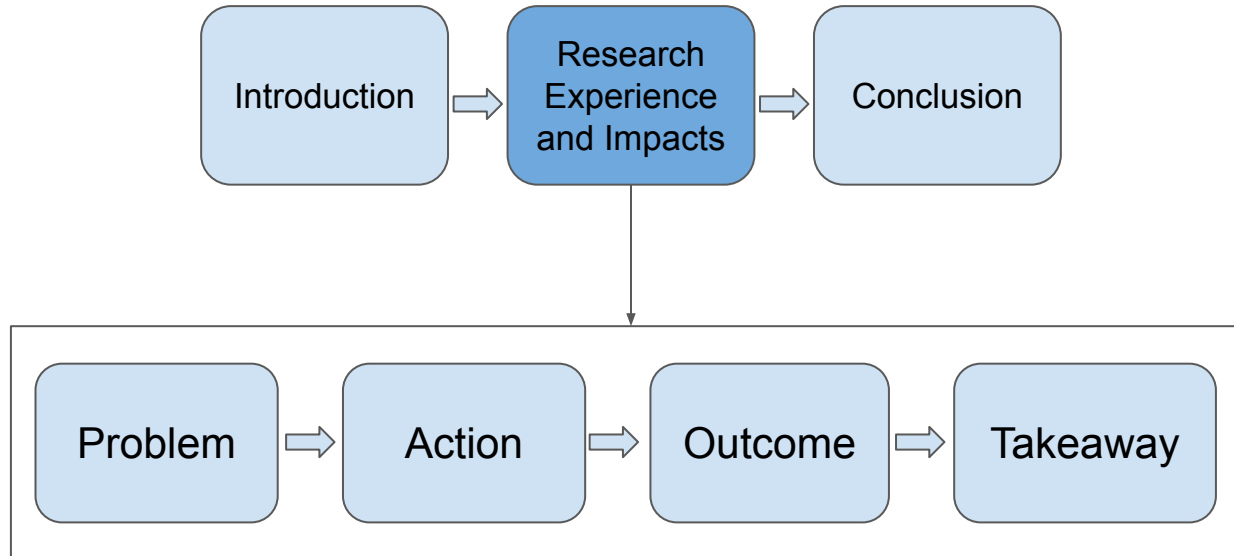Which experiences led you to develop your skills and passions?

Where have you demonstrated accomplishment, leadership, and collaboration?

- For example: **research**, teaching, relevant extracurriculars
- State any concrete achievements and outcomes e.g. awards, discoveries, publications (recommend in-line **bolding**).
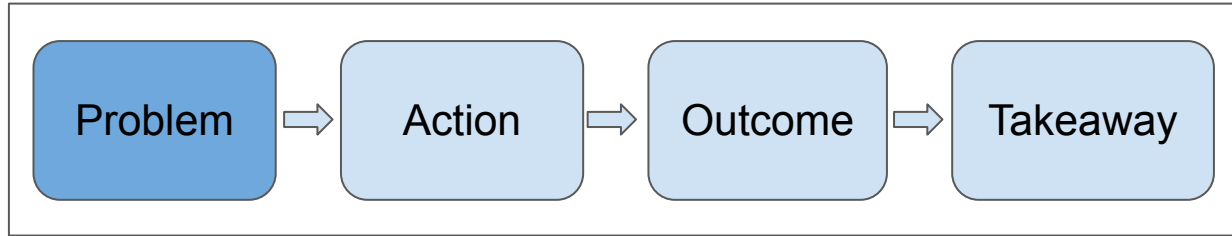
Overview	**Personal Statement**	Research Statement	Conclusion

Concretizing Experiences


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┌─────────────┐     ┌─────────────┐     ┌─────────────┐
│             │ ──▶ │  Research   │ ──▶ │             │
│ Introduction│     │ Experience  │     │ Conclusion  │
│             │     │ and Impacts │     │             │
└─────────────┘     └──────┬──────┘     └─────────────┘
                           │
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│  ┌─────────┐    ┌─────────┐   ┌─────────┐   ┌──────────┐ │
│  │ Problem │──▶ │ Action  │──▶│ Outcome │──▶│ Takeaway │ │
│  └─────────┘    └─────────┘   └─────────┘   └──────────┘ │
└─────────────────────────────────────────────────────────┘
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Concretizing Experiences

Problem ⇒ Action ⇒ Outcome ⇒ Takeaway

- What was the goal of the project you were working on?
- Were there measurable criteria for success?
- What were the challenges raised by the project?

Vague experience:

I showed initiative in my second project in the lab.

Concrete experience:

Frustrated with the direction of my first project, I consulted with other faculty and proposed an entirely new project.

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Concretizing Experiences

Problem	⇨	Action	⇨	Outcome	⇨	Takeaway
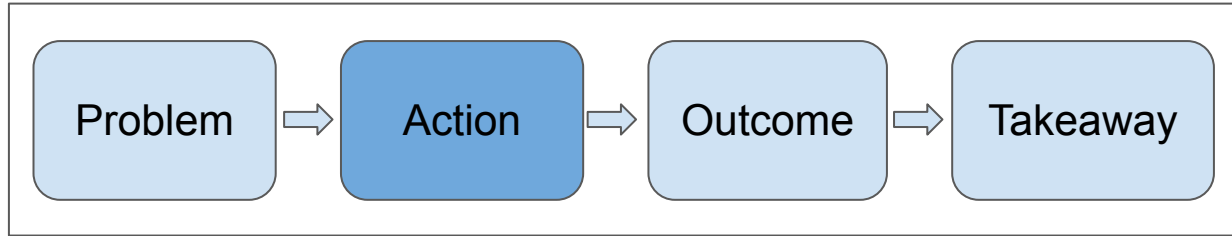
Vague experience:
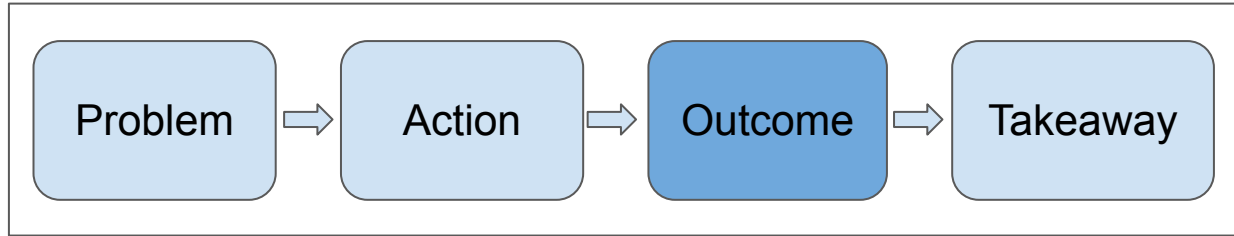
During my first year, I became a more curious and capable scientist.

Concrete experience:

I explored the literature and proposed two alternative procedures to make the experiment efficient.

Overview	**Personal Statement**	Research Statement	Conclusion

Concretizing Experiences

Problem ⇒ Action ⇒ Outcome ⇒ Takeaway

Quantify the outcomes of your actions. What were the results?

Vague experience:

I used performance engineering to improve algorithm performance.

Concrete experience:

I improved algorithm speed by 2x and reduced the memory usage by 5x.

Adding Meaning to Experiences

| Problem | → | Action | → | Outcome | → | Takeaway |
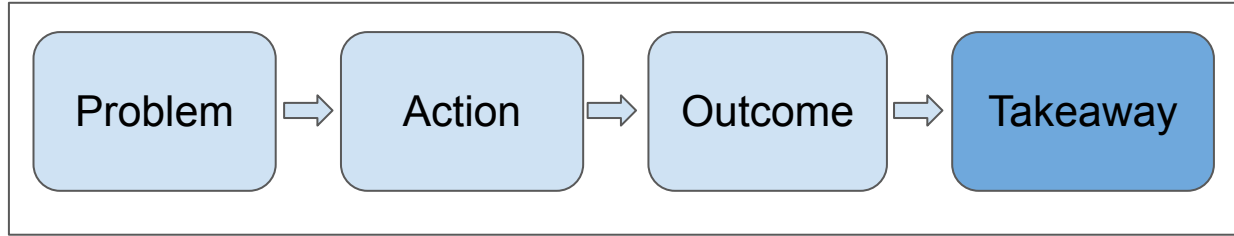
Experiences should speak to (at least) one of the GRFP requirements:

- How has this experience prepared you to seek a graduate degree?
- How will it help you become a globally engaged knowledge expert or leader?
- How will it help you contribute to research, education, or innovations in science and engineering?
- How will your graduate experience prepare you for a career that expands scientific understanding or benefits society?
- (optionally, to transition) How did it motivate you to seek out new research opportunities?

Make these connections explicit for your audience
(*reviewers may only read this final sentence*).

| Overview | **Personal Statement** | Research Statement | Conclusion |

Personal Statement Activity

https://docs.google.com/document/d/1XPrviiaAwrUWkevHnGUPRJVj Dx_IVDyKC8OyjNH_xY4/edit?usp=sharing

Overview	**Personal Statement**	Research Statement	Conclusion

Pro Tip: Involve your letter writers in the GRFP process. Send them drafts and iterate. Let them see your growth.

Writing the GRFP is a unique way to deepen their understanding of your research ideas and personality and will **lead to better letters**.

2 Personal Statement

2.1 Content

- [ ] **Intellectual Merit** (At least one of the following)
  - [ ] Advance knowledge within own field.
  - [ ] Advance knowledge across many disciplines.

- [ ] **Broader Impacts** (At least some of the following)
  - [ ] Full participation of women, persons with disabilities, and underrepresented minorities in science, technology, engineering, and mathematics (STEM);
  - [ ] Improved STEM education and educator development at any level;
  - [ ] Increased public scientific literacy and public engagement with science and technology;
  - [ ] Improved well-being of individuals in society;
  - [ ] Development of a diverse, globally competitive STEM workforce;
  - [ ] Increased partnerships between academia, industry, and others;
  - [ ] Improved national security
  - [ ] Increased economic competitiveness of the US;
  - [ ] Enhanced infrastructure for research and education.
  - [ ] Something else in the same vein as above

- [ ] **Describe some personal experiences that speak to the other considerations mentioned in this outline**
- [ ] **Future Goals**
  - [ ] **What do you want to do?**

[1] http://www.nsf.gov/pubs/2015/nsf15597/nsf15597.htm#review

1

  - [ ] Why do you want to do that thing?
    * [ ] Why does it have Intellectual Merit?
    * [ ] What are its Broader Impacts?
  - [ ] Do you have the resources to accomplish your goal?

- [ ] **Funding Solicitation**
  - [ ] Why are you well suited for a GRFP Fellowship?
  - [ ] What will you do with the fellowship?
  - [ ] **How will an NSF Fellowship help you accomplish that goal?**
  - [ ] Will the Fellowship provide you resources for that goal?

Research Proposal

Research Plan Statement (2 pages)

"Present an original research topic that you would like to pursue in graduate school. **Describe the research idea, your general approach,** as well as any unique resources that may be needed for accomplishing the research goal...You may choose to include important literature citations. **Address the potential of the research to advance knowledge and understanding within science as well as the potential for broader impacts on society.**"

https://www.nsfgrfp.org/applicants/application_components/screenshots

| Overview | Personal Statement | **Research Statement** | Conclusion |

Research Plan Structure

| Introduce Research Area	→	Project Proposal and Approach	→	Conclusion
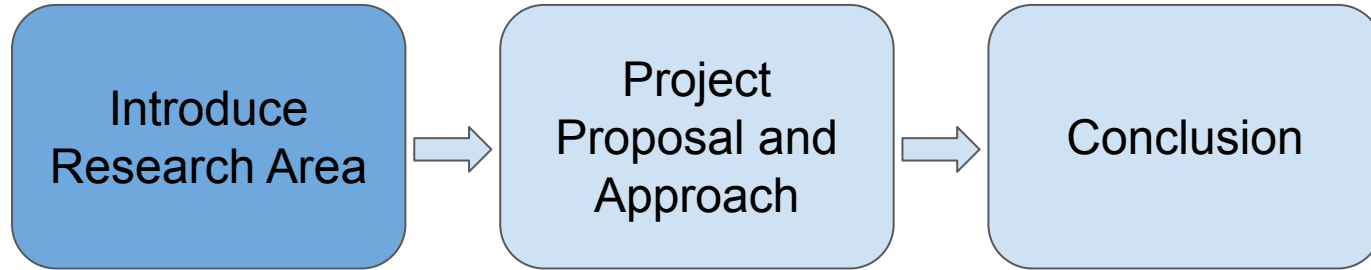
Goal: to convince the reviewers that you are capable of being a successful researcher by proposing a creative, feasible research plan.

You do **not** have to carry out this project, unlike under many other research grants/fellowships. The NSF GRFP funds a **person**, not a **project**.

Overview	Personal Statement	**Research Statement**	Conclusion

Research Plan Structure

Introduce Research Area	→	Project Proposal and Approach	→	Conclusion
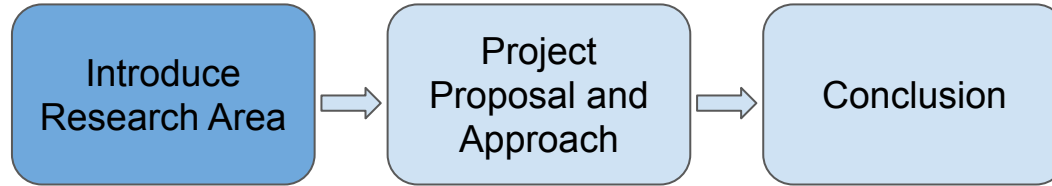
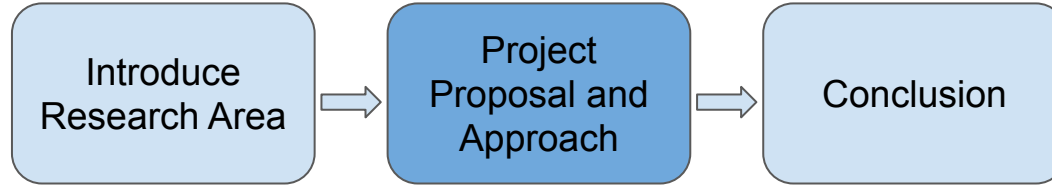**Introduction:** Background and problem statement behind your research. What is the existing literature on the problem, and where is the gap?

- **Intellectual Merit:** What is the scientific problem your proposal fits into?
- **Broader Impacts:** What is the problem's impact on society?

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Research Plan Structure

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┌─────────────┐    ┌─────────────┐    ┌─────────────┐
│  Introduce  │ ⇒  │   Project   │ ⇒  │ Conclusion  │
│ Research    │    │ Proposal and│    │             │
│   Area      │    │  Approach   │    │             │
└─────────────┘    └─────────────┘    └─────────────┘
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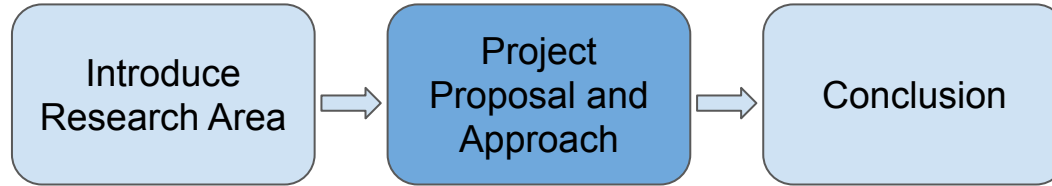
Project Proposal: What specific questions are you interested in and why are you the right person to answer them?

- **Intellectual Merit:** Define the concrete problems you will work on and your approach.

- **Broader Impacts:** What is the impact of answering these questions?

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Heilmeier Catechism

| Introduce Research Area	→	Project Proposal and Approach	→	Conclusion

Questions to help you think through research programs:

- What are you trying to do? Articulate it without jargon.

- How is it done today, and what are the limits of current practice?

- What is new in your approach and why do you think it will be successful?

- Who cares? If you are successful, what difference will it make?

- What are the midterm / final "exams" to check for success?

Overview	Personal Statement	**Research Statement**	Conclusion

Research Plan Structure

| Introduce Research Area | → | Project Proposal and Approach | → | Conclusion |
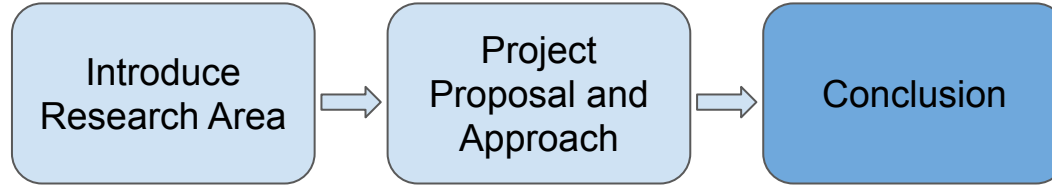
Conclusion: Summarize your project and the intellectual merit / broader impacts of your specific research proposal.

Exercise

Read the following research proposal:

https://drive.google.com/file/d/1gjzHrwICVaKbSoAjNOEPkdXKwtdejx65/view

- What did you like about it? What could be improved?
- What do you see as the intellectual merit?
- How does this statement address the broader impacts?

Research Plan Tips

Know your audience: The reviewers will typically be from your broad area (e.g. materials research) but not from your specific area (e.g. optoelectronics). Be explicit about the how and why of your proposal.

Do your homework: Before writing, make sure what you're proposing is novel and possible.

Balance creativity and credibility: Find a problem you can probably solve that demonstrates understanding of the field.

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Additional Resources

https://www.nsfgrfp.org/

Commkit articles:

https://mitcommlab.mit.edu/eecs/commkit/nsf-research-proposal/

https://mitcommlab.mit.edu/eecs/commkit/nsf-personal-statement

Lots of examples and pointers:

https://www.alexhunterlang.com/nsf-fellowship

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Good luck in your GRFP application!

For all your fellowship needs, the EECS Communication Lab is here to help!

We offer in-person and virtual appointments and can advise on any part of the NSF application.

Schedule an appointment at:

http://mitcommlab.mit.edu/eecs/

Email: eecscommlab@mit.edu

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