Common Advice for NSF GRFP applications

By Logan Pearce

From Fall 2020 - Fall 2021, I worked as a graduate consultant for the University of Arizona GRFP Application Development Program. As an undergrad at the University of Texas, I worked as a consultant at the University Writing Center for three semesters, helping folks improve their writing on all kinds of writing pieces, of which maybe 50% were applications for scholarships or programs. I've developed a toolbox of common advice and feedback throughout all these consultations.

Here is a list of the most common things I say to folks when reviewing their GRFP application materials (which can be applied to other application materials as well)

Active voice/ Active verbs

Active voice is more engaging for readers and more clear. Too much passive voice gets boring to read and honestly confusing. Active voice identifies who is doing the action. Passive: "The cookies were stolen" Active: "Jimmy stole the cookies". A signpost of passive voice are those "be" verbs - the cookies *were* stolen. The use of passive voice is prevalent in most application materials I read. Definitely strive for active voice, using subjects like "I" or "we".

Example:

> Passive: "This data analysis pipeline will be used to perform analysis of black hole spectra"
>
> Active: "We will use this data analysis pipeline to analyze black hole spectra"

Similarly, active verbs are more engaging to read than passive. Look out for those "be" verbs. A simple change from passive to active verb choices makes a big difference for readability of your materials.

Example:

> Passive: "I was able to attend the seminar"
>
> Active: "I attended the seminar"

Also, look out for sentences that cast you in a passive role rather than an active role. You want to paint the picture of you as someone going after your goals and seizing opportunities, not sitting back and letting things happen to you.

Example:

Passive: “I became familiar with the python package.”
Active: “I familiarized myself with the python package.” or “I learned to use this python package.”

This one’s a bit more subtle, but you want to choose language that paints you as the driving force of your work. Word choice that makes the reader imagine you taking charge and using your skills as opposed to you following along with what someone else is doing.
Example:
Passive: “I assisted with the project”
Active: “I contributed to the project”

Narrative

This is definitely not the place for creative writing, but you should think of your personal statement as a narrative. A story you’re trying to tell, and the message of the story is “I am a strong and productive scientist who is actively pursuing my goals, who takes charge of projects and produces results, and is a safe bet for you to invest your money.” So craft your narrative with that message in mind. Use language and examples that show these things. Demonstrate to them that you are a good investment scientifically.

But also think narratively about your journey as a scientist. Go chronologically. You may not need to start with childhood (see next section), but your examples and things you talk about should proceed in a logical order. Example: Don’t talk about your current grad school research, then an award you won in undergrad, then grad school outreach work. It’s jarring for a reader to jump back and forth in time, and frankly it gets confusing. Think about telling the **story** of you as a scientist and all the bits and pieces that went into bringing you to this point. I find framing it in your mind as a story helps you craft a more logical progression to what you talk about.

But, again, this is not a time to flex your creative writing skills. Keep it professional but not boring.

Opening Paragraph

The first sentence is usually the hardest isn’t it. Where do you start on the personal statement. I have it on good authority that most application readers don’t want to read about watching the stars with your grandpa. By the time they get to the 100th application they’ve read about ~80 grandpas. It gets boring really quickly, and everyone’s essay starts to sound the same. (Note: this may vary depending on your field. I know some medical professions DO want the story about your grandpa in the hospital. So be sure you’re up on the expectations for your field).

But, you do still need to tell your backstory and give some context to who you are as a scientist. And maybe starting in childhood is the most logical place for your story as a scientist to start.

That's ok, but stay away from trying to inject too much whimsy into the opener. They don't want a creative writing story, they want a professional piece of writing.

How can you make your story stand out? What is unique about you and your journey that you can highlight? Turn differences into strengths. Example: "Taking a few years off between undergrad and grad school gave me perspective and leadership skills". Instead of framing is as a problem (Oh no I've been away from school for a while!) turn it into a strength (Hey look at what I did in those years that made me better at my job!)

There are a lot of approaches to the first paragraph, so definitely check out examples of successful essays and see what kinds of things folks did and what would work for your story. For my personal statement, I started with a declaration of my career intentions and how the support of the GRFP will help me get there. This felt right for me to start off with a strong declaration of my intent to pursue science as a career. Then I stepped back and told a bit about my journey to get to where I was in the second paragraph. But that was my choice, there are a large variety of starting paragraphs among selected essays!

Broader Impacts

I am convinced the Broader Impacts section is the make-or-break section for this application. It's hard, and people usually save it for last, so a weak Broader Impacts will really weaken your application. And the NSF values it highly. So don't save it for last, and give it more than a few sentences at the end of your personal statement.

In my opinion, the strongest Broader Impacts are ones that:

1. Connect to your story. They should be part of that narrative you've established, so that by the time the reader gets to your Broader Impacts section, they are prepped and what you say there flows naturally out of what you've told them about yourself so far. Example: "Because of my experience at a rural high school, where we had little access to STEM enrichment opportunities, I understand the value of specific STEM outreach to rural high schools. I intend to start a program targeting high schools in rural Arizona, around the Tucson area, bringing STEM engagement opportunities to their campus." etc etc. You should have talked about struggling to access STEM enrichment in the background section, so it makes sense to the reader why you would propose something like that.
2. Propose something specific for the future, in addition to describing what you've done in the past. This could be expanding what you've already been doing, contributing to or expanding an existing outreach program, or proposing an entirely new outreach program.
3. Are specific about what you want to do/propose. Example: "I want to continue working with women in STEM" is vague. How could you do that? "I intend to run for president of the Women in STEM Student Council, and as president I will expand our outreach to middle schools in the local area through targeting specific teachers at underserved

schools and developing after-school STEM programs. I've already begun this as a member of WISSC by XXXX" etc. etc. Be specific.

4. The Broader Impacts in your research proposal connects to what you proposed in your personal statement. This one may or may not work for your specific situation, but if you can connect them in some way, all the better.
5. If you can't connect it to your own struggle, then be specific about why you're engaged in the kind of outreach you are or want to be, and what you are accomplishing with it. Example: "Science literacy is an issue in our society (give stats maybe). Reaching the public in an informal, non-elite sounding, grassroots way is important for reaching people where they're at and getting them excited about the work of scientists. I have been involved in Astronomy on Tap (AoT) for two years, which has just this mission in mind. AoT is a network of shows around the world holding local public astronomy talks at a bar. I am currently the organizer of AoT Tucson, which meets at Borderlands Brewing once a month. The relaxed atmosphere has fostered a good rapport with our audience, and we have seen our attendance grow. In the next few years we plan to expand our outreach by..." etc. etc. Support with numbers. Focus on what the mission of the outreach is and what it's accomplishing. And then propose for the future.

You may or may not be able to hit all of these points, but in my opinion these are the kinds of things that make a strong Broader Impacts section. As always, check out what other successful applicants have done with their Broader Impacts.

Audience

Always consider who will be reading your application materials. They may be in your field or they may not, and you need to be able to reach any potential reader with your writing. I suggest imagining your reader as someone who is scientifically educated but is not in your field. So you can use concepts and terms common to science, but will need to explain discipline specific terms and concepts.

If the reader's understanding of a specific term is important for them to understand what you are proposing, then define it explicitly. If it's not as important, see if you can say the same concept using more general words.

Example:

"The planet is disrupted when it approaches within the star's Roche Lobe":

- If "Roche Lobe" is a key part of your project, define it. Something like "The planet is disrupted when it approaches within the star's Roche Lobe - the distance within which the tidal forces caused by the star's gravity are strong enough to destroy the planet."
- If it's not a key term to understand your proposal, then reword the same idea without using the term. Something like: "The planet is disrupted by the star's

gravitational influence when it passes too close to the star." Everyone should have enough of an understanding of gravity to understand that.

Be sure to spell out all acronyms the first time you use them, and include the abbreviation in parenthesis immediately following.

Example:

"I am applying for the National Science Foundation's Graduate Research Fellowship Program (NSF GRFP)."

Use strong declarative language

As said above, the point of the materials is to paint the picture of you as an active and capable scientist going after your goals and producing results. I often see folks use weaker language to talk about their skills and their goals, and suggest they take a stronger approach to language. Instead of words like "I would like to" or "I hope to", I suggest stronger declarations like "I will" or "I intend to". No one will ask you in 5 years time if you actually did the thing you said you were going to do. So make a strong claim on where you want to be in the future and what you're doing to get there, even if you're not 100% sure you will end up there. But don't lie of course.

Example:

"I hope to obtain a position as faculty in geosciences" vs. "I intend to pursue a career as faculty in geosciences"

"I would like to start an outreach program" vs. "I plan to start an outreach program"

Also, don't paint yourself as "lucky to be here". I often see folks discount their own initiative and hard work by implying they were privileged to get such and such opportunity. It is fine to recognize it in other contexts, but this application is not the place for it. Remember you are painting yourself as a capable scientist who belongs here, so own that.

Example:

"I was privileged to attend the summer institute" vs. "I attended the summer institute"

"I was fortunate that Professor X took me on as a summer researcher" vs. "I worked with Prof X over the summer" or "I approached Prof X about a summer project"

In the research proposal, you should use strong language to talk about the importance of your work. Think words like "crucial", "critical", or "revolutionary". Convince the reader that what you're proposing is of vital importance to the current problems in your subfield (which you outlined in the background section).

Example:

"This work will help improve the research on giant stars because..." vs. "This work will be vital to the field of giant star research because..."

"This object will be useful for brown studies" vs. "This object will be a crucial benchmark for brown dwarf studies"

Consider including a sentence in the personal statement about what the support of the fellowship will mean for you. I chose to end my PS with that sentence.

The “P” word

How many applications do you think your readers are reading? Hundreds? And how many of those contain the word “passion”? Like, 95% of them?? It gets old and boring REALLY fast. I highly suggest doing everything you can to avoid that word! How can you say the same idea but in a more active and engaging way?

Example:

> “Because I am a woman in STEM, I am passionate about STEM outreach to young women in high school” vs. “Because of my experience as a woman in STEM, I understand first-hand the importance of women-focused STEM outreach and the impact it made in my life.”

See how much more interesting the second version is? And it connects directly to your story. And it sets the stage for you to talk about your idea for outreach to women in your broader impacts!

Research Experiences in Your Personal Statement

Remember the goal of the personal statement is to tell the story of you as a productive and capable scientist and a good place for them to invest their money. So the bulk of your personal statement should be about your research and/or leadership experiences. I suggest devoting one paragraph per research experience. That paragraph should address all of the following:

- why did you chose that particular lab/internship/faculty member; be specific about what drew you to the subject or the person
- what is the science goal of the lab/project (~one sentence, not more than two)
- what did *you* do to contribute to the problem
- what did you produce (a new data pipeline, a refined lab technique, a python package, etc)
- What was the result of your work/what did you find (even if it’s still ongoing)
- what did you do with the work: published/publishing a first-author paper (give expected publication timeline), contributed to a paper (give expected publication timeline), presented a poster at a conference, gave a talk at my university, etc. Include things that will happen in the near future (give timeline).
- what did you learn: technical skills (be specific), presentation skills, I learned I didn't really love the work (that's important!), I learned I'm good at and really like public outreach, whatever. Focus on skills/norms that your discipline highly values.

If you don't have much research experience, you can also discuss leadership roles you've taken on and address similar things. BE SPECIFIC.

Research Proposal

Just a few tips when thinking about the research proposal

- In my opinion, the background/intro should be the largest section of the proposal. You need to do a lot to bring the reader up to speed on the scientific context of the problem what you are proposing is trying to address. Remember you should not expect your audience to know anything about the problem you're addressing.
- Summarize the current state of research on the problem. What has been done in the past, and what is currently being done. You should have several citations pointing to the current state of work on this topic. Your proposal should fit nicely into the current context of the topic and clearly build upon what has already been done.
- It's generally a good idea to include one figure. (I did not do this in my application, but if I were to apply again I would include a figure!)
- Include discussion of anticipated results of your proposal.
- As I said above, don't leave the broader impacts as an afterthought, and devote more than just a few sentences!

Tell your reader what to think

Don't leave it up to the reader to connect the dots between two things you've said, connect those dots for them. Make sure you tell them exactly what you want them to come away knowing..

To bold or not to bold

It's common to see folks bold certain sentences in both personal statement and research proposal. It serves to direct the reader's eye to things you really want to be sure they see, that they come away knowing. I suggest **keeping bolding to a minimum** and only bolding the really important sentences. For example, you might bold the sentence in your research proposal that declares what you are proposing (Ex: "I propose a study to blah blah…") and the one that summarizes why this proposal is vital to science problem. You might want to bold the statement in your personal statement about your career goals for the future (Ex: "I intend to pursue a career as …."). In my personal statement, I bolded what I intended to pursue as a career, when my first-author paper was expected to be published, the thing I was proposing for my broader impacts. I did not bold complete sentences, but I think if I were doing it over again I probably would bold just one or two sentences rather than a few words in several sentences. It's up to the

author, there's no right or wrong way. I recommend seeing what other folks have done in their successful essays.

Reference Letters

When you ask folks for letters, be sure to ask if they are willing to write you a GOOD letter of recommendation!

It's a good idea to ask for letters from folks who can speak to diverse things about you. For example, I asked my undergrad research advisor, one of my research advisors from a summer internship, and the astro department chair. I specifically asked the department chair to write me a letter about the service I had given the astro department during my time as an UG there. I knew this was something she could speak specifically to because I had worked with her on some initiatives during my time there. I asked her if she could write about those specific things.

It's a good idea to tell your letter writers what you would like them to address specifically. Also, send them a draft of your application materials so that they have an idea of what you're saying about yourself, and can complement and build off of it.

Remember that faculty are busy, and be sure to (politely!) remind them of deadlines.

Concluding thoughts

If you have questions or ideas of things I can add to this list, you can email me at loganpearce1@email.arizona.edu.