

National Science Foundation Proposal Writing Tips

NSF STRUCTURE AND GOALS

1. How is the NSF organized?
2. What are the NSF's strategic goals?
3. What are the challenge areas?
4. What is the "cycle of innovation"?

TYPES OF PROPOSALS AND DUE DATES

5. What type of a grant should a first-time PI apply for? What is a CAREER grant?
6. What distinguishes a REESE proposal from a DR K-12 proposal?
7. What is the purpose of a preliminary proposal? Letters of Intent?
8. When is the DR K-12 proposal due?

LOGISTICS OF PREPARING FOR AND SUBMITTING THE PROPOSAL

9. What are some useful NSF resources for preparing a proposal?
10. What is FastLane?
11. What background knowledge should PIs have before writing a proposal?
12. What kind of interaction can an applicant have with Program Officers while developing an idea?
13. How is the project budget calculated?
14. What should be included in the evaluation plan?
15. What are the criteria for selecting members of an advisory board?

WRITING THE PROPOSAL: CRITERIA AND GUIDELINES

16. What are the merit review criteria?
17. What sections are required in the proposal?
18. Are there any formatting or writing style requirements?
19. How much of the proposal should be dedicated to the review of literature?
20. What makes a proposal competitive?

REVIEW PROCESS

21. What are the stages of the review process once the proposal has been submitted to the NSF?
22. What is the timeline for proposal review?
23. Who reviews proposals?
24. What is the acceptance rate for DR K-12 proposals?
25. What does it mean if I receive questions during the review process? What does it mean for my proposal?

NSF STRUCTURE AND GOALS

1. How is the NSF organized?

The NSF is organized into discipline-based directorates. Within each directorate, there are several divisions, which, in turn, are organized by sections. Each section consists of several programs. DR K-12 is one such program within the Division of Teaching and Learning in the directorate of Education and Human Resources (EHR).

2. What are the NSF's strategic goals?

All proposals to the NSF, including EHR, should address the strategic goals in some way. The NSF's strategic goals include:

- *Discovery*: Foster research that will advance the frontiers of knowledge, emphasizing areas of greatest opportunity in fundamental and transformational science and engineering.

- *Learning*: Cultivate a world-class, inclusive science and engineering workforce, expanding the scientific literacy of all citizens.
- *Research infrastructure*: Build the nation’s research capability through critical investments in advanced instrumentation, facilities, cyberinfrastructure, and experimental tools.
- *Stewardship*: Support excellence in science and engineering research and education through a capable and responsive organization.

* From the DRL Proposal Writing Guides Presentation for the CADRE Fellows, 4.1.10.

3. What are the challenge areas?

There are four program challenge areas in DR K-12 that proposals should address:

- *Assessment*: How can enhanced assessments of student knowledge and skills advance preK-12 STEM teaching and learning?
- *Opportunities to Learn*: How can all students be assured the opportunity to learn significant STEM content?
- *Teachers and Teaching*: How can we enhance the ability of teachers to provide high quality STEM education for all students?
- *Scale-up and Sustainability*: How are effective innovations successfully implemented, scaled, and sustained in schools and districts in a cost effective manner?
- *Learning Materials*: How can next-generation, cyber-enabled learning materials radically transform students’ STEM learning experiences and enhance their abilities and interests in STEM fields?

4. What is the “Innovation Cycle”?

The cycle of innovation is a framework that helps the NSF think about the projects they fund and the ways in which they can build on each other and prior work.

The different phases identified in the cycle include:

- Explore, Hypothesize and Clarify
- Design, Develop, and Test
- Implement, Study Efficacy, and Improve
- Scale Up and Study Effectiveness
- Synthesize and Theorize

Projects that hypothesize and clarify are considered exploratory projects, and are usually funded for \$450,000. The basic goal of this type of project is to get preliminary evidence to help you prepare for a larger study. The next award level tests an intervention more fully. This type of an award includes all other phases of the Innovation Cycle. These awards can be \$3.5 million over five years and could include designing curricula, software, or a new model for classroom interaction, or testing a hypothesis.

TYPES OF PROPOSALS AND DUE DATES

5. What type of a grant should a first-time PI apply for? What is a CAREER grant?

Beginning work that is exploring a new idea would likely be a “hypothesize and clarify” project, whereas more mature ideas would be more appropriate for other parts of the cycle. A “hypothesize

and clarify” project would be focused upon testing an idea to give it some grounding before going into more substantial research funding. This is likely to be the most appropriate grant for a new PI.

The Faculty Early Career Development (CAREER) Program cuts across NSF divisions to support early career researchers in building the foundation for their work in education and research. For DRL CAREER proposals, PIs must apply to one of the programs (e.g. DR K-12 or REESE), and the proposed project should align with the requirements of the division. This award provides \$400,000 of support over 5 years. For more information, visit

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503214

6. What distinguishes a REESE proposal from a DR K-12 proposal?

The REESE and DR K-12 programs seem to superficially support similar projects in STEM education. Informally, the difference between the two programs is how the R & D (research and development) is emphasized; REESE is more interested in basic research, while DR K-12 is more focused upon taking an innovative and transformative idea and translating it into an intervention that will have an effect. However, research is still required in DR K-12, and all proposals must make a hypothesis about an intervention that will be tested.

7. What is the purpose of a preliminary proposal? Letters of Intent?

A preliminary proposal is an early review of ideas. The original idea behind preliminary proposals was to help PIs who are new to the NSF get additional insight from experienced PIs into whether or not their idea would be appropriate for the DR K-12 program. However, DR K-12 has received preliminary proposals from veteran PIs as well. As stated by one veteran PI about the value of submitting a preliminary proposal, if “you want to try out a radical idea, [it’s a] good testing ground to see how far you can push the system.”

Preliminary proposals are optional in the DR K-12 program and typically have been due in October several months prior to submission. DR K-12 will not accept preliminary proposals in 2010-2011. A Letter of Intent (LOI) is required for the most recent DR K-12 solicitation and are due on November 5, 2010. The letter must be submitted via FastLane and should describe the challenge that the proposal will address, provide the tentative project title, and identify the principal investigators, and the organizations involved. Letters of Intent (LoI) help NSF prepare for the review process; i.e., identify panelists and plan panels. More information is available in the solicitation:

<http://www.nsf.gov/pubs/2010/nsf10610/nsf10610.htm>

8. When is the DR K-12 proposal due?

[Proposals](#) to DR K-12 are due on January 6, 2011. Please note that Letters of Intent are required this year. For more information, please refer to the solicitation:

<http://www.nsf.gov/pubs/2010/nsf10610/nsf10610.htm>

LOGISTICS OF PREPARING FOR AND SUBMITTING THE PROPOSAL

9. What are some useful NSF resources for preparing a proposal?

There are a variety of resources on the Web and directly from Program Officers that can be utilized while you're developing an idea and writing the proposal. The NSF or CADRE site is a good place to look for existing projects and read through abstracts and updates on projects. This can be used to learn more about the portfolio and current work in the field, and to find mentors or advisors if they are doing work that is similar to yours. PIs are generally happy to share the narrative of the proposal with you, and their contact information is available on the NSF website and CADRE website.

- NSF, project search: <http://www.nsf.gov/awardsearch/>
- CADRE: <http://CADREK12.org/>

Additionally, Program Officers provide assistance and feedback on proposal development. Because they are affiliated with various parts of the STEM education community, they frequently give presentations at major professional meetings, including AERA, NCTM, and NARST. Furthermore, you can discuss specific ideas with Program Officers.

10. What background knowledge should PIs have before writing a proposal?

PIs should be comfortable with the solicitation, the field, and the process before writing a proposal. Specifically:

- Become familiar with the NSF website, the Grant Proposal Guide (GPG), and FastLane (see #12) http://www.nsf.gov/pubs/policydocs/pappguide/nsf10_1/gpgprint.pdf
- Read the solicitation (multiple times) <http://www.nsf.gov/pubs/2010/nsf10610/nsf10610.htm>
- Review previously funded projects on the NSF Awards Search Page: <http://www.nsf.gov/awardsearch/>
- Read sample proposals (contact PIs)
- Discuss your ideas with Program Officers
- Gain an in-depth understanding of the relevant and appropriate literature even outside of STEM education

11. What kind of interaction can an applicant have with Program Officers while developing an idea?

The way to get further feedback or advice is to contact a Program Officer and correspond with them. They expect to be contacted by prospective PIs and, for most part, offer information and suggestions willingly. The best approach for contacting a Program Officer about an idea is to write a one-page prospectus of your idea and send it to the DR K-12 email address requesting to talk to a Program Officer about the idea. It will be forwarded to the appropriate Program Officer, who will then initiate correspondence. The one-page summary is intended to get the conversation going and does not need to include every detail of your proposal. You cannot, however, submit a final proposal to a Program Officer for review.

12. What is FastLane?

All proposals must be submitted to the NSF electronically. FastLane is the website for submitting these proposals. Contact your organization's OSP representatives to set up an account, and familiarize yourself with the website, requirements, and process prior to the proposal deadline. Proposals can also be submitted via Grants.gov. FastLane: www.fastlane.nsf.gov

13. How is the project budget calculated?

All proposals must contain a budget for each year of support, in accordance with the requirements of each program. Generally, the amounts requested for each item should be clearly documented and justified (justifications should be no more than three pages in length). The following budget lines are required:

- Salaries and Wages
- Fringe Benefits
- Equipment
- Travel
- Participant Support
- Other Direct Costs (materials and supplies, publication/dissemination, consultants, computer services, sub-awards)

Ensure the budget is realistic by:

- Thinking through exactly what is needed to carry out the project.
- Reviewing the project timeline and the costs for each phase of work. Asking others to review your budget to check for accuracy.

14. What should be included in the evaluation plan?

It is important to describe in your proposal exactly how you will decide whether or not your project has successfully achieved its objectives. It is important to outline how you intend to demonstrate that the investment in this project was worthwhile.

- Directly refer to your objectives in your evaluation plan. Include both a formative evaluation (ways to gain feedback on the project while it is being conducted) and summative evaluation (ways to show that the project fulfilled that which was originally proposed). To make this clear, create two separate evaluation plans.
- The evaluation plan should include some attention to the sustainability of the project or future impacts after the project has ended.

15. What are the criteria for selecting members of an advisory board?

Advisors should be selected based upon the expertise they can provide the project, particularly if their expertise is not represented by PIs, co-PIs, or other collaborators. Potential advisors can be identified from a search of current DR K-12 PIs conducting similar work.

WRITING THE PROPOSAL: CRITERIA AND GUIDELINES

16. What are the merit review criteria?

Each proposal is rated on two families of criteria:

1) *Intellectual Merit*: Does the PI/proposed project:

- Ask an important question? Will it advance field?
- Have the qualifications/experience necessary to do the work? PIs need to make the case that their own expertise is appropriate to the project, or that there are other collaborators that have the expertise.
- Sufficient access to resources? For example, if a project plans to work in schools, has the PI made contact with prospective schools and will the schools allow it?

- Have transformative potential? It must have the potential to make dramatic change in the field.
 - Explore creative, original, and/or potentially transformative ideas?
- 2) *Broader Impact*: The project must have the potential to affect a larger audience. Does the proposed project:
- Promote teaching, training, and learning?
 - Broaden the participation of underrepresented groups?
 - Enhance the infrastructure for research and education?
 - Disseminate results broadly?
 - Benefit society?

* From the DRL Proposal Writing Guides Presentation for the CADRE Fellows, 4.1.10.

17. What sections are required in the project description?

Project summary/project description should address the following components:

- Separate paragraphs that explain how your proposal addresses intellectual merit and potential broader impact
- Clearly articulated STEM content
- Appropriate research design and methodology
- Sensible chain of reasoning
- Arguments for why the problem is important
- Citations of appropriate literature
- Potential impacts of the research

18. Are there any formatting or writing style requirements?

The NSF has clear formatting requirements that must be followed in order for your proposal to be reviewed. Follow the rules for appropriate margins and font size, and adhere to the 15-page limit.

Ask colleagues (in and out of your field) to read and critique your proposal to ensure the clarity of writing in addition to its content.

19. How much of the proposal should be dedicated to the review of literature?

Using literature as the foundation of your work is essential; but, you should highlight relevant findings without going into too much detail. With a 15-page limit, the bulk of the proposal should describe the proposed project.

However, five pages are often allowed to describe prior NSF support.

20. What makes a proposal competitive?

All of the components and formatting guidelines listed above must be included in a proposal for it to be competitive. The question and the rationale for your approach must be well developed and clearly presented. It is also important to be familiar with the solicitation and deeply aware of developments in the field, both by reviewing the recent literature and being aware of currently funded NSF projects.

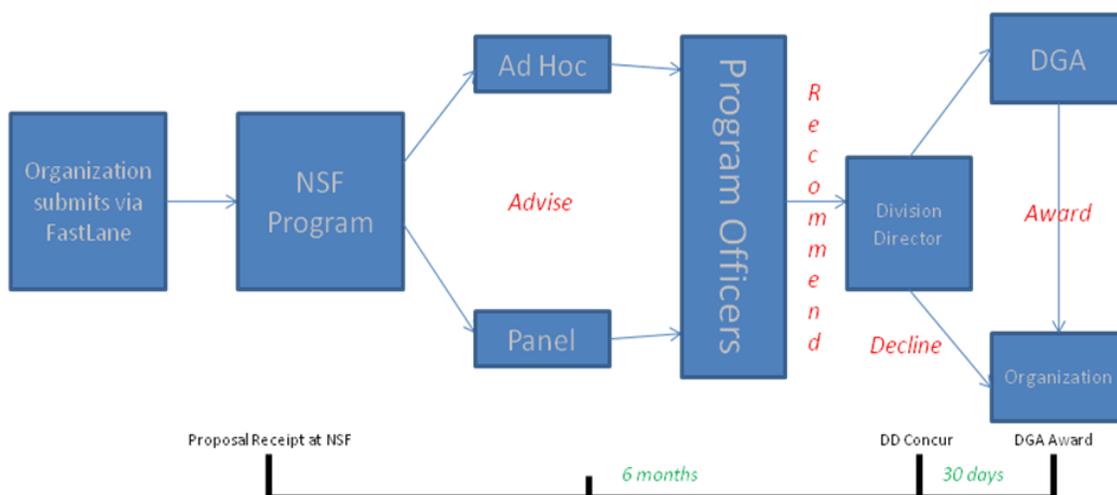
Most importantly, the proposed project must address the merit review criteria: intellectual merit and broader impact. Many strong proposals have not been funded in the past because the method or product is highly context-specific and not appropriate for the general K-12 audience.

REVIEW PROCESS

21. What are the stages of the review process once the proposal has been submitted to the NSF?

The proposal is first directed to the appropriate program at the NSF. Next, the proposals are reviewed by a panel of peer reviewers and/or ad hoc reviewers, depending upon the subject matter of the proposal. The review panel then advises Program Officers on which proposals are strongest. The best proposals are then recommended for awards by the division director.

Proposal Review Process and Timeline



22. What is the timeline for proposal review?

It can take up to six months for applicants to be notified about the NSF's decision. However, this timeline varies based upon the number of proposals received in a given year.

23. Who reviews proposals?

The proposal is reviewed by a panel. The review panel is formed annually consists of "peers," of education researchers, such as content or methodology experts. Individuals with experience at the school and school-system level are also included to gauge whether an idea has the potential to influence school practice. However, panels deal with a wide range of topics and methodologies in proposals, and it is difficult to have an expert represented on the panel for every proposal received. Ad hoc reviewers are called upon for this purpose. Program Officers also review the proposals and consult with other Program Officers to get a sense of the bigger picture of what the program has funded in the past and how a given proposal can add to the current work.

24. What is the acceptance rate for DR K-12 proposals?

DR K-12 funds only about 15% of proposals each year. However, PIs who are initially unsuccessful in receiving a grant generally reapply in subsequent years based upon the feedback they receive from the review process.

25. What does it mean if I receive questions during the review process? What does it mean for my proposal?

After a proposal is reviewed, there are usually negotiations between the Program Officer and the PI. In fact, one DR K-12 PO commented that there has never been an award without questions. Program Officers present these as questions to the PI towards the end of the review process. Receiving questions is generally considered a positive sign, as it is clear that the NSF is interested in your idea. The types of questions received vary with the proposal. Sometimes questions require a simple change, such as adding members to the advisory board; at other times, the NSF may have serious questions about the research approach. Experienced PIs who have been through this process have noted that these interactions are very helpful to clarify ideas and move forward. After the PIs respond to questions raised, and if the responses are satisfactory, the proposal will move toward funding.

Bibliography:

Fey, Jim. (2010). DRL Proposal Writing Guides Presentation for the CADRE Fellows, April 1, 2010.