Winning an NSF/ILI Laboratory Grant - An NSF Reviewer Gives Advice

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Abstract

Each year the National Science Foundation (NSF) receives nearly two thousand proposals vying for one of its Instrumentation and Laboratory Improvement (ILI) grants. Roughly 500 of these proposals seek support for engineering laboratories. Each year the NSF gathers together several hundred professionals, most of whom are educators, who review the proposals and recommend which should be funded.

The NSF reviewers are grouped into panels, each consisting of about six members. Each panel reviews and ranks 15 to 20 proposals. Since only about one in five proposals receive funding, each panel can expect to have the NSF fund only their top three or four. Interestingly, most proposals are weak and easily denied funding. This paper explains why this is so and gives clear, specific advice on how to ensure that your NSF/ILI grant proposal can have its best chance for funding. Most of the advice offered here will apply equally well to all types of NSF grant proposals.

The NSF

The purpose of the NSF is to promote and advance scientific and engineering progress in the United States. The Foundation is also committed to ensuring that the nation has an adequate supply of scientists, engineers and science educators.

The NSF funds research and education in most fields of science and engineering. It does this through grants, contracts, and cooperative agreements with more than 2,000 American colleges, universities and other research and education organizations. Faculty from all science, mathematics, and engineering departments at any college or university in the United States or its territories are eligible to compete for these grants.

The DUE

The NSF/ILI program falls under the jurisdiction of the Division of Undergraduate Education (DUE). The purpose of the DUE is to promote undergraduate education in science, mathematics, engineering, and technology. It supports:

- students of science, mathematics, and engineering;
- students of science and engineering technology;
- future elementary and secondary school teachers; and
- non-science majors seeking scientific and technical literacy.

The goals of the DUE include the:

- enhancement of the quality of instruction, not only in universities, but also in two- and four-year colleges, and
- improvement of access to science and engineering education for underrepresented populations.

The ILI Program

According to the NSF publication, *Undergraduate Education* (NSF 94-160), "The objective of the ILI (Instrumentation and Laboratory Improvement) Program is to support the development of experiments and laboratory curricula which improve the science, mathematics, engineering, and technology education of undergraduate students, both science majors and non-science majors, including pre-service teachers."

The program consists of two options:

1. The Leadership in Laboratory Development option (ILI-LLD), which provides funds for resources, including time, technical support, and travel, in support of projects that have the promise of being national models for laboratory instruction. Proposals submitted under this program must address a major challenge facing U.S. undergraduate education. A small number of awards are made for this option each year.
2. The Instrumentation Project option (ILI-IP), which provides *matching funds* for the purchase of equipment needed to make improvements in undergraduate laboratories. The majority of ILI proposals are submitted under this program, which is the focus of this paper.

The ILI-IP program seeks proposals that request funds for the purchase of instructional scientific equipment. A maximum of $100,000 may be requested, and the host institution must provide an equal or greater amount of funding. The minimum grant request is $5,000. Those whose proposals receive funding are given 30 months in which to acquire the required equipment and implement the proposed laboratory.

Example Projects and Equipment

Examples of appropriate ILI projects include the implementation of laboratories that:

- are introductory;
- acquaint non-majors with the principles of engineering;
- advance the education of engineering majors;
- educate elementary and/or high school teachers;
- are especially designed for groups who are underrepresented in engineering;
- address fundamental engineering concepts within specific degree programs;
- are associated with honors programs, student research, and independent study; and
- are accessible by others over computer networks such as the Internet.

The NSF/ILI grants are to be used primarily to purchase scientific and computing equipment, including software. The grants can also be used to pay for the construction and assembly of required equipment. In addition, the program allows the purchase of safety equipment, as well as the payment of shipping costs and taxes.

However, neither NSF funds nor institutional matching funds may be used to purchase items such as teaching aids (for example, slide or movie projectors), expendable items (for example, paper or chemicals),

vehicles, furnishings, cabinets, or maintenance equipment. Nor may funds be used to pay salaries, institutional indirect costs or overhead, or the costs of building construction or modification.

The Review Process

The NSF receives ILI grant proposals in mid November. The NSF acknowledges receipt of the proposals and then, if they otherwise meet NSF requirements, the proposals are submitted to the review process.

All proposals are first reviewed by a scientist, engineer, or educator serving as an NSF Program Officer. The proposals are then reviewed, usually in January, by educator-reviewers whom the NSF assembles in Washington, DC. These reviewers are experts in the particular field represented by the proposals they review. Their recommendations for awards are further reviewed by senior NSF staff for conformance with NSF policy.

During the January gatherings, the educator-reviewers are grouped into panels according to their expertise. Therefore, engineers judge proposals for engineering laboratories, chemists judge chemistry-related proposals, and so on. The panels assess each of 15 to 20 proposals according to the:

- merit of its basic premise. Is the proposed project of high quality? Does it reflect currency in its field? Will it genuinely promote education in that field?
- capability of the investigators and the host institution. Do the investigators have the knowledge, time, and will to carry this project through to completion. Does the institution have the required support structure and will its administration adequately support the investigators?
- utility of the project to the institution and its community. Will the proposed project really improve education at the host institution? Will the institution's immediate community profit from the project?
- impact on the national infrastructure. Will the proposed project increase the literacy of the nation's teachers, minorities, women, and/or handicapped?
- dissemination efficacy. Will the results of the proposed project be adequately disseminated so that other institutions and individuals can profit from the activities of the host institution?

Although the panels follow the above NSF instructions, they are given considerable leeway in the application of their judgment. In practice, the review panels tend to look for proposals that:

- are innovative. More of the same will not do. Simple replacement of existing equipment, no matter how badly needed, will not receive funding.
- are progressive. The proposal should show how much more could be done with existing facilities once expanded using NSF funding.
- impact large numbers of undergraduate students. Ideally, the effected laboratory is used within the context of one or more required, rather than elective, courses. Small institutions should show how a large percentage of their students would be affected by the project.
- impact minorities, women, non-majors, high school students, and/or high school teachers. Impact on groups who are underrepresented in engineering is a big plus.
- give strong evidence of the investigators' expertise and will to implement the proposed project.
- demonstrate the investigators' successful completion of previously funded projects, if any.
- do not over-specify or request more funding than needed, but also do not sacrifice quality for economy.

Many NSF/ILI proposals are weak and easily rejected, sometimes for reasons one might not expect. For example, some proposals are rejected because they do not think big enough, requesting too little funding. The majority of the rejected proposals miss out on funding due to their:

- lack of innovation. Boring!
- poor evaluation, dissemination, or development plans. No clear, precise plan!
- lack of potential impact. Small numbers of beneficiaries!

Some Proposal-Writing Tips

Some proposals offer fine ideas, but are poorly written, making it difficult for the reviewers to grasp the merits of their case. The following tips will help make the reviewers' task easier and increase the chances of a good idea receiving the funding it deserves:

- Let the reviewers know on page 1 exactly what you want and why. Don't make them search for, or try to guess, this information.
- Be concise; avoid wordiness.
- Make sure you use correct spelling and grammar.
- Keep your paragraphs small, aiding the proposal's readability.
- Break the proposal up into appropriate, clearly labeled, sections; this also aids readability.
- Adhere closely to the requirements listed in the *Undergraduate Education Program Announcement and Guidelines* document. For example, do not exceed the maximum page count, and do provide *all* requested information.
- Have colleagues read and evaluate your proposal before submitting it.
- Start work on your proposal early. Waiting until the last minute will result in a proposal that is clearly a rushed effort.

Decision Notification

Usually some time in late summer, you will receive from the NSF a notice of either an award or a declination. Included will be verbatim copies of the panel members' reviews. You may also request and obtain any other releasable material in NSF's file on their proposal. Everything in the file except information that directly identifies either reviewers or other pending or declined proposals is usually releasable.

Trying Again

A declined proposal may be resubmitted only after it has undergone substantial revision. Resubmittals that have not clearly taken into account the major comments or concerns resulting from the prior NSF review may be returned without further review. The Foundation will treat the revised proposal as a new proposal, subject to the review procedures described above.

For More Information

The publication *Undergraduate Education* (NSF 94-160) contains guidelines for 1995 proposal preparation. For further information, call (703) 306-1667 or write to:

Division of Undergraduate Education

National Science Foundation
4201 Wilson Boulevard, Room 835
Arlington, Virginia 22230

The DUE can also be reached by email at undergrad@nsf.gov or at its World Wide Web site, http://www.ehr.nsf.gov/ehr/due/start.htm.

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