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AMEE GUIDE

How to write an educational research grant: AMEE Guide No. 101

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Abstract

Writing an educational research grant in health profession education is challenging, not only for those doing it for the first time but also for more experienced scholars. The intensity of the competition, the peculiarities of the grant format, the risk of rejection, and the time required are among the many obstacles that can prevent educational researchers with interesting and important ideas from writing a grant, that could provide the funding needed to turn their scholarly ideas into reality. The aim of this AMEE Guide is to clarify the grant-writing process by (a) explaining the mechanics and structure of a typical educational research grant proposal, and (b) sharing tips and strategies for making the process more manageable.

Introduction

Prior analyses of medical education research highlighted the importance of adequate funding to produce high-quality studies (Reed et al. 2005). However, grant funding for health professions education research is very limited globally, and as a result, extremely competitive. It is difficult for health professions educators to find both sources of funding and write competitive proposals for their ideas. Furthermore, detailed guidance on how to prepare such educational grants is relatively scarce in the literature. Educators from around the globe would benefit from understanding the practicalities of grant writing for career development and for advancing health professions education research.

As discussed previously, it is important to acknowledge the great variability from one country to the next in the importance, value, and feasibility of seeking grant funding for health professions education research. In many countries, education is considered the responsibility of the school and thus, as this line of reasoning goes, should be paid for by tuition and institutional funds. In contrast, in other countries, education is a societal responsibility, funded by the government. In both of these environments, separate research and innovation funding through grant mechanisms may be nonexistent. Some nations fund basic education through government and/or tuition but use grant mechanisms to support innovation and other efforts that go beyond the basic educational mission. Frequently, obtaining grant funding is more of a benefit to the individual investigator than it is to the school; for the investigator, a grant may provide resources and opportunities to pursue individual scholarly interests and it may be evidence of the investigator's ability to compete with peers and excel. In other contexts,

Practice points

- Guidance on writing a health professions education grant is lacking in the literature. This guide provides practical tips for both novice and experienced grant writers.
- Grant funding promotes high-quality research and career development; however, it is difficult for educational researchers to both find sources of funding and write competitive proposals for their ideas.
- Developing a grant application is a challenging undertaking that requires quality and rigor in ideas, methods, expertise, conceptual framework, and practical implementation. Moreover, the products and processes of a grant application have important differences from writing a research paper.
- Critical to the success of any grant project is putting together a team that is committed, has the expertise, the passion, and the time to commit to the work.
- Writing a full-fledged grant proposal and obtaining formative feedback is instrumental to a scholar's professional development.

obtaining grant funding is considered an integral responsibility, and grants funds may, in fact, be a fundamental component to an educator's compensation.

The aim of this AMEE Guide is to clarify the health professions education grant-writing process by (a) explaining the mechanics and structure of a typical health professions education research grant proposal and (b) sharing tips and strategies for making the process more manageable.

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Educational grants: Ideas and funders

The “hidden side” of grant writing: Where do the ideas come from?

Any grant proposal starts with an idea about an issue or problem that can contribute to our knowledge of some aspect of health professions education. Some ideas are about fundamental educational questions, such as “how do practitioners develop and maintain expert clinical reasoning?” Other ideas address questions that are focused on the application of research findings to educational innovations, such as “how can a training program take advantage of test-enhanced learning to improve patient care?”

Regardless of their focus, sound and appealing grant ideas do not develop overnight. It is difficult if not impossible to conceive of competitive research ideas from scratch when a grant opportunity arises. Ideas can be generated from literature reviews, discussions with colleagues, familiarity with grant programs, and/or casual reading of the literature. The following paragraphs describe strategies for cultivating scholarly ideas that can eventually progress to sound material in applying for an educational grant.

Successful grant proposal requires that the work be grounded in the relevant literature, and hence, keeping up with the field is an essential hidden side of grant writing (Bierer et al. 2015). The literature on health science education has grown exponentially over the last few decades (Lee et al. 2013), and although educational scholars might find it challenging to keep pace with even a subset of literature in their area of interest, there are plenty of worthy ideas lurking in the literature. While scholars scan the literature, librarians can become great allies for coping with the ever-growing scientific literature. It is always worth checking with the librarians at the institution about resources or services that are available for helping faculty navigate the literature. For example, librarians might be able to assist scholars with conducting expert literature searches or send electronic updates of recently published articles related to specific topics of interest. Additionally, many journals and tools, such as Twitter™ and Google Scholar™, can be setup to send updates and automated tables of contents via email and news feeds when new content is published.

Attending professional meetings is another way to nurture competitive ideas for grant writing. Scholars may get new insights from presentations, keynote addresses, and discussion forums. Sharing evolving thoughts with other scholars is often an effective way to help improve and refine ideas. Furthermore, scholars can establish a group of collaborators with whom to write a grant proposal. These groups can be established either at the local institution or as a result of networking at professional meetings.

Ideas can also stem from examining the funding agencies themselves. Familiarity with the grant programs’ call for proposals will give scholars insight into how to tailor their interests to the funders goals, while addressing a gap (or gaps) in the existing literature. Reviewing projects previously funded can also help scholars identify areas in need of further research

and can limit proposals which duplicate previously funded ideas.

Searching for a funding opportunity or source

Existing literature on grant writing recommends that scholars research and identify appropriate funding opportunities (Wisdom et al. 2015). There are two basic strategies to search for funding. The first is to start with a carefully crafted, concisely communicated idea and search for a funding agency that might be interested in the project. The second is to scan the landscape of funding agencies for one that is seeking to support projects that might be similar (in one way or another) to a more general idea. The first strategy is directive, focused, and efficient—if a prospective funder can be found. This strategy can also be long and drawn out if the idea does not fit the interests or goals of funders. The second strategy is more opportunistic and will likely require the investigator to mold and reshape a general interest to make it fit the funder’s interests. This strategy requires creativity and flexibility. It also requires a deep understanding of the fundamental research question(s) and/or identified problem(s) and recognition that any question can be asked in many different ways and any problem can be viewed through many different conceptual lenses.

Funding agencies, which are a clear fit for health professions’ education projects, are small in number and often limited in resources (Reed et al. 2005). Professional organizations, such as the International Association for Medical Education in Europe (AMEE 2015) and the Group on Educational Affairs of the American Association of Medical Colleges (GEA 2015) in the USA, offer grant programs that award small amounts of money to help scholars with the development of their research agenda while fostering collaboration and educational scholarship. Some medical schools also have internal educational research and development grant programs to promote educational research, innovation, and faculty career development (Adler et al. 2015). More significant amounts of money are available from national and international health granting agencies, like the World Health Organization (WHO 2015) the United States Agency for International Development (USAID 2015), and the South Korean National Research Foundation (NRF 2015), but educational research is often a low priority. Some private foundations provide funding for educational projects that embrace their mission and values; for example, The Josiah Macy Jr. Foundation (The Josiah Macy Jr. Foundation 2015) in the United States and the Netherlands Organization for Scientific Research (NWO 2015) in the Netherlands. The United States–India Educational Foundation (USIEF 2015) is an example of a partnership initiative that may be configured to support medical education research.

Some institutions have a centralized institutional office or unit that can help scholars identify potential source of funding for their project by either providing a list of sources from their records or searching funding sources for proposal calls that match a particular project’s focus area.

The rhetoric of grant writing: Differences between writing a grant proposal and a research paper

Although the sections of a grant proposal often vary by funding source, most grants are structured much like a research paper, with several important differences. A primary difference is the purpose. A grant is intended to convince an organization to fund an idea for a project that has not yet begun (or is in its initial phases). A research paper presents findings from a scholarly investigation that has been completed. In this primary distinction, a number of salient differences arise, including audience, advocacy, format, and teams.

Audience

The author of a grant should be aware of two key distinctions regarding audience. The first entails the argument for funding; that is, a compelling reason why the idea should be funded by this specific organization at this particular point in time. Authors should conduct a close review of prior successful funded projects (if they are available through the funding agencies' websites or by contacting the grant's program office, e.g. AMEE). The second key audience distinction entails the grant reviewing team. The grant reviewers might or might not be experts in the area of the proposal. Thus, the proposal should also appeal to nonsubject matter experts (Wisdom et al. 2015). Authors should use clear language and avoid jargon as much as possible. There are times when authors may be able to learn more about the expertise of the grant review team, by, for example, performing a Google Scholar™ search on the listed members from the website. When possible, such an approach can help authors tailor their writing.

Advocacy

Unlike writing a research article for a journal, where authors have the supporting evidence (i.e. data) to convey the importance of their findings, grant writing aims to convince the agency to fund the idea(s) before the investigation has been conducted (or following limited preliminary background work). Successfully convincing a funder to support a yet-to-be-conducted project typically requires that authors write a clear, logical, and compelling introduction to foreground the proposed methods and then describing how this specific work fills an identified gap in the literature (Wisdom et al. 2015). For this reason, a sound, focused and captivating introduction of a grant proposal is critical. Indeed, some experts go even further, suggesting that the first paragraph (actually, the first sentence) of the grant is the most important single section needed to catch the reviewers' attention and make them interested in the proposal. Authors must lay out a compelling argument in the first few opening sentences of the proposal. Grant authors should keep in mind that reviewers are often responsible for evaluating many competitive proposals, and authors will be against many opponents. As such, authors must advocate for the need and importance of the ideas and investigations proposed, writing in a perhaps more

provocative and forceful manner than they would use for a scholarly paper.

A related concept is convincing the agency of the need for funding. In the initial phases of a grant proposal (i.e. the letter of intent), the authors are writing to obtain money for an idea as opposed to convincing the reviewer that the science of a completed project is sound. Conversely, it might not be a new idea but one based upon previous sound research that has led to new ideas. Establishing the need for funding goes beyond conveying that the idea is a priority area for the funder and that the investigator has the team to do it; it entails conveying that the work cannot happen without grant funding. If grant reviewers need to consider funding one of two projects they view are critical to the field, conveying that the project could be completed without funding may lead to rejection. Establishing the need for funding should be balanced with a convincing argument that the project is realistic and achievable (Wisdom et al. 2015). Grant authors should not overpromise or attempt the unachievable; yet, at the same time, they need to aim high. Investigators need to carefully walk a fine line throughout the proposal process.

Format

Later, in this Guide, the format and sections of the grant are described in more detail. This section suffices to note that grant authors should clearly articulate what they are planning to do and how they will do it. This includes clearly identifying challenges to completing the work and a cogent description of how the authors plan to mitigate such challenges. It is worth remembering that grant writing involves work that has not yet been conducted, and so the authors need to clearly outline their plans and describe expected challenges (e.g. recruitment) and mitigation strategies (e.g. project advocacy from institutional leadership).

Most granting agencies set precise guidelines for what must be included in a grant proposal, as well as strict format requirements and word/page limits. Reviewers are accustomed to finding information in specific sections of the application. Thus, it is important that the authors read the directions carefully, follow the guidelines, and organize their application to guide reviewers through it. Doing so creates an efficient evaluation process and saves reviewers from hunting for required information. It is important to note that reviewers must often read 10 to 15 applications in great detail and form an opinion about each of them. An application has a better chance of being successful if it is easy to read and follows the specified format.

A useful strategy is to create a checklist, if one is not provided. This can be a good way to organize work and keep track of the required sections. Also, it is often helpful to have another member of the grant-writing team read through the directions and confirm completion of the checklist items (Blanco & Lee 2012). Since grant writing is a team effort, all the members of the team are expected to edit and otherwise proofread the proposal. Writing quality counts; authors can make a good impression by submitting a clear, well-written, properly organized, and error-free application

Team

In contrast to a scholarly paper, where the contributions of the authors are highlighted at publication, the strengths and capabilities of the grant-writing team must be evident at the outset. This is done, in part, to give reviewers a sense of the team's experience and to ensure the team has the needed expertise and number of members to complete the work outlined in the proposal. Grant authors should think about the expertise of the team compared to the expertise that they will need to complete the work (and convince the grant funders). The grant optimally conveys who is doing what and why they have been chosen to be part of the team. Writing as a team is discussed in more detail in the next section.

Description of the common components of an educational grant

Letter of intent

To leverage limited reviewer resources, some funding agencies use a two-phase submission process. In the first phase, all applicants submit a letter of intent (LOI), also called a preproposal, in which they succinctly describe their project often in only three to five pages. Following LOI review, only a few investigators, those with proposals deemed most meritorious by reviewers, are then invited to submit a more detailed proposal in the second phase. These more expansive full proposals are reviewed again; one or more are then selected for an award.

An LOI needs to accomplish a great deal in just a few pages. It must reflect the state of the field and identify the knowledge/practice gap, captivate reviewers with an important and interesting research question, provide sufficient methodological detail for reviewers to judge its rigor and feasibility, and describe a grant team that exudes competence and has the requisite expertise, resources, and support.

Reviewers are not expecting an in-depth literature review or a long list of citations (indeed, the number of references included in a LOI is often restricted). Nevertheless, applicants need to convince reviewers that their scholarship builds upon the work of others and, in turn, is likely to make a valuable contribution to the field. To this end, applicants should judiciously choose a few key references that, altogether, describe the state of the field and identify a gap they intend to address with the proposed research.

It is critical that applicants meaningfully and deliberately apply a conceptual framework, such as a theory, pedagogy, or model, to guide their work. Such a framework is paramount to ensuring that reviewers do not discard the proposal; without a conceptual framework, applicants are just proposing to simply conduct a "project," rather than scholarly work that builds on the work of others and, ultimately, creates new knowledge (Bordage 2009).

Applicants should carefully read the instructions for the LOI to ensure their proposal covers all of the required elements. Typical elements (described in more detail in the next section) include the following:

- Background and problem statement

- Methodology, including research design, sampling, and approach to statistical or qualitative analysis
- Total funds requested
- Description of the grant team, including their qualifications and facilities (i.e. the team's areas of expertise and why they were chosen)

Grant proposal

Typically, a health professions education research grant proposal will include some combination of the following major sections: title and abstract, background and problem statement, study purpose, goals, and/or objectives (often including the research questions and hypotheses), review of the relevant literature and preliminary data (if any exists), research design and proposed methods, project timeline and deliverables, budget and budget justification, and qualifications of the grant team. Although most grants require many of the same sections, the order and specific requirements for each section often varies. A description of each major section is provided below, along with some recommendations and strategies for writing. In addition, Box 1 provides a bulleted list of questions that grant authors should consider as the team crafts each section of the grant proposal. Such questions are often used as evaluation criteria by reviewers.

Title and abstract

In a complete grant proposal, the title and abstract are usually the first components of the grant proposal that reviewers read. Therefore, it is crucial that grant authors carefully craft their title and abstract so as to immediately capture the reviewers' attention and interest in learning more about the proposal. The title should be descriptive and portray the context, participants, and research design. The abstract should provide a concise and clear account of the main components of the proposal: the problem statement, the need for the research, the research design and methods, and the educational implications of the research.

Background and problem statement

As referred earlier, one key to securing grant funding is to effectively "make the case" for the project. To do so, authors should answer the following basic questions: (1) what problem is being addressed in the proposed research? and (2) to what extent is the problem timely, important, and relevant to the field and the funding agency? The introduction or background section of the proposal is the opportunity to clearly and succinctly answer these two questions. It is important to recognize that this section of a grant proposal is somewhat different from that of a research paper, because it is not enough to simply identify the problem and show that it is important to the field. The authors must also make the case that the problem is important and relevant to the funding agency.

Along with a brief introduction and review of the relevant literature, this section should include a succinct problem statement. As an example:

Remediation is important for struggling trainees. When trainees struggle to meet accepted standards,

Box 1. Questions to guide the writing of each major section of a grant proposal.

Title

- Is the title descriptive; does it encourage reviewers to want to read the proposal?

Background and problem statement

- Is there a scientific problem that is addressed in the proposed research?
- Have the investigators described the importance and relevance of their work to the field?
- Does the research add to the current knowledge and discourse in the field?
- Is the knowledge gained by the research relevant only locally, or is it useful for the wider scientific community?
- Does the potential exist for practical implications?

Literature review (including theoretical and/or conceptual framework)

- Is the relevant literature clearly and concisely reviewed?
- Is the proposed research grounded in an appropriate theoretical and/or conceptual framework?
- Is the research aimed at testing existing theories, or developing new theories?
- Is the proposed research innovative; does it challenge existing ideas?

Study purpose, goals, and/or objectives (including research questions and hypotheses)

- Has the overarching purpose of the proposed research been clearly articulated?
- Are there specific goals and objectives for the research?
- Are there clearly defined and answerable research questions?
- Are the hypotheses informed by theory or supported by prior empirical findings?
- Has the research team collected preliminary data that supports the proposed study?

Research design and proposed methods

- Are the data collections and analysis methods appropriate given the research questions?
- Have the methods been described in sufficient detail (i.e. study context, target population, sampling strategy, procedures, measurement instruments [including evidence of reliability and validity], analyses, and measurement outcomes)?
- Has a power analysis been conducted to determine the appropriate sample size for quantitative proposed research?
- Is the research ethical and have Institution Review Board requirements been considered?

Project timeline and deliverables

- Is the proposed timeline reasonable (i.e. can the work be accomplished)?
- What are the proposed deliverables (e.g. measurement instruments, theoretical contributions, dissemination in papers/presentations)?

Budget and budget justification

- Are the costs reasonable and well justified?
- Can the proposed research be finished and within budget?

Qualifications of the research team

- Does the research team have the requisite experience and expertise to conduct the proposed research?

medical educators typically provide remediation, such as directly observing trainee performance and providing feedback. However, while such approaches may be useful in identifying specific behaviors that are problematic, they are often shown to be ineffective at providing individualized feedback and improving overall performance.

Problem statements generally identify a gap in theory, research, or practice, and the proposed study is offered as a way to investigate a solution (or solutions) that might fill the gap.

Literature review

Depending on the funding agency, the grant proposal may include a separate literature review section. Alternatively, this portion may simply be included as part of the background. Whatever the case, authors should strive to review the appropriate literature and demonstrate to the reviewers that they know the field and have thoroughly examined previous research (Wisdom et al. 2015). All too often, investigators propose studies that have already been done, with research questions that have already been answered. A likely cause for such repetitive proposals is a failure to conduct a proper literature review (Albert et al. 2007).

An equally important reason to conduct a thorough literature review is to help better articulate the problem and identify the variables of interest through application of an appropriate conceptual framework. As Bordage (2009) noted,

“Conceptual frameworks represent ways of thinking about a problem or a study, or ways of representing how complex things work. They can come from theories, models or best practices. Conceptual frameworks illuminate and magnify one’s work” (p. 312). When used properly, conceptual frameworks can help researchers identify variables that might be linked and why. Conceptual frameworks also allow researchers to make reasoned hypotheses and define the context and scope for the study (Norman 2007). Unfortunately, proper use of conceptual frameworks is often absent from health professions education research (Bordage 2009).

Study purpose, goals, and/or objectives

The overarching purpose or goal of the proposed study follows directly from the background and problem statement and typically addresses the gap that the grant authors have identified. In the example above, the study purpose might be as follows:

To develop a theoretically grounded assessment methodology that is capable of identifying and assessing trainees’ regulatory processes and to use the new assessment to guide individualized remediation and improve performance.

From this overarching, purpose or study goal forms the study objectives. Unlike the study purpose or goal, the study objectives are more specific and often provide an outline of

the activities to be completed and the research questions to be addressed. To continue with the example, two study objectives might be the following:

(1) To refine a previously developed assessment protocol through expert reviews and (2) To collect reliability and validity evidence for the assessment using a sample of second-year medical students.

Research questions and specific hypotheses, if appropriate, often follow the study objectives. It is important to note, however, that not all health professions education research is hypothesis-driven. Instead, it may be descriptive in nature and/or designed to build theory or generate hypotheses.

Regardless of the specific type of research being proposed, grant authors should avoid presenting their work as a single study (versus a program of research) that is being proposed simply because the opportunity has presented itself in their local context. Such studies usually are not oriented toward knowledge building and generalization beyond the walls of a local institution (Albert et al. 2007). What is more, educational scholars have recently argued for less “effectiveness-driven” research (i.e. studies that compare one intervention to another) and more “discovery-driven” research (i.e. studies that ask deeper questions, such as what works, why it works, and under what conditions it works (Rotgan 2012).

Finally, including preliminary data in the submission tells the funder that the grant investigators have a track record, it also indicates that they have had some prior success with the proposed line of inquiry. The author’s track record and past research achievements suggest that the research has a high probability of success. Some funding agencies will not fund applications that do not have at least some amount of preliminary data. On the other hand, other agencies fund only novel studies and innovations, and so, having too much preliminary data may indicate to funders that the work is not, in fact, all that novel or innovative. In either case, the authors should check the application instructions carefully for guidance about preliminary data and pilot studies and tailor their submission accordingly.

Research design and proposed methods

Once the case for the project has been made and the goals and objectives have been defined, and the next task is to detail the research design and methods. This portion of the grant proposal is often the longest, because it generally requires the most detail and explanation. Grant authors must show the reviewers that the design and methods are appropriate given the research objectives and questions (Wisdom et al. 2015). Effectively making this case requires alignment of the goals, objectives, and research questions with the overarching research method (i.e. quantitative, qualitative, or mixed methods). A mismatch between these study components is an almost certain way to receive a less-than-stellar evaluation from the grant reviewers.

The research design and methods section should include a thorough description of the study setting, target population and sampling strategy, specific procedures (including timing), measurements instruments (including evidence of their reliability and validity), analyses, and outcomes. High-quality

grant proposals, particularly those that utilize quantitative methodologies, should also include an appropriate power analysis to justify the proposed sample size. For the qualitative studies, investigators should evaluate the quality of the data collected against the research methods, the purposeful sampling used, and the research product intended to determine the final sampling size (Sandelowski 1995). Authors should then state that sampling will continue until they reach a point of information saturation and provide their best estimate of how many subjects will be needed based on the purposeful sampling strategy and qualitative methods they propose (Sandelowski 1995). In some countries, if the project involves human subjects, grant authors will also need to obtain a research ethics review through their institution. Even in countries in which a research ethics review is not required, the funding agency may require one, so investigators should consider how they might obtain such a review.

Like the rest of the proposal, the study design and methods must be organized and logical. The authors reasoning processes should be easy for reviewers to follow and the components of the study should fit together logically. The grant authors should consider using diagrams, flow charts, and tables to improve readability; this is especially important for complicated research designs with multiple phases, arms, and/or sites.

Project timeline and deliverables

The grant proposal should provide reviewers with an easy-to-read project timeline that has been examined and approved by the grant team. A graphic or table highlighting the timeline can provide a quick summary of the planned project sequence. It is also a good idea to have other, more experienced colleagues review the grant proposal, particularly those with experience conducting research in the local context (Wisdom et al. 2015). The grant timeline should include a list of milestones or deliverables and be realistic. Grant authors should not propose more work than can be reasonably done during the proposed project period and allow time for unanticipated delays, such as problems with participant recruiting. In the cases where research ethics approval is required, approvals can take anywhere from a few days to many months, depending on the institution (Dyrbye et al. 2007) and multisite studies typically demand even more time. The timeline and list of deliverables can also include plans for dissemination (e.g. conference presentations, technical reports, and/or journal publications). When appropriate, grant authors might consider dissemination plans that include distribution to nonacademic audiences, such as policy makers, and/or practitioners locally, nationally, and internationally.

Budget and budget justification

The budget should be developed concurrently with the research plan. Everything in the budget must be justified by the proposed work and research activities (Wisdom et al. 2015). The proposed budget should be reasonable and align with the funding agency’s instructions. Funding agencies differ widely with respect to the budget items that are eligible for funding and the amount of justification required. Common

areas in which agencies differ include travel, indirect costs (also known as administrative overhead; see section on “Dealing with Institutional Red Tape” below), equipment, student stipends, and open-access journal fees. Although it is unlikely that the proposal would be rejected solely on the basis of a poorly written budget, funding agencies will not fund unreasonable costs, and so it is not unusual to win a grant but receive less than full funding. A budget that is well planned and/or justified reduces this possibility. Grant authors can always check budget questions that they might have with the grant program officer before submitting their proposal, especially given that the criteria/guidelines for budget allocations in grant calls are often ambiguous.

Qualifications of the Grant Team and Writing as a Team

Critical to the success of any project is putting together a team that is committed and has the expertise, the passion, and the time to commit to the work. The size of the team is dictated in part by the granting agency and allocation of budget. As mentioned earlier, smaller grants may not provide for funding of an investigator's salary, instead, requiring that time committed to the project be supported by the home institution. If applying for a grant without salary support, an estimated time needed for the project should be determined prior to submitting the grant; a discussion with a senior mentor may help in attaining a realistic estimate. Failure to complete a project due to time constraints will be a disappointment for both the investigator and the granting agency and reflects poorly on the investigator's institution.

The number of team members and their expertise are important considerations for the success of a proposal. The principal investigator (PI) should ensure that the right people are on the team and be careful not to include large numbers of individuals who are not funded in some way to support the project. Funding may be through the project budget or through “cost-sharing” in which the institution “contributes” the effort of those individuals without a financial transfer. If there are many investigators on the team who will participate “pro bono,” reviewers are likely to raise doubts about the probability of the project actually succeeding.

When assembling the study team, open discussions with clear expectations for each team member are necessary. The PI will lead the group through the project and typically is the key point of contact with the granting agency throughout the review period and the funding period. The PI will be responsible for writing the grant (or for compiling individual sections written by other members of the team), for establishing timelines, and for overseeing all aspects of the project. Coinvestigators (often referred to as associate investigators) will work directly with the PI on the design of the project and in providing feedback and edits to the grant. If funded, the coinvestigators will work closely with the PI to ensure project success. Consultants may be included on the study team to provide expertise for specific parts of the project. The role of consultants, their anticipated contributions, and their total time dedicated to the project should all be made clear in the proposal.

Each team member should read through the grant prior to submission and provide feedback to the PI. Ideally, development of the grant will allow time for the team to carefully review and revise the proposal. Depending on the complexity of the project, individual team members may elect to write various sections of the grant proposal. Deadlines should be negotiated at the beginning of the grant-writing process and adhered to by the study team. The PI will need time to edit and organize the final product. Experience suggests that a team member who is too busy to participate in the development of the grant during the writing process, while well intentioned, may also ultimately be unable to commit the necessary time to contribute to the actual project, should it be funded.

Forming an effective and committed research team is not a trivial matter. O'Sullivan et al described useful strategies that support collaborative research from inception to completion (2010). Passion for the project is as important as expertise. Each member of the team is typically asked to submit a short biographical description of their relevant skills and prior work. Although having a team of well-recognized coinvestigators on a project may impress the granting agency, the project will only be successful if each person follows through with his or her expected contributions. Thus, less experienced but committed junior colleagues may be as valuable as better known but overextended senior colleagues.

In summary, the personnel on the grant team should have the appropriate scientific skills, expertise, and experience. Having a skilled and experienced grant team, but a weak study design, will not get the project funded. However, having a skilled and experienced grant team combined with a strong study design will greatly increase the odds of funding.

Appendices

In general, the use of appendices should be avoided. Appendices should only be used for supporting evidence, such as a tool that will be used in the research (i.e. a measurement tool, such as a questionnaire, that has already been developed). Reviewers might not even look at the appendices, and so the proposal must convey all the crucial information as a stand-alone piece.

Writing style and format

Grant authors might struggle with how much detail should be provided in each section. Oftentimes, too much detail is contained in the introduction and literature review at the expense of the methods and design. The length of the introduction must not be a hindrance to providing all the necessary details in the methods. Moreover, reviewers are typically very busy people, so the grant proposal should be easy to read and engaging. The writing style and organization are keys to grabbing the reviewers' attention—style counts! That said, nothing substitutes for quality content. For a good flow, grant authors can create headings that contain the “take-home message” for each section, if the format permits, and/or use bullet points or subheadings to break down the text and highlight key components (Blanco & Lee 2012). It can also be helpful to review prior successful grant proposals to get more insights into how to craft a successful submission.

Dealing with institutional red tape

Unfortunately, preparing a grant application involves jumping through several bureaucratic hoops. It is a time-consuming process, and thus, grant authors should plan accordingly. First, it is important to note that an educational grant, once funded, constitutes a contract between two parties—the granting agency and the PI's organization—each of which may stipulate certain terms and requirements. Most universities or teaching hospitals have an administrative office dedicated to managing grants and contracts. This office may want to review and approve the application *a priori* to submission. The grants management office or equivalent will verify salary figures, overhead rates, and promises of time, effort, and other resources. The purpose of this step is to assure the funder that the promises made in the proposal are legitimate and that the institution will commit to them.

Most academic organizations require that PIs budget for “overhead, facilities and administrative costs” (also called “indirect costs”). In other words, they want PIs to budget for an additional percentage of the total requested funds to help the organization manage the grant and provide overall institutional support. Prestigious organizations can require as much as an additional 70–100% in indirect costs! Funding agencies, understandably, are pushing back on such practices and usually limit or outright disallow the inclusion of overhead costs. If a funding agency limits the amount of overhead they will pay, this often will need to be approved by the institution via some type of funding waiver. To avoid getting caught in a tug of war at the last moment between the funding agency and the institution, PIs must reconcile what their institution demands and what the funding agency allows. It is therefore imperative that PIs interact with the grant's management office early on in the process and inquire about issues such as the following:

- (1) What are the institutional requirements regarding indirect costs?
- (2) How much time do they request for reviewing the proposal before submission?
- (3) Is the PI entitled to submit the grant in the first place?

To the last point, universities have various levels of faculty ranks, ranging from clinical instructors to tenure-track professors. In keeping with century-long traditions, these various “breeds” in the professoriate are not all created equal and, depending on the institution's rules, only some ranks may be allowed to submit a grant proposal (particularly if the grant author is planning to submit the grant as the PI). The grant office can clarify this and explain how special dispensation can be given, if need be.

Another potential bureaucratic morass that the PI needs to navigate is the research ethics review. Institutions in many countries, but not all, have their own research ethics review processes or contract with an external organization for such reviews. Some grant programs require that the research protocol receive research ethics review and approved prior to submission (although this is not the norm). On the other hand, some research ethics review committees may require a guarantee of funding before they will review a submission. Most of the time, funding agencies will be satisfied if the

protocol is under review by the time of submission; funding is then contingent on final ethics review approval.

Should the proposal get funded, the funding agency will issue a cheque (or, more likely, an electronic distribution) directly to the PI's institution (and not to the PI personally). The PI's grants and contracts office will set up a fund against which the PI can charge research-related expenses. The grant is now a legally binding agreement between two parties that documents a statement of work and a timeline for deliverables. The latter usually includes periodic progress reports and, ultimately, a final report and ledger account of funds. If the investigators need to deviate from the original research plan because of unforeseen circumstances, the PI should contact the grant's program officer (or program director) before any changes are implemented. Any changes in the research protocol may require another research ethics review and approval. If the grant team needs more time to complete the project, the PI often can negotiate a “no-cost extension” with the funding agency.

No one enjoys dealing with bureaucracy, but effective interaction with the grants management office and research ethics review process is key. By investigating and anticipating the preparation process, PIs can avoid unpleasant surprises and, despite stubborn academic traditions, may actually get a good night's sleep the night before the deadline.

Last, but not least, the PI must submit the proposal to the funder according to their instructions. Some require submission by mail, some by the web. All have deadlines that need to be honored—a late proposal is unlikely to be reviewed; so meeting the deadline is critical. What's more, depending on the PI's institution and the requirements as set forth by the funder, final submission of the proposal may need to be done by the PI's grants management office (or equivalent), and not by the PI him/herself.

Once submitted, the PI should get verification of when the submission was received, whether by return receipt of the email, web verification, or postal signature receipt. In cases where the proposal is misplaced or lost, having this documentation can help the PI argue that the funder accepts a resubmission.

What to do if the proposal is not funded

The vast majority of proposals will not receive funding; rejection rates for grant proposals of between 80–90% are common. Grant authors can contact an official or staff member of the funding agency to find out what the acceptance rate is for their grant program. Doing so will help PIs accurately set their expectations.

Because grant teams put much thought and time into the proposal, it understandably hurts when they receive the dreaded rejection notification. The team should put the rejection notification aside for a day or two and then carefully look at what the reviewers had to say. Writing a full-fledged grant proposal and getting formative feedback is instrumental to a scholar's professional development. While the review process is not an exact science, every well-respected grant

program has a fair and transparent selection process in which every step is documented. If little or no reviewer feedback is provided, authors should feel free to contact the funding agency representative, not to complain or to argue, but to get a sense of the strengths and weaknesses of their proposal.

If reviewers have done their work, they will provide the authors with constructive feedback for improving the proposal. First of all, the authors should take the reviews seriously. Even though reviewers may seem to miss the obvious, raise irrelevant concerns, pick at minor details, and/or misunderstand the clearly logical arguments the authors are making, their concerns must be considered. If reviewers misunderstand something, the authors need to consider it their failure in communication and find a way to make things clear. Having a reviewer describe something written as “unclear” is essentially the definition of “lack of clarity.” Remember that when it comes to grant reviews, “the reviewer is always right”—even when they are wrong (Eva 2008). There are occasions when a reviewer is biased or simply unfamiliar with key aspects of the research proposal. In such cases, it may be possible to contact the funder to lodge a concern about the validity of that review and seek a rereview or an exclusion of that review. This is rarely successful, however, if only because it takes time and happens after the funding decision has been made. The grant authors should think long and hard before lodging such a complaint. Simply waiting until the next grant cycle to resubmit the proposal (with revisions) is often the best approach.

While the grant authors may disagree with some of the reviewers’ arguments, they are now well positioned to craft a more compelling proposal. Chances are the authors can resubmit the proposal to the same or different program after revising it, or find another funding agency to support the project.

Conclusion

Preparing a grant application is a major undertaking that requires the highest quality and rigor in writing, ideas, methods, expertise, conceptual framework, and practical implementation. A recent review of the literature offered a summary of recommendations for grant writing based on an in-depth review of current publications (Wisdom et al. 2015). There are many details that need attention and every step of the process takes time. The competition is often very high and probabilities of success are modest (at best). So, with all of these challenges, why bother writing a grant? The primary reason is to be able to do high-quality research that is too expensive to conduct without funding. High-quality research is essential to developing the field of health professions education. Success in grant funding is also among the most compelling evidence of the quality and rigor of the investigator’s own independent thought, research acumen, and leadership. In many institutions, receiving a grant provides much more prestige than several peer-reviewed publications. Finally, funded research lets investigators pursue their own interests and ask questions outside of the day-to-day routine. In other words, obtaining grant funding to purpose innovative work is enormously gratifying.

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