

Research Grant Proposal Writing Course for Students in Higher Institutions

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Abstract

Research grant proposals have become part of the everyday life of every scientist working in the field of life sciences. Although most early career researchers begin working on research grant proposals during their doctorate, laying the foundation of this complicated task should occur during their undergraduate training. This editorial serves as an introduction into research grant proposal writing for students enrolled in higher education and tackles subjects such as choosing a research topic and writing a successful grant application, as well as possible challenges and funding opportunities that we considered appropriate for students and early career researchers.

Key Words: Research Proposal; Funding Opportunities; Proposal for Funding; Research Grant; Proposal Writing (Source: MeSH-NLM).

Introduction

Writing a research proposal is already a big challenge in itself. How much more if you write a research proposal to seek funding? Can we do it? How? The answers to these questions are provided in this editorial. While it is true that writing a research proposal is indeed a challenging task, it does not mean that it is impossible. It does take time and a lot of effort, but once you have done it, getting someone to fund it, is not much of a problem anymore. A lot of funding agencies, local, national and international are willing to fund research projects that are sound, innovative and have the potential to help improve the way we do things, the environment and the community.

So where do we start? We begin by conceptualizing a research question that seeks to answer or clarify a certain need or problem. The research question can come from daily experiences and challenges. It can be a local, national or global issue or problem that needs to be clarified, improved or addressed. An example of a global problem that needs solutions would be climate change. In developing and tropical countries like the Philippines, research on Dengue Fever can be considered relevant. Most recently is the emergence of a new infectious viral disease, the novel Coronavirus pandemic (COVID-19). Ideas that would seek to address these problems are good research topics to work on. Since these problems pose great impact for society, naturally, many agencies would support research innovations that offer potential solutions to such. This is where we start.

Choosing a Research Topic

In everyday life, we are confronted with so many problems. So how do we choose? You can approach this issue in several ways. Firstly, you may consider thinking about your potential

beneficiaries. Who do you want to help? What subset of the population do you want to benefit from your project? For example, if you want to help the earthquake victims, then think of disaster related activities that can help improve the way we deal with natural calamities or disaster preparedness. Such ideas may address problems that have occurred before, during or after the disaster. In particular, you can think of ways on how to streamline the approach of distributing relief goods for the affected community so that these goods reach the victims in the earliest time possible while minimizing expenses. Secondly, you may opt to look for funding opportunities first that are in line with your expertise, then think of a particular problem you want to address. For example, you may just search the World Wide Web: look for legitimate websites like for the Philippines, Department of Health (DOH) or Department of Science and Technology (DOST) and scroll down on funding opportunities.¹ These websites usually give details on the research topics they prefer to fund. Choose a topic you are most interested in and that suits your expertise and write about it. These funding sites also have their own research proposal templates which you need to follow.

Writing the Research Proposal

Generally, the major components of a research proposal are the following: Introduction, Methodology, Results (Dummy tables), Timetable and Budget (*Figure 1*). The following section presents the general contents of a research proposal as well as instructions on how to write each component. Normally, since we are still proposing something, we use the future tense especially in the Methodology section. There may be variations depending on the funding institution. Nevertheless, this section will just serve as a guide on how to develop your research proposal.

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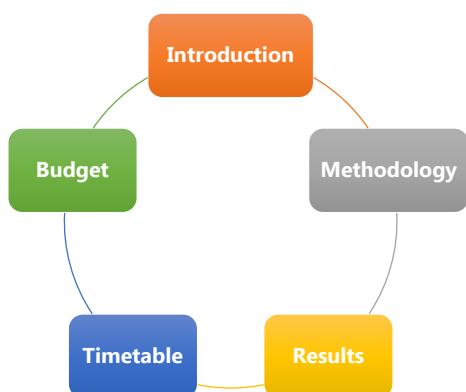
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Figure 1. Major Components of a Research Proposal.



Preliminaries

Title Page

Write the title of your research proposal. Some funding agencies may have specific formats for you to follow. There is no ideal number of words that should make up a research title although some sources advise to limit it to 10 to 15 words.² In our opinion, researchers should not limit themselves with a specific number of words but that the title should be as concise as possible, yet adequate enough to describe the contents and purpose of your research. Firstly, a good title predicts the content of the research paper. Secondly, a good title should be interesting to the reader. Thirdly, it should reflect the tone of the writing. Fourthly and finally, it should contain important keywords that will make it easier to be located during a keyword search. Avoid phrases like “A study on...” or “Analysis of...”; research titles are usually in the form of a phrase or less commonly a question.²

Table of Contents

Arrange this section with main headings and subheadings with the following major parts, namely: Introduction, Methodology and Results. The Results section will only include dummy tables. Other important parts include the preliminaries, references, appendices, and curriculum vitae.³

List of Tables

List the number and titles of tables as they appear in the body of the research proposal. The first table may start in the Methodology.³

List of Figures

Make a list of figures and arrange in this section as they appear in the body of the research. The first figure may start in the Methodology.³

Body of a Full-Blown Research Proposal

The full-blown proposal contains only three parts: Introduction, Methodology and Results (dummy tables only).³

Introduction

This part justifies the need to answer the main question you are designed to answer. It gives a clear idea about the seriousness of

Table 1. Sample Table of Contents.³

Table of Contents	Page
Title Page	
List of Tables	
List of Figures	
Introduction	
Background	
Review of Related Literature	
Theoretical framework	
Conceptual framework	
Objectives	
Significance of the Study	
Methodology	
Research Design	
Setting	
Population	
Variables and Measures	
Sampling	
Sampling Design	
Randomization	
Estimation of Sample size	
Data collection Procedure	
Data Analysis	
Limitations of the Study	
Ethical Consideration	
Results (Dummy Tables)	
Timetable	
Budget	
References	
Curriculum Vitae	
Appendices	

the problem. It sets the scene of the setting of the study that is to interest the reader. It starts with general ideas then moves down to specifics. This contains the background, review of related literature, theoretical framework, conceptual framework, objectives, hypothesis, and significance of the study.³

Background of the Study

Writing the background of your study is like writing an interesting story that will engage your reader. Start with a brief provocative problem statement that is applicable to the theme of the study. This one statement should catch the attention of the reader. Include convincing arguments that will support the statement on the seriousness and urgency of the problem. Follow with facts/statistics that portray the problematic situation (global, national, regional, and local setting). Present a resume of events/programs/projects that have been done by various public and private sectors to address the problem. Indicate a firm stand on the need to bridge the gap between existing facts and the problematic situation. Indicate what should be done and what data are needed to address the problem. Present the rationale on the need to conduct the study.⁴⁻⁵ The length of the write-up should not exceed three pages in double space setting.³

Review of Related Literature

This section provides information on the background of the problem, theories that explain the existence of the problem and determinants, and previous studies done. Acquaint the reader with existing studies as to what has been found, who has done the work, when and where the latest studies have been conducted. Provide the reader with information on what research methods were utilized and provide information on what problems were met and how were they resolved. Use sub-headings and use past tense.⁶⁻⁷ Establish the theoretical and conceptual framework for the research.

- a) Theoretical Framework - Make use of a theory or theories to explain why a phenomenon exists and how the different factors which brought about the phenomenon are interrelated. The purpose of the theoretical framework is to develop and present a unified explanation of related ideas and to provide the foundation on which the study will build and develop.^{3,8}
- b) Conceptual Framework - Make a diagram to present how different variables in the study are related to each other. It has the same function as the theoretical framework but instead of using theories, it uses constructs which are specific and well-defined. Explain how the different variables are related to each other.^{3,8}

Objectives

These are statements of purpose for which the investigation is conducted. These serve as guides in the specification of variables, selection of research methods, determination of the data to be collected and planning of analysis of results.

For a quantitative study, state the General Objective by transforming the problem statement from an interrogative form to a declarative statement, usually introduced by the phrase "to determine". State the specific objectives which are specific activities/questions that are desired to be done to answer the general objectives. These are statements of the specific outcomes expected in the study.^{3,9}

In a qualitative study, the objectives appear as a) "Grand Tour Question" as the main aim which is written in a declarative statement; and b) the sub-problems which are in the interrogative form.^{3,10} Although the focus of this editorial is quantitative research, it is also good to note this distinction between quantitative and qualitative research in terms of objective formulation.

Hypothesis

This section appears in the proposal only if the study determines relationship(s) or difference(s) between variables. This is an educated guess, an assertion or proposition about the interrelationship or about differences between two or more variables. If your study does not test causal relationships or

differences between variables, do not use a hypothesis (e.g., in purely descriptive, diagnostic, or exploratory investigations). There are two types of hypotheses, the Null Hypothesis (statement of denial of an existence, attribute, relationship, difference, or an effect) and Alternative Hypothesis (statement of relationship, difference or an effect). Of these two, use the null hypothesis because errors in accepting or rejecting the hypothesis can be easily avoided.^{3,11}

Significance of the Study

State the value of the study or justification for making the study. Make a list of potential users and indicate the specific contribution of the results (findings, conclusions, recommendations) to these beneficiaries of the study. (Note: In the final research write-up, you have to integrate significance in the Discussion).³

Methodology

This section provides a detailed description of the basic research plan or procedure on how the study will be done so that it will be reproduced by a competent colleague or that the procedures are needed to judge the validity of its answer. This may be a place to begin writing then return to introduction when a flow of words has already started. Include in this section the following parts: research design, setting, population, variables and measures (dependent and independent variables), sampling (design, randomization and estimation of sample size), data collection procedures and ethical considerations.³ In the proposal, this chapter is written in future tense. In the final write-up, it is written in past tense.

Research Design

This refers to the plan of action, approach or strategy to be used in the study. Define the research design used, whether it is descriptive, cross-sectional, case-control, cohort or experimental, quasi-experimental, etc. Indicate who has the authority of such definition and cite the reference.³

Setting

Describe the study area or the venue where the study will be conducted (e.g., hospital, university, research centre, etc.). Provide a justification for choosing the study area. A map may be shown when necessary.³

Population

Indicate the number and significant characteristics of the participants. Provide inclusion criteria (specific characteristics that make the participants qualified to participate in the study) and exclusion criteria (specific characteristics that render a certain segment of the population to be ineligible to be included in the study).³

Variables and Measures

Variables are characteristics that are measured numerically (e.g. blood pressure) or in terms of categories (e.g. presence or absence of a disease, smoker or non-smoker, etc.). If your study determines a relationship between variables, write the dependent

variable first. A dependent variable “hangs on” to another variable or is a putative effect of one or more variables. Then write the independent variable(s). This/these characteristic(s) is/are the assumed cause(s) or reason(s) for any variation of a dependent variable which is usually the problem in the study.³

Specify the categories or classes of the dependent and independent variables in terms of scales of measurement. These maybe written in a form of a nominal (two or more categories that are qualitatively different from each other (e.g. place of delivery such as hospital and home); ordinal (ranked categories, e.g. severity of a disease); interval (zero does not indicate absence of attribute and equal differences between any pair of numbers in the scale indicate equal differences but not in the amounts of the attribute such as temperature); and ratio (zero indicates absence of attribute and equal differences between any pair of numbers is the same as that between the amounts of attribute being measured (e.g. hemoglobin concentration or scores in the examination)).³

Sampling

Explain the process of choosing the samples that will represent the entire population. Include in this section three issues about sampling: i.e., sampling design, randomization, and estimation of sample size if appropriate.

Sampling design: Explain the entire procedure on how the participants will be chosen. Choose the appropriate sampling design. There are two basic types of sampling designs namely non-probability or non-random or judgmental sampling (e.g. accidental and purposive) and probability sampling (e.g. simple random, systematic, stratified random, stratified systematic, cluster, two-stage and multi-stage designs). State the sampling frame, whether a spot map or a list will be used.³

Randomization: Describe the randomization procedure if needed in the study. This refers to the procedure where each participant is assigned to a treatment group or control group by chance (e.g. by random numbers) to reduce the influence of extraneous factors.³

Estimation of sample size: Show how sample size is derived using some formula for estimation of sample size. This is used to consider the availability of human resources and logistics.³

Data Collection Procedure

Explain in detail how pre-testing or pilot testing will be conducted including the number of participants, recruitment, setting, and instrument to be pre-tested, procedures to be used in pre-testing.³

Explain in detail how the data will be gathered, whether through observation method using instruments (like tape measure or weighing scale); personal interview using a structured interview schedule, self-administered interview, key informant interview and/or focus group discussion. Describe the instrument in terms of number and content of questions to be used, type of scale, how these are organized, and the method of validation. Attach a

copy of the instrument in the appendix. Also describe here when the study will start and when it will end. Describe the enumerators in terms of their educational attainment, employment status, experience as interviewers/observers, method and duration of training for the study.³

Data Analysis

Indicate the type of statistical test(s), decision making criteria (alpha level) and computer software that will be used in the study. Refer to the specific objectives as a guide in the identification of appropriate statistical tools. (Note: In the final research write-up, integrate data analysis in the Results).³

Limitations of the Study

The limitations of the study should provide information on certain conditions which are beyond the control of the investigator. (Note: In the final paper, integrate limitations of the study in the Discussion).³

Ethical Considerations

Describe the ethical issues that will be observed to protect the rights, safety, privacy, and sensitivity of laboratory animals and/or human participants as well as the researchers themselves, the community and the environment. If the study deals with human participants, state clearly how informed consent is obtained. This means that the participants will give their consent (by signing in the informed consent form) after they have been informed of the nature of the study, their roles in the study, risks and inconveniences, benefits for participation, compensation, provision for illness/injury, whom to contact, voluntariness of participation, and confidentiality that must be carried out to secure their anonymity and privacy. Guidelines for ethical considerations can be accessed from the manual of the Research Ethics Committee of the institution in accordance with internationally approved ethical standards in the conduct of human research.¹² If the study deals with animals, it should be stated that extreme care must be observed in every step from the time these are purchased to the time that they are disposed of. These guidelines should be available and well stipulated in the Institutional Animal Care and Use Committee (IACUC) Manual.¹³ Take into consideration that any research project you conduct must also adhere to the local regulations, national law and the Helsinki Declaration of 1975, as revised in 2008.¹⁴ Do not forget to disclose any possible conflicts of interest or competing interests: research funding, honoraria from pharmaceutical companies, personal fees, payments for partaking in advisory boards, etc.

Results

The results section of a research proposal will only contain the Dummy tables and/or figures which should be left empty until data have been collected and analyzed. The dummy tables and/or figures will depend on the specific objectives of your research. Roughly, there should be at least one table and/or figure per specific objective.³

For example, if one specific objective states: To determine and compare the demographic data of the participants in the

treatment and control group. For this type of objective, a table summarizing the demographic data of your population would be most appropriate.

Timetable

Timetables or Gantt charts provide a visual presentation of the specific tasks that will be undertaken in the research project and their relative timing or expected length of time from start to completion of each task.¹⁵ This gives the reader an idea on the chronological activities to be undertaken from the beginning to the end of the research project ([Table 2](#)).

Table 2. Sample Timetable for a One-Year Research Project.

Activities	1	2	3	4	5	6	7	8	9	10	11	12
Signing of MOA	x											
Hiring and Appointment of personnel	x											
IACUC Clearance	x											
Procurement	x	x	x									
Solvent Partitioning				x								
In vivo screening of bioactivity				x	x	x						
Phytochemical Testing				x	x							
Acute Toxicity Testing						x	x					
In vitro toxicity testing						x						
In vitro efficacy studies							x	x				
Standardization of bioactive calabash fractions							x	x	x			
Formulation of Tablet											x	
Structure Elucidation									x	x	x	
Data Analysis			x	x	x	x	x	x	x	x	x	
Reporting of Findings												x

Budgets

A budget plan is a crucial part of every research proposal. If a funding agency has already been identified, just check the website and you will surely find a budget template which will serve as your guide. Generally, the basic parts of a budget proposal consist of the following: Personnel Services, Maintenance and Operating Expenses, and Supplies or Capital Outlay but the format may vary according to the preferred budget format of the funder. Personnel Services include

honoraria of the researchers and salaries of research assistants who will help conduct the study. Maintenance and other operating expenses (MOOE) includes repairs and maintenance of facilities and equipment, supplies and materials, travelling and communication expenses and all expenses pertaining to the data collection and completion of the research.¹⁶

A good budget proposal is often a reflection of well-planned research activities. It provides information on how the requested funds will be spent. As much as possible, the amount reflected in the budget should be based on actual costs. Additionally, some funders may require budget justification or explanations aside from the costing.¹⁶ Please find below ([Table 3](#)) an example of a budget proposal of one of our funded research projects.

Challenges

Writing a research proposal for funding is a very challenging and demanding job. Even if you are convinced that the problem or issue you want to address is relevant and has a big potential to change or improve the way we do things, we can never say 100% that it will be funded. The decision whether our proposal will be funded or not remains in the hands of the funding agency. To increase our chance to be funded, we need to seek guidance from the funding agencies themselves. We need to determine what types of research they prefer and what their needs are. Priority issues or problems that need solutions are usually included in the research agenda of the funding agency which we can access from their websites. Once we have set our goals on what research proposal we are going to pursue, we work on it to the best of our abilities. If ever we fail to get the funding the first time we submit our proposal, it does not mean we give up right away. Usually, the funding agencies will give their comments and recommendations on how to improve our proposal. If their recommendations are doable, then we can work on them, improve our proposal, and submit again. Hard work and perseverance will usually get you somewhere. We can also opt to submit our proposal to another funding agency, but we have to submit to only one funding agency at a time. Do not make the mistake of sending your proposal to several funding agencies at one time. This is not a good research practice.

Funding Opportunities for Students

Although the opportunities to receive funding as a student are small, opportunities may arise at any time during an aspiring young researcher's career. In many instances, students should take into consideration that the first research proposal and grant that they present to the scientific world is their graduation thesis. Most of the time, their investigation is financed by their university or by research grants obtained by their supervisors and (or) coordinators. However, there are still some opportunities to apply for financing from professional societies. Fortunately, most international societies offer free membership for students, and we encourage you to join as many societies as possible and benefit from free lectures, workshops, or participation in congresses, as well as apply for travel and (or) accommodation grants as to partake in scientific events.

Table 3. Actual Example of a Budget Proposal for Funding.

Item	Details	Amount
Personal Service		
Salaries	One (1) URA II @ P 33,306.00 x 12mos	399,672.00
	One (1) URA I @ P27,525.60 x 12mos	330,307.20
	One (1) Laboratory Aide I @ P 14,113.20 x 12 mos	169,358.40
Honoraria	One (1) Project Leader @8,800 x 12 months	105,600.00
	One (1) Project Staff III @7,500 x 12 months	72,000.00
	One (1) Project Staff II @6,000 x 12 months	90,000.00
Subtotal PS		1,166,937.60
Maintenance and Other Operatin Expenses		
Traveling Expenses	Airfare, Accommodation, Per Diem allowance during sample collection and reporting	350,000.00
Communication Expenses	Monthly Prepaid cellphone load, internet	10,000.00
Repair and Maintenance of Facilities	Repair and calibration of equipment	200,000.00
Transportation and Delivery Expenses	Local Transportation, courier	60,000.00
Supplies and Materials Expenses	Office Supplies	80,000.00
Trainig and Extension Expenses	Laboratory supplies	1,420,000.00
	Training of URAs on XO inhibition assay at UP Diliman	80,000.00
	Training of other DMSF Faculty and Personnel on TLDC SOP	70,000.00
Rental Expenses	Vehicle Rental during sample collection, coordination meetings, etc.	100,000.00
Representation Expenses	Food during meetings and reporting	30,000.00
Professional Services	Consultancy (plant Authentication) @ P3,000 x 6 consultations	18,000.00
	Consultancy (Sample Collection and Laboratory Analysis) @P3,000 x 4 consultations	12,000.00
	Consultancy (Auditor) @ P3,000 x 1 consultation	9,000.00
	Consultancy (Biostatistics) @P3,000 x 4 consultations	12,000.00
	Labor (field assistants for collection, transport, and processing)	59,000.00
Other Maintenance and Operating Expenses	Analytical Services (Cytotoxicity testing by orthogonal assays)	1,000,000.00
Subtotal MOOE		3,510,000.00
Indirect Cost		
	Honorarium for two (2) Proyects Support Staff Lever 2 @ P1,500/qtr x 4 qtr	12,000.00
	Honorarium for two (2) Proyects Support Staff Lever 1 @ P1,000/qtr x 4 qtr	8,000.00
	DOST Monitoring Costs	80,000.00
	Utilies	250,770.00
Subtotal Indirect Cost		350,770.00
Capital Outlay		
	Ultra-Low Freezer	1,000,000.00
	Recirculating chiler	300,000.00
	Rotary Evaporator with vacuum pump	500,000.00
	Vacuum concentrator	1,200,000.00
	Freeze dryer	1,200,000.00
	Heating mantle	60,000.00
	Grinder	50,000.00
	GPS tracker	40,000.00
Subtotal CO/EO		4,350,000.00
Grand Total		9,377,707.60

Legend: Budget in Romanian leu. 1 Romanian leu equals 0.2 USD.

For example, the **Association for Medical Education in Europe (AMEE)** offers several awards and grants for students interested in medical education. The **Student Initiatives Grant** consists of a funding opportunity of £2000 (<https://amee.org/awards-prizes/student-initiatives-grant>) for students who would like to coordinate a project in the field of medical education. Another

AMEE change to receive an imbursement (£10000) is the **Research Grant Awards** for an educational research project.¹⁷⁻¹⁸ In addition, the pharmaceutical company AMGEN finances an undergraduate summer research program in Science and Biotechnology (**AMGEN Scholars Program**) for undergraduates willing to partake in a short research internship in a top-notch university in the United States, Canada, Europe, Australia or Asia, such as Harvard University, Yale University, Cambridge University, The Pasteur Institute, The Karolinska Institute, The University of Tokyo or The University of Melbourne. The AMGEN Foundation does not ask for previous experience in research for the students who want to apply. More details can be obtained at the following website: <https://amgenscholars.com/>.¹⁹

In addition, the **American Society of Hematology (ASH)** offers awards for **Medical Students and Early-Career Investigators** who are aspiring to conduct research in the field of Hematology or who want to pursue specialty training in Hematology. More information can be obtained at the following address: <https://www.hematology.org/awards/medical-student>.²⁰

In terms of courses and lectures, the **European Society of Medical Oncology (ESMO)** organizes annual five-day courses for medical students who are interested in the field of Oncology. Some of the topics tackled during these scientific meetings are Breast Cancer, Colorectal Cancer, Lung Cancer, Ovarian Cancer, Melanoma and other malignancies. Please access <https://www.esmo.org/meetings/esmo-eso-courses-on-medical-oncology-for-medical-students> to discover this opportunity.²¹

Further Recommended Readings and Training Opportunities

Although there are less opportunities for students enrolled in higher education to submit grant applications and receive funding for their ideas, there are sufficient chances to receive free training in the field before starting to get involved in research projects. For example, Elsevier’s Researcher Academy (<https://researcheracademy.elsevier.com>) offers several free webinars and e-learning opportunities for researchers who want to improve their grasp of knowledge. The e-learning modules are focused on research preparation (funding, management of data, research collaborations), writing for research (manuscript preparation and book writing), the basics of the publication process, peer-review and methods to communicate your research findings.²²

Another opportunity for students to get involved in the process of manuscript and grant evaluation is The Web of Science Academy (<https://clarivate.com/webofsciencegroup/solutions/web-of-science-academy/>) a peer-review training course available for free which enables researchers to become certified peer-reviewers. Applicants are mentored by experts in their field of research and the course is divided in 10 modules: introductory modules, an overview of peer-review and scientific journals, ethics, how to evaluate different sections of a paper (introduction, methodology, data and results, discussions, conclusions) and how to structure a review.²³

Conclusion

In summary, we have given you a guide on how to make a research proposal for funding from conceptualization to execution to facing the challenges and more.²⁴ Writing a research proposal for funding is hard work and very challenging. However,

if you succeed, it is also very rewarding, not as much financially but more so on the potential of improving the lives of the people in the community and in contributing to the body of knowledge which can benefit humanity.

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Acknowledgments

M.-A.G. acknowledges the support of the Society of Students in Medicine of Bucharest (SSMB) - research grant competition for students, contract no. 231/29.03.2017.

Conflict of Interest Statement & Funding

The Authors have no financial relationships or conflicts of interest to disclose. Dr. Juan C. Puyana work is partially funded by the National Institute of Health (NIH) of the United States with the grant 5UG3HL151595. The opinions expressed in this article are the author's own and do not reflect the view of the National Institutes of Health, the Department of Health and Human Services, or the United States government.

Cite as

Dable-Tupas G, Toralba-Lupase V, Puyana JC, Găman M-A. Research Grant Proposal Writing Course for Students in Higher Institutions. Int J Med Stud. 2022 Jul-Sep;10(3):226-32.

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ISSN 2076-6327

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