Proposal Writing I

Dianne Nagy
COE Grants Coordinator
South Dakota State University

January 25, 2013
Workshop Overview

- General grantsmanship
- Proposal components
  - Introduction/overview
  - Statement of significance
  - Literature review
  - Goals/Objectives/Hypotheses
  - Research design
  - Methods
Not an Academic Journal Article

A proposal must

◦ communicate passion.
◦ communicate impact.
◦ be easy to understand by readers with various backgrounds.
◦ focus on the future, not the past.
◦ be persuasive.
You must convince the reviewers...

• This is a project that should be done.
  ◦ It supports the goals of the agency and program.
  ◦ It will yield significant results.
  ◦ It is more important than other proposed projects.

• You are the right one(s) to do it.
  ◦ You have the skills and resources to be successful.
  ◦ You have thought through the project.

• And most importantly, you must....
Intrigue the Reviewers
Introduction and Overview

- Opening sentence/paragraph should be unique to your project.
  - Grab the reviewer’s attention.

- After reading the introduction, the reviewer should
  - Have a basic understanding,
  - Be convinced of need,
  - Want more details.
Introduction and Overview

Section should contain:

- Long-term goals (your research agenda),
- Specific project goals,
- Hypotheses or research questions,
- Objectives and expected outcomes,
- Overview of approach,
- Statement of significance.
Why should they care?

SIGNIFICANCE
Statement of Significance

- Motivates the reviewer to read closely.
- Establishes the framework for the study.
- Targets necessary background info.
- Leads to objectives and hypotheses.
- To be persuasive, must be consistent with
  - other sections
  - scope of project
Identifying Significance

- What will the funders think is important?
- Consider broad and narrow disciplinary point of view.
- What would scientists inside and outside the field value most?
- Consider both the empirical and theoretical contributions that may result.
Identifying Significance

- Consider basic and applied uses of the data.
- How will your research be used by others?
- Compare importance 1 year vs. 10 years after completion.
- How might an impartial reader dispute your claims?
Expressing Significance

- Describe how your study will
  - Synthesize information from several areas.
  - Advance the state of science in your field.
  - Impact other fields.
  - Enable research previously not possible.
  - Address public issues specific to the agency’s mission.
Significance Conveys

- The project is important.
  ◦ Relates to an important human problem.
  ◦ Fills a substantial knowledge gap.
  ◦ Impacts theory.

- The project is interesting.
  ◦ Addresses important areas that are unproven, controversial, or ambiguous.
  ◦ Involves new experimental approaches, new hypotheses, new interpretations of old data.
Contents of Significance Section

- The problem
- Relevance to agency
- What others have done
  - why insufficient
- How your approach is different
- Anticipated public impact
What is the context?

LIT REVIEW
Purpose of the Lit Review

- Place the research question in context.
- Explain and justify decisions made.
- Demonstrate knowledge of the field.
  - As it relates to your project
- Identify the current limits of knowledge and how your project will contribute.
- **Not** to educate the reader on the state of science.
Lit Review Do’s

- Set off main point followed by detail and support from lit.
- Critically evaluate relevant literature.
- Remain focused on issues your study will address.
- Establish what is original in your approach.
- Show how your study will help resolve important issues.
- Identify relevant publications you/your lab contributed to.
Lit Review Don’ts

• Don’t use controversial material without discussing the debate.
• Don’t limit yourself to published work.
• Don’t cite a reference without reading it.
• Don’t make an unimportant point appear important by using multiple examples.
• Don’t state that a study will be carried out “because it has never been done.”
Preliminary Data

- Understand the expectations of the agency and program.
  - Higher risk research requires more.
  - Less experienced researchers generally need more.
- Summarize the significance of your data as it relates to your project.
- Be clear who did the work – beware passive voice and the royal “we”.
Exercise 1

- List the main points you want to make in your introductory sections and relate them to your proposed project and funding agency.
What do you hope to accomplish?

GOALS & OBJECTIVES
Goals vs. Objectives vs. Tasks

- **Long-term goals**: What big question or need does your research address? (Your research agenda)
- **Project Goals**: What do you want to accomplish in this project?
- **Objectives**: What specific things do you have to get done to accomplish your goals?
- **Tasks**: How will you get those things done?
Goals

- Long-range plans, often continuous.
- Often exceed the scope of the proposal.
- Usually do not have terminal end points that can be measured.
- Use “fuzzy” verbs
  - Understand
  - Contribute to the knowledge of…
- Short-term goals addressed within 5 years
Objectives

- Define specific outcomes in measurable terms.
  - Identify what will be accomplished by the expenditure of grant money.
  - Describe how change will be measured.
- Specify measurement indicators and performance standards.
- Emphasize end results, not tasks or methods.
- Should not be confused with procedures of the study or problem driving the study.
- Should not be dependent upon the success of the preceding objective(s) (cascading).
Types of Objectives

- **Behavioral** - A human action is anticipated.
  - 50 of the 70 children participating will learn to swim.

- **Performance** - A behavior will occur at an expected proficiency level.
  - 50 of the 70 children pass a basic swimming test administered by a Red Cross-certified lifeguard.

- **Process** - The manner in which something occurs.
  - We will document the teaching methods used, identifying those with the greatest success.

- **Product** - A tangible item results.
  - We will create a manual to be used in teaching swimming to this age and proficiency group.
The Research Objective

- The research objective of this project is to test the hypothesis $H$.
- The research objective of this project is to measure parameter $P$ with accuracy $A$.
- The research objective of this project is to prove conjecture $C$.
- The research objective of this project is to apply method $M$ from field $Q$ to problem $X$ in field $R$. 
Strong Research Objectives

- The research objective of this project is to measure the cross-section of the muon-nutrinono interaction at 5 GeV accurate to 10%.
- The research objective of this project is to test the hypothesis that chip formation in high-speed machining of brittle materials is determined by parameters x, y, and z.
- The research goal of this project is to account for uncertainty in engineering design decision making through the application of utility theory.
Weak Research Objectives

- This project aims to advance the research in predictive modeling for manufacturing process optimization.
- The proposed study will significantly advance the theory of random fields.
- This study will develop modeling and simulation-based technologies for building construction.
- New methods in robust optimization are proposed for optimizing complex models under uncertainty.
Bloom’s Taxonomy

- Categorizing Levels of Abstraction
  - Knowledge
  - Comprehension
  - Application
  - Analysis
  - Synthesis
  - Evaluation

- Weak verbs: characterize, determine, understand, identify

- Stronger verbs: assess, analyze, develop, define, create, compare
What do you want to learn?

HYPOTHESIS
Hypotheses

- Are based on trends noticed in prior experiences—preliminary data, pilot studies, field work, etc.
- Lead directly to the experiments.
- Reflect the imagination and insight of the investigator.
- Suggest the investigator knows the field and what to look for.
Hypotheses

- Should relate to basic mechanisms and/or a broad theoretical model, the understanding of which advances science.
- Should be directly testable or give rise to corollaries or predictions that can be tested.
- Should be directional, not null.
Hypotheses

- Research that cannot be expressed in terms of hypotheses may be viewed as nothing more than a data-gathering exercise.
- Funders are not likely to support such a “fishing expedition.”
Exercise 2

- Create a table or figure that links the goals, objectives, hypotheses and methods of your study.
- Indicate how they relate to the larger field of theoretical and empirical research.
What is your blueprint?

RESEARCH DESIGN
Purpose of the Design

- Explain the logic and conduct of the project, without describing methods.
- Persuasively justify the chosen approach.
- Articulate plans to reduce and interpret the data.
- Identify what new knowledge will be gained.
  ◦ Clarify how it will relate to goals and objectives.
  ◦ Discuss both expected and unexpected results.
- Acknowledge potential problems and alternatives.
Methods

- Are the means to fulfill the objectives.
  - Details specific plan of action for each objective.
  - Identify what will be done, who will do it, how long it will take, the materials needed.
- Must be feasible given the time and support available.
- Must be appropriate and sufficient to answer hypotheses and objectives.
- Should result in critical and innovative outputs.
Contents of Methods Section

- List procedures at beginning.
  - If not using the latest methods, indicate awareness of newer ways and explain choice.
- Include specifics if approach is unpublished or novel.
- If standard approach, simply name or cite.
- Designate who is responsible for which activities.
  - Name collaborators and summarize qualifications
- Delineate specific time frame.
Contents of Methods Section

- Describe the sequence and interrelationship of activities and how they will fulfill objectives.
- Address logistics.
  - Access to equipment or special materials
  - Special requirements or permits
- Include a discussion of risk (why success is probable).
- Mention limitations that may affect interpretation.
- Identify what you will do if you get negative results or an approach doesn’t pan out.
  - Include a decision tree.
Critique of Methods Section

- Are these the correct and best methods for the specific questions?
- Are the methods proven and properly cited?
- Do the methods have any particular limitations that might affect the interpretation of results?
- Are the investigators competent in the use of all these techniques?
Project Schedule

- Reiterate major objectives and specific tasks in same order presented in plan.
- Show that your project is well thought out and properly scoped.
- Graphical representation of the duration of project tasks over time.
  - Start and complete times of each task
  - Education, outreach, and management activities
  - Personnel and resources
  - Milestones
Milestones

- Milestones are NOT a list of tasks to be completed; they are goals to be achieved.
- Note that not all of your activities generate milestones.
- The milestones must provide objective and quantitative outcomes by which to justify advancing the project.
- The quantitative success criteria should be clearly defined.
## Example Flow Charts and Schedules

### GANTT chart with Summary and Milestone

<table>
<thead>
<tr>
<th>Task 1: description</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task 2: description</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task 3: description</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task 4: description of how it all comes together in this task</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Objective 1: Development of the hoosits
- Integration and calibration
- Optimization of frumpits measurement methodology

### Objective 2: Assess XYZ
- XYZ spectroscopy
- MOA microscopy
- ABC testing
- Pandax studies

### Objective 3: Integrate hoosits with XYZ
- Instrument integration
- Instrument testing
- Demonstration

<table>
<thead>
<tr>
<th>Task</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Get Beans</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Grind coffee</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Boil Water</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Fill machine</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Heat cup</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Prepared</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Make &amp; Serve</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Make Coffee</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Serve</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>P-R-O-J-E-C-T</td>
<td>2000</td>
<td>2001</td>
<td>R-E-S-P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>------</td>
<td>------</td>
<td>--------</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ENGINEERING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site Survey</td>
<td>18</td>
<td>15</td>
<td>Manwell Engineering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Draft Survey Results</td>
<td>18</td>
<td>4</td>
<td>Manwell Engineering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GMBH Review</td>
<td>4</td>
<td>29</td>
<td>Lost Creek Point Mgmt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Survey RPT (Final)</td>
<td>1</td>
<td>22</td>
<td>Electrical Contractor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GMBH RFV Approval</td>
<td>3</td>
<td>6</td>
<td>Lost Creek Point Mgmt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>System Design</td>
<td>14</td>
<td>20</td>
<td>Manwell Engineering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HMBE Review</td>
<td>20</td>
<td>4</td>
<td>Electrical Contractor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bid and Award</td>
<td>4</td>
<td>4</td>
<td>Manwell Engineering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction Support</td>
<td>27</td>
<td>5</td>
<td>Manwell Engineering</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CONSTRUCTION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buy Cable Conduit</td>
<td>24</td>
<td>16</td>
<td>Electrical Contractor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Install Cable</td>
<td>2</td>
<td>7</td>
<td>Electrical Contractor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Procure Hardware</td>
<td>24</td>
<td>21</td>
<td>A &amp; J Security</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Install Hardware</td>
<td>21</td>
<td>20</td>
<td>A &amp; J Security</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deliver Console</td>
<td>9</td>
<td>11</td>
<td>A &amp; J Security</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load Data</td>
<td>13</td>
<td>11</td>
<td>Lost Creek Point Mgmt.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Configure Software</td>
<td>1</td>
<td>26</td>
<td>A &amp; J Security</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Timeline – Gantt Chart

- www.Gantter.com
  - Free, web-based project management tool that provides various templates to help build a schedule.
  - Requires nothing but a web browser.
  - Integrates with Google docs.
  - Import files from Microsoft Project
Exercise 3

- Sketch a flow chart of your research plan including all major tasks and subtasks.
- Indicate critical or high-risk tasks.
- Show special resources or collaborators if applicable.
Persuasion

- Significance
- Hypotheses
- Objectives
- Methods
Next Seminar

- Proposal Writing II
  - Abstract/project summary
  - Title
  - Formatting
  - Common pitfalls
  - Others?

- 2/22 @ 2
CONTACT INFORMATION

Dianne.Nagy@sdstate.edu
688-4373
Daktronics Engineering Hall, room 309B