Guide for Preparation of NSF CAREER Grant Proposals

Lecture 4: Where to begin: logic models

Robert Finney, PhD
Office of Research Advancement and Partnerships
Prepared for Washington State University
2021
Required Elements

Research plan purpose

• To acquire mostly knowledge,
• Also, expertise, reagents, facilities, interdisciplinary teams -
• Not only to this project, but to future projects
• Meets department and organization mission
• Meets NSF objectives

Education plan purpose

• Infrastructure to enable long-term solution to a problem
### Generic Logic Model for NIFA Reporting

(This model is intended to be illustrative for reporting on NIFA-funded research, education, and extension activities. It is not a comprehensive inventory of our programs.)

<table>
<thead>
<tr>
<th>Situation</th>
<th>Inputs</th>
<th>Activities</th>
<th>Outputs</th>
<th>Assumptions</th>
<th>External Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description of challenge or opportunity</strong></td>
<td>- Farmers face increasing challenges from globalization. - Opportunity to improve animal health through genetic engineering. - Insufficient # of trained &amp; diverse professionals entering agricultural fields. - Youth at risk. - Invasive species is becoming an increasing problem. - Biorearmament. - Obesity crisis. - Impaired water quality.</td>
<td>What we do (Activities): - Design and conduct research. - Publish scientific articles. - Develop research methods and procedures. - Teach students. - Conduct non-formal education. - Provide counseling. - Develop products, curriculum, &amp; resources.</td>
<td>Products, services and events that are intended to lead to the program’s outcomes: - New fundamental or applied knowledge. - Improved skills. - How technology is applied.</td>
<td><strong>ASSUMPTIONS</strong> - These are the premises based on theory, research, evaluation, knowledge, etc., that support the relationships of the elements shown above, and upon which the success of the portfolio, program, or project rests. For example, finding animal gene markers for particular diseases will lead to better animal therapies.</td>
<td><strong>EXTERNAL FACTORS</strong> - A brief discussion of what variables have an effect on the portfolio, program, or project, but which cannot be changed by managers of the portfolio, program, or project. For example, a plant breeding program’s success may depend on the variability of the weather, etc.</td>
</tr>
<tr>
<td><strong>What we invest:</strong> - Faculty. - Staff. - Students. - Infrastructure. - Federal, state &amp; private funds. - Time. - Knowledge. - The collection of stakeholder opinions.</td>
<td><strong>Knowledge</strong></td>
<td><strong>Actions</strong></td>
<td><strong>Conditions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occur when there is a change in knowledge or the participants actually learn: - New fundamental or applied knowledge. - Improved skills. - How technology is applied. - How new and applied technology is used. - Use new plant &amp; animal varieties.</td>
<td><strong>Copyright 2013</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occur when there is a change in behavior or the participants act upon what they’ve learned and: - Apply new improved fundamental or applied knowledge. - Accept new improved skills. - Directly apply information from publications. - Accept and use new methods or improved technology. - Use new plant &amp; animal varieties.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occur when a societal condition is improved due to a participant’s action taken in the previous columns. For example, specific contributions to: - Increased market opportunities overseas and greater economic competitiveness. - Better and less expensive animal health. - Vibrant &amp; competitive agricultural workforce. - Higher productivity in food provision. - Better quality-of-life for youth &amp; adults in rural communities. - Greater food supply. - Reduced obesity &amp; improved nutrition &amp; health. - Higher water quality &amp; a cleaner environment.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Version 1.3
Logic Models
A visual means to align relationships

Difficulty with writing (fluently) stems from lack of thinking and organizing your thoughts.

Logic models are great to align these.
Logic Models

Planned Work

- Resources/Inputs
- Activities

Intended Results

- Outputs
- Outcomes
- Impact
Logic Models

How to read a Logic Model
Progresses over time – from planning to results

If..............

Then................
1. **Resources/Inputs**
   - We have these available resources.

2. **Activities**
   - If we have these resources, then we can do these activities.

3. **Outputs**
   - If we complete the activities, then we will deliver these measurable products or services.

4. **Outcomes**
   - If we provide the deliverables, then the community will benefit in these ways.

5. **Impact**
   - If the community benefits, then transformations in research or society or economics are enabled.

---

**Logic Models**
Logic Models
Research plan

Status:
• What is the big picture problem?
• What is the current solution?
• What are the faults of the current solution?
• Conclude with a need statement

These are the bullet points you will put in the logic model
Status / Need

• You ultimately want to focus the problem on lack of knowledge

• The lack of knowledge is not only important for the specific project at hand, but will enable a new or more effective approach to other projects as well (e.g. your career)
• **Framing:**
  - Very often, knowledge is required to enable efficiency or new approaches or applications with social or economic importance
  - In a proposal, it is common to acquire the knowledge as it relates to a widget.
  - The focus is not on the widget, it is on the knowledge gained in the process
  - It will provide for your career and part of your specialty status
Logic Models
Research plan

• **Widgets:**
  • Devices / Components / etc.
  • Procedures or processes
  • Strategies – Policies
  • Drugs
  • Diverse and relate to all fields

• **Need:**
  • Again, the primary need is for knowledge
  • The secondary need may be the specific widget of the proposal
Logic Models
Research plan

Status:
• How do you know the problem is important to your community?
  • Active research
  • 3rd party acknowledgement (agencies, meeting proceedings, etc.)
  • Funding agency calls
PLANNED WORK

1. Resources / Inputs
   - Preliminary data
   - Expertise
   - Facilities
   - Reagents
   - Equipment
   - Cohorts
   - Other

Think “Competitive Advantage”
Is there anything that speaks to establish you as a specialty, and not a commodity? contrast
PLANNED WORK

1. Resources / Inputs
   • Preliminary data
   • Expertise
   • Facilities
   • Reagents
   • Equipment
   • Cohorts
   • Other

Preliminary data is important

• Reflection of you: it needs to be awesome
• Support your approach and your ability to accomplish them
• Surprising and unexpected results are always powerful – especially for new research approaches
PLANNED WORK

1. Resources / Inputs
   • Preliminary data
   • Expertise
   • Facilities
   • Reagents
   • Equipment
   • Cohorts
   • Other

Leverage

• Leverage is powerful: it enables higher return on investment for prior investments
• We mentioned EAGER grants before
• Is there anything that has been funded by NSF or others that you will leverage in this project?
PLANNED WORK
2. Activities: what will be done.
• Experiments
• Other data acquisition
• Don’t forget dissemination

Think “Innovation”
• Why will your approach work where others have not?
• Can you convince reviewers?
  • Often depends on preliminary data

Contrast
Logic Models

Intended Results
1. Outputs: Deliverables.
   • Each activity should align with a tangible and measurable output
   • Knowledge is one of those outputs
   • Data, specialty reagents or equipment, new methods or specialized procedures.

Think “Metrics”
Think “FOA”

• Recall: you must provide means for assessment
• Also, the purpose is to establish your CAREER. Knowledge, data, specialty reagents, methods, procedures, etc. all contribute to your specialty and value to the community
Intended Results

2. Outcomes:
   • Specific changes scientific community behavior, knowledge, skills, etc.
   • One outcome is to establish you in your career: an expert/resource in the field
   • Fulfill your role in the mission of your department

Think “Transformative”

• What will the knowledge acquired enable for others?
  • e.g. new approaches, new efficiencies, etc.
Intended Results

5. Impact: fundamental benefit to society.
   • Health or Well-Being
   • Economics: Competitive advantage for U.S.
   • Work force
   • Environment
   • Manufacturing
   • Energy, Water, Etc.

Often attained ONLY after completion of numerous continuation grants.
Logic Models

Planned Work

- Status / Need
- Resources/Inputs
- Activities

Intended Results

- Outputs
- Outcomes
- Impact

Assumptions

External Factors
Assumptions
What kinds of things does this depend on?
• Preliminary results
• Available cohort
• Access to land / facilities
• Other

Think “Potential Problems Alternatives”
• It is better that you think of these and address them – as opposed to reviewers pointing these out to you
• You want to mitigate these as much as possible
External Factors
What is out of your control?
• Politics (US or Other)
• Weather
• Other

Think “Potential Problems and their Solutions”
• Again, it is better that you think of these and address them – as opposed to reviewers pointing these out to you
Done….. But does everything align?

- Each resource should have a function in an activity (directly, or supporting data)
- Each activity should have an output
- Each output should contribute to an outcome
- Each outcome should contribute to an impact

- Sometimes things do converge: that is fine
Logic Models
Education Plan

Use the same progression to develop a logic model for your education plan
Logic Models

Education Plan

**Education Activities** – The education component of the proposal may be in a broad range of areas and may be directed to any level: K-12 students, undergraduates, graduate students, and/or the general public, but should be related to the proposed research and consistent with the career goals of the PI. Some examples are: incorporating research activities into undergraduate courses; teaching a graduate seminar on the topic of the research; designing innovative courses or curricula; providing mentored international research experiences for U.S. students; linking education activities to industrial, international, or cross-disciplinary work; supporting teacher preparation and enhancement; conducting outreach and mentoring activities to enhance scientific literacy or involve students from groups that have been traditionally underrepresented in science; researching students' learning and conceptual development in the discipline; implementing innovative methods for evaluation and assessment; or creating cyberinfrastructure that facilitates involvement of the broad citizenry in the scientific enterprise. Education activities may also include designing new or adapting and implementing effective educational materials and practices. Such activities should be consistent with research and best practices in curriculum, pedagogy, and evaluation. Proposers may build on, or otherwise meaningfully participate in, existing NSF-supported activities or other educational projects ongoing on campus.
Logic Models
Education Plan

• Please refer to slides 54 – 58 of the Academic Research Funding Strategies presentation.
  • They do a reasonably good job at directing you toward a viable education plan.
Logic Models

Education Plan

Your education plan will have an education need that aligns with your interests and your departments.
Logic Models
Education Plan

• **Resources**
  • Consider what your department may have for resources/programs
  • Think about under-served populations
  • It is important (if not essential) that it builds on your prior efforts

• **Activities** *(these serve as your objectives for the grant)*
  • What will you do?
  • Remember, activities need to relate/integrate with your research

• **Outputs**
  • What are measurable outputs?
Logic Models
Education Plan

• **Outcomes**
  - A viable program or course or club, etc. are outcomes
  - Exposure to something new or enhancing student/other interest in your field are outcomes

• **Impact**
  - How will this impact the students or others?
  - How will it impact your local community?
  - How will this impact your field?
  - Fulfills your role in the mission of your department
  - Enables you to have an impact/career in educational outreach
Logic Models

Done..... But does everything align?