Proposal Writing Strategies

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Annual ASEE Conference
24 June 2007
Caution

Most of the information presented in this workshop represents the opinions of the individual program offices and not an official NSF position.
NSF has several programs supporting undergraduate education

- Different requirements
- Different slants

Proposal improvement ideas apply to all

- But in varying degrees

Choose ideas based on

- Program solicitation
- Judgment

Warning on Generalizations
Overview of Workshops

Goal: Prepare you to write more competitive proposals

Three separate but related sessions

- Proposal Strategy
- Project Evaluation
- Broader Impacts
Framework for the Workshop
Learning situations involve prior knowledge
- Some knowledge correct
- Some knowledge incorrect (i.e., misconceptions)

Learning is
- Connecting new knowledge to prior knowledge
- Correcting misconception

Learning requires
- Recalling prior knowledge – actively
- Altering prior knowledge
Active-Cooperative Learning

Learning activities must encourage learners to:

- **Recall** prior knowledge -- actively, explicitly
- **Connect** new concepts to existing ones
- **Challenge** and alter misconception

The think-share-report-learn (*TSRL*) process addresses these steps
Workshop Format

“Working” Workshop
- Short presentations (mini-lectures)
- Group exercise

Exercise Format
- Think → Share → Report → Learn
  - (TSRL)

Limited Time – May feel rushed
- Intend to identify issues & suggest ideas
  - Get you started
  - No closure -- No “answers” – No “formulas”
Group Behavior

- Be positive, supportive, and cooperative
  - Limit critical or negative comments
- Be brief and concise
  - No lengthy comments
- Stay focused
  - Stay on the subject
- Take turns as recorder
  - Report for group not your own ideas
Workshop Outcomes

After the workshop, you should be able to:

- Identify areas where proposals can be enhanced
  - Made more competitive
- Generate a list of suggestions for each area
Proposal Strategy Session Agenda

- Enhancement strategies
  - General aspects
  - Goals, objectives, and outcomes
  - Rationale
  - Evaluation & Dissemination (more later)
  - Realities of the review process

- Exercise on selected strategy
NSF Engineering Education

- NSF funds research and development proposals on engineering education
- Two main programs
  - EHR/DUE -- Course, curriculum and laboratory improvement (CCLI)
    - CCLI:
      - For Phase 2 and 3 proposals: Full Proposal Deadline Date: 10 Jan 2008
      - For Phase 1 proposals: Full Proposal Deadline Date: May 2008
  - ENG/EEC -- Engineering Education and Centers (EEC)
- Others – check the website
**Vision:** Excellent STEM education for all undergraduate students.

**Goal:** Stimulate, disseminate, and institutionalize innovative developments in STEM education through the production of knowledge and the improvement of practice.

**Components:**
- Material & pedagogy development
- Faculty development
- Implementation
- Assessment
- Research
Reflective Exercise (1)

Identify the **single most important** piece of advice you would give to a colleague writing a proposal on curriculum development

- Materials, pedagogy, laboratory

- This will be a continuing exercise
- Write your answer
- Leave space for more answers
Turning a Good Idea into a Competitive Proposal
Scenario: Origin of a Curriculum Development Proposal

- **Prof X has taught Signal Processing at U of Y for several semesters.**
- **She has an idea for greatly improving the course by adding “new stuff”**
  - “New stuff”
    - **Material (e.g., modules, web-based instruction)**
    - **Activities (e.g., laboratories, projects)**
    - **Pedagogy (e.g., problem based learning)**
- **She has done some preliminary evaluation**
- **She decides to prepare a CCLI proposal**
Professor X’s Initial Proposal Outline

Problem Statement:
- Items describing the problem as she sees it

Proposed Approach:
- Items describing how the “new stuff” will look

Proposed Activities:
- Items describing how she will develop “new stuff”

Schedule:
- Items describing the timing of the development
Better Initial Proposal Outline

**Goals:** Develop “new stuff” to enhance student learning at U of Y

**Rationale:** Observed shortcomings in educational experience of the students at U of Y and felt that new stuff would improve the situation

**Project Description:** Details of “new stuff“

**Evaluation:** Use U of Y’s course evaluation forms to show difference

**Dissemination:** Describe “new stuff“ using conference papers, journal articles, and web site
Exercise 1
Proposal Strategy

As a colleague, provide a few suggestions to guide Prof. X as she develops her curriculum development proposal.
PD’s response to Proposal Strategies

- **Read the program solicitation**
  - Determine how your ideas match the solicitation and how you can improve the match

- **Articulate goals, objectives, & outcomes**
  - Outcomes should include improved student learning

- **Build on existing knowledge base**
  - Review the literature
  - Present evidence that the “new stuff” is doable; will enhance learning; is the best approach

- **Explore potential collaborations**
PD’s response to Proposal Strategies

- Use data to document existing shortcomings in student learning
- Describe management plan
  - Provide tasks, team responsibilities, timeline
- Provide clear examples of the approach
- Integrate the evaluation effort early
  - Build assessment tools around defined objectives and expected outcomes
  - Connect with independent evaluation experts
PD’s response to Proposal Strategies

- Identify strategies for dissemination
  - Define a plan to contribute to knowledge base
  - Address broader impacts
  - Collaborate, form partnerships (build community)
Write Proposal to Answer Reviewers’ Questions

What are you trying to accomplish?
What will be the outcomes? \{ Goals etc. \}

Why do you believe that you have a good idea?
Why is the problem important?
Why is your approach promising? \{ Rationale \}

How will you manage the project to ensure success?
How will you know if you succeed? \{ Evaluation \}

How will others find out about your work?
How will you interest them?
How will you excite them? \{ Dissemination \}
Aspects of Research Proposal

- Similar for research proposal
  - Research question
  - Rationale
  - Methodology
  - Impact
- Same for faculty development proposal
- Same for assessment proposal
Goals → Objectives → Outcomes
Developing Goals & Outcomes

- Start with one or more overarching statements of project intention
  - Each statement is a goal

- Convert each goal into one or more expected measurable results
  - Each result is an outcome
Goals -> Objectives -> Outcomes

Converting goals to outcomes may involve intermediate steps

Intermediate steps frequently called *objectives*
More specific, more measurable than goals
Less specific, less measurable than outcomes
Definition of Goals, Objectives, and Outcomes

**Goal** – Broad, overarching statement of intention or ambition
- A goal typically leads to several objectives

**Objective** – Specific statement of intention
- More focused and specific than goal
- A objective may lead to one or more outcomes

**Outcome** – Statement of expected result
- Measurable with criteria for success

*NOTE: No consistent definition of these terms*
Exercise 2: Identification of Goals/Outcomes

- Read the abstract
  - Note - Goal statement removed
- Suggest two plausible goals
  - One focused on a change in learning
  - One focused on a change in some other aspect of student behavior
Abstract

The goal of the project is …… The project is developing computer-based instructional modules for statics and mechanics of materials. The project uses 3D rendering and animation software, in which the user manipulates virtual 3D objects in much the same manner as they would physical objects. Tools being developed enable instructors to realistically include external forces and internal reactions on 3D objects as topics are being explained during lectures. Exercises are being developed for students to be able to communicate with peers and instructors through real-time voice and text interactions. The material is being beta tested at multiple institutions including community colleges. The project is being evaluated by … The project is being disseminated through …
PD’s Response -- Goals

- Goals may focus on
  - Cognitive behavior
  - Affective behavior
  - Success rates
  - Diversity
    - Cognitive, affective, or success in targeted subgroups
GOAL: To improve understanding of

- Concepts & application in course
  - Solve textbook problems
  - Draw free-body diagrams for textbook problems
  - Describe verbally the effect of external forces on a solid object

- Concepts & application beyond course
  - Solve out-of-context problems
  - Visualize 3-D problems
  - Communicate technical problems orally
PD’s Response – Goals on Affective Behavior

**GOAL:** To improve

- Interest in the course
- Attitude about
  - Profession
  - Curriculum
  - Department
- Self-confidence
- Intellectual development
PD’s Response – Goals on Success Rates

- Goals on achievement rate changes
  - Improve
    - Recruitment rates
    - Retention or persistence rates
    - Graduation rates
PD’s Response – Goals on Diversity

**GOAL:** To increase a target group’s

- Understanding of concepts
- Achievement rate
- Attitude about profession
- Self-confidence

“Broaden the participation of underrepresented groups”
Exercise 3: Transforming Goals into Outcomes

Write one expected measurable outcome for each of the following goals:

1. Increase the students’ understanding of the concepts in statics

2. Improve the students’ attitude about engineering as a career
PD’s Response --
Outcomes

**Conceptual understanding**
- Students will be better able to solve simple conceptual problems that do not require the use of formulas or calculations.
- Students will be better able to solve out-of-context problems.

**Attitude**
- Students will be more likely to describe engineering as an exciting career.
- The percentage of students who transfer out of engineering after the statics course will decrease.
Project Rationale

- Rationale is the narrative that provides the context for the project
  - It’s the section that connects the “Statement of Goals and Outcomes” to the “Project Plan”

- What’s the purpose of the rationale?
  - What should it contain?
  - What should it accomplish?

- What should an applicant include in their rationale?
  - What topics should a PI address?
Write a list of questions that the Rationale for a CCLI proposal should answer (pay particular attention to questions the reviewer will expect answered)
PD’s Response
An Effective Rationale

What does the knowledge base say about the approach?

- What have others done that is related?
- What has worked previously?
- What have been the problems/challenges?

Why is this problem important?

- Is it a global or local problem?
- What are the potential broader impacts?
- How will it improve quality of learning?
What is the evidence that the approach will solve the problem?

- Address the defined outcomes?
- Achieve the defined outcomes?
- Improve student learning?

What are alternate approaches?
PD’s Response
An Effective Rationale

- What are the potential problems & limitations?
  - What can be done about them?

- Has the applicant done prior work?
  - Has funded work lead to interesting results?
  - Are there any preliminary data and what do they show?
Reflective Exercise (2)

Identify the single most important piece of advice you would give to a colleague writing a proposal

Write it down with your original answer
Evaluation
Project Evaluation Plan

- All projects require evaluation
  - All proposal require an evaluation plan

- During the project, evaluation:
  - Monitors progress toward goals
  - Identifies problems

- At the end of the project, evaluation:
  - Tells you what you accomplished
  - Provides data for you to use in telling others
Exercise 5
Evaluation Plan

Read the sample *Evaluation Plan* and list suggestions for improving it.
Sample Evaluation Plan

Assessment of the Student Response Technology (SRT) will be both quantitative and qualitative. First, students will be surveyed at the end of the semester on the content, level of difficulty, and their perceived level of mastery of the concepts of Statics. Second, faculty members teaching the course using SRT will be asked to judge its effectiveness in monitoring student achievement throughout the semester. In addition, faculty members who have been teaching Statics course for several years will be asked to compare students' abilities after using SRT with those in previous years who have not used SRT. Finally, the final grades of students using SRT will be compared with those from previous years who have not used the technology in the classroom.
**PD’s Response**

**Evaluation Plan (1)**

- **Include formative assessment**
  - Provides feedback during the design and implementation phases
  - Helps monitor progress toward outcomes
Get help at the beginning – in the proposal writing phase

- Involve an expert evaluator
- Consider an outside (independent) evaluator
  - Size of budget
  - Importance of objectivity
Consult other sources

- NSF’s User Friendly Handbook for Project Evaluation

- Existing tools
  - Online Evaluation Resource Library (OERL)
    - http://oerl.sri.com/
  - Field-Tested Learning Assessment Guide (FLAG)
    - http://www.wcer.wisc.edu/archive/cl1/flag/default.asp

- Science education literature
  - J. of Engineering Education, Jan, 2005
PD’s Response
Evaluation Plan (4)

- Provide details on tools & experimental design
  - Describe how
    - Students will be “surveyed”,
    - Faculty will be “asked”,
    - Grades will be “compared”
  - Indicate who will do these tasks
  - Indicate who will analyze and interpret the data
  - Consider confounding factors
  - Try to measure deeper learning
  - Collect demographic data on student populations
PD’s Response
Evaluation Plan (5)

Consider broadening the approach
- Examine effects on retention and diversity
- Involve larger populations
  - More diverse populations
- Collaborate
- Beta test
Dissemination

(Contributing to Knowledge Base & Building Community)
Effective Dissemination Plans

- Education&D projects need dissemination plan
- CCLI projects need to contribute to:
  - The STEM education knowledge base
  - Building the STEM education community

How does a proposal convince the reader (the reviewer or program officer) that the project will:
- “Contribute to the STEM education knowledge base”?
- “Help build the STEM education community”?
Exercise 6
Effective Dissemination Plan

Read the sample *Dissemination Plan* and list suggestions for improving it.
This project will serve as a pilot for other courses at the University of ____ and at other colleges and universities throughout the country. The results of our evaluation will be disseminated on the University's web site, which will contain a special page devoted to this NSF-sponsored project. Additional dissemination will occur through presentations at conferences, such as teacher education and science education conferences, regionally and nationally, and through articles published in peer-reviewed journals.
PD’s Response
Dissemination Plan (1)

- Be more proactive in promoting website & materials
- Integrate community building, dissemination, and evaluation
Target and involve a specific sub-population
- Those who teach similar course at other locations
- Ask them to review various products, data, and approaches
- Work with them to organize
  - Email exchanges and listserves
  - Informal meeting at a conference or on-campus
  - Faculty development workshops (on-campus and at conferences)

Explore beta test sites
PD’s Response

Dissemination Plan (3)

Be specific about how the project will serve as a “pilot”

- Strategy for evaluating and disseminating
- Strategy for getting “buy-in” by others
Be more specific in publication efforts

- Indicate the specific conferences and journals
  - Include conference travel and journal page charges in budget
  - Include a tentative title & description of paper
- Explore other venues
  - CUR (http://www.cur.org/), PKAL (http://www.pkal.org), State Academy of Science meetings
  - Science news publication and lay press
  - Professional society and specialty listserves
Dissemination Plan (5)

- Explore commercialization
  - Discuss contacts with software and textbook publishers
- Put material in a form suitable for the National Science Digital Library (NSDL)
Review Process -- Practical Aspects
Practical Aspects of Review Process

Reviewers have:

- Many proposals
  - Ten or more from several areas
- Limited time for your proposal
  - 20 minutes for first read
- Different experiences in review process
  - Veterans to novices
- Different levels of knowledge in proposal area
  - Experts to outsiders
- Discussions of proposals’ merits at panel meeting
  - Share expertise and experience
Exercise 7
Practical Aspects of Review Process

Write a list of suggestions (guidelines) that a colleague should follow to deal with these practical aspects

*Abbreviated TSRL*
**PD’s Response**

**Review Process**

- **Use good style (clarity, organization, etc.)**
  - Be concise, but complete
  - Write simply but professionally
  - Avoid jargon and acronyms
  - Check grammar and spelling
  - Use sections, heading, short paragraphs, & bullets (Avoid dense, compact text)

- **Reinforce your ideas**
  - Summarize them; Highlight them (bolding, italics)

- **Give examples**
PD’s Response
Review Process

- Provide appropriate level of detail
- Pay special attention to Project Summary
  - Summarize goals, rationale, methods, and evaluation and dissemination plans
  - Address intellectual merit and broader impacts
    - Explicitly and independently
    - Three paragraphs with headings:
      - “Summary”
      - “Intellectual Merit”
      - “Broader Impacts”
Follow the solicitation and GPG

- Adhere to page, font size, and margin limitations
  - Use allotted space but don’t pad the proposal
- Follow suggested (or implied) organization
- Use appendices sparingly (check solicitation to see if allowed)
- Include letters showing commitments from others
  - Avoid form letters
PD’s Response
Review Process

- Prepare credible budget
  - Consistent with the scope of project
  - Clearly explain and justify each item
- Address prior funding when appropriate
  - Emphasize results
- Sell your ideas but don’t over promote
- Proofread the proposal
- “Tell a story” and Turn a good idea into a competitive proposal
Reflective Exercise (3)

Identify the single most important piece of advice you would give to a colleague writing a CCLI proposal

Write it down with your earlier answers
Questions and Concerns During Proposal Preparation

- Read the solicitation and the *GPG*
- Get advice - NSF program directors & experienced colleagues
- “Imaginary panel” (Experts, novices, in-field/out)
  - How would they respond to a question?
  - How would they react to an idea? To a written section?
  - What else would they like to see?
  - What questions will they have?
- Use your judgment

Don’t include a poorly developed section because someone told you that it is needed
Conclusion

Presentation at:
http://www.nsf.gov/events/

Read the solicitation!
Read the GPG!

Read the solicitation!
Read the GPG!
THANKS FOR COMING!