A Planning Guide for New Extension Services

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The program Research on Gender in Science and Engineering at the National Science Foundation is aimed to improve the capacity of our educational systems to attract and graduate more diverse students in science and engineering, especially females, in answer to a national talent crisis.

A funding track called Extension Services was initiated in 2005. The concept of Extension Services was to build capacity among educators to understand new research findings, adopt proven practices that fit their culture, and adopt a more data-driven approach to improving the diversity of students in science and engineering education. The concept is modeled on agricultural extension services, which were highly successful in the diffusion of new ideas and new tools that came out of research.

The program funded a study of lessons learned in 2010, in order to learn more about the funding track. Grants of $2.5 million for five years went to nine projects between 2005 and 2009. Is it working? What is the experience in the field? What are successes and frustrations, and especially, lessons learned?

This Planning Guide converts the lessons learned and common elements among the projects into a step-by-step decision process. It is meant to be useful without reading the *Lessons-Learned* study first. The intended audience is people interested in a model for the diffusion of innovation of new strategies in education. It is most relevant to those initiating a new extension service with NSF funding.

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INTRODUCTION

The Idea

"Extension Services" is familiar to many readers as "agricultural extension services," which are also known as cooperative extension services and now appear in many rural areas in countries around the globe. How did the idea come over to the context of education?

Generically, extension services are about introducing change and innovation into a community. The idea originated in England in the late 19th Century, with university advisors going out to rural farming communities to provide training and to help farmers apply and integrate new practices into their daily routines. Inherently, it is about the transfer of skills from experts and researchers through the informal (out-of-school) education of adults. Inherently, its purpose is to connect research to practice by making it relevant and applied.

The change sought here is in *educational practice*, in *science and engineering* (S&E) fields, and with an interest in *the recruitment of more student*s, from *populations that had been historically excluded* from our higher education systems and from these fields in the past.

As the scientific enterprise grew after World War II and grew in importance to our national competitiveness, prosperity, and security, leaders were concerned about the availability of a skilled workforce. At various times, we have had a heightened awareness of a talent crisis—too few students to meet the demands for growth and innovation.

The National Science Foundation was mandated to invest in the recruitment of more students to science and engineering in 1981, with the Equal Opportunities for Women and Minorities in Science and Technology Act. Among the suite of programs that followed was the Program for Women and Girls, created in fiscal year 1993 and housed in NSF's Division of Human Resource Development, Directorate for Education and Human Resources.

The goal of the program, later named Research on Gender in Science and Engineering (GSE), is to improve the capacity of our educational systems to attract and graduate more diverse students in science and engineering.

How does Federal funding achieve this goal? Various human resources programs have funded scholarships and fellowships to individuals, research on the root causes behind the lack of interest or lack of engagement in science, and barriers to recruitment and retention. Experimental programs are funded to explore changes in curriculum, the ways science is taught, and the educational pipeline, and where good students are "leaking out" and where they might be retained.

In 2005, the GSE program was at a point where many promising practices had been tried and tested over the prior decade. Experimental practices were designed to address root causes for low participation identified in research. The practices were evaluated for their ability to improve on engagement, enrollment, and graduation of students in S&E fields. Many strategies and programs were documented and started to migrate from their pilot experiment into wider practice.

The problem was: how to make promising practices more widely known, and, more important, get them into sustained practice?

Case Studies   In the five years following 2005, nine projects were funded to conduct extension services supporting the GSE agenda. They were still experiments in educational innovation, but larger and with a longer duration than prior pilot programs. The NSF offered $2.5 million over five years, with a third-year performance review. This was still not on the level of agricultural extension services (unless those run by Non-Governmental Organizations in the developing world), but it was an attempt to see if the program could have a wider impact on practice in this way.

With prior funding tracks in GSE, funded projects were small (1-3 years, up to $1 million) and barely reached multiple institutions or a state or two as a geographic base. Short-term grants were given to groups that spread the word for a year or two through seminars, websites, books, or workshops.

With its relatively low level of funding, the GSE program would not achieve national systemic change, but it might achieve pockets of sustained adoption of promising strategies and programs.

In year five of the extension services funding track, the program invested in a study of lessons-learned. It was too early for summative evaluations, as none of the extension services had finished their planned scope and duration. Still, it was possible to identify patterns and characteristics. Nine grantees were shaping the culture, definition, and reputation of the model. The *Lessons-Learned* report offered an inside look, gained from interviews with the leaders. It made details transparent across

projects and to the community of practice concerned with the agenda of gender diversity in S&E.[1]

Purpose

The *ES Lessons-Learned* report posed another opportunity: to convert the findings into a planning guide. The extension services funded by GSE are still a work in progress. There is complexity. There is difference from prior funding models. There is still relatively low investment, making it hard for new entrants to spend much time studying the idea. There is a steep learning curve to grasp the concept and to build on experience.

The following guide aims to be very practical. It decomposes elements of the model(s) and presents them as a step-by-step decision process. Sections can be used as checklists or as a planning template.

The reality of this community of practice is that the intellectual work of concept definition and planning is a luxury. Thinking through and writing up an idea is squeezed by a lack of resources, typical in the non-profit work of education and especially in the work of experimental educational projects.

We want to ease the way, and support good ideas and successful requests for funding. The model of extension services for diffusing innovation could transport to others working in education, and to other domains beyond education.

WHAT IS AN EXTENSION SERVICE PER NSF GSE?

Extension Services are networks created to deliver innovations in education to practitioners. They use a combination of strategies to transfer learning to the field: structured in-person training, online courses, podcasts, guides and handbooks, personal customized technical assistance, regular conference calls and feedback. They intelligently and strategically select and recommend promising practices appropriate to a particular community (such as engineering schools), matching to the needs and culture of the target community.

The solicitation for ES proposals suggests: a unified program of change (based on research evidence), training and consulting services aimed at a well-defined community of educational practice, resources and guides appropriate for the

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[1] Sevo, R. & Chubin, D.E. (2010). *Lessons-learned from "Extension Services" grantees 2005-2009 (NSF Research on Gender in Science and Engineering Program): a national view.* Washington, D.C.: American Association for the Advancement of Science, Center for Advancing Science & Engineering Capacity.

community, and provision of services of ad hoc problem-solving and technical assistance.[2]

ES services are aggregators and integrators of the best work from prior research and small experimental programs.

ARE THERE EXAMPLES?

As of September 2010, nine projects are funded. A detailed profile of each project is available in the report on lessons-learned (see footnote above).

FY	PI	GSE/ES Title	Target Communities
2005	Fortenberry	Engineering Equity Extension Service (EEES)	Educators from middle school thru the college sophomore level, inside and outside classroom, providing an engineering curriculum
2005	Sanders	Mobilizing Implementation of Effective Practices to Increase Participation of Women in Computing (NCWIT, or National Center for Women in Information Technology)	Faculty in undergraduate computer science
2006	Milgram	California Women Tech (CalWomenTech)	Educators providing technology education in community colleges
2006	Froschl	Great Science for Girls (GSG): Gender Equity in Science through After-School Programs	Educators in after-school youth programs, esp. serving low and moderate-income urban children
2006	Peterson	National Girls Collaborative Projects (NGCP)	Educators providing out-of-school girl-serving programs with STEM content
2007	Lufkin	STEM Equity Pipeline (a.k.a. NAPE)	Educators in high school and community colleges providing STEM curriculum, through state-based offices
2008	Meszaros	Appalachian Information Technology Extension Services (AITES)	Educators in information technology in middle and high schools, and county-based communities
2009	Metz	ESE: IM Services in Engineering: Improving Instruction and Mentoring to Retain Undergraduate Women (a.k.a. ENGAGE)	Faculty in engineering colleges
2009	Brown	Girls RISE (Raising Interest in Science and Engineering) Museum Network	Educators in science museums and centers

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[2] National Science Foundation, Research on Gender in Science and Engineering (2010). *Program solicitation.* NSF 10-516. Downloaded on October 11, 2010 from http://www.nsf.gov/pubs/2010/nsf10516/nsf10516.pdf.

WHO LEADS THE EXTENSION SERVICES?

Leaders from Everywhere

What kind of people responded to the call to initiate Extension Services? The task is entrepreneurial – building a service that didn't exist, reaching a theoretically-defined customer base, marshalling experts and advisors, and recruiting agents. They had to compete by NSF rules and standards. All were prior NSF grantees. Nearly all come from non-profit or academic sectors. Leaders include:

- A technology training company executive
- A pair of hearty inner-city youth program leaders
- A university-based director for diversity programs
- A professor of human development with extension services experience
- A government senior executive & engineer
- An executive director of a non-profit supporting implementation of the Perkins Act (open access to career and technical education)
- A museum executive specializing in education programs
- A senior executive from the technology industry

Only two of the nine projects are based in a university. One is based in a museum. The rest are non-profit organizations with a focus on education, with a strong interest in diversity or equity issues. All are experienced managers and administrators, which is not the typical NSF Principal Investigator for research, but more common for principal investigators getting grants in education. Only two come out of a primary career as academic faculty, and in research. They had to know how to plan a large new program, describe it persuasively, and implement it.

The lead teams are relatively lean, comprising a few FTE's in total staffing, spread among several part-time people. The biggest functions are coordinating training events, preparing resource materials, and evaluation activities. These functions can be delegated to specialists, while the lead team handles project planning, management oversight, reporting, and publicity.

Skills

What kinds of skills are needed to lead an extension service?

- Initiative, to create an organization that did not exist

- A time commitment at least part-time over the course of five years
- Experience and interest in outreach, and organization and community development
- Planning skills to set the course
- Management skills to build a team of people who are not full-time, and who may be mostly consultants
- Connections to a network through which experts and consultants can be recruited
- Knowledge of the issue (the status of women in science and engineering) and the agenda (increasing participation), from the perspective of either research, practice, or education consulting, enough to speak in public and to speak with the press
- Understanding of evaluation practices enough to work with an evaluator
- The ability to choose and rely on others with skills in the delivery of professional training, the development of guides, and preparing marketing materials

Motivation   Why have people stepped up to the challenge? They usually have interests in:

- Improving educational practice
- Sharing an excitement for science, engineering, and technology
- Applying research to practice as a process in itself
- Changing the educational experience of girls and women
- Community and network building around a good cause
- Advocacy for equal access to education and jobs, and correcting for historical exclusions and bias in our systems
- A good job with national visibility, with Federal funding
- An idealistic vision of the future: a better environment for our children

Competitive-ness   A proposal to NSF requires 2-page biosketches of each person in the lead team. Basically, these describe the qualifications of the individuals for the jobs they are assigned in the proposal. As the planning team, make sure that every important function is covered by someone on your "dream team." Various key roles are further described below.

IS MY ORGANIZATION A COMPETITIVE CANDIDATE?

Grantee Potential

From the perspective of NSF, the organization submitting a proposal for funding is a candidate to be a grantee. Grantees have to meet minimum requirements in order to receive Federal funding. A newly formed, ad hoc, unincorporated non-profit may not be able to perform accountably. There is provision for an application from an unaffiliated individual, but consult the Program Officer before you proceed.

In NSF's *Grant Proposal Guide[3],* there is a section: "Who May Submit Proposals." The list includes:
1. Universities and colleges
2. Non-profit, non-academic organizations
3. For-profit organizations
4. State and local governments
5. Unaffiliated individuals (U.S. citizens)
6. Foreign organizations
7. Other Federal agencies

"Scientists, engineers and educators usually initiate proposals that are officially submitted by their employing organization."

If in doubt, the advice is: a) read the relevant *Grant Proposal Guide* section, and b) consult the Program Officer overseeing the funding program.

If the proposal is recommended for award, then the organization is processed as a "new performer." The grant comes with many legally binding certifications spelled out in the *Grant General Conditions*.[4]

In universities, the Sponsored Research Office staff is usually familiar with the process and technicalities and advises Principal Investigators as they prepare the proposal. If your organization does not have this expertise available, you may consult NSF directly.

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[3] National Science Foundation (2010). *Grant proposal guide, January 2010.* GPG 10-1. Downloaded on October 11, 2010 from http://www.nsf.gov/pubs/policydocs/pappguide/nsf10_1/gpgprint.pdf
[4] National Science Foundation (2010). *Grant general conditions effective October 1, 2010.* GC-1. Downloaded on October 11, 2010 from http://www.nsf.gov/pubs/gc1/oct10.pdf

Bottom line: Accountability to the government is not a light matter. Consider your access to this expertise, possibly through teaming with other organizations that have it.

Competitive-ness

Your organization should have experience and capacity to perform the scope of the proposed project. You will include at least a paragraph describing your organization highlighting its most relevant strengths. In writing the paragraph, answer the question: "Why are we the best people to do this project?"

Cost Factors

The budget for the project will usually include indirect costs, or overhead. An organization that has never received an NSF or other Federal grant will possibly not have an approved indirect cost rate to use in the budget. "Proposing organizations submitting a proposal to NSF for the first time are encouraged to request guidance from the Cost Analysis & Audit Resolution Branch of NSF's Division of Institution & Award Support at (703) 292-8244."

The rate can be 25% or higher. If a funder is offering $100,000, for example, and your rate is 25%, then the project will have $75,000 available. Find out what your organization's indirect cost rate is, or what rate you are required to use.

DO WE HAVE A LEADERSHIP TEAM?

Key Roles

The dream team for an extension service needs people who can fill the following roles:

- Visionary CEO – the leader who is the primary contact for the press, who makes the trains run on time, who is the primary contact to the funding agency, who protects the vision and the plan
- The community organizer – the person who glues others together around a common cause; a people person; an energizer
- The project director/administrator – someone who knows where the resources are and can account for all financial transactions, and who handles logistics for activities, and contracts
- The marketer –the person who can represent the project to the peer community, explain what it is about, and what it can mean to others
- The master trainer – who designs the professional development to be delivered and directs training events

- The expert in research and/or promising practices – who packages authoritative and accessible knowledge and delivers it in workshops
- The technical writer – who can translate the research and promising practices into guides that the target community can digest
- The evaluator – who can create a logic model, identify or create survey instruments, and collect, analyze, and report evaluation findings
- The project reporter/technical writer – who can describe the activities, periodically, in formats required by the funding agency

Configure Staffing

Current ES's are staffed by only a few people. The most time-consuming functions are coordinating training events, preparing resource materials, and evaluation activities. Several projects use a full time Project Director who handles multiple functions in one person.

Once you have identified what will need to be done, year by year, you can make rough estimates of how much time the function, activity or product will take. Map that to your individual team members.

In a request for funding, you will describe key personnel, their qualifications, and what each will do.

Cost Factors

Members of the lead team within the lead organization can be in the budget for a number of person-months for each year. The person-months include fringe benefits. If someone is outside the lead organization, they can be compensated through a sub-award, or as a consultant. The evaluator in particular is likely to be from a separate organization.

PICKING A TARGET COMMUNITY AND SCOPE

Picking a Mission

Whom do you want to influence to do what differently?

You can start with "rose colored glasses," look forward as a visionary leader, and ask: what does the field need at this time; what kind of work will move it forward, and can you provide it?

At the same time, in brainstorming your mission and scope, a good starting point is, what do you and your organization do well? Then, with whom do you have credibility as a thought leader? Where are your best relationships; where is your network of stakeholders among all the adults surrounding education (parents, counselors, K-12 teachers, community colleges, undergraduate departments, professional associations, outreach directors, etc.).

It is hard to separate WHAT you want to do from WHOM you want to influence. One brainstorming strategy is to look at a fairly comprehensive, recent (2010) list of 39 promising practices compiled in order to arrive at recommendations to the government for investment.[5] Each of the promising practices is supported by research on root causes for the low participation of women in S&E. The top five, for example, are:

1. Help teachers change their interactions with students to engage and motivate all students
2. Support programs that expose students to diverse role models and mentors
3. Emphasize the awareness and adoption of new ways of teaching STEM that have proven to engage and recruit more students
4. Increase the number of TV programs that spark interest in STEM subjects
5. Cultivate and support collaboration among groups, companies, and leaders

Any one of these goals is not a complete answer to "what will you do?" However, the analysis behind this report is a sound starting point for your discussion of options.

The list of straw recommendations was taken from a dynamic online report that attempts to analyze root causes comprehensively.[6] Root causes are organized by area of influence such as Education, Career Information, Family, Internal/Individual, and Societal Issues. Under each area, Root Causes are identified, and a Theory about the Root Cause. Then Strategies addressing the Root Causes are given. Evidence for each Theory is discussed in Part II of the report, as well as Effective Practices and Resources. The latter were the basis for 39 straw recommendations to the government.

Even if this list does not offer a mission that you want to propose, it is useful as a context. The document points to research findings that support particular promising practices. You will need to make a case for investment in a particular direction, citing research.

Examples

Here is the list of the target communities selected by the current ES projects:

EEES
· **Teachers** of middle school (grade 6), high school, undergraduate, and out-of-class (informal) educators **who are affiliated with five particular associations**

NCWIT
· 35 **Undergraduate computer science departments** who joined the NCWIT-organized Academic Alliance

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[5] National Coalition for Women and Girls in Education (2010). *Memo to the Educate to Innovate Campaign to increase the participation of girls and women in science, engineering and math education.* "From the July 19th Collaboration." Downloaded October 12, 2010 from http://www.ncwge.org or http://stemcollaboration.org .

[6] National Alliance for Partnerships in Equity (2010). *Nontraditional career preparations: Root causes and strategies.* Downloaded on October 12, 2010 from http://02b47b1.netsolhost.com/foundation/page.php?55

CalWomenTech

· 8-10 *Community colleges in California that are technology centers*

GSG

· 14 *After-school, youth-serving organizations*

NGCP

· 14 Regional Collaboratives created by NGCP that organize *girl-serving organizations that deliver STEM programming*

STEM Equity Pipeline

· 12 *State departments of education* that oversee implementation of the Perkins Act

AITES

· 10 *Counties among five Appalachian Highlands states, community teams* focused on technology education and workforce development

ENGAGE

· 30 *Engineering schools*

Girls RISE

· 10 *science-rich museum programs* serving low-income Hispanic and African American girls

The Target Client Unit	The current ES projects exhibit three models for structuring an ES service. None is required or prescribed in the solicitation.

1. The first is to work with *particular sites*. The ES sends trainer/consultants to museums, undergraduate departments, or community colleges, for example, and *works with people at the site*.

2. The second is to work with *intermediary professional organizations*. The ES builds *relationships with contacts in associations*, usually staff who are already delivering training as part of the association's services to its membership. These contacts become the ES's trainers. For example, EEES built relationships with the American Society of Mechanical Engineers and Project Lead the Way, among others, in order to influence how engineering is taught at the high school and undergraduate levels. The STEM Equity

Pipeline works with staff in State Departments of Education. Great Science for Girls works with 14 national associations supporting youth-serving after-school programs.

3. The third is to create ***ad hoc community-or-region-based networks***. The ES team *creates a network that did not exist before.* It recruits local leaders, trains them in its mission and content, and helps them with outreach to particular segments within a geographic area. For example, the NGCP creates Regional Collaboratives. The AITES project works with teams in 10 counties in Appalachia.

The pros and cons of each structure, and more information about each current ES project, are in the *ES Lessons-Learned* report.

Educational Specialization

Another way to map your target is to consider the educational levels you think you can (or must) cover to be effective, and, whether you will specialize in a particular subject within science, engineering, technology or mathematics.

Others have chosen:

Coverage of Extension Services by Educational Area
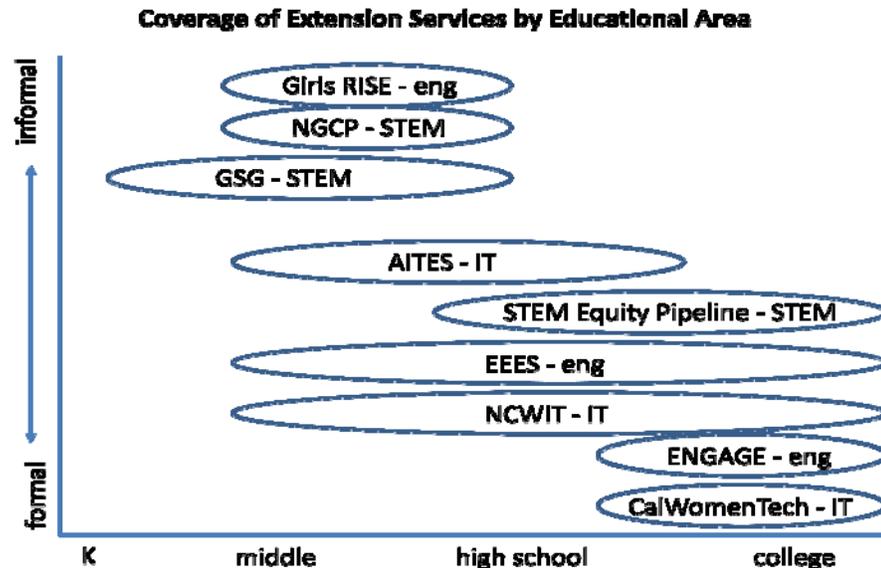
Finding a Fit   Where does your project fit on a chart of coverage?

Again, consider, what is needed, and what do you and your organization do well? With whom do you have credibility as a thought leader? Where are your best relationships; where is your network of stakeholders?

You have the core of your elevator speech: "We are going to accomplish _[promising practices]__ working with __[community units]__, specializing in grade levels __[K-20]_____ and ___[stem]____ fields within S&E."

A section below addresses "how many do you think you can reach?"

Cost Factors   Where are your client units located? There are travel costs implicit in the choices you make. The location of your national conference, training workshops, and sites, relative to your location and the locations of your experts-trainers-consultants have implications for costs and for your time spent travelling.

PICKING PROMISING PRACTICES

Looking for Proof   The section above considered Target Community and Scope. Even so, once you decide, for example, "we will focus on engineering and technology learning at the elementary and middle school levels," you need to ask yourself HOW? *What will you do specifically?*

The main purpose of an extension service is to promote and assist the adoption of particular promising practices that are substantiated as needed based on research, and effective based on evaluation. It must have a certain scale and complexity to warrant the investment, thus the solicitation uses the phrase "comprehensive program of change."

Your team may have originated a particular intervention or program that is promising and proven as a pilot. As an extension service, it has to be scaleable – transported to many. The evidence for effectiveness needs to be documented and convincing, preferably in peer-reviewed academic publications.

Many experimental educational programs do not meet a high standard of assessment. Some have been replicated widely—they are well known-- and people perceive them as worthwhile, although they never had enough funding to measure their impacts

rigorously. There is a perception of success, but the articulation of a logic model (what is the activity or event fundamentally aiming for?) and measurement are missing. Your funding agency and its reviewers will expect you to cite evidence and findings.

Some examples of "missing evidence:" a one-day outreach event for girls that attracts hundreds of participants and funding from local companies over many years; a regular summer camp for girls focused on technology or environmental sciences; a workshop for adults that is inspiring and meaty, repeated many times. What was the event designed to accomplish in terms of impact, and did it succeed? Popularity, visibility, and sponsorship do not meet the standard.

But what is the standard? The whole field of education has moved in the direction of more rigorous measurement and assessment, in spite of the difficulties—lack of resources, lack of assessment sophistication, lack of comparisons with a control population. Several groups have wrestled the complexities of standards into a report and applied a proposed standard to established educational programs, to recognize excellence and to set examples for standards.   For example:

- The Department of Education has a web resource on "what works" to encourage girls in math and science, prepared by a panel of experts. It lists five recommendations. For each recommendation, evidence is cited. They explain a "level of evidence" rating as well.[7]

- The BEST organization issued a report on programs that worked for undergraduates, giving list of criteria for selecting the "best practices" or programs.[8]

You may have a good idea for promising practices to promote through an extension service, but you will have to make a case for its "proof." You may have superb skills in planning and organizing a business from scratch, mobilizing communities, communicating the issue to the media and to communities, etc. – but without roots in academic research and roots in evaluation findings, you have a significant competitive weakness.

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[7] Department of Education, What Works Clearinghouse (2010*). *Encouraging girls in math and science.* http://dww.ed.gov/topic/?T_ID=18
[8] Building Engineering and Science Talent (2004). *A Bridge for all: Higher education design principles to broaden participation in science, technology, engineering and mathematics.* Downloaded January 9, 2008 from http://www.bestworkforce.org/PDFdocs/BEST_BridgeforAll_HighEdFINAL.pdf

An extension service is not the arena in which to try out a good idea. That was the pilot. If you are committed to a particular practice or program with "missing evidence," then you might pursue funding for an experimental program, in order to conduct rigorous assessment conducted.

Research

How do you give your "comprehensive program of change" legs? Someone on your team, even a consulting academic, needs to find and describe the promising practices you will promote.

You need someone who is comfortable with library research (online or otherwise), who understands what constitutes evidence for effective educational practice, and who is comfortable writing in an academic style (with citations).

Here are a few places to look for the "best practices" literature and especially academic, peer-reviewed articles on the impacts of projects, giving their evaluation findings.

- **WEPAN Knowledge Center**. A growing digital library that indexes the core literature on the issue of women in S&E. Many summaries of promising or "best practices" are cited, including those listed below. Many have links to the full document. It includes conference proceedings where many projects describe themselves, even if they do not publish an academic paper. http://www.wepanknowledgecenter.org/

- **What Works Clearinghouse**. The Department of Education had a team of experts review the literature and identify approaches that met a high standard for evidence of effectiveness. They have a section called *Encouraging girls in math and science.* http://dww.ed.gov/topic/?T_ID=18

- **NSF's New Formulas for America's Workforce**. The program Research on Gender in Science and Engineering has funded hundreds of educational experiments and research on root causes. The evidence for effectiveness of promising practices may not appear in the descriptions, but you can find candidate approaches and ideas. The leaders behind the projects did research the literature before you, and might help you. Also, you can search Google Scholar, for example, to find academic papers on the project. http://www.nsf.gov/ehr/hrd/Newformulas/newformulas.jsp

- **NSF Recent Awards**. The *New Formulas* book stops with projects up to 2006. More recent grants can be viewed via the GSE program site. http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5475&org=HRD&from=home

- **Current ES Grantee Websites**. Many summarize best practices beyond the ones they are actively promoting and supporting.
    - NCWIT offers practices in IT, undergraduate: http://www.ncwit.org/resources.res.practices.php
    - EEES covers engineering education http://www.nae.edu/Activities/20676/21702/26338/35823/EEESHome/EEESPremierProducts.aspx
    - CalWomenTech covers technology training http://www.iwitts.org/proven-practices
    - GSG covers informal education http://www.iwitts.org/proven-practices
    - NGCP covers informal education http://www.ngcproject.org/resources/informallearning.cfm
    - NAPE covers K-16 http://www.stemequitypipeline.org/Resources/OnlineResources/Curriculum.aspx

- **Root Causes Paper**. The National Alliance for Partnerships in Equity starts with causes and then links to practices that address barriers. http://02b47b1.netsolhost.com/foundation/page.php?55

- **Guide to Informal IT Education**. The National Center for Women in Information Technology and Girl Scouts of the USA. *Guide to promising practices in informal information technology education for girls.* Prepared by Carrie Liston, Karen Peterson, and Vicky Ragan. Based on a survey of 156 programs, identifies eight practices that contribute most to success. These are true for science and IT. http://www.ncwit.org/pdf/Practices_Guide_FINAL.pdf

- **Higher Education**. Building Engineering and Science Talent (2004). *A Bridge for all: Higher education design principles to broaden participation in science, technology, engineering and mathematics.* http://www.bestworkforce.org/PDFdocs/BEST_BridgeforAll_HighEdFINAL.pdf

- **Best Practices Overview in Policy Context**. Committee on Maximizing the Potential of Women in Academic Science and Engineering (2007). *Beyond bias and barriers: Fulfilling the potential of women in academic science and engineering.* Committee on Science, Engineering, and Public Policy. Covers everything from brain research to best practices. Very concise recommendations. http://www.nap.edu/catalog.php?record_id=11741

- **Higher Education**. DePass, A.L. & Chubin, D.E. (Eds.) (2009). *Understanding interventions that encourage minorities to pursue research careers: Building a community of research and practice.* Summary of a Conference in Atlanta, GA, May 204, 2008. Bethesda, MD: American Society for Cell Biology.

- **A Journal Specializing in the Field**. The *Journal of Women and Minorities in Science and Engineering.* Many GSE-funded projects try to publish here and present their evaluation results. It is not indexed in Google Scholar but you can see all the tables of contents via http://dl.begellhouse.com/journals/00551c876cc2f027.html

- **Other Rich Sets of Links**. Sevo, R. (2009). *10 x 10 list: 100 recommended resources.* http://momox.org/10x10.html

- **Internet Search.** Try Google Scholar using key words. http://scholar.google.com

- **Commercial Books**. Enter key words (women, science) in http://amazon.com

To be competitive, you need the time and the expertise to pin down selected promising practices for your target community and scope.

Examples   The current ES grantees are promoting the following types of content:

To computer science departments (NCWIT):
- Collaborative learning environments and pair programming
- Supportive student-faculty interactions including mentoring
- "Preferred assignments" – applying computer science to societal problems

To community colleges (CalWomenTech):
- A designed package of recruitment and retention best practices

- Teacher training for diversity
- Spatial reasoning skills added to some courses

To youth-serving afterschool program providers (GSG):
- Franklin Institute and Girl Scouts - Girls at the Center
- Twin Cities Public Television - SciGirls
- Chabot Space & Science Center - Techbridge
- Education Equity Center/AED - After-school Science PLUS
- Girls, Inc. – Operation SMART
- U Nebraska State Museum & Nebraska 4-H – Wonderwise 4-H
- NASA – Afterschool Universe

To State Departments of Education (STEM Equity Pipeline):
- A 5-step improvement process
- Data analysis of metrics for the Perkins Act
- Best Practices Handbook
- Professional development materials including GESA (Generating Expectations for Student Achievement)

To communities in Appalachian counties (AITES):
- Emphasis on whole community participation in workforce development: parents, counselors, teachers, youth programs, local IT industry, schools, state & regional consortia
- Awareness of IT careers and job opportunities
- Customized Guide for Best Practices

To engineering schools (ENGAGE):
- Teaching introductory engineering using "relevant" and "everyday applications" to heighten interest
- Incorporating spatial visualization skills training
- Improving faculty-student interaction

To science museums and centers (Girls RISE):
- Assessment of organization climate & sensitivity to gender, race and ethnicity
- Culturally competent programming especially aimed at Hispanic and African American girls, in engineering
- Peer mentoring among museums and centers
- Engineers as role models and mentors

Branding	If you choose models or products that have been developed by others, you are implicitly aligning your reputation with theirs. Your selection and promotion of them is an endorsement – your "Seal of Approval."

Conversely, your partners feel part of your enterprise too. You give them greater visibility and identity with your project.

Cost Factors	If you choose an approach that has been packaged for dissemination and replication, then you may have to factor for the cost of purchasing copies of materials (guides, kits, "programs in a box"). Examples are recruitment kits from CalWomenTech or SciGirls guides.

There may be information products from others, such as Talking Points, or Fact Sheets, that are appropriate for your target community, and which you want to purchase or copy (with permission).

It might be the case that your service would gain better quality if you had help from the originators of an approach. In that case, you might pay the originators for technical assistance to your team or to your clients. That becomes a cost in your budget. Alternatively, you can plan to have them bill your clients for the additional technical assistance, via direct agreement between the owners of the product and your clients. That is a hidden cost of your service, not included in your budget.

IDENTIFYING GOALS AND OBJECTIVES

The language of strategic planning and evaluation is not commonly used with precision and consistency. The easiest route is to enlist the help of someone trained and fluent, in stating your plan. Or, study some definitions and apply them.

Purpose, Mission, Vision	A **Mission** or **Vision** statement expresses the long range picture of the world you are seeking to create.

For example: "An educational experience that is engaging, equitable, and encouraging for all students."

The Mission or Vision is then decomposed into accomplishments to be achieved, if the mission is to become real. These are stated as Goals.

Goals vs. Objectives

Goals are:
- Broad, general intentions
- Intangible, abstract
- Can't be validated or measured
- Long-term vision that may not be achieved
- Changes and outcomes you want to see
- May have multiple implementation steps, i.e., objectives
- Examples: "Educators understand new pedagogies for science and mathematics such as inquiry-based, hands-on learning; problem solving; and cooperative team learning." "Educators understand the dynamics of stereotype threat and biased interactions with students." "Educators interact in ways to encourage a growth mindset and self-efficacy in all students, especially girls."

Goals are then converted into *results that will lead to the Goal*, stated as **Objectives**.

Objectives are:
- Results oriented
- Narrow, precise: what you will do and how you will do it
- Tangible, concrete, activities or products: the deliverables
- Can be validated and measured
- Are achievable and realistic
- Time-bound; have a completion date
- Examples: "Deliver 10 workshops in 5 years." "Follow up workshops with classroom observation and coaching." "Train a cadre of master teachers who provide advice and assistance." "Set up procedures for follow up." "Customize materials on each area of learning."

Action plans and activities further detail the logistics of meeting the **Objectives**. They are at the level of "who will do what when."

Outputs vs. Outcomes

Outputs:
- Specific units that can be counted or measured directly
- Administrative units
- *Outputs are measuring Objectives*: Did we do it? How many?

- Examples: number of workshops, number of times an online document is downloaded, number of brochures distributed

Outcomes:
- Impacts on participants: their knowledge, attitude, skills, behavior or condition (situation, status)
- *Outcomes are measured by Indicators*: Did we have the impact we sought?
- Examples: student learning, equitable climate, reduced bias, cultural competency

Both OUTPUTS and OUTCOMES are measured. But *Outcomes tell you whether you are meeting the Goals and Purpose of your project. **Outputs** reveal activity, events, and products – which may or may not add up to the desired impact.*

Examples of Outcomes

At a retreat for ES leaders, a discussion group listed possible outcomes for their projects.[9]

Client community outcomes:

- Participants understand research and promising practices on women in S&E
- They understood the recommended program or strategy and put it into practice
- They had greater commitment to the goal of increasing the participation of women in S&E; they identified with the goal
- Programs receiving services were stronger in sustainability and fund raising

Student outcomes:

- More students enrolled in STEM courses
- The rate of retention of students was higher
- The graduation rate of students was higher
- Students were more aware of career and job options

Agent/consultant outcomes:

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[9] National Academy of Engineering, Center for the Advancement of Scholarship on Engineering Education (2010). *Retreat for the extension service projects of the National Science Foundation's Research on Gender in Science and Engineering program, January 19-21, 2010.* Available via http://www.nae.edu/CASEE

- Participants understood the recommended program or strategy
- They were able to advise clients and solve problems
- They were committed to the goals of the ES and could present on research findings and promising practices

EVALUATION PLANNING

Evaluation Plan	A rudimentary evaluation plan describes how the evaluator will go about conducting an evaluation.
Evaluation vs. Assessment	The goal of an evaluation is to judge the worth of a project, from the evidence for its impacts. Evaluation includes an assessment process. Assessment is the gathering of data, analysis, and reporting. The evaluator helps decide what the Outcomes of the project are, the objectives, and what will be measured. Assessment may include the use of surveys and data-capture points, whether invented for the project or adapted from similar projects. Examples of "standard" survey instruments are available from the AWE project.[10]
Logic Model	It is helpful to have a logic model from the very beginning of the project, as a way to describe the interrelationships between detailed activities and logistics, and the purpose of the project. A logic model is usually a table that shows how events and actions are connected to objectives, objectives to outcomes, and outcomes to indicators or metrics. Each indicator will have a data gathering strategy. Evaluators prepare logic models.
Metrics and Measurement	The evaluator will determine what metrics will be used as indicators of impact, in meeting target Outcomes. They will also help determine what Outputs are useful to count and report.

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[10] Pennsylvania State University & University of Missouri (2010). *Assessing women and men in engineering.* http://aweonline.org

For example, Outputs can be reported as "Expected" versus "Actual" to show progress each year:

- The number of workshops; number of webinars
- The number of participants at workshops
- The number of organizations reached by the workshops
- Number of mini-grants
- The number of agent/consultants recruited
- Demographics of agent/consultants and workshop participants
- Qualifications or background of agent/consultants and workshop participants
- Number of information products distributed, to whom
- Number of students indirectly involved via the educators at the workshops
- Demographics of students indirectly affected

Cost Factors   The evaluator usually estimates the effort and cost of evaluation activity. This is compensated via consulting fees or via a sub-award to the evaluator's organization.

WHAT IS THE BEST WAY TO REACH THE COMMUNITY?

Planning Stage   Once you have identified the target community and the target client unit (above), the question is: do you have relationships in place, and a process to solidify them? How far along do you have to be to convince your funders that "yes, we understand our community and we have a charter for action."

Your key clients, or a sample, can be asked to write a letter of commitment to participate.

Sites   Whether reaching out to a school district, a museum, or a university school or department, there are some common issues.

Interest. What leads you to believe that if you build it (an ES), they will come? If you do not have a list of client sites, or only a partial list, describe how you will market your service, to invite participation.

Readiness. One of the ES lessons-learned is that all parties who are interested in participating may not have the capacity to act, successfully, within the few years allotted. For example, if your project is going to rely on the availability of data on the participation of girls in order to assess the local needs for emphasis, does the data

exist or will you be in the position of building a data collection capacity FIRST? Do you anticipate this process and cost in your budget? If you will recruit trainers on site, who do more than act as a contact person, are they available for the time investment you are assuming?

Commitment. Some ES's require a contract or a formal Memorandum of Understanding to define mutual expectations. Since the ES is accountable to the funder for performance, this ensures that the client site is accountable to the project also. However, one ES found that a formal Memorandum was a barrier because it required signatures at higher levels that were hard to get. Individuals were able to participate in training and such without an MOU.

Selection. Some ES's find more sites are interested than can be included in the plan. A process for selection outlines what factors are considered for inclusion, for example: readiness and capacity, commitment to diversity, demographics (for diversity in the client pool), geographic location (for geographic diversity), and availability of primary contacts. Do you have a way to include those who cannot get the "full service" from you? Will you help find funding so that you can reach them? Will you get to them later, somehow?

Rewards and Incentives. The ES budget may not be large enough to fund all the activity it may inspire and require on the local site. For example, if you expect college departments to review and revise their curriculum, and implement a revised course, they might need resources. Some ES's offer mini-grants to incentivize action locally. Or, the local trainers are compensated as consultants. You can offer recognition and publicity to your participants – credit for their action toward addressing the issue of diversity and S&E workforce development, for example.

Culture. Another ES lesson learned is that all sites are not alike. Your knowledge of the community shows in your ability to anticipate local politics, budget cuts, loss of a highly committed local contact to a new job, and so on. One insurance tactic is to have depth in the local team – multiple people.

Professional Organizations

Several ES's started out with a plan to work with a short list of professional organizations and were able to add others later.

Many of the same issues listed above for sites apply to organizations:
- Interest
- Readiness
- Commitment
- Rewards and Incentives

- Culture

However, because the organizations become the "lead trainers" in a "train-the-trainer" scenario, it is much more important to have them on board in the plan. *The level of accountability is much higher, in order for the ES to work. They are the middle tier in your ES organizational structure.*

You may not be able to "swap out" a partner who is not really committed and does not send people to training, or deliver training, as promised. You are depending on them to communicate your mission and agenda – sell the idea of diversity and explain promising practices —to their membership, through training. Your ES is staked on them to reach the full target community. There may not be other organizations that fit your scope as well as those on your short list.

Geographic Communities

Even more challenging is to create a community of practice or a network that did not exist before.

In this case, you can describe what geographic areas you will target, and describe your process for building community there. The prior ES's name individuals they have already recruited, or describe the kind of people they will recruit to be leaders. A pilot project is a good idea: showing that your process of recruitment and community building results in a community that does accomplish your agenda.

The key variables for client communities apply also, but interpreted as characteristics of a geographic community:
- Interest
- Readiness
- Commitment
- Rewards and Incentives
- Culture

For example, AITES working in Appalachian counties looked for the presence of major IT industry partners, the presence of an infrastructure for economic development, evidence of prior or existing efforts to promote STEM education and especially IT, the presence of individuals and agencies interested in becoming partners, and high minority populations. AITES had a planning grant to develop this model.

Cost Factors

How much time and effort does it take to reach your target client unit – whether sites all over the country, professional organizations, or geographic communities?

Experience has given us a reality check.

- One project says it can take up to two years to get a site "on board" politically.
- Another working with academic departments found that it had to lay the ground work in selling the idea that diversity was important. Diversity was not in the campus strategic plan, there was no diversity committee, and there were few recruitment practices that were designed around seeking diverse students. That is, the local context was a shallow ground on which to build the ES agenda.
- Another project found it took up to nine months to put in place the leadership for a new regional community, through a competitive selection process.
- Another found that the response of potential sites the first year was lukewarm and that in the second year, word had gotten out and there was a waiting list for training.

AN ESSENTIAL SKILL:

DELIVERING TRAINING, SEMINARS, PROFESSIONAL DEVELOPMENT

Workshop
Design

A workshop is an educational experience. "Training trainers" or preparing consultant/advisors has all the elements of a course:

- Learning objectives and social objectives
- Content
- Pedagogy (how will the content be taught/learned)
- Duration
- Facilitation

Nearly all the ES's developed custom training for their scope and target community. Only one incorporated an established – possibly "turnkey"-- workshop. There are precedents and examples of workshops from other ESs. A new project could pull in the advice of people involved with an earlier ES if they are close in scope/audience.

One lesson learned was to modularize content from the beginning, and, to create your own "turnkey" workshop.

There is different content and social dynamics depending on the client's prior exposure to the material, that is, do you need an introductory workshop and then a follow-up that has greater depth? Planning should address the need to prepare multiple workshops over the course of years with the same clients.

Some ES's combine the function of the workshop to train, with a session during which participants prepare action plans. It is hard to get people to pull away from daily work and give their attention to new activities. Part of the time can be used to launch the process of preparing for needs assessments or action plans.

Some found that participants were less interested in hearing about research topics and theory; they wanted a practical, action-oriented approach. They wanted less on WHY is this important and more on WHAT to do and HOW.

A big decision is who to mix among the participants in the workshop. Some ES's found that locating training at a site or exclusively with one intermediary organization was more productive than holding a meeting combining participants across sites or organizations.

Another consideration is how much the in-person workshop is integrated into later interactions online, facilitated by the ES.

Cost Factors

Workshops are a core activity of an ES and probably represent one of the larger cost components.

There are costs of development and design, and costs of repeated execution.

For each iteration, consider costs for:
- Facilities
- Trainer/expert/consultant
- Facilitator
- Handout materials
- Travel and accommodations
- Lunch and refreshments

In an NSF proposal, costs associated with individual attendees may be budgeted as Participant Support. Funds in this category may not be redirected elsewhere. Formal permission is required to increase or decrease the amount.

THE ROLE OF EXPERTS

Translators

Experts are consultants who understand, in depth, the research and practice within the scope of your project. They supplement the expertise available within the

leadership team. In the agricultural model, experts are people who can interpret research and evaluation findings for the benefit of practitioners.

For example, experts can be used to:
- Advise and review the content of workshops
- Advise and review the content of customized materials
- Deliver parts of the workshop
- Lead entire workshops
- Provide technical assistance to sites or organizations
- Lead webinars on research or promising practices topics

They provide foundational training and specialized technical advice.

Some ES's develop a matrix of experts and qualifications/specializations so that they can be called on and assigned based on client needs. The pool of experts is available on the basis of service-for-hire. This enables the selection of experts to be driven by data – what the site or organization needs.   (For example, a planning specialist, someone with direct experience with a recommended curriculum, an evaluator.)

Another option is to orient experts to be consultants to particular sites or organizations, and work with them closely on a wide range of processes: training, planning, needs assessment, implementation, and evaluation. One ES allots for more than 100 hours per site for an assigned consultant. The consultant signs up understanding that there is a commitment to a relationship with contacts at the site.

Your project must decide how much "hands-on" the experts will be, in training and in ongoing technical assistance.

Management of expert consultants, and quality control, are functions of the lead team. The consultants are staff of the ES—part of the face of the ES.

Cost Factors   Management time for recruiting, orienting, assigning, and monitoring consultants. Setting up management systems and contracts.

Billable time and travel costs from the expert consultants.

"AGENTS" – CONSULTANTS – TECHNICAL ADVISORS

The Hands-On Local Leaders

What is the difference between an "expert" and an "agent?" It is probably the extent to which an individual is specialized on the spectrum between research and practice, and, geography.

Your ES service does not have to have both. They can be synonymous.

In current ES practice, experts are people stepping out of their research and academic positions temporarily to advice on how to apply findings from prior projects as relevant to your scope. Agents are more likely to be practitioners who have experience with the recommended strategies and their implementation, and are advisors on how to implement.

For example, in a project working with academic departments, the agent/consultants may be peers who have implemented a particular program or curriculum on their campus. They are not necessarily researchers of that practice; they are experienced peers. In a public school context, they may be master teachers. The assumption is that they understand implementation and they are committed to inspire action and provide technical assistance.

A scenario for a site-based ES might be:
- Recruit campus-based people and train them in the role of leading peers in change, present professional development/seminars to peers
- Recruit retirees from other kinds of sites who have insider relationships
- Recruit more than one person for a local team, for depth and sustainability
- Build their sense of identity and community as your agents
- Establish guidelines and expectations for them
- Stay in touch, assist as needed, monitor progress

A scenario for an intermediary organization relationship might be:
- Develop a starter kit for contacts in the organization, defining their role and responsibilities, and your expectations
- Visit frequently to stay in touch
- Hold quarterly face-to-face meetings

A scenario for community-development efforts might be:
- Recruit local leaders based on explicit criteria and expectations
- Make participation in your ES attractive: provide free professional

development, support, and an identity with a larger community
- Follow-up continuously
- Hold annual conferences to build community, refresh inspiration and information, and stay in touch
- Help trouble-shoot frustrations

Incentives

What are the incentives for local leaders to participate and incorporate the demands of working with the ES? Here are a few:

- Opportunities for leadership training
- Experience outside of the usual work setting
- Opportunity to exercise leadership; acting as a change agent and as a consultant
- Working in a larger arena, in a way more structured than participating in national professional organizations
- Learning about research and practice related to diversity
- Group identity, affiliation, mutual support; expanding personal networks
- Access to modest financial resources

Several ES's offer a limited number of mini-grants competitively. These are in amounts of $1,000-$4,000-$10,000 depending on the activity they are encouraging. These amounts are sufficient, however, to enable new activities locally. Local leaders gain the prestige of bringing in external funding and the opportunity to do something they could not do before.

Cost Factors

How much and how you compensate your agents depends on the culture of the community, and the role you expect from your agents. Local community interface can depend on a combination of paid part-time leaders and volunteers.

In some current ES's, for example, the volunteers already have full-time paid positions working in outreach, and their personal alignment with the ES is an extension of their work. They gain benefits from the association, and financial compensation is not as important. In other cases, the work for the ES is outside normal professional duties and must be supported (travel costs, time).

Mini-grants may be in the budget as Participant Support costs, since the funds are transferred to others.

HOW MUCH SHOULD YOU PLAN TO DO? (FEASIBILITY)

Scale

Probably no one has done before what you are planning to do. There are many risks in claiming a high scale of operation and not making it. You won't be alone in possibly over-reaching. If your scale is too modest, however, it won't look like it is worth the investment.

The number of locations is not the only parameter in your outreach. The planned intensity of services is another key parameter. That is, there is a tradeoff between *the number of locations* an ES can serve, and *how much it can do at each one.* The challenge is to be convincing that you have a reasonable balance.   ES services are supposed to have national visibility, with significant regional or national impact. Both parameters – numbers and substantive impact – are important.

Here are some parameters of scale from the first ES's. In their planning, they did not have the benefit of precursors and examples.

Site-based services:
- 35 undergraduate departments (NCWIT)
- 8-10 community colleges (CalWomenTech)
- 12 state departments of education (STEM Equity Pipeline)
- 30 engineering schools (ENGAGE)
- 10 science museums (Girls RISE)

Services through intermediary organizations:
- 14 after-school, youth-serving organizations (GSG)
- 6 associations (EEES)

Community-based networks:
- 14 regional collaboratives (NGCP)
- 10 counties among five states (AITES)

Cost Factors

Geographic spread is a factor, due to the cost of travel, for the lead team, experts, consultants, and participants.

TEAMING WITH OTHER ORGANIZATIONS

Roles

There are many reasons to team with another organization in operating an extension service. Two reasons stand out: access to the target local communities and clients

through their membership in the partner organization, or access to quality programming that is best supported by a partner. For example, if an association already convenes annual conferences which draw the attendance of most of the client community, then the ES can be attached to the services and structures already in place reaching the client community. The regular meetings of the partner become a natural setting for ES business also.

Each of the reasons is essentially a matter of leverage – taking advantage of the capacity of others, and building on it.

Are you partners, or are you in the role of a provider of services to the organization, which is your client? In a partnership, there is joint accountability for performance of the extension service. There is mutual responsibility for reporting, measurement of impacts, and coordination for success.

Usually one organization is the lead. Each may receive funding independent of the other, and thus each is accountable to the funder.

If one is providing services to the other, then the lead is dependent on the organization receiving services, but accountability is softer. Some money may flow from one to the other.

Another way to enlist partners without having a large financial relationship is to invite them to be members of an advisory board. They may be asked to participate in planning, design, quality control, recruitment of participants, and dissemination.

Cost Factors   In the NSF scheme, more than one organization submitting a request for funding can indicate that they comprise a collaboration. Only one proposal has the complete Project Description. The second and other collaborators submit independent proposals with their own budgets, but the lead Project Description covers them all. Each organization submits its own budget, applying its own indirect cost rate. This scenario avoids the second budgets being additionally burdened with the indirect costs of the primary.

Another scenario is that the second and other organizations are sub-awards to the primary organization, which receives all the funding and passes it through to the others. In this case, the sub-award is burdened by the second organization, and then additionally burdened by the indirect costs of the primary within the primary's budget, thus the total budget available to the project may be reduced further.

It is also possible to pass funds to other organizations in the role of consultants to the primary organization.

Some universities may have policies stating preferences for certain relationships within a grant.

RESOURCE MATERIALS

Customizing

The ES model assumes that information passed to target communities is packaged for them and is responsive to their culture.

Current grantees found that the work of summarizing relevant research finding, instructional practices or curricula, and outreach strategies was very time consuming, and necessary.

Many prepared custom Fact Sheets, Talking Points, and Frequently Asked Questions focused on their educational scope.

It can take a year to prepare materials. As materials are tested with actual clients, new needs come up, and new ideas for new information products.

One planning strategy is to look at what others have done and interpret some of the choices that you will make. For example, will you use a particular method for needs assessment and strategic planning to start the initial work with the site, or organization, or community? Is there a tool available, or one that could be adapted?

As part of planning, you can write "specs" for the first materials you will need: what information is to be captured, sources for the information, and models from other projects. This makes it easier to estimate the effort.

Website

All the ES projects are large and long enough to warrant a dedicated website. The range of functions—access to a library of materials, a program or person directory, a window supporting applications for mini-grants or special resources, social networking—depends on the project and the community.

Cost Factors

Cost factors include the time of a technical writer, time of experts to advise-review-edit, and production of the products (design, layout, presentation: website or paper).

Since a website plays a large role in your "branding" and dissemination, it probably needs a budget.

COMMUNITY AND IDENTITY BUILDING

Identity   Every ES creates a community of clients who are embarking in learning together, and applying the learning. They are enlisting to be change agents and advocates for the cause of increasing the number of students in S&E, and the diversity of students in S&E.

The "cause" may not be popular and it may take some courage for people to identify with – and identify themselves with-- the agenda.

On the other hand, many committed, idealistic, and action-oriented people welcome finding kindred spirits and allies. They welcome becoming part of a learning community and a community of practice. Research shows that learning in teams and groups is not only emotionally satisfying; it is effective in reinforcing new knowledge and attitudes.

Many of the ESs heard feedback from their local team members and volunteers that the identity gained through the network was important. Face-to-face conferences and workshops helped networking and mutual support, through frustrations of introducing new ideas and practices.

Whether or not the ES is designed around building ad hoc networks and collaborations, it is more effective if it consciously builds "brand" and identity, and meets needs and interests in professional development and networking.

Cost Factors   Budget for in-person meetings, workshops, and conferences (for example, annual conferences). Allow time for networking. Support travel outside the work location for local leaders. Virtual meetings are fine but will not satisfy the interest and benefits of informal socializing and networking.

PUBLICITY AND ACCOUNTABILITY

To the "Outside"   The project itself is a vehicle expressing national goals to increase the recruitment of students to S&E and increase diversity. It is part of the national community of research and practice on women in S&E. It is part of the NSF grantee community.

At a minimum, ES's typically create a brochure and a visible website. They share resources collected as part of the service. They may have a restricted online

community venue, and, join in open social networking sites.

Some materials, such as overviews of promising practices, become resources to others immediately, and are announced via general community listserves and press releases.

Interaction with the media may be relevant for larger events. Talking points or press kits can help leaders in the ES articulate a consistent message and description of the project.

Partners may invite the project to present to their organizations at annual conferences.

Funders will expect the project to be visible and represent the mission of the funding program. They will look for specifics on planned conferences, submissions to academic journals, publications, and generally proactive dissemination.

Framing the Agenda

People in the target community and the general public may question the agenda of recruiting girls and women to S&E as a political or advocacy agenda. Current ES's found that they needed to consciously reposition the agenda as *improving education for all* and *building the S&E workforce.*

The topic is still new. However, many welcome the idea of recruiting students to science and mathematics, reaching out to lower-income students, and retaining more students through educational pathways to careers. They welcome hearing that there are jobs, even locally, that are waiting to be filled by local people with technical skills.

An ES can consciously frame its mission (and its title) so that is it not controversial or provocative, and still support the goal of gender diversity.

Cost Factors

Travel and registration at national conferences to give presentations about the project. Preparation of a brochure (writing, design, printing). Preparation of a poster. Preparation of talking points for ES leaders. Writing and submitting articles to academic journals. Attendance and presentation to the annual NSF grantee meeting.

ADVISORS AND BOARDS

Social Capital There are many functions for an advisory board. A large project with national scale run by a few individual leaders usually needs depth. An advisory board constitutes additional social capital.

Some of the functions and benefits of a board (that are implicit in invitations to particular individuals):

- Relationships to important stake-holder companies, associations, and projects
- Expert advice and ideas on everything: plans, content, logistics, materials, trouble-shooting
- Contribution to promotion, advocacy and visibility of the project, "champions"
- Additional funding opportunities or ideas
- Feedback on quality and impact assessment
- Input to planning and key decisions
- An extended professional network with connections to resource people of all kinds

Cost Factors Travel to an in-person meeting, a number of times during the project. Virtual meetings. Honorariums for participation (as advisors, consultants). Possible travel to key sites for visibility, promotion, or trouble-shooting.

TEMPLATE FOR A FUNDING REQUEST

Plan Versus Request Converting plans into a request for funding is not a trivial task. Teams can spend 30 to 100 person-hours wrestling ideas into a persuasive narrative.

Sometimes good ideas are not funded because of weak writing – disorganized, boring, overly detailed or not detailed enough, incomplete on important topics, not enough evidence, not enough about capacity and qualifications, etc. It is an art, and can be learned.

Solicitation Guidelines for what is important to the funder are first base.[11] They give you the criteria that will be applied in the review of your request. They give you more than clues as to what topics are important, and some instructions that must be followed.

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[11] National Science Foundation, Research on Gender in Science and Engineering (2010). *Program solicitation.* NSF 10-516. Downloaded on October 11, 2010 from http://www.nsf.gov/pubs/2010/nsf10516/nsf10516.pdf.

| Writing Resources | There are a number of books on writing requests for funding, even specific to NSF, if you have people building up this professional skill.

For example:

- Chapin, P.G. (2004). *Research projects and research proposals: A guide for scientists seeking funding.* Cambridge University Press.

- Friedland, A.J. & Folt, C.L. (2009). *Writing successful science proposals.* Second Edition. Yale University Press.

- Hall, M.S. & Howlett, S. (2003). *Getting funded: The complete guide to writing grant proposals.* 4th Edition. Continuing Education Press |

| Template: Summary | **Opening (paragraph):**
- Who are you and what are you planning to do? Place yourself in context. Are you doing to do research, or run an experimental program, or provide/operate services?
- Why: what is the problem it solves, or the need it meets, or the opportunity it demonstrates?
- Does anything like this exist?

Intellectual merit (one-half page):
- What will you do in more detail, technically? What is your approach, method, technology, theory?
- Why is this a good idea? What is good about the approach your will take? Will you leverage particular knowledge, products, or talent?
- What are you offering that is new, smart, building on other work?
- Who will you work with and why is that a great teaming idea?
- Who will you serve and why? How many (scale)?
- Who will lead the project? Do you and/or your organization have good capacity or qualifications to carry this out? Have you done similar work?
- Do you need special resources and do you have access to them (data, equipment, experts)? |

Broader impacts (paragraph):
- What is the benefit to society, to science and engineering in general, or to the field (your context)?
- What is the unique contribution? Does it add knowledge capital, human capital, or social capital (infrastructure)? Does it support diversity in S&E? Reach the public? Link research to practice?
- What is the ultimate societal goal? Why is this work important and who will care?

Template:

Description

Overview of Scope (1 page)
- You may repeat the Project Summary

Why is the proposed work needed – the problem statement (1.5 pages)
- What problem does your project solve?
- Is it building on prior work (your own or others')?
- What research, policy, or prior efforts indicate that this is important to do?
- What is our current knowledge about the problem; what are contributing factors and root causes?
- Display your knowledge of relevant findings or policy
- Position your work: emphasize that prior work does not address your goal

Goals and objectives (.5 page)
- How will you accomplish the vision/mission/purpose of the project? What are main goals and main objectives?
- Can be previewed here and repeated in the Evaluation section

Methodology or strategies (1 page)
- Is there a theoretical framework behind your approach, for example a theory of change, or a disciplinary theory?
- How will you carry out your mission?
- What methods are you using? Do they have a basis in a discipline or body of research?

Selection of subjects or clients (1 page)
- Who will you study or serve?
- Why did you pick this population?
- How will you establish a relationship with your target population?
- Are there special contracts, agreements, permissions that you will use?
- Are there special problems in reaching the population, and how will you approach them?

- Do you have experience with this population?

Special topics, e.g., training workshops; materials development; recruitment of experts, trainers, or agents; conferences; recruitment and management processes **(1 page)**
- Use your statement of Objectives to outline logistics
- What will you do? How will you do it? What problems do you anticipate? Do you have a philosophy about it? Quality factors? How many do you plan for?

Evaluation (1 page)
- Do you have a logic model?
- What are the goals for outcomes of your project?
- What metrics will you use measure success in achieving the outcomes?
- Who is your evaluator and what are their qualifications for evaluating this project?
- How will they gather data? Is there an evaluation timetable?

Publicity, promotion, dissemination (.5 page)
- How will you let your community of research or practice know about your project?
- Will you try to publish? Where?
- Will you present your project at national conferences? Which ones?

Advisory Board (.5 page)
- Will you have others advise your project? What kind of people, or, name names and what they bring to the project, potentially.

Lead Organizations (.5 page)
- What is the organization that will be the grantee? What special capacity does it have for this project?

Project Team (1 page)
- Who are the principal leaders and what are their roles?
- Describe each one, their role, and qualifications for the role.
- (Refer to 2-page biosketches. The summary in the plan mainly highlights qualifications in terms of the scope of the project.)

Management Approach (.5 page)
- What is your planned organizational structure? How will the work be coordinated and carried out?

Timeline or action plan (.5 page)
- What are key events over the duration of the project?

Related Efforts (.5 page)
- Is anyone doing similar work and how does your project differ? Reposition your project as a unique and needed contribution.

Prior Support (.5 page or less)
- Have you been funded for related work in the past? Give one or two sentences per grant, emphasizing results.

Summary of Impact (paragraph)
- The punch line: What impact will this project have, on the narrow field (its context) or the science and engineering enterprise, or society?

References/Citations (a separate section)

Cost Factors

Who funds the work of "writing grants?" In universities, writing grants is considered part of regular professional work. Staff in the Office of Sponsored Research can assist, especially with technicalities and requirements of Federal and other funding sources.

In non-profits, this is an activity billed to overhead. It is the cost of doing business.

Usually the lead team does most of the writing. They can enlist others to help, but articulating detailed plans—especially the technicalities of education and research -- is hard through third-parties. However, someone who is a general editor can improve the writing.

Funding entities usually do not pay for the work of preparing requests for funds for future work, unless through planning grants expressly designed for developing a concept (and its articulation).