



Directorate for Education and Human Resources
Division of Undergraduate Education

Supplemental Information for Principal Investigators and Applicants to NSF's Course, Curriculum, and Laboratory Improvement Program

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Introduction

The purpose of this document is to provide information that will assist current Principal Investigators (PIs) and future applicants to NSF's Course, Curriculum, and Laboratory Improvement (CCLI) program to:

- (a) develop proposals that are responsive to CCLI program objectives;
- (b) describe the objectives of their proposed projects so that reviewers can more easily determine how well the proposed project responds to the objectives of the corresponding CCLI track; and
- (c) manage their projects to achieve project objectives and to enable reporting on the project consistent with program and NSF goals.

Revitalization of courses, curricula, and laboratories promotes improved achievement in mathematics and science skills needed by all Americans. Promoting improved achievement is, in turn, one of NSF's key investment strategies to address the relevant outcome goal of the National Science Foundation Strategic Plan, FY 2000–2005: *a diverse, internationally competitive, and globally engaged workforce of scientists, engineers, and well-prepared citizens*. In support of this goal, the CCLI program aims to fund projects that lead to the development, adoption, adaptation, implementation, and dissemination of effective models, products, and practices that address the educational needs of all undergraduates—i.e., students with diverse backgrounds and career goals.

The following sections describe the objectives of each of the three tracks of the CCLI program. Tables in each section list indicators of progress toward or successful achievement of the objectives.

Educational Materials Development (EMD) Track

The objective of the CCLI program's Educational Materials Development (EMD) track is to support the development of educational materials that incorporate educational practices that are effective in improving learning of science, mathematics, engineering, or technology (SMET) by undergraduates with diverse backgrounds and career aspirations (i.e., all students). Indications of the program's progress will be reflected by progress exhibited by the projects supported, in terms of *product development* and demon-

strations of the *effectiveness of the practices* incorporated. Because the chart below is intended to provide a framework for assessing the EMD track as a whole, each project is not expected to contribute data to every indicator, nor will an individual project be evaluated on the basis of the data it provides for compilation. Within each key area, indicators of progress are presented roughly in the order they are likely to be achieved, with the expectation that more projects are likely to achieve those listed at the top of the list, within the period of the grant.

<p>Indicators of progress toward or successful achievement of EMD objectives with respect to:</p> <ul style="list-style-type: none"> • developing and testing of product, • making others aware of product’s availability and effectiveness (dissemination), and • preparing faculty to use product.
<p>EMD Proof-of-Concept projects</p> <p>A detailed plan for development of a prototype product or practice has been prepared.</p> <p>Educational practices generally regarded by the community as effective in enhancing learning are being incorporated into the prototype, or new approaches are being developed.</p> <p>An assessment instrument and/or an approach to evaluate the prototype’s impact in improving student learning has been developed.</p> <p>A prototype of a product or practice has been developed and made ready for testing.</p> <p>Prototype has been tested in a pilot program.</p> <p>Documentation has been prepared so that others can test prototype.</p> <p>Presentations have been given (at professional meetings or other institutions) or articles have been published about the prototype and its potential uses, and/or it has been cited by others.</p> <p><i>If prototype is successful</i>, an outline of a plan has been developed for:</p> <ul style="list-style-type: none"> (a) developing the prototype into a full set of materials, including beta testing and evaluation of the product at diverse types of institutions and with diverse student populations, and (b) commercial or other self-sustained distribution of a fully developed product or practice.
<p>EMD projects planning for full development of a product or practice</p> <p>An educational product or new pedagogical approach has been developed for pilot testing at the PI’s home institution.</p> <p>Pedagogical practices incorporated in materials being developed are generally regarded by the community as effective in enhancing learning. (Some projects are expected to be developing new, untested practices, whose effectiveness has yet to be established.)</p> <p>A plan has been developed to assess the effectiveness of products and practices.</p> <p>Product or practice has been pilot-tested at PI’s home institution.</p> <p>Documentation has been prepared so that others can test product.</p> <p>Product or practice has been beta-tested at other institutions.</p> <p>Effect of the product or practice on student learning has been evaluated.</p> <p>The product or practice developed positively affects learning by the population of students for whom it was intended (e.g., those majoring in a SMET discipline, or non-science majors, or more limited populations, such as members of groups that are underrepresented in the SMET professions—women, minorities and persons with disabilities).</p> <p>Students’ perceptions of their learning experience have been affected:</p> <ul style="list-style-type: none"> (a) at the PI’s home institution; (b) at beta test sites. <p>Material has been submitted to a publisher.</p> <p>Material has been submitted for inclusion in a discipline-oriented archive or repository.</p> <p>Material has been accepted by a discipline-oriented archive or repository.</p>

Material has been accepted by a publisher.
Material has been published commercially or in another self-sustaining manner.

Adaptation and Implementation (A&I) Track

The objective of the CCLI program’s Adaptation and Implementation (A&I) track is to promote the improvement of undergraduate education in science, mathematics, engineering, and technology for students with diverse backgrounds and career objectives, through the adaptation and implementation of materials, techniques, and practices developed elsewhere by others, which have been shown to be effective, in order to accomplish positive change at an institution.

<p>Indicators of progress toward or successful achievement of A&I objectives with respect to:</p> <ul style="list-style-type: none"> • adaptation and testing of modified product, and • implementation and integration into curriculum.
Materials and/or practices, shown to be effective elsewhere, have been adapted or modified for use at the PI’s institution.
A plan has been developed to assess the effectiveness of the materials and practices.
Adapted materials and practices have been tested.
Further modification has occurred as a result of initial tests, if necessary.
The effect of the adaptation on student learning has been evaluated.
The product and/or practice developed positively affects learning by the population of students for whom it was intended (e.g., those majoring in a SMET discipline, or non-science majors, or more limited populations, such as members of groups that are underrepresented in the SMET professions).
Students’ perceptions of their learning experience have been affected.
Documentation has been prepared about the use of adapted product or practice, so that the product can be adopted and implemented by other faculty or at other institutions.
Presentations have been given (at professional meetings or other institutions) or articles have been published about the adaptations and resulting educational experiences.
Modified product and/or practice has been incorporated into the curriculum at the PI’s institution, with the necessary authorization, funding, faculty effort, and facilities to support success.
For those projects that acquired equipment, the equipment has been successfully incorporated into the curriculum.
Other faculty at the PI’s home institution are prepared to make use of the adapted product or equipment acquired.
<i>Other indicators of a project’s success, depending on its goals, may include:</i>
Adaptation has been beta-tested at other institutions.
Modified materials have been adopted by others, or submitted to a commercial publisher and/or published.
Faculty at other institutions have been prepared to use the modified product or practice.

National Dissemination (ND) Track

The objective of the CCLI program’s National Dissemination (ND) track is the national dissemination of exemplary materials and practices through the provision of faculty professional development opportunities.

<p>Indicators of progress toward or successful achievement of ND objectives with respect to:</p> <ul style="list-style-type: none"> • program materials and logistics, • recruitment of participants, • dissemination of materials or practices, and • deployment and evaluation.
PROGRAM MATERIALS AND LOGISTICS
The infrastructure and organization have been set in place to provide, on a national scale, the administration and logistical support for a program that delivers services to SMET faculty seeking to learn or to develop new, effective approaches in SMET education.
Existing effective instructional materials have been collected, organized, and compiled into a set of materials for use by participants in the ND project.
Advertising and recruiting materials have been prepared, including brochures, advertisement copy, and acquisition of potential participant lists.
A review mechanism has been established to allow for the removal of unsuccessful offerings and for the timely addition of new offerings.
New materials have been produced, if required, to meet the instructional needs of the program (e.g., for instruction or for recruiting to meet the needs of specifically targeted groups, such as faculty who are members of groups that are underrepresented in SMET disciplines, faculty who teach students who are from groups underrepresented in SMET, faculty from specific SMET disciplines, faculty who teach non-SMET majors, or faculty who have not participated in previous professional development activities).
RECRUITMENT OF PARTICIPANTS
Advertisements, brochures, and registration mailings have been distributed.
Advertising and recruitment has reached out to diverse types of institutions and professional organizations and professional societies.
Participants respond and register for the program.
DISSEMINATION OF MATERIALS OR PRACTICES
Instructional materials or descriptions of instructional practices have been prepared by participants such that they could be used in the courses they teach.
DEPLOYMENT AND EVALUATION
A plan has been developed to assess the impact of the national dissemination activities and their effectiveness on the participants.
The proposed scale of the project has been met (in terms, for example, of the total number of topics offered, the disciplines that participated, academic group or professional society partners, individual workshops held, diversity of institutional types represented by participants, numbers of participants, participation by faculty from groups underrepresented in SMET, geographic distribution of participants).
Faculty have learned new materials and/or acquired new skills.
If the project was designed for graduate students and postdoctoral fellows, these potential faculty have broadened their perspective of an academic career to include preparation for teaching as well as research.
The assessment and evaluation mechanism has been used to change the programs offered (e.g., added or removed programs), consistent with the project's proposal.

<i>The following activities, although not routinely expected, would represent outstanding achievement:</i>
Materials collected or newly developed for the project have been submitted to a commercial publisher.
Materials have been published as a commercial product and/or adopted by others in courses or other curricular applications.
A cadre of faculty who participated in professional development activities have subsequently become actively involved in further efforts to disseminate information about these practices to others.
The project has been successful in attracting other sponsors or co-sponsors to sustain further professional development and dissemination activities.

ABOUT THE NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) funds research and education in most fields of science and engineering. Grantees are wholly responsible for conducting their project activities and preparing the results for publication. Thus, the Foundation does not assume responsibility for such findings or their interpretation.

NSF welcomes proposals from all qualified scientists, engineers and educators. The Foundation strongly encourages women, minorities, and persons with disabilities to compete fully in its programs. In accordance with federal statutes, regulations, and NSF policies, no person on grounds of race, color, age, sex, national origin, or disability shall be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving financial assistance from NSF (unless otherwise specified in the eligibility requirements for a particular program).

Facilitation Awards for Scientists and Engineers with Disabilities (FASSED) provide funding for special assistance or equipment to enable persons with disabilities (investigators and other staff, including student research assistants) to work on NSF-supported projects. See the program announcement or contact the program coordinator at (703) 306-1636.

The National Science Foundation has Telephonic Device for the Deaf (TDD) and Federal Relay Service (FRS) capabilities that enable individuals with hearing impairments to communicate with the Foundation regarding NSF programs, employment, or general information. TDD may be accessed at (703) 292-5090 or (800) 281-8749, through FRS on 1-800-877-8339.

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