Course, Curriculum, and Laboratory Improvement (CCLI)

Program Solicitation
NSF 05-559
Replaces Document **NSF 04-565**

National Science Foundation
Directorate for Education and Human Resources
Division of Undergraduate Education

Full Proposal Deadline(s) (due by 5 p.m. submitter's local time):

May 17, 2005

For Phase 1 proposals from submitting organizations located in states or territories beginning with A through L.

May 18, 2005

For Phase 1 proposals from submitting organizations located in states or territories beginning with M through N.

May 19, 2005

For Phase 1 proposals from submitting organizations located in states or territories beginning with O through W.

January 24, 2006

For Phase 2 and 3 proposals

REVISIONS AND UPDATES

- The CCLI program has changed substantially for FY 2006. The program has increased its emphasis on projects that build on prior work and contribute to the knowledge base of undergraduate STEM education research and practice. In addition, projects should contribute to building a community of scholars who work in related areas of undergraduate education. Finally, the revised program requires proposals to explicitly identify a set of measurable outcomes that will be used in the project management and evaluation.

- To provide a framework for projects to maximize their effectiveness on improving undergraduate STEM education, the program identified five components of a cyclic model of knowledge production and the improvement of practice. The program will accept proposals that may combine one, several, or all of the following components:
  - Conducting research on undergraduate STEM teaching and learning;
  - Creating learning materials and teaching strategies;
  - Developing faculty expertise;
  - Implementing educational innovations;
  - Assessing learning and evaluating innovations.

- The program will accept three types of proposals representing different phases of development:
  - Phase 1, Exploratory Projects with a total budget up to $150,000 ($200,000 when four-year colleges and universities collaborate with two-year colleges) for 1 to 3 years;

- Phase 2, Expansion Projects with a total budget up to $500,000 for 2 to 4 years;
- Phase 3, Comprehensive Projects with a total budget up to $2,000,000 for 3 to 5 years.

- In the previous solicitation, the CCLI program consisted of four tracks. All proposals that could have been submitted to the previous CCLI program are welcome in the current program, with certain modifications as explained above.
  - Adaptation and Implementation (A&I): A project under the former A&I track is likely to involve the new component, *Implementing Educational Innovations*, and will probably fall under *Phase 1, Exploratory Projects*. Such projects may include the purchase of instrumentation and equipment in order to achieve educational innovations.

  - Educational Materials Development (EMD): A project under the former EMD track is likely to involve the component, *Creating Learning Materials and Teaching Strategies*. A former EMD-Proof-of-Concept project would be submitted in the current program as a *Phase 1, Exploratory Project*, while a former EMD-Full Development project would include more components and would probably be a *Phase 2, Expansion Project* or, for national-scale projects, a *Phase 3, Comprehensive Project*.

  - Assessment of Student Achievement (ASA): A project under the former ASA track is likely to involve the component, *Assessing Learning and Evaluating Innovations*. A proposal may be submitted to any of the three phases, depending on its size.

  - National Dissemination (ND): A project under the former ND track is likely to involve the component, *Developing Faculty Expertise*, but now should involve other components as well. A proposal may be submitted to any of the three phases.

- Proposal deadline dates have been revised. Phase 1 Projects have a different deadline date from Phase 2 and 3 Projects.

- All proposals must conform to the Grant Proposal Guide formatting requirements; formerly A&I and EMD-Proof-of-Concept proposals had a shorter page limit.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Course, Curriculum, and Laboratory Improvement (CCLI)

Synopsis of Program:

The Course, Curriculum, and Laboratory Improvement (CCLI) program seeks to improve the quality of science, technology, engineering, and mathematics (STEM) education for all undergraduate students. Based on a cyclic model of knowledge production and improvement of practice, CCLI supports efforts that conduct research on STEM teaching and learning, create new learning materials and teaching strategies, develop faculty expertise, implement educational innovations, assess learning, and evaluate innovations. The program supports three types of projects representing three different phases of development, ranging from small exploratory investigations to comprehensive projects.

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Applicable Catalog of Federal Domestic Assistance (CFDA) Number(s):

- 47.076 --- Education and Human Resources

Eligibility Information

- **Organization Limit:** None Specified.
- **PI Eligibility Limit:**

An individual may be the lead PI on only one proposal submitted for any submission deadline. There is no restriction on the number of proposals for which a person may serve as a co-PI. Please see the full text of this solicitation for further information.

- **Limit on Number of Proposals:** None Specified.

Award Information

- **Anticipated Type of Award:** Standard or Continuing Grant
- **Estimated Number of Awards:** 71 to 99 - including 55 to 70 Phase 1 awards, 15 to 25 Phase 2 awards, and 1 to 4 Phase 3 awards
- **Anticipated Funding Amount:** $31,000,000 pending availability of funding

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Full Proposal Preparation Instructions:** This solicitation contains information that supplements the standard Grant Proposal Guide (GPG) proposal preparation guidelines. Please see the full text of this solicitation for further information.

B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is not required by NSF.
- **Indirect Cost (F&A) Limitations:** Not Applicable.
- **Other Budgetary Limitations:** Not Applicable.

C. Due Dates

- **Full Proposal Deadline Date(s)** (due by 5 p.m. submitter's local time):
  - May 17, 2005
    - For Phase 1 proposals from submitting organizations located in states or territories beginning with A through L.
  - May 18, 2005
    - For Phase 1 proposals from submitting organizations located in states or territories beginning with M through N.
  - May 19, 2005
    - For Phase 1 proposals from submitting organizations located in states or territories beginning with O through W.
  - January 24, 2006
    - For Phase 2 and 3 proposals

Proposal Review Information

- **Merit Review Criteria:** National Science Board approved criteria. Additional merit review considerations apply. Please see the full text of this solicitation for further information.

Award Administration Information

- **Award Conditions:** Standard NSF award conditions apply.
- **Reporting Requirements:** Additional reporting requirements apply. Please see the full text of this solicitation for further information.

TABLE OF CONTENTS

I. INTRODUCTION

The vision of the Course, Curriculum, and Laboratory Improvement (CCLI) program is excellent science, technology, engineering, and mathematics (STEM) education for all undergraduate students. The program's goal in pursuit of this vision is to stimulate, disseminate, and institutionalize innovative developments in undergraduate STEM education through the production of knowledge and the improvement of practice. To achieve this goal, the CCLI program addresses challenges identified in several major reports. For example the report, "Greater Expectations: A New Vision for Learning as a Nation Goes to College," (http://www.greaterexpectations.org/) recommends enabling students to become empowered, informed, and responsible learners ready to assume productive roles in society in both STEM and non-STEM related careers. Furthermore, the National Research Council's (NRC report, "Evaluating and Improving Undergraduate Teaching in Science, Technology, Engineering, and Mathematics," (http://www.nap.edu/books/0309072778/html/) raises challenges that include improving the assessment of learning outcomes, teaching a broad range and large number of students, providing engaging laboratory and field experiences, and enhancing the faculty's knowledge of research on effective teaching.

In meeting such challenges, the CCLI program builds on a number of recent publications analyzing the current state and future needs in undergraduate STEM education. The NRC volume, "How People Learn," (http://books.nap.edu/html/howpeople1/) advocates that teachers draw out and work with students' preexisting knowledge, teach subject matter in depth and provide examples, help students develop self-monitoring and reflection skills, and integrate these practices into the curriculum in a variety of subjects. In addition, the National Research Council (NRC) report, "Scientific Research in Education," http://www.nap.edu/books/0309082919/html/ recommends that educational research projects pose significant questions that can be investigated using direct empirical techniques, allow replication and generalization across educational settings, and present results to encourage professional critique.

The CCLI Program also acknowledges the need for undergraduate research and development efforts in undergraduate STEM education to build on and contribute to the STEM education knowledge base. The Project Kaleidoscope report, "Recommendations for Action in Support of Undergraduate Science, Technology, Engineering, and Mathematics," (http://www.pkal.org/documents/ReportonReports.pdf) calls for "collective action" to share ideas and materials so that projects build on, connect to, and enhance the work of others. It stresses that educational research and development efforts must move away from the practice in which an individual "owns" a new approach from conception to implementation. The CCLI program supports a collaborative model where investigators learn about and adapt the work of others and disseminate the results so that others can continue the investigation. The rationale and methods in CCLI projects will use the STEM education knowledge base, as reflected in the education research literature, the discipline-based education literature, or other appropriate sources that describe previous work by others. Also, all projects will contribute actively to this knowledge base and expand the experience base by sharing their findings.

In addition, the CCLI Program recognizes that sustained improvement in undergraduate STEM education requires that all participants engage in building a community of scholars. The National Academies Press report, "Improving Undergraduate Instruction in Science, Technology, Engineering and Mathematics," (http://www.nap.edu/books/0309089298/html/) emphasizes the importance of expanding faculty and scholarly networks to promote effective instruction and to support rapid dissemination and adaptation of successful educational innovations. Furthermore, "Recommendations for Action in Support of Undergraduate Science, Technology, Engineering, and Mathematics" concludes that "we must find new ways to identify and bring new voices into the dialog." To help build this community of scholars, CCLI projects will seek ways to increase the participation of STEM faculty in educational reform and innovation, particularly through activities such as implementation, assessment and dissemination.

II. PROGRAM DESCRIPTION

The CCLI program is based on a cyclic model of the relationship between knowledge production and improvement of practice in undergraduate STEM education, adapted from the report, "Mathematical Proficiency for All Students" (see http://www.rand. org/publications/MR/MR1643/). In this model, research findings about learning and teaching challenge existing approaches, leading to new educational materials and teaching strategies. New material and teaching strategies that show promise lead to faculty development programs and methods that incorporate these materials. The most promising of these developments are first tested in limited environments and then implemented and adapted in diverse curricula and educational practices. These innovations are carefully evaluated by assessing their impact on teaching and learning. In turn, these implementations and assessments generate new insights and research questions, initiating a new cycle of innovation.
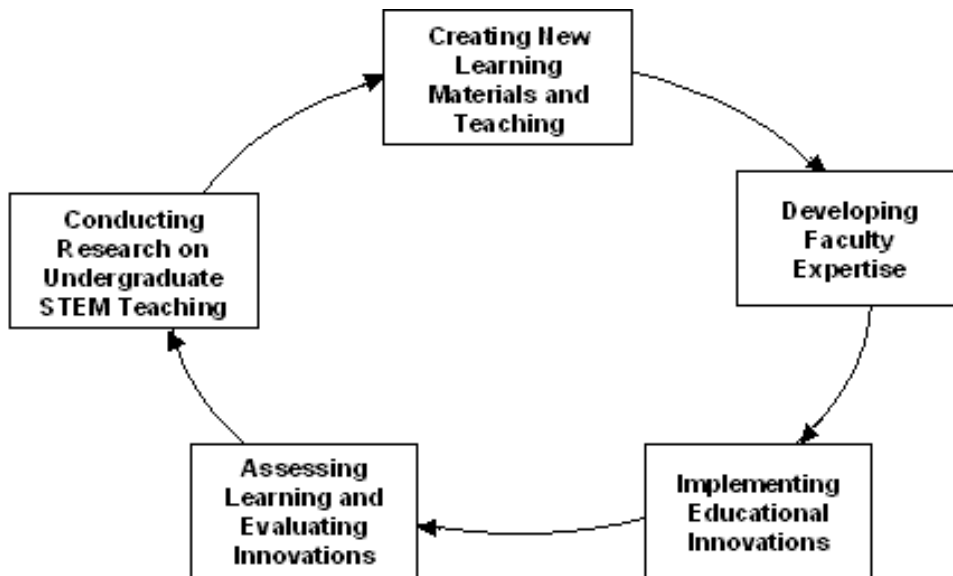
Cyclic model for knowledge production and improvement of practice in undergraduate STEM education

A. Project Components

Proposals may focus on one or more of the following components of this cyclic model for knowledge production and improvement of practice, as it is applied to stimulating and sustaining innovative developments in undergraduate STEM education.

- **Conducting Research on undergraduate STEM Teaching and Learning**. Results from assessments of learning and teaching and from projects emphasizing other components in the cyclic model provide a foundation for developing new and revised models of how undergraduate students learn STEM concepts and for exploring how effective teaching strategies and curricula enhance that learning. Projects may also contribute to educational research by synthesizing previous results and theories. These projects will have a practical focus, in that they will lead to testable new ideas for creating learning materials and teaching strategies that will have an impact on STEM educational practices.

- **Creating Learning Materials and Teaching Strategies.** Guided by research on teaching and learning or by evaluations of previous efforts, projects will develop new learning materials and tools, or create new and innovative teaching methods and strategies. Projects may also revise or enhance existing educational materials and teaching strategies, based on prior results. Such projects may include activities that help faculty develop expertise in adapting these innovations and incorporating them effectively into their courses.

- **Developing Faculty Expertise**. Using new learning materials and teaching strategies often requires faculty to acquire new knowledge and skills and to revise their curricula and teaching practices. Projects will design and put into practice methods that enable faculty to gain such expertise. These can range from short-term workshops to sustained activities that foster new communities or networks of practicing educators. Successful projects will provide cost-effective professional development for a diverse group of faculty so that new materials and teaching strategies can be widely implemented.

- **Implementing Educational Innovations**. Learning materials, teaching strategies, or faculty-development methods that have demonstrated success in their original contexts will be disseminated to new educational settings, or

adopted more widely, by projects that implement educational innovations. These materials, strategies and methods may come from CCLI projects or from other sources in the STEM community. Funds may be requested for local adaptation and implementation projects, including instrumentation to support such projects. Results from implementation projects will illuminate the challenges to and opportunities for adapting innovations in diverse educational settings, and may provide a foundation for the development of new tools and processes for assessments of learning and teaching.

- **Assessing Learning and Evaluating Innovations**. Implementing educational innovations will create new needs to assess student learning and faculty development. Projects will design and test new assessment and evaluation tools and processes. Projects that apply new and existing tools to conduct broad-based assessments or evaluations may also be considered, provided they span multiple projects and are of general interest. Results obtained using these tools and processes will provide a foundation that leads to new questions for conducting research on teaching and learning.

Central to each project is an iterative design-implement-test process with results from each step in the process informing successive iterations and leading to increasingly effective implementations. In all projects, testing to determine the effectiveness of the innovation should be appropriate to the stage of the development and guide its further development and implementation. In addition to affecting the subsequent development of an innovation within one component, evaluation and assessment results from one component will influence the design of other components. For example, results from faculty development efforts may lead to refinement of learning materials and teaching strategies, and results from projects implementing educational innovations may identify the need for new approaches for developing faculty expertise.

B. Project Types

In FY 2006 the CCLI program accepts proposals for three types of projects representing different phases of development. These phases reflect the number of components of the cyclic model included in the project (scope); the number of academic institutions, students and faculty members involved in the project (scale); and the maturity of the proposed educational innovation (state).

Phase 1: Exploratory Projects – total budget up to $150,000 ($200,000 when four-year colleges and universities collaborate with two-year colleges) for 1 to 3 years.

Phase 1 projects typically will address one program component and involve a limited number of students and faculty members at one academic institution. Projects with a broader scope or larger scale can be proposed provided they can be done within the budget limitations. In order to encourage collaboration between four-year colleges and universities and two-year colleges, projects involving such collaboration may request an additional $50,000. The distribution of effort and funds should reflect a genuine collaboration. Expected results from Phase 1 projects are significant enough to contribute to the undergraduate STEM education knowledge base.

Phase 2: Expansion Projects – total budget up to $500,000 for 2 to 4 years.

Phase 2 projects build on smaller-scale successful innovations or implementations, such as those produced by Phase 1 projects, and refine and test these on diverse users in several settings. In terms of scope, their focus ordinarily includes two or more components of the cyclic model with the connections between components explicitly addressed. Phase 2 projects carry the development to a state where the results are conclusive so that successful products and processes can be distributed widely or commercialized when appropriate.

Phase 3: Comprehensive Projects – total budget up to $2,000,000 for 3 to 5 years.

Phase 3 projects combine established results and mature products from several components of the cyclic model. Such projects involve several diverse academic institutions, often bringing different kinds of expertise to the project. Evaluation activities are deep and broad, demonstrating the impact of the project's innovations on many students and faculty at a wide range of academic institutions. Dissemination and outreach activities that have national impact are an especially important element of Phase 3 projects, as are the opportunities for faculty to learn how to best adapt project innovations to the needs of their students and academic institutions.

Although it is expected that some Phase 1 projects will lead to Phase 2 projects and some Phase 2 projects to Phase 3 projects, there is no requirement that a proposal be based on CCLI-funded work. While it is unlikely that the program would be able to support a single multi-year project to address all components in depth at a large scale, a succession of grants might support such an effort. In all cases the funds requested should be consistent with the scope and scale of the project.

C. Important Features of Successful Projects

Although projects will vary considerably in the number of components they address, in the number of academic institutions, faculty, and students involved, and in the maturity of the products, approaches, and ideas being pursued, all successful projects will share certain characteristics.

- *Quality, Relevance, and Impact:* Successful projects are innovative and involve state-of-the-art products, processes, and ideas. When appropriate, they utilize the latest technology in student laboratories, classrooms and other learning environments. These projects, even those that involve a local implementation, address issues that have broad implication for undergraduate STEM education. The results of these projects advance the knowledge and understanding within the discipline and within STEM education in general.

- *Student Focus:* Successful projects, regardless of the component(s) involved, have a focus on student learning with a clear link between project activities and an improvement in STEM learning. Moreover, they involve approaches that are consistent with the nature of today's students, reflect the students' perspective and, when possible, solicit student input in the design of the project.

- *Use of and Contribution to the STEM Education Knowledge Base:* Successful projects reflect high quality science, technology, engineering, and mathematics. They have a rationale and use methods derived from the existing undergraduate STEM education knowledge base. They also have an effective approach for adding the results of the project to this knowledge base.

- *STEM Education Community-Building:* Successful projects include interactions between the investigators and others in the undergraduate STEM education community. These interactions enable the project to benefit from the knowledge and experience of others and to engage them in the development and evaluation of the educational innovation. This collaborating network involves investigators working on similar or related approaches in the proposer's discipline or in other STEM disciplines and it may also include experts in evaluation, educational psychology or other similar fields.

- *Expected Measurable Outcomes:* Successful projects have goals and objectives that have been translated into a set of expected measurable outcomes. These are used to monitor progress, guide the project, and evaluate its ultimate success. Some of the expected measurable outcomes pay particular attention to student learning, contributions to the knowledge base, and community building.

- *Project Evaluation:* Successful projects have an evaluation plan that includes both a strategy for monitoring the project as it evolves to provide feedback to guide these efforts and a strategy for evaluating the effectiveness of the project in achieving its goals when it is completed. These efforts are based on the project's specific expected measurable outcomes defined in the proposal.

D. Program Evaluation

The Division of Undergraduate Education (DUE) conducts an on-going program evaluation to determine how effectively the CCLI program is achieving its goal to stimulate, disseminate, and institutionalize innovative developments in STEM education through the production of knowledge and the improvement of practice. In particular, the program seeks to understand how effectively its projects are using current learning models in developing their innovations, contributing to the knowledge base on STEM education, and building a community of scholars in undergraduate STEM education. In addition to project-specific evaluations, all projects are expected to cooperate with this third party program evaluation and respond to all inquiries, including requests to participate in surveys, interviews and other approaches for collecting evaluation data.

III. ELIGIBILITY INFORMATION

Proposals are invited from all organizations and in any field eligible under the standard GPG guidelines. Specifically excluded are projects that address solely professional training in clinical fields such as medicine, nursing, and clinical psychology. There is no limit on the number of proposals an organization may submit. An individual may be the lead PI on only one proposal submitted for any deadline. There is no restriction on the number of proposals for which a person may serve as a co-PI.

IV. AWARD INFORMATION

NSF anticipates having $31 million for all CCLI awards, pending the availability of funds. The awards will be made as standard or continuing grants. The number and size of awards will depend on the quality of the proposals received and the availability of funds. The expected number of awards, and duration and range of total NSF/DUE support over the lifetime of a CCLI project, including indirect costs, are as follows:

- **Phase 1: Exploratory Projects** – 55 to 70 awards expected, each with a total budget up to $150,000 ($200,000 when four-year colleges and universities collaborate with two-year colleges) for 1 to 3 years.
- **Phase 2: Expansion Projects** – 15 to 25 awards expected, each with a total budget up to $500,000 for 2 to 4 years.
- **Phase 3: Comprehensive Projects** – 1 to 4 awards expected, each with a total budget up to $2,000,000 for 3 to 5 years.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Full Proposal Instructions:

Proposals submitted in response to this program announcement/solicitation should be prepared and submitted in accordance with the general guidelines contained in the NSF *Grant Proposal Guide* (GPG). The complete text of the GPG is available electronically on the NSF Website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from pubs@nsf.gov.

Applicants should make sure that their proposals respond to the list of questions provided both in the NSB general review criteria and in the additional program-specific review criteria in Section VI-A below. They should review the discussion of the components, phases, and important features in Section II above. Additional information on writing proposals can be found in "A Guide for Proposal Writing*"* (http://www.nsf.gov/pubsys/ods/getpub.cfm?nsf04016).

Principal Investigators are strongly encouraged to match their proposed budgets carefully to the scope and scale of a project. Excessive or poorly justified budgets indicate that the project is not well understood and thought out.

For projects that plan to post material on the web, the proposal should include a sustainability plan for tagging these products with descriptive metadata (http://dublincore.org/ and http://metamanagement.comm.nsdlib.org/outline.html) to ensure they can be indexed and cataloged within the National Science Digital Library (www.nsdl.org).

Proposers who intend to collect data from or about students, deans, professors, faculty, or other human subjects should comply with the section of the GPG on Proposals Involving Human and Animal Subjects (http://www.nsf.gov/cgi-bin/getpub?gpg)

Proposers are reminded to identify the program announcement/solicitation number (05-559) in the program announcement/solicitation block on the proposal Cover Sheet. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

B. Budgetary Information

Cost Sharing:

Cost sharing is not required by NSF in proposals submitted under this Program Solicitation.

C. Due Dates

Proposals must be submitted by the following date(s):

Full Proposal Deadline(s) (due by 5 p.m. submitter's local time):

May 17, 2005

For Phase 1 proposals from submitting organizations located in states or territories beginning with A through L.

May 18, 2005

For Phase 1 proposals from submitting organizations located in states or territories beginning with M through N.

May 19, 2005

For Phase 1 proposals from submitting organizations located in states or territories beginning with O through W.

January 24, 2006

For Phase 2 and 3 proposals

Proposers should allow sufficient time for all organizational approvals and for correction of errors in uploading the proposal in FastLane. No corrections to submitted proposals will be accepted after the deadline. Proposals received after the deadline will be returned without review. Proposals that do not meet the GPG requirement for separately and explicitly addressing **intellectual merit** and **broader impacts** in the Project Summary will be returned without review. Proposals that do not comply with the formatting requirements (e. g. page limitation, font size, and margin limits) specified in the GPG will be returned without review.

D. FastLane Requirements

Proposers are required to prepare and submit all proposals for this announcement/solicitation through the FastLane system. Detailed instructions for proposal preparation and submission via FastLane are available at: https://www.fastlane.nsf.gov/a1/ newstan.htm. For FastLane user support, call the FastLane Help Desk at 1-800-673-6188 or e-mail fastlane@nsf.gov. The FastLane Help Desk answers general technical questions related to the use of the FastLane system. Specific questions related to this program announcement/solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this announcement/solicitation.

Submission of Electronically Signed Cover Sheets. The Authorized Organizational Representative (AOR) must electronically sign the proposal Cover Sheet to submit the required proposal certifications (see Chapter II, Section C of the Grant Proposal Guide for a listing of the certifications). The AOR must provide the required electronic certifications within five working days following the electronic submission of the proposal. Proposers are no longer required to provide a paper copy of the signed Proposal Cover Sheet to NSF. Further instructions regarding this process are available on the FastLane Website at: http:// www.fastlane.nsf.gov

VI. PROPOSAL REVIEW INFORMATION

A. NSF Proposal Review Process

Reviews of proposals submitted to NSF are solicited from peers with expertise in the substantive area of the proposed research or education project. These reviewers are selected by Program Officers charged with the oversight of the review process. NSF invites the proposer to suggest, at the time of submission, the names of appropriate or inappropriate reviewers. Care is taken to ensure that reviewers have no conflicts with the proposer. Special efforts are made to recruit reviewers from non-academic institutions, minority-serving institutions, or adjacent disciplines to that principally addressed in the proposal.

The National Science Board approved revised criteria for evaluating proposals at its meeting on March 28, 1997 (NSB 97-72). All NSF proposals are evaluated through use of the two merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

On July 8, 2002, the NSF Director issued Important Notice 127, Implementation of new Grant Proposal Guide Requirements Related to the Broader Impacts Criterion. This Important Notice reinforces the importance of addressing both criteria in the preparation and review of all proposals submitted to NSF. NSF continues to strengthen its internal processes to ensure that both of the merit review criteria are addressed when making funding decisions.

In an effort to increase compliance with these requirements, the January 2002 issuance of the GPG incorporated revised proposal preparation guidelines relating to the development of the Project Summary and Project Description. Chapter II of the

GPG specifies that Principal Investigators (PIs) must address both merit review criteria in separate statements within the one-page Project Summary. This chapter also reiterates that broader impacts resulting from the proposed project must be addressed in the Project Description and described as an integral part of the narrative.

Effective October 1, 2002, NSF will return without review proposals that do not separately address both merit review criteria within the Project Summary. It is believed that these changes to NSF proposal preparation and processing guidelines will more clearly articulate the importance of broader impacts to NSF-funded projects.

The two National Science Board approved merit review criteria are listed below (see the Grant Proposal Guide Chapter III.A for further information). The criteria include considerations that help define them. These considerations are suggestions and not all will apply to any given proposal. While proposers must address both merit review criteria, reviewers will be asked to address only those considerations that are relevant to the proposal being considered and for which he/she is qualified to make judgments.

What is the intellectual merit of the proposed activity?
How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of the prior work.) To what extent does the proposed activity suggest and explore creative and original concepts? How well conceived and organized is the proposed activity? Is there sufficient access to resources?

What are the broader impacts of the proposed activity?
How well does the activity advance discovery and understanding while promoting teaching, training, and learning? How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?

NSF staff will give careful consideration to the following in making funding decisions:

Integration of Research and Education
One of the principal strategies in support of NSF's goals is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions provide abundant opportunities where individuals may concurrently assume responsibilities as researchers, educators, and students and where all can engage in joint efforts that infuse education with the excitement of discovery and enrich research through the diversity of learning perspectives.

Integrating Diversity into NSF Programs, Projects, and Activities
Broadening opportunities and enabling the participation of all citizens -- women and men, underrepresented minorities, and persons with disabilities -- is essential to the health and vitality of science and engineering. NSF is committed to this principle of diversity and deems it central to the programs, projects, and activities it considers and supports.

Additional Review Criteria:
- **All projects:** Are the goals and measurable expected outcomes defined and are they appropriate to the scope, scale, and state of the project? Does the proposal describe a convincing rationale and appropriate methods that are grounded in the STEM education knowledge base? Is there a clear work plan that is aligned with the expected outcomes? Is the project likely to produce high quality results that contribute to the undergraduate STEM education knowledge base? Is the project likely to have an impact on STEM education, student learning, and faculty practice? Are expected results (e.g., the research, products, tools, processes, implementations, or workshops developed) defined and appropriate? Is the evaluation plan likely to produce useful formative and summative information? Is the project likely to help build a community of STEM education scholars?
- **Phase 1 Projects**: How likely is it that the project will result in a successful implementation, prototype, or pilot study?
- **Phase 2 Projects**: Is the project's work based on previously developed and tested innovations and implementations? Does the proposed work involve more than one component and multiple academic institutions and is this level of involvement appropriate for the project? How likely is it that the project will successfully deliver a mature version of the work?
- **Phase 3 Projects**: Is the project based on established results and mature products? Does the project include most of the program components defined in the cyclic model of STEM knowledge production and improvement of practice? Does the project involve a set of diverse academic institutions? Is it likely that the outcomes will have a national impact? Is there an appropriate plan for sustainability or commercialization?

B. Review Protocol and Associated Customer Service Standard

All proposals are carefully reviewed by at least three other persons outside NSF who are experts in the particular field represented by the proposal. Proposals submitted in response to this announcement/solicitation will be reviewed by Panel Review.

Reviewers will be asked to formulate a recommendation to either support or decline each proposal. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

A summary rating and accompanying narrative will be completed and submitted by each reviewer. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers, are sent to the Principal Investigator/Project Director by the Program Director. In addition, the proposer will receive an explanation of the decision to award or decline funding.

NSF is striving to be able to tell proposers whether their proposals have been declined or recommended for funding within six months. The time interval begins on the closing date of an announcement/solicitation, or the date of proposal receipt, whichever is later. The interval ends when the Division Director accepts the Program Officer's recommendation.

In all cases, after programmatic approval has been obtained, the proposals recommended for funding will be forwarded to the Division of Grants and Agreements for review of business, financial, and policy implications and the processing and issuance of a grant or other agreement. Proposers are cautioned that only a Grants and Agreements Officer may make commitments, obligations or awards on behalf of NSF or authorize the expenditure of funds. No commitment on the part of NSF should be inferred from technical or budgetary discussions with a NSF Program Officer. A Principal Investigator or organization that makes financial or personnel commitments in the absence of a grant or cooperative agreement signed by the NSF Grants and Agreements Officer does so at their own risk.

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

Notification of the award is made to *the submitting organization* by a Grants Officer in the Division of Grants and Agreements. Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Program Division administering the program. Verbatim copies of reviews, not including the identity of the reviewer, will be provided automatically to the Principal Investigator. (See section VI.A. for additional information on the review process.)

B. Award Conditions

An NSF award consists of: (1) the award letter, which includes any special provisions applicable to the award and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award letter; (4) the applicable award conditions, such as Grant General Conditions (NSF-GC-1); * or Federal Demonstration Partnership (FDP) Terms and Conditions * and (5) any announcement or other NSF issuance that may be incorporated by reference in the award letter. Cooperative agreement awards are administered in accordance with NSF Cooperative Agreement Financial and Administrative Terms and Conditions (CA-FATC). Electronic mail notification is the preferred way to transmit NSF awards to organizations that have electronic mail capabilities and have requested such notification from the Division of Grants and Agreements.

*These documents may be accessed electronically on NSF's Website at http://www.nsf.gov/awards/managing/. Paper copies of these documents may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from pubs@nsf.gov.

More comprehensive information on NSF Award Conditions is contained in the NSF *Grant Policy Manual* (GPM) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpm. The GPM is also for sale through the Superintendent of Documents, Government Printing Office (GPO), Washington, DC 20402. The telephone number at GPO for subscription information is (202) 512-1800. The GPM may be ordered through the GPO Website at http://www.gpo.gov.

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the PI must submit an annual project report to the cognizant Program Officer at least 90 days before the end of the current budget period.

There are two special CCLI reporting requirements. When CCLI PIs submit interim and final reports through FastLane, they will be asked to provide additional information for the *Project Information Resource System* (PIRS). In addition, PIs of CCLI grants will also be expected to cooperate with data collection associated with the CCLI program evaluation conducted by a third party organization supported by NSF.

Within 90 days after the expiration of an award, the PI also is required to submit a final project report. Failure to provide final technical reports delays NSF review and processing of pending proposals for the PI and all Co-PIs. PIs should examine the formats of the required reports in advance to assure availability of required data.

PIs are required to use NSF's electronic project reporting system, available through FastLane, for preparation and submission of annual and final project reports. This system permits electronic submission and updating of project reports, including information on project participants (individual and organizational), activities and findings, publications, and other specific products and contributions. PIs will not be required to re-enter information previously provided, either with a proposal or in earlier updates using the electronic system.

VIII. CONTACTS FOR ADDITIONAL INFORMATION

General inquiries regarding this program should be made to:

- Barbara N Anderegg, Program Director (ENG), Directorate for Education & Human Resources, Division of Undergraduate Education, 835 N, telephone: (703) 292-4634, fax: (703) 292-9015, email: bandereg@nsf.gov
- Myles G. Boylan, Program Director (SOC), Directorate for Education & Human Resources, Division of Undergraduate Education, 835 N, telephone: (703) 292-4617, fax: (703) 292-9015, email: mboylan@nsf.gov
- Mark Burge, Program Director (CS), Directorate for Education & Human Resources, Division of Undergraduate Education, 835 S, telephone: (703) 292-4645, fax: (703) 292-9015, email: mburge@nsf.gov
- Susan L. Burkett, Program Director (ENG), Directorate for Education & Human Resources, Division of Undergraduate Education, 835 N, telephone: (703) 292-4629, fax: (703) 292-9015, email: sburkett@nsf.gov
- Diana Gant, Program Director (CS), Directorate for Education & Human Resources, Division of Undergraduate Education, 835 N, telephone: (703) 292-4642, fax: (703) 292-9015, email: dgant@nsf.gov
- John R. Haddock, Program Director (MATH), Directorate for Education & Human Resources, Division of Undergraduate Education, 835 N, telephone: (703) 292-8670, email: jhaddock@nsf.gov
- Susan H. Hixson, Program Director (CHEM), Directorate for Education & Human Resources, Division of Undergraduate Education, 835 N, telephone: (703) 292-4623, fax: (703) 292-9015, email: shixson@nsf.gov
- R. Corby Hovis, Program Director (PHY), Directorate for Education & Human Resources, Division of Undergraduate Education, 835 N, telephone: (703) 292-4625, fax: (703) 292-9015, email: chovis@nsf.gov
- Daniel Litynski, Program Director (PHY), Directorate for Education & Human Resources, Division of Undergraduate Education, 835 N, telephone: (703) 292-4640, fax: (703) 292-9015, email: dlitynsk@nsf.gov
- David McArthur, Program Director (SOC), Directorate for Education & Human Resources, Division of Undergraduate Education, 835 N, telephone: (703) 292-4622, fax: (703) 292-9015, email: dmcarthu@nsf.gov
- Duncan E. McBride, Program Director (PHY), Directorate for Education & Human Resources, Division of Undergraduate Education, 835 N, telephone: (703) 292-4630, fax: (703) 292-9015, email: dmcbride@nsf.gov
- Kathleen A. Parson, Program Director (CHEM), Directorate for Education & Human Resources, Division of Undergraduate Education, 835 N, telephone: (703) 292-4653, fax: (703) 292-9015, email: kparson@nsf.gov
- Russell L. Pimmel, Program Director (ENG), Directorate for Education & Human Resources, Division of Undergraduate Education, 835 N, telephone: (703) 292-4618, fax: (703) 292-9015, email: rpimmel@nsf.gov
- Nancy L. Pruitt, Program Director (BIO), Directorate for Education & Human Resources, Division of Undergraduate Education, 835 N, telephone: (703) 292-4627, fax: (703) 292-9015, email: npruitt@nsf.gov
- Herbert H. Richtol, Program Director (INTERDIS), Directorate for Education & Human Resources, Division of Undergraduate Education, 835 N, telephone: (703) 292-4648, fax: (703) 292-9015, email: hrichtol@nsf.gov
- Jeanne Rudzki Small, Program Director (BIO), Directorate for Education & Human Resources, Division of Undergraduate Education, 835 N, telephone: (703) 292-4641, fax: (703) 292-9015, email: jsmall@nsf.gov
- Keith A. Sverdrup, Program Director (GEO), Directorate for Education & Human Resources, Division of Undergraduate Education, 835 N, telephone: (703) 292-4644, fax: (703) 292-9015, email: ksverdru@nsf.gov
- Elizabeth J. Teles, Program Director (MATH), Directorate for Education & Human Resources, Division of Undergraduate Education, 835 N, telephone: (703) 292-8670, fax: (703) 292-9015, email: ejteles@nsf.gov
- Harry G. Ungar, Program Director (CHEM), Directorate for Education & Human Resources, Division of

Undergraduate Education, 835 N, telephone: (703) 292-4647, fax: (703) 292-9015, email: hungar@nsf.gov

- Bevlee A. Watford, Program Director (ENG), Directorate for Education & Human Resources, Division of Undergraduate Education, 835 N, telephone: (703) 292-5323, fax: (703) 292-9015, email: bwatford@nsf.gov
- Terry S. Woodin, Program Director (BIO), Directorate for Education & Human Resources, Division of Undergraduate Education, 835 N, telephone: (703) 292-4657, fax: (703) 292-909015, email: twoodin@nsf.gov
- Lee L. Zia, Program Director (MATH), Directorate for Education & Human Resources, Division of Undergraduate Education, 835 N, telephone: (703) 292-5140, fax: (703) 292-9046, email: lzia@nsf.gov

For questions related to the use of FastLane, contact:

- FastLane Help Desk, telephone: 1-800-673-6188, email: fastlane@nsf.gov
- Ms. Antoinette Allen, Division of Undergraduate Education, telephone: 703-292-4646, email: duefl@nsf.gov

IX. OTHER PROGRAMS OF INTEREST

The NSF *Guide to Programs* is a compilation of funding for research and education in science, mathematics, and engineering. The NSF *Guide to Programs* is available electronically at http://www.nsf.gov/cgi-bin/getpub?gp. General descriptions of NSF programs, research areas, and eligibility information for proposal submission are provided in each chapter.

Many NSF programs offer announcements or solicitations concerning specific proposal requirements. To obtain additional information about these requirements, contact the appropriate NSF program offices. Any changes in NSF's fiscal year programs occurring after press time for the *Guide to Programs* will be announced in the NSF E-Bulletin, which is updated daily on the NSF Website at http://www.nsf.gov/home/ebulletin, and in individual program announcements/solicitations. Subscribers can also sign up for NSF's MyNSF News Service (http://www.nsf.gov/mynsf/) to be notified of new funding opportunities that become available.

ABOUT THE NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) funds research and education in most fields of science and engineering. Awardees 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, although some programs may have special requirements that limit eligibility.

Facilitation Awards for Scientists and Engineers with Disabilities (FASED) 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 GPG Chapter II, Section D.2 for instructions regarding preparation of these types of proposals.

The National Science Foundation promotes and advances scientific progress in the United States by competitively awarding grants and cooperative agreements for research and education in the sciences, mathematics, and engineering.

To get the latest information about program deadlines, to download copies of NSF publications, and to access abstracts of awards, visit the NSF Website at http://www.nsf.gov

- **Location:**   4201 Wilson Blvd. Arlington, VA 22230

- **For General Information**   (703) 292-5111
  (NSF Information Center)**:**

- **TDD (for the hearing-impaired):**   (703) 292-5090

- **To Order Publications or Forms:**

    Send an e-mail to: pubs@nsf.gov

    or telephone: (703) 292-7827

- **To Locate NSF Employees:**   (703) 292-5111

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the proposal review process; to applicant institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies needing information as part of the review process or in order to coordinate programs; and to another Federal agency, court or party in a court or Federal administrative proceeding if the government is a party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records," 63 Federal Register 267 (January 5, 1998), and NSF-51, "Reviewer/Proposal File and Associated Records," 63 Federal Register 268 (January 5, 1998). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

An agency may not conduct or sponsor, and a person is not required to respond to an information collection unless it displays a valid OMB control number. The OMB control number for this collection is 3145-0058. Public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing instructions. Send comments regarding this burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to: Suzanne Plimpton, Reports Clearance Officer, Division of Administrative Services, National Science Foundation, Arlington, VA 22230.

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Last Updated: 06/09/05
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15