

Course, Curriculum, and Laboratory Improvement (CCLI)

Adaptation and Implementation Track

[Program Solicitation](#)

NSF-02-095

DIRECTORATE FOR EDUCATION AND HUMAN RESOURCES
DIVISION OF UNDERGRADUATE EDUCATION

FULL PROPOSAL DEADLINE(S) :

December 4, 2002 A&I Track



NATIONAL SCIENCE FOUNDATION



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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 (ST-EM) education for all students and targets activities affecting learning environments, course content, curricula, and educational practices. The program has three tracks:

1. *Adaptation and Implementation (CCLI-A&I)*

Projects are expected to result in improved education in science, technology, engineering, and mathematics at academic institutions through adaptation and implementation of exemplary materials, laboratory experiences, and/or educational practices that have been developed and tested at other institutions. Proposals may request funds in any budget category supported by NSF, or may request funds to purchase only instrumentation.

2. *Educational Materials Development (CCLI-EMD)*

Projects are expected to produce innovative materials that incorporate effective educational practices to improve student learning of science, mathematics, engineering, and technology. Projects to develop textbooks, software, or laboratory materials for commercial distribution are appropriate. Two types of EMD projects will be supported: a) those that intend to demonstrate the scientific and educational feasibility of an idea, a "proof of concept" or prototype, and b) those based on prior experience with a prototype that intend to fully develop the product or practice. Such materials are expected to be disseminated nationally for adoption and adaptation.

3. *National Dissemination (CCLI-ND)*

Projects are expected to provide faculty with professional development opportunities to enable them to introduce new content into undergraduate courses and laboratories, and to explore effective educational practices to improve their teaching effectiveness. Projects should be designed to offer workshops, short courses, or similar activities on a national scale in single or multiple disciplines.

Cognizant Program Officer(s):

- Division of Undergraduate Education, telephone: 703-292-8666, e-mail: undergrad@nsf.gov.

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

- 47.076 --- Education and Human Resources

ELIGIBILITY INFORMATION

- **Organization Limit:** Proposals are invited from organizations in the United States and its territories: two-year colleges, four-year colleges, universities, professional societies, consortia of institutions, and non-profit and for-profit organizations.
- **PI Eligibility Limit:** Please see the full program announcement/solicitation for further information.
- **Limit on Number of Proposals:** None

AWARD INFORMATION

- **Anticipated Type of Award:** Standard or Continuing Grant
- **Estimated Number of Awards:** 200
- **Anticipated Funding Amount:** Approximately \$20 million in FY2003, pending availability of funding. Matching requirements have changed for FY 2003. Please see the full program solicitation for additional information including some exceptions.

PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

- **Full Proposals:** Supplemental Preparation Guidelines
 - The program announcement/solicitation contains supplements to the standard Grant Proposal Guide (GPG) proposal preparation guidelines. Please see the full program announcement/solicitation for further information.

B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is Specialized. Please see the full program solicitation for further information.
- **Indirect Cost (F&A) Limitations:** Not Applicable.
- **Other Budgetary Limitations:** Other budgetary limitations apply. Please see the full program announcement/solicitation for further information.

C. Deadline/Target Dates

- **Letters of Intent (*optional*):** None
- **Preliminary Proposals (*optional*):** None
- **Full Proposal Deadline Date(s):**

December 4, 2002 A&I Track

D. FastLane Requirements

- **FastLane Submission:** Required
- **FastLane Contact(s):**
 - Fastlane Help Desk, telephone: 1-800-673-6188, e-mail: fastlane@nsf.gov.
 - Division of Undergraduate Education, telephone: 703-292-4646, e-mail: duefl@nsf.gov.

PROPOSAL REVIEW INFORMATION

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

AWARD ADMINISTRATION INFORMATION

- **Award Conditions:** Additional award conditions apply. Please see the program announcement/solicitation for further information.
- **Reporting Requirements:** Additional reporting requirements apply. Please see the full program announcement/solicitation for further information.

I. INTRODUCTION

Undergraduate education is central to the National Science Foundation's mission in human resource development. Whether preparing students to participate as citizens in a technological society, to enter the workforce with two-or four-year degrees, to continue their formal education in graduate school, or to further their education in response to new career goals or workplace expectations, undergraduate education provides the critical link between the Nation's secondary schools and a society increasingly dependent upon science and technology. The Course, Curriculum, and Laboratory Improvement program (CCLI) supports the strengthening of the undergraduate curriculum in science, technology, engineering, and mathematics across all types of institutions of higher education.

The CCLI program has three tracks that emphasize, respectively, the development of new educational materials and practices for a national audience, the adaptation and implementation into an institution of previously developed exemplary materials and practices, and the national dissemination of exemplary materials and/or practices. Projects may address the needs of a single discipline or cut across disciplinary boundaries. Instrumentation requests are encouraged and are generally most appropriate within the Adaptation and Implementation Track.

This program solicitation describes the Adaptation and Implementation Track. A separate solicitation describing the characteristics of the Educational Materials Development and the National Dissemination Tracks is available (NSF 02-043). Applicants must identify on the Cover Sheet and on the Project Data Form (Form 1295) the track in which they wish their project to be reviewed.

RATIONALE FOR ADAPTATION AND IMPLEMENTATION (CCLI-A&I)

DUE's programs and leadership efforts reflect the recommendations made in the National Research Council Report *Transforming Undergraduate Education in Science, Mathematics, Engineering and Technology* (NRC, 1999). This report and follow-on activities have had broad-based input involving faculty from science, technology, engineering, and mathematics (STEM) disciplines, presidents and other administrators at academic institutions, representatives from business and industry, students, and parents. Among the major recommendations in the report are those stating:

- All colleges and universities would continually and systematically evaluate the efficacy of courses in STEM;
- All postsecondary institutions would provide the rewards and recognition, resources, tools, and infrastructure necessary to promote innovative and effective undergraduate STEM teaching and learning; and
- Postsecondary institutions would provide quality experiences that encourage current postsecondary faculty to acquire additional knowledge about how teaching methods affect student learning.

The report offers a number of strategies for promoting and implementing these recommendations, including those that call for opportunities for faculty to upgrade their teaching skills and knowledge of educational issues, and to discuss, explore, and implement innovative and effective educational practices.

The report *Then, Now, and In the Next Decade* (F. G. Rothman, and J. L. Narum, Project Kaleidoscope, 1999) stresses the importance of networks of faculty reformers and the importance of dissemination and adaptations of innovations that work as components of the strengthening of undergraduate STEM education.

The CCLI-A&I track provides support for faculty to undertake a number of the steps recommended in these reports.

II. PROGRAM DESCRIPTION

Adaptation & Implementation (CCLI-A&I)

This track within CCLI promotes the improvement of STEM education in the funded institution(s) through adaptation and implementation of specific exemplary materials, laboratory experiences, and/or educational practices that have been developed and proven successful at other institutions. CCLI-A&I projects should effect change within or across departments or other institutional units by having broad faculty and administrative support.

The CCLI-A&I track invites proposals for two types of projects that aim to achieve these goals: those that intend to undertake direct curriculum improvement (Type I), and those that enable a group of faculty to explore strategies for overcoming identified challenges and barriers to educational reform (Type II).

Type I

Type I projects are expected to adapt and implement high quality STEM curricula, materials, and/or techniques in order to achieve specific curricular changes. The acquisition of instrumentation and its integration into the curriculum is appropriate as part of a Type I project. When possible, projects are expected to include students in meaningful ways in the activities so that they are able to provide input to the planning and decisions. Proposers are encouraged to consider including developers of the model(s) being adapted as consultants for the adaptation and evaluation efforts. Projects might include, for example:

- The incorporation of laboratory experiments or field experiences that effectively engage students in scientific processes and exploration of scientific concepts;
- The adaptation and testing of exemplary materials for use by a student audience significantly different from the one for which they were originally developed;
- The enhancement of teaching and learning through the use of resources, particularly instructional and information technologies, demonstrated to be of high quality;
- The development and use of collaborative learning, learning communities, and other innovations that aim to improve pedagogy in courses;
- The integration of the study of pedagogy and content in STEM core courses for prospective preK-12 teachers; or
- The integration of significant advances or techniques from research fields into the undergraduate curriculum.

Project scope may range from improvements in an individual course or laboratory to a more comprehensive effort that impacts entire curricula or programs. The funds may be requested in any budget category supported by NSF or may be entirely for instrumentation.

Proposals must specifically identify the materials and/or practices developed elsewhere that are being adapted including references to the literature or to other institutions using the materials and/or practices, and must describe the modifications to be effected. Materials and/or practices for adaptation may be drawn from more than one source.

The outcomes expected of funded Type I projects include all of the following:

- Adaptation and implementation of exemplary practices and/or materials for course, curriculum, or laboratory improvements in innovative ways;
- An evaluation that informs the institution and others of the effectiveness of the implemented materials and practices in improving student learning, and also guides development of the project;
- Faculty professional development, as needed, in support of curricular adaptation and implementation;
- Efforts to build on the project and to broaden its impact at the institution, within the discipline or across disciplines; and
- Effective dissemination of project results to the broader community.

Type II

Type II projects provide support for a group of faculty who have identified the challenges or barriers that are currently preventing curriculum reform to pursue a plan that details their strategies for overcoming these problems. In order to begin significant curriculum reform, projects are expected to explore exemplary STEM curricula, materials, and/or practices. The projects also are expected to include students in meaningful ways in the activities so that they are able to provide input to the planning and decisions. Projects might include, for example:

- A combination of intensive faculty enhancement activities (such as attendance at workshops, seminars or discussion groups that bring in outside experts, visits to exemplary programs, or other activities) to prepare a group of faculty to implement new curricula or practices;
- A series of pilot efforts within a department or program to determine which of several reform methods is most effective within that environment;
- A modification of the curriculum in ways that will broaden student participation by determining student opinions and perceptions that restrict student participation in courses, programs, and/or majors;
- An investigation of important curricular changes that can be implemented to take advantage of new technologies or facilities that have become available at the institution(s);

- A combination of faculty enhancement efforts and retreats in which faculty explore together how to incorporate a theme (writing, communications, greater quantitative ability, international perspectives, undergraduate research) across a number of courses; or
- A multi-institutional effort that allows a group of faculty to prepare for the implementation of joint or parallel curricula among the institutions, or for the implementation of coordinated curricula that ensure a seamless articulation for students moving among the institutions.

The proposing group may be an entire department or larger unit, or a logical subset of a department, cross-departmental group, or cross-institutional group. The proposal must provide evidence that the proposed effort is a priority for all of those involved. The proposal must describe the ultimate long term curricular goals that are to be achieved, the challenges or barriers to be overcome, the steps to be undertaken during the grant period, and the benchmarks that will be used to measure progress as the project moves forward. The funds may be requested in any budget category supported by NSF.

Proposals must specifically identify the materials and/or practices developed elsewhere that are being explored including references to the literature or to other institutions using the materials and/or practices, and must describe the relationship of these materials and/or practices to the defined goals of the project. Materials and/or practices for adaptation may be drawn from more than one source.

The outcomes expected of funded Type II projects include all of the following:

- Lowering of the challenges or barriers that were defined in the proposal;
- A description of the exemplary curricula, materials, and/or practices that were explored by the group and the progress that has been made toward implementation of curricular reform;
- A summary of student contributions to the project;
- An evaluation, using the benchmarks defined in the proposal, that informs the institution and others of the progress made toward the goals defined in the proposal;
- Effective dissemination of project processes and results to other members of the applicant's academic community;
- A specific plan, including a timeline, for continuing the reform that was initiated at the institution(s) as a result of the project; and
- Submittal to the appropriate academic officer at the institution(s) of the evaluation results and the specific plan for continuing the reform.

Additional Information for All CCLI-A&I Projects

In CCLI, the word "laboratory" includes experiences ranging from those fully integrated within a course to those forming separate components in the curriculum. The setting may involve, for example, a field site, an observatory, a computer room, or an integrated laboratory/classroom, as well as the traditional laboratory, and may involve a redesign of instructional approaches using technology to enhance student learning.

Information about the results of projects funded through DUE programs can be obtained via the DUE Project Information Resource System (http://www.ehr.nsf.gov/pirs_prs_web/search/). Many of these previously funded projects are in progress, and proposers may wish to contact the project PIs for further information.

Institutional commitment and plans to build upon the project are critical to the success of CCLI-A&I projects. The CCLI-A&I track discourages proposals that:

- Are justified solely on the basis of financial need or increased enrollments;
- Seek replacement instrumentation without a well-conceived plan for enhancing learning;
- Provide only the basic level of support for STEM instruction needed to maintain a viable program;
- Replicate an existing program without further adaptation; or
- Describe a project that will not serve as a basis for further change at the institution.

III. ELIGIBILITY INFORMATION

Eligible Fields and Disciplines

Proposals may be submitted for support of projects in any field of science, technology, engineering, and mathematics ordinarily supported by NSF. Projects involving fundamental scientific, mathematical, or engineering concepts within technical, professional, or pre-professional programs are appropriate. Multidisciplinary and interdisciplinary proposals are especially encouraged.

Specifically excluded are projects that address clinical fields such as medicine, nursing, clinical psychology, and physical education, and those that primarily involve social work, home economics, the arts, and the humanities.

Eligible Institutions and Individuals

Proposals are invited from organizations in the United States and its territories: two-year colleges, four-year colleges, universities, professional societies, consortia of institutions, and nonprofit and for-profit organizations. Proposals from a formal consortium should be submitted by the consortium; proposals from an informal consortium or coalition may be submitted by one of the member institutions. For additional details see the [Grant Proposal Guide](#). An individual may be the lead Principal Investigator (PI) on only one A&I proposal submitted to the CCLI program per deadline and may also be a Co-PI on other proposals. There is no restriction on the number of proposals for which a person may serve as a Co-PI. An individual may be lead PI on one A&I and either one EMD or ND proposal submitted in the same fiscal year.

Projects may involve a single institution, collaboration with business and industrial partners, or collaboration among several institutions. For example, projects may include collaborative efforts that improve the transition of students between the collaborating institutions, such as transfer between two- and four-year institutions.

The categories of proposers identified in the [Grant Proposal Guide](#) are eligible to submit proposals under this program announcement/solicitation.

IV. AWARD INFORMATION

NSF anticipates having \$20 million in FY 2003 for this program, pending the availability of funds. The number and size of awards will depend on the quality of the proposals received and the availability of funds. Grant duration is typically 2-3 years for A&I projects. The minimum budget request is \$5,000. The expected range of total NSF/DUE support over the lifetime of a CCLI-A&I project is as follows:

Adaptation & Implementation: Type I: Efforts of varying scope, up to \$100,000 for a single course and up to \$200,000 for comprehensive projects. Type II: Up to \$75,000

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Full Proposal:

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 Web Site at: <http://www.nsf.gov/cgi-bin/getpub?gpg>. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (301) 947-2722 or by e-mail from pubs@nsf.gov.

Except as modified by the guidelines set forth in this solicitation (in particular, the maximum page limits, length of project summary, double-spacing, and guidelines for appendices), standard NSF guidelines contained in the GPG are applicable.

Advice to Proposal Writers

DUE staff often provide informal guidance to proposers about potential projects. The advice most frequently sought about proposal writing in general has been collected in *A Guide for Proposal Writing* ([NSF 98-91](#)). For examples of DUE-funded projects, refer to the DUE Project Information Resource System http://www.ehr.nsf.gov/pirs_prs_web/search/. For information that will assist applicants and Principal Investigators to: a) develop proposals that are responsive to CCLI program tracks; 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, see the *Supplemental Information for Principal Investigators and Applicants to NSF's Course, Curriculum, and Laboratory Improvement Program* ([NSF 00-117](#)).

Formal Proposal Preparation

1. Information about Principal Investigators

As described in FastLane.

2. Cover Sheet

The proposal title should include informative key words that indicate, for example, the discipline, the target audience, and the nature of the problem or innovative solution. After selecting the CCLI program solicitation number, be sure to also choose the specific CCLI track - A&I. Correctly identifying the CCLI program and track on the cover sheet is important for processing at NSF.

3. Project Summary

The Project Summary is the first statement that reviewers and NSF staff will read about a proposed project and it sets the context in which the rest of the proposal will be read. Thus, the summary should be a clear, concise, self-contained description of the project. It should be informative to other persons working in the same or related fields, and insofar as possible, understandable to a scientifically literate reader. It should not contain extraneous descriptions of the institution, department, or PIs. In no more than 250 words the summary should describe:

- The problem(s) being addressed by the proposal;
- The objectives and expected outcomes;
- How the objectives will be accomplished;
- Special audiences targeted by the project, as appropriate; and
- Notable collaborations with other institutions.

4. Project Description, including Results from Prior NSF Support

Text in this section of a formal proposal must be double-spaced (3 lines per 2.5 cm). The format must be readily legible. Use no less than 2.5-cm margins and a standard font with font size no smaller than 12 point. The following page limit applies:

- Adaptation & Implementation: 15 double-spaced pages

DUE will not accept proposals in which the Project Description (including Results from Prior NSF Support) exceeds this page limit. Proposals that are not in compliance will not be reviewed or considered for funding.

This section of the proposal presents most of the information that determines whether or not the proposal will be recommended for an award. Write the proposal to respond to the criteria that will be used by reviewers in judging the merit of the proposal. (See the Merit Review Criteria and Additional Criteria later in this program solicitation.)

Results from Prior NSF Support

If the prospective PI or Co-PI(s) has received support from NSF pertaining to undergraduate education in the past five years, briefly describe the earlier project(s) and outcomes or on-going progress. Do not include information on research projects unless those projects have a direct bearing on the new proposal. Provide sufficient detail to permit a reviewer to reach an informed conclusion regarding the value of the results achieved. Include the NSF award number, amount and period of support, the title of the project, a summary of the results of the completed work, and a list of publications and formal presentations that acknowledged the NSF award (do not submit copies with the proposal). Note that the PI and all Co-PIs must submit a Final Project Report for any completed NSF-funded project before a new grant can be awarded.

Project Description

This description of the project should contain:

- **Goals and Objectives:** Describe the goals clearly and concisely, relating them, as appropriate, to local or national needs and recent trends.
- **Detailed Project Plan:** This should be the longest section of the Project Description. Describe the project's features, clearly delineating the need or problem you will address, what you plan to do, how you plan to achieve the outcomes expected from the project, the timetable for executing the project, and the facilities and resources available for realizing the project's objectives. Where appropriate, include evidence of past successes that support the methods you plan to use; such evidence may come from the current literature or from pilot programs. You may include a URL for your materials if you think that providing a URL will enhance the reviewer's ability to appreciate how you plan to achieve your objectives. However, the reviewers are not required to access this material, and may not have access to the Internet during the review process. Therefore, all essential material should be submitted in written format. The literature cited in the bibliography should reflect an understanding of the knowledge base in the field in which the problem or question is posed. Appropriate literature on research in teaching and learning should be cited. Any literature cited should be clearly and specifically related to the proposed project, and it should be clear to a reader how the information in a reference has played a role in the design of the project.
- **Experience and Capability of the Principal Investigator(s):** Briefly describe the experience and capability of the PI(s). Include a brief description of the rationale for including the specific faculty members and institutional units within the project. State the role of each and cite the expertise that each will contribute to the project.
- **Evaluation Plan :** Describe the criteria that will be used to evaluate the quality and impact of the project, how the project's impact on student learning will be assessed, and the process for collecting and analyzing information at the applicant's institution or from others involved in testing of materials developed. Provide a timeline for the evaluation activities. Describe the qualifications of the individuals who will perform the evaluation tasks. The objectivity and credibility of the evaluation team should be evident. The breadth of the evaluation plan and the composition of an advisory committee should be appropriate to the size and complexity of the project. The following references may be helpful in designing the evaluation plan:
 - *User Friendly Handbook for Project Evaluation: Science, Mathematics, Engineering and Technology Education* (NSF 93-152, revised 2/96).
See: <http://www.ehr.nsf.gov/EHR/RED/EVAL/Handbook/handbook.htm>
 - *User Friendly Handbook for Mixed Method Evaluations* (NSF 97-153).
See: <http://www.ehr.nsf.gov/EHR/REC/pubs/NSF97-153/start.htm>
 - *Online Evaluation Resource Library*. See: <http://oerl.sri.com>
 - *Field-tested Learning Assessment Guide (FLAG)*. See: <http://www.wcer.wisc.edu/nise/CL1/flag/>

- **Dissemination of Results:** Describe plans to communicate the results of the project to other professionals in the STEM and education communities, both during and after the project. Identify the audience to be reached and describe the information or materials to be disseminated (e.g., textbooks, laboratory manuals, software, multimedia materials); how the material will be made available to other institutions; the means of dissemination (e.g., faculty development workshops, journal articles, conference presentations, electronic networks and media); and the procedures for determining the success of the dissemination effort. Describe the procedures to be used to maintain the quality and currency of any material developed, to provide support for faculty users, and to publicize the availability of materials.

Special Instructions for Instrumentation Requests

Eligible Items

For proposals submitted to DUE programs, items or functional units of instrumentation (e.g. scientific apparatus and devices, laboratory and field instrumentation, computers, software, etc.) that have a unit acquisition cost of \$500 or more and an expected service life of more than one year are considered instrumentation. These items should be entered under Line *DEquipment* of the budget.

Scientific and computing instrumentation, to be used in any phase of undergraduate STEM education, may be requested. The instrumentation must be for use in specific curricular improvements discussed in the Project Description. Purchase of software essential to the scientific, technical, and educational objectives of the project is permitted. Software that costs more than \$500 should be considered instrumentation. Each software package must be itemized, justified, and the cost indicated. Software ordered in conjunction with new computing instrumentation should be regarded as part of a functional unit.

Construction of instrumentation, including material and labor costs, is allowed. Sufficient justification must accompany requests for instrumentation construction funds, such as a detailed explanation of the advantages of the proposed units over commercially available items. Requests for instrumentation fabrication must be supported by drawings, diagrams, parts lists, and estimates for labor charges, as appropriate.

Instrumentation assembly costs for on-site assembly of multi-component instruments, as distinct from instrumentation installation or building or laboratory modification, are allowable. Specialized safety instrumentation may be purchased where necessary for the safe utilization of the instrumentation requested.

Shipping costs, if not included in the purchase price, should be separately itemized. Reasonable estimates should be used, as opposed to a percentage of instrumentation costs.

Required taxes may be included if the institution cannot be exempted from paying them.

Ineligible Items

In any DUE project, neither NSF funds nor institutional matching funds may be used to purchase:

1. Teaching aids (e.g., films, slides, projectors, "drill and practice" software), word-processors, or library reference materials;
2. Instrumentation that is not mainly for undergraduate use;

3. Vehicles, laboratory furnishings or general utility items such as office equipment, benches, tables, desks, chairs, storage cases, routine supplies, general consumables, and items that are considered a routine part of a laboratory setting;
4. Maintenance items and maintenance or service contracts-even when these are for items procured through a DUE program;
5. Building or laboratory modifications or construction required for installation of the instrumentation (as distinct from simply integrating multiple computational resources or interfacing computers to instruments);
6. A flat percentage inflation allowance;
7. Replacement instrumentation that does not significantly improve instructional capability.

Information to Include in the Project Description

The instrumentation requested must be appropriate for the project's objectives. The Project Description must show how the proposed curriculum improvement will incorporate the requested instrumentation, and how the instrumentation will be used to improve student learning. A proposal seeking support for instrumentation for several unrelated projects or for a list of instrumentation to be used in unrelated ways is not appropriate.

Be sure to include the following:

- i) Instrumentation Requests: Indicate why the particular instrumentation was chosen, what alternatives were considered and rejected, and why. Reviewers do not need to be told what functions the instrumentation can perform unless those functions are unusual. Specifically explain requests for 1) apparatus of a quality or cost not usually encountered in undergraduate instruction; 2) instrumentation which is to be fabricated rather than purchased as a unit; or 3) purchases which might appear to be at variance with the academic setting in which the project would operate. Justification of these items must be related to the improvement of undergraduate education. Arguments based on enhancement of graduate-level courses, improvement of faculty research capabilities, or other activities outside the scope of undergraduate education are inappropriate.
- ii) Implementation and Instrumentation Maintenance: Briefly, but explicitly, outline the institution's plan for starting the project and for maintaining the instrumentation beyond the duration of the grant.

5. References Cited

Refer to the GPG for guidelines.

6. Biographical Sketches

Provide a biographical sketch of no more than two pages for each person listed as Senior Personnel. Refer to the GPG for what information must be included within the two-page limit and for a definition of Senior Personnel.

7. Budget and Budget Justification

The amounts indicated on the FastLane Budget Form should include only the amounts requested of NSF. For example, **instrumentation has a required 1:1 match** so only the amounts requested of NSF (typically one half of the total cost) should be included on Line *DEquipment*, while the matching amounts should be included on Line *M Cost Sharing*. See the instructions in the GPG ([NSF 01-2](#)) for more information. **For this solicitation "cost sharing" and "matching funds for instrumentation" are the same.**

Text for the budget justification is limited to a total of no more than 3 pages. For budgets which include cost-sharing, please include a four column table that lists: a) in the first column all items to be supported under the project; b) in the second column the amount that NSF is being asked to contribute; c) in the third column the amount that will come from non-federal sources as matching; and d) in the fourth column the total cost of the item.

For multi-institutional submissions, the budget justification should include the contributions of each institution and the amount each will receive from the grant. For multi-year projects, the results of the project are expected to be integrated into the academic programs of the institutions within the period of the award, and therefore it is expected that the budgets will reflect the assumption of financial responsibility by the participating institution(s) as the educational innovations are fully implemented.

NSF funds may not be used to support expenditures that would have been undertaken in the absence of an award, such as the cost of activities that are considered part of a faculty member's normal duties.

Cost Sharing Requirements, Level, & Amount

Consistent with the objectives of Executive Orders 12876, 12900, and 13021, NSF will waive matching requirements for Historically Black Colleges and Universities, Hispanic Serving Institutions, and Tribal Colleges that do not offer STEM degrees beyond the masters level, and for Minority Post-Secondary Institutions that do not offer STEM degrees beyond the bachelors level. Please note this waiver in your budget justification, if you are eligible to take advantage of this waiver. (For more information on this exemption, please see the DUE web site at <http://www.ehr.nsf.gov/due/programs/general/msi.asp>.)

Except for the special conditions of the above Executive Orders, requests for instrumentation must be matched 1:1 by funds or instrumentation from non-Federal sources equal to the funds requested for instrumentation from NSF. To qualify as matching, these resources must be used specifically for the instrumentation (or its equivalent) listed in the budget approved for the project. **Starting in FY2003, matching on non-instrumentation items is no longer required for the A&I track.** For the instrumentation match only, an institution may obligate its matching funds or receive gifts of instrumentation to be counted toward matching at any time following the program deadline date under which the awarded proposal was submitted, but before the grant expiration date specified in the grant document. This normally provides a lengthy period during which the institution must fulfill the requirement to match NSF instrumentation funds. (For all other categories of matching (e.g., personnel time) an institution may obligate its matching funds at any time *following the award effective date* but before the grant expiration date specified in the grant document.)

Preparation of Instrumentation Budget Items and Justification

Reviewers must be able to recognize the function of the requested instrumentation. Therefore, on a separate page list all individual items by a descriptive name and the probable brand, model, and price. Such selections may be changed after an award.

For this solicitation, instrumentation budget items may be either single items meeting the cost of \$500 or more, or part(s) of a functional unit where the sum of the components is \$500 or more. A functional unit is an assemblage of instruments, modules, and components that together perform a specific task or that will normally be used together. Each component of a functional unit must be itemized and the cost indicated; the subtotal for the entire unit should be entered as the unit cost.

Many manufacturers routinely offer educational or institutional discounts. In preparing the budget, contact manufacturers or distributors to obtain discounted prices. On the detailed instrumentation budget page show both the list price and the discounted price used to compute the total cost of the project. If it is possible to negotiate on an individual basis a special discount not routinely available to educational institutions, list the usual discounted price in the project's budget. The amount by which the special discount exceeds the standard educational discount may be counted as matching funds.

Workshops

In proposals that involve professional development workshops, it is generally expected that the home institutions of the faculty participants will bear the cost of travel to and from the workshop unless a compelling reason can be offered to request NSF support for this travel.

In all DUE programs, the NSF grant may include participant support costs for subsistence (lodging and meals) during the workshop. In addition, funds may be requested for a stipend of up to \$60 per day of the workshop for participants. Requests for such stipends must be specific to the target audience and fully justified; for example, to assure participation by faculty with few professional development opportunities or from resource-poor institutions. No tuition or other fees may be charged to the participants. Note that indirect costs may not be charged on participant support costs. The host institution is expected to provide the facilities and instrumentation necessary to operate the project, and therefore NSF will ordinarily support no permanent instrumentation or facilities. The host institution is also expected to cover the expenses incurred by their own faculty participants.

With the exceptions noted above, the NSF grant may provide for planning and provision of the workshop, follow-through activities, participant support, and indirect costs. The total cost per participant-day varies considerably depending on the proposed activity.

8. Current and Pending Support

All current external support to the PI(s), including the proposed project, must be noted under Current and Pending Support. This information is needed to ensure that project leaders will have time to conduct the project and that there is no duplication of support. The GPG ([NSF 01-2](#)) requires that the proposal being submitted be listed as pending support.

9. Facilities, Equipment, and Other Resources

Provide the information as is required in FastLane.

10. Project Data Form

The information on the Project Data Form (NSF 1295) is used to direct the proposal to appropriate reviewers and to announce and advertise the nature of NSF-supported projects. This form is available in FastLane to the proposer after the CCLI program solicitation number is selected on the coversheet.

11. Appendices

Appendices should be relevant and concise. This information should be entered in the "Supplementary Docs" section. For materials development proposals, a sample of prior work or work in progress is recommended.

FastLane Requirements

FastLane, NSF's System for conducting business over the Internet, must be used to prepare and submit proposals. PIs who have not used FastLane before are asked to make sure that their institution is a registered FastLane institution and to contact this institution's Sponsored Research Office (which might also be known as the Office of Grants Administration, Office of Sponsored Research, Office of Research, etc.) to be added to the NSF PI database. (All Co-PIs listed in the proposal must also be in the NSF PI database.) PIs who intend to use sub-awards in their proposal (see the GPG, Section II.C.6.f.v.) are reminded that the subcontract institution(s) must also have an NSF Institution ID Number before FastLane can be used to prepare the subaward budget(s). *New FastLane users should acquaint themselves with the system as early as possible--well before the proposal deadline.*

Detailed instructions for proposal preparation and submission via FastLane are available at: <http://www.fastlane.nsf.gov>. If there are extenuating circumstances, the institution may apply to the Assistant Director of EHR for a waiver to submit a paper proposal. Requests should be sent via electronic mail to undergrad@nsf.gov, with "FastLane Waiver request" in the subject line. If such a waiver is granted, the paper proposal must be postmarked by the deadline date.

Proposers are reminded to identify the program solicitation number (NSF-02-095) 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

For this program solicitation "cost sharing" and "matching funds for instrumentation" are the same. All CCLI tracks require requests for instrumentation to be matched 1:1 by non-Federal sources. As described in section Cost Sharing Requirements, Level, & Amounts (V.A.7), certain HBCU's, HSI's, Tribal Colleges, and Minority Serving Institutions are exempt from these requirements.

The proposed cost sharing must be shown on Line M on the proposal budget. Documentation of the availability of cost sharing must be included in the proposal. Only items which would be allowable under the applicable cost principles, if charged to the project, may be included as the awardee's contribution to cost sharing. Contributions may be made from any non-Federal source, including non-Federal grants or contracts, and may be cash or in-kind (see OMB Circular A-110, Section 23). It should be noted that contributions counted as cost-sharing toward projects of another Federal agency may not be counted towards meeting the specific cost-sharing requirements of the NSF award. All cost-sharing amounts are subject to audit. Failure to provide the level of cost-sharing reflected in the approved award budget may result in termination of the NSF award, disallowance of award costs and/or refund of award funds to NSF.

Other Budgetary Limitations: See detailed range of expected award sizes in Section IV ("Award Information") of the program solicitation.

C. Deadline/Target Dates

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

Full Proposals by 5:00 PM local time:

December 4, 2002 A&I Track

D. FastLane Requirements

Proposers are required to prepare and submit all proposals for this Program Solicitation through the FastLane system. Detailed instructions for proposal preparation and submission via FastLane are available at: <http://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 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 two merit review criteria are listed below. 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 judgements.

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**Review Considerations Specific to DUE Programs**

With regard to DUE's programs, NSF's two general merit review criteria lead to questions such as the following, which are often raised in the review process.

Intellectual merit:

- Does the proposed project address a major challenge facing undergraduate STEM education?
- Does the project have potential for improving student learning of important STEM principles?
- Are the goals and objectives, and the plans and procedures for achieving them, worthwhile, well developed, and realistic?
- Is the rationale for selecting particular activities or components for development or adaptation clearly articulated?
- Does the project design consider the background, preparation, and experience of the target audience?

- Is the project informed by research in teaching and learning, current pedagogical issues, the efforts of others, and relevant literature?
- Does the project provide for effective assessment of student learning, which reflects the proposed educational objectives and practices?
- Are plans for evaluation of the project appropriate and adequate for the project's size and scope and will the evaluation appropriately inform project development?
- Does the project have the potential to provide fundamental improvements in teaching and learning through effective uses of technology?
- Is the project led by, and supported by, the involvement of capable faculty (and where appropriate, practicing scientists, mathematicians, engineers, technicians, teachers, and student assistants), who have recent and relevant experience in education, in research, or in the workplace?
- Is the project supported by adequate facilities, resources, and departmental commitment?

Is there evidence of faculty and institutional endorsement of this effort?

Broader impacts:

- Are the proposed activities integrated into the institution's academic program?
- To what extent will the results of the project contribute to the knowledge base of activities that enhance student learning?
- Will the project evaluation inform others through the communication of results?
- Are the results of the project likely to be useful at similar institutions?
- Will the project result in significantly improved content and pedagogical preparation of faculty and teachers of science, mathematics, engineering, and technology?
- Does the project effectively address one or more of the following objectives:
 - Ensure the highest quality education for those students planning to pursue STEM careers?
 - Increase the participation of women, underrepresented minorities, and persons with disabilities?
 - Provide a foundation for scientific, technological, and workplace literacy?
 - Develop multi- and interdisciplinary courses and curricula?
 - Develop courses and curricula that are aligned with national standards, as appropriate?

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 identities of 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.

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 Mail and/or 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.

In most cases, proposers will be contacted by the Program Officer after his or her recommendation to award or decline funding has been approved by the Division Director. This informal notification is not a guarantee of an eventual award.

NSF is striving to be able to tell applicants 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 one's 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 also are administered in accordance with NSF Cooperative Agreement Terms and Conditions (CA-1). 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 Web site at http://www.nsf.gov/home/grants/grants_gac.htm. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (301) 947-2722 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 Web site at <http://www.nsf.gov/cgi-bin/getpub?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 Web site at <http://www.gpo.gov>.

Special Award Conditions

See individual tracks for special award conditions.

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.

PIs are required to use the new reporting system for submission of annual and final project reports. The Division of Undergraduate Education maintains the "Project Information Resource System" (PIRS) to provide the community at large current information about funded projects. Some of the information provided by PIs in the interim, annual, and final report will be available through PIRS. Applicants are encouraged to review the information now available through PIRS http://www.ehr.nsf.gov/pirs_prs_web/search/ about projects NSF has funded in undergraduate education.

The final report for a Type II CCLI-A&I award must include a specific plan, including a timeline, for continuing the reform that was initiated at the institution(s) as a result of the project.

Within 90 days after the expiration of an award, the PI also is required to submit a final project report. Approximately 30 days before expiration, NSF will send a notice to remind the PI of the requirement to file the final project report. Failure to provide final technical reports delays NSF review and processing of pending proposals for that PI. PIs should examine the formats of the required reports in advance to assure availability of required data.

NSF has implemented an electronic project reporting system, available through FastLane. 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 Course, Curriculum, and Laboratory Improvement (CCLI) should be made to:

- Division of Undergraduate Education, telephone: 703-292-8666, e-mail: undergrad@nsf.gov.

For questions related to the use of FastLane, contact:

- Fastlane Help Desk, telephone: 1-800-673-6188, e-mail: fastlane@nsf.gov.
- Division of Undergraduate Education, telephone: 703-292-4646, e-mail: 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 web site at <http://www.nsf.gov/home/ebulletin>, and in individual program announcements/solicitations. Subscribers can also sign up for NSF's [Custom News Service](#) (<http://www.nsf.gov/home/cns/start.htm>) to be notified of new funding opportunities that become available.

In addition, the Division of Undergraduate Education maintains a web site at http://www.ehr.nsf.gov/ehr/duelinks/other_programs.asp that lists other funding opportunities specifically for undergraduate STEM education.

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 (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/solicitation for further information.

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

The National Science Foundation is committed to making all of the information we publish easy to understand. If you have a suggestion about how to improve the clarity of this document or other NSF-published materials, please contact us at plainlanguage@nsf.gov.

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.

Pursuant to 5 CFR 1320.5(b), 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, or to Office of Information and Regulatory Affairs of OMB, Attention: Desk Officer for National Science Foundation (3145-0058), 725 17th Street, N.W. Room 10235, Washington, D.C. 20503.

OMB control number: 3145-0058.