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ADVANCED TECHNOLOGICAL EDUCATION (ATE)

Program Solicitation

NSF 00-62

DEADLINES: *Preliminary Proposals: May 25, 2000*
 Formal Proposals: October 19, 2000

DIRECTORATE FOR EDUCATION AND HUMAN RESOURCES
Division of Undergraduate Education
Division of Elementary, Secondary, and Informal Education



NATIONAL SCIENCE FOUNDATION

ADVANCED TECHNOLOGICAL EDUCATION (ATE)

SUMMARY OF PROGRAM REQUIREMENTS

GENERAL INFORMATION

- **Program Name:** Advanced Technological Education (ATE)
- **Short Description/Synopsis of Program:**

This program promotes improvement in technological education at the undergraduate and secondary school levels by supporting curriculum development; the preparation and professional development of college faculty and secondary school teachers; internships and field experiences for faculty, teachers, and students; and other activities. With an emphasis on two-year colleges, the program focuses on the education of technicians for the high-technology fields that drive our nation's economy. The program also promotes articulation between programs at two-year colleges and four-year colleges and universities--in particular, articulation between two-year and four-year programs for prospective teachers and between two-year and four-year programs in science, mathematics, engineering, and technology (with a focus on disciplines that have a strong technological foundation).

- **Cognizant Program Officers:** *Lead Program Directors:* Dr. Elizabeth J. Teles, Division of Undergraduate Education, Suite 835, telephone 703.306.1668, e-mail ejteles@nsf.gov; and Dr. Gerhard L. Salinger, Division of Elementary, Secondary, and Informal Education, Suite 885, telephone 703.306.1620, e-mail gsalinge@nsf.gov.
- **Applicable Catalog of Federal Domestic Assistance (CFDA) No.:** 47.076 -- Education and Human Resources

ELIGIBILITY INFORMATION

- **Limitation on the categories of organizations that are eligible to submit proposals:** None; but two-year colleges are especially encouraged to submit proposals. If the submitting institution is not a two-year college, then the proposal is expected to include one or more two-year colleges in a leadership role.
- **PI eligibility limitations:** An individual may serve as the Principal Investigator (PI) on no more than one proposal per round of competition.
- **Limitation on the number of proposals that may be submitted by an organization:** None

AWARD INFORMATION

- **Type of award anticipated:** Standard Grants and Continuing Grants
- **Number of awards anticipated in FY2001:** Approximately 75
- **Anticipated funds available in FY2001:** Approximately \$41 million, pending availability of funds
- **Anticipated date of award:** April 2001

PROPOSAL PREPARATION & SUBMISSION INSTRUCTIONS

- **Proposal Preparation Instructions**

- **Letter of intent requirements:** None
- **Preproposal requirements:** The submission of a preliminary proposal is *required* for *Dissemination Focal Points* and *Special Activities* proposals and is *encouraged* (but not required) for all other proposals.
- **Proposal preparation instructions:** Standard NSF *Grant Proposal Guide* (GPG) (NSF 00-2) instructions apply to all proposals except preliminary proposals for *Special Activities*, which are discussed later in this solicitation.
- **Supplemental proposal preparation instructions:** A *Project Data Form* (NSF Form 1295) must be completed as part of all proposals *except* preliminary proposals submitted in paper form. This form is available in FastLane.
- **Deviations from standard (GPG) proposal preparation instructions:**

For both formal and preliminary proposals:

- Proposers should not submit a list of suggested reviewers unless asked to do so by an NSF program officer.
- The *Project Summary* should be no longer than 500 words. It should be single-spaced, in a standard font with a size no smaller than 12 points.
- The *Project Description* must be double-spaced (i.e., no more than 3 lines of text per 2.5 cm of vertical space), in a standard font with a size no smaller than 12 points. (All other formatting instructions described in GPG, Section II.C, apply.)
- In the *Project Description*, the subsection devoted to *Results from Prior NSF Support* should only cover awards pertaining to education. Research awards should be described only if they have a direct bearing on the new proposal.
- A *Budget Justification* (up to three pages) *must* accompany the budget forms and provide details about budget line items.
- Small Grants for Exploratory Research (SGER) proposals (see GPG, Section II.D.12.a), Equipment Proposals (see GPG, Section II.D.12.c), and Accomplishment-Based Renewal (ABR) proposals (see GPG, Section VI.B.2) are not appropriate for the ATE program.

For formal proposals:

- The *Project Description* (including *Results from Prior NSF Support*) must not exceed 15 pages (double-spaced) for *planning grants* for Regional Centers, and must not exceed 30 pages (double-spaced) for all other project types.
- Appendices are allowed but must be concise and relevant. The total length of the (combined) appendices may not exceed 15 pages. Proposers should *not* send videotapes, computer diskettes, CD-ROMs, slides, books, etc.

For preliminary proposals:

- The following proposal sections (see GPG, Section II.D) should be *omitted*:
 - *Special Information and Supplementary Documentation*
 - *Appendices*
 - A *Table of Contents* is optional for preliminary proposals submitted in paper form. One is automatically generated for proposals submitted via FastLane.
 - Signatures are not required on the *Cover Sheet* (NSF Form 1207) of a preliminary proposal; therefore, for a preliminary proposal submitted via FastLane, it is not necessary to mail the cover sheet separately to NSF.
 - The entire *Project Description* must not exceed 10 pages (double-spaced).
 - Budget forms for *subawards* are not required in preliminary proposals. If the proposer chooses to include these forms, it is not necessary that they be signed by the Authorized Organizational Representative of the subawardee organization(s).
 - Information about *Current and Pending Support* (NSF Form 1239) is required only for the PI in preliminary proposals.
- **Budgetary Information**
 - **Cost sharing/matching requirements:** (1) Funds requested for *equipment* (see GPG, Section II.D.7.c) and other technology (as defined later in this solicitation) must be matched by non-Federal funds, equipment, or technology with a value equal to the funds requested from NSF. (2) In proposals for *Adaptation and Implementation* projects, cost sharing at a level of 25 percent of the funds requested from NSF is required. (3) Cost sharing/matching requirements will be waived for minority-serving institutions (historically Black colleges and universities, Hispanic-serving institutions, and tribal colleges and universities) that do not offer science, mathematics, engineering, and technology (SMET) degrees beyond the baccalaureate level.
 - **Indirect cost (F&A) limitations:** In *planning grants* for Regional Centers, indirect costs may not exceed 10 percent of modified total direct costs.
 - **Other budgetary limitations:** Funds requested for *equipment* (see GPG, Section II.D.7.c) and other technology (as defined later in this solicitation) must not exceed \$100,000 or 10 percent of the total NSF funding request, whichever is larger.
 - **FastLane Requirements**
 - **FastLane proposal preparation requirements:** Use of FastLane is *required* for formal proposals and is *strongly encouraged* (but not required) for preliminary proposals, except preliminary proposals for *Special Activities*, which should be submitted in paper form only.
 - **FastLane point of contact:** Ms. Romona Truesdale, Division of Undergraduate Education, Suite 835, telephone 703.306.1670, e-mail duefl@nsf.gov; or FastLane Help Desk, telephone 703.306.1142, e-mail fastlane@nsf.gov.

- **Deadline/Target Dates**
 - **Preliminary proposal deadline:** May 25, 2000
 - **Full proposal deadline:** October 19, 2000

The deadline dates above do not apply to *Special Activities* proposals.

PROPOSAL REVIEW INFORMATION

- **Merit review criteria:** Standard National Science Board approved criteria, supplemented by program-specific criteria described in this solicitation

AWARD ADMINISTRATION INFORMATION

- **Grant Award Conditions:** GC-1 or FDP III
- **Special grant conditions anticipated:** Yes
- **Special reporting requirements anticipated:** None

ADVANCED TECHNOLOGICAL EDUCATION (ATE)

New Emphases in 2000

- Regional Centers for manufacturing or information technology education.
- Articulation Partnerships between two-year colleges and four-year colleges and universities, focusing on:
 - the role of two-year colleges in the science, mathematics, and technology preparation of prospective K-12 teachers; and
 - students' transition from associate's degree programs in science, mathematics, engineering, or technology to related bachelor's degree programs, especially those having a strong technological basis.

I. INTRODUCTION

The Advanced Technological Education (ATE) program promotes improvement in the education of science and engineering technicians at the undergraduate and the secondary school levels. The program is managed jointly by the Division of Undergraduate Education (DUE) and the Division of Elementary, Secondary, and Informal Education (ESIE).

It has become increasingly apparent that the quality of America's high-technology workforce depends on strong and innovative science, mathematics, engineering, and technology (SMET) education at associate degree-granting institutions. For this reason, the ATE program focuses on two-year colleges and expects two-year colleges to have a leadership role in all projects. Effective technological education programs should involve partnerships between two-year colleges, four-year colleges and universities, secondary schools, business, industry, and government, and should respond to industry's need for well-prepared workers having adaptable skills.

Proposals to the ATE program may aim to affect either specialized technology courses or core science, mathematics, and technology courses that serve as prerequisites or corequisites for specialized technology courses.

Activities in support of advanced technological education may include the design and implementation of new educational materials, courses, laboratories, and curricula; the adaptation of existing exemplary educational materials, courses, and curricula in new educational settings; the preparation and professional development of college faculty and secondary school teachers; internships and field experiences for students, faculty, and teachers; and the broad dissemination of exemplary educational materials and pedagogical strategies that have been developed through previously funded ATE awards. Activities may have either a national or a regional focus, but not a purely local one. Fields supported by the ATE program include, but are not limited to, agricultural technology, biotechnology, chemical technology, computer and information technology, electronics, environmental technology, geographic information systems, manufacturing and engineering technology, marine technology, multimedia technology, telecommunications, and transportation technology.

All projects supported by the ATE program must be guided by a coherent vision of technological education--a vision that recognizes the needs of the modern workplace, of students as lifelong learners, and for articulation of educational programs at different levels. The program especially encourages efforts that:

- develop innovative educational approaches in core science, mathematics, and technology courses at the secondary school and college levels, so that students with diverse needs can acquire strong backgrounds that enable them to complete programs in technological fields and continue in future academic work;
- implement the national science, mathematics, technology, and industry standards in education;
- recognize current and projected occupational requirements and give prospective technicians insight into real-world work environments;
- serve the needs of not only first-time students but also returning students and workers seeking new career opportunities or new skills;
- link educators and educational programs in two-year colleges, four-year colleges and universities, secondary schools, and industry;
- aim to spur major changes and significant improvements beyond the grantee institution and to produce educational materials that can be used nationally; and
- address one or more of the four themes (see http://www.ehr.nsf.gov/ehr/duet/about/DUE_themes.htm) that DUE and ESIE have targeted for special emphasis--i.e., teacher preparation, professional development for faculty and teachers (including workplace experiences), integration of current and emerging technologies into education, and increasing diversity within the technical workforce.

In addition, the ATE program seeks to enhance educational opportunities for postsecondary students by encouraging comprehensive articulation agreements between two-year and four-year institutions. Through these articulation partnerships, the program focuses specifically on strengthening the science, mathematics, and technology preparation of K-12 teachers and on facilitating the transition of students from SMET associate's degree programs to related bachelor's degree programs, especially those having a strong technological basis.

This year the ATE program has identified two areas of technology for special emphasis: information technology and manufacturing. Proposals are invited for Regional Centers that focus on these areas.

II. PROGRAM DESCRIPTION

A. Program Tracks

The ATE program supports proposals in three major tracks: ATE Projects, ATE Centers, and Articulation Partnerships.

1. ATE Projects

While ATE Centers are expected to be comprehensive in scope, ATE Projects may focus more narrowly on one or more of the seven categories described below. Multifaceted projects that cut across these categories are especially encouraged. Except for *Special Activities* projects, grants for projects normally range from \$25,000 to \$300,000 per year and span up to three years.

a. Adaptation and Implementation

Since the first ATE awards were made in 1994, many ATE grantees have developed high-quality educational materials, novel degree programs, effective educational practices, and thriving partnerships involving education, industry, and government. These results deserve to be disseminated, adapted, and implemented to meet needs in other institutional settings. In addition, as the ATE program has matured, fruitful discussions and collaboration have taken place among projects with similar foci. The program wishes to foster continued community-building and dialogue among grantees, so that effective educational strategies can achieve the broadest possible recognition and impact. Consequently, the program supports proposals for the adaptation and implementation of exemplary

educational materials, courses, and curricula that have been developed through other ATE grants, as well as exemplary resources developed in other programs (including those not supported by NSF) that can be adapted to technological education.

Proposals for *Adaptation and Implementation* should involve an innovative use or a significant extension of resources developed in other projects, not merely the duplication of a course, program, or pedagogy in a different location. Proposals might involve, for example:

- the adaptation and testing of exemplary materials with a student audience significantly different from the one where they were developed;
- the adaptation of materials developed for an educational program or course in one technical field to the needs of a program or course in a different technical field;
- the use of different pedagogical approaches or technologies to enhance and extend curricula;
- professional development opportunities for college faculty or secondary school teachers in support of an adapted curriculum;
- a systemic implementation of a developed program that links industries, faculty, and students; or
- a comparative evaluation of the effectiveness of an implemented course or curriculum in the new setting and in the original one.

Resources may be adapted from more than one project. Proposals should describe the materials and practices being adapted, as well as the innovations required to effect the desired improvements.

After carefully researching the existing ATE grants that have been made in a particular area of technological education (see Section B ["Information About Previous Awards"]), proposers may wish to contact the Principal Investigators of exemplary projects to explore possibilities for adapting materials, establishing a new test site, or collaborating in other ways.

As specified in Section V.B.1 ("Cost Sharing Requirements"), *Adaptation and Implementation* proposals are expected to show cost sharing at a level of 25 percent of the funds requested from NSF, as one demonstration of both the strong institutional commitment required to conduct such projects successfully and the return that an institution receives by utilizing resources that have already been developed and tested elsewhere.

b. Curriculum and Educational Materials Development

Supported activities should affect the learning environment, course content, and the experience of instruction. Projects often result in textbooks, laboratory experiments and manuals, software, CD-ROMs, videos, and other courseware. Such products are expected to be widely disseminated through commercial publishers, conferences, workshops, electronic networks, journal articles, and other means. A project's focus may range from the substantial revision of existing instructional materials to the creation of entirely new ones; from a few modules at a single educational level to a comprehensive curriculum for multiple years; and from a single subject to the integration of several disciplines.

c. Teacher and Faculty Enhancement

Secondary school teachers and college faculty play a key role in advanced technological education. It is critical that they have a sound disciplinary background, with knowledge of state-of-the-art developments and techniques in their fields; be intellectually vigorous and excited about their disciplines; employ modern teaching practices (including new instructional technologies); and regard teaching as an important and rewarding activity. They should also have opportunities to synthesize knowledge that cuts across disciplines and to interact with expert educators and practicing scientists, mathematicians, engineers, and technicians. Toward these ends, the ATE program promotes activities that enhance the disciplinary capabilities, teaching skills, currency, and vitality of current teachers and faculty.

The ATE program seeks projects that provide in-service teachers and faculty with opportunities for continued professional growth in areas related to advanced technological education. Such projects typically include conferences, workshops, intensive seminars, industrial internships (which also fall under the *Technical Experiences* category below), or a combination of such activities. These activities typically last from a few days to several weeks and are usually conducted in the summer, with follow-up activities during the academic year. To effect long-term change, projects for teacher and faculty enhancement should normally span at least two academic years.

The program particularly encourages activities that involve secondary school teachers and two-year college faculty working together. Projects that bring together in-service and pre-service teachers are also encouraged; see Section 3.a ("Teacher Preparation in Two-Year Colleges").

d. Technical Experiences

Well-designed technical experiences in the classroom and in a work or community environment can give students, faculty, and teachers a broad, up-to-date, real-world perspective on technical fields. Such experiences typically allow participants to:

- get hands-on exposure to applications of science, mathematics, engineering, and technology and thereby gain confidence in their abilities in technical areas;
- interact closely with working scientists, mathematicians, engineers, and technicians;
- engage in the actual practice and thought processes of science, engineering, and technology--formulating problems and questions, designing appropriate models, troubleshooting, and using technological tools;
- obtain information about various careers as technicians and become aware of the academic preparation necessary for such careers; and
- become acquainted with the environments of two-year colleges and other academic institutions, businesses and industries, government laboratories, and other research organizations.

Projects providing technical experiences may consist of any combination of activities involving instruction, problem solving, research, product development, and industrial internships. Projects ideally should provide a balance of classroom, laboratory, and field experiences. While some activities may be individualized, project activities should stress group interactions that foster collaborations among peers and provide substantive feedback. Student-faculty teams are particularly encouraged to participate in technical experiences and to translate those experiences into meaningful classroom activities that introduce other students to the role of technicians in the workplace.

Proposals should describe recruitment strategies; criteria for selection of participants; the relevance of the planned experiences to curricula; the content of any components dealing with ethics in the workplace or career awareness; and strategies for evaluating the value of the experiences in the education of students and the professional development of teachers and faculty. Proposals should include letters of commitment by schools, colleges, or industries to provide resources for implementing project activities.

e. Laboratory Development

Laboratory or field experiences using suitable modern instrumentation are crucial elements in advanced technological education, especially at the two-year college level. The ATE program supports the development of innovative methods for using laboratory and field exercises to improve students' understanding of basic principles and for using modern instrumentation, new technologies, or applications of instruments that extend their instructional capability. The program also encourages the establishment of equipment-sharing arrangements through consortia or ATE centers.

Instrumentation-only requests might be appropriate for some proposals, although laboratory development is often coupled with the development of new programs, courses, and educational materials. Proposals whose primary rationale is financial need or the replacement of equipment at the same level of capability are not appropriate.

As specified in Section V.B ("Budgetary Information"), funds requested for equipment and other technology (1) must not exceed \$100,000 or 10 percent of the total NSF funding request, whichever is larger, and (2) must be matched by non-Federal funds, equipment, or technology with a value equal to the funds requested from NSF.

f. Dissemination Focal Points

The ATE program seeks projects that will act as clearinghouses for, and will broadly disseminate, the exemplary educational materials, curricula, and pedagogical practices designed by previously funded ATE centers and projects. Like an ATE center, a "dissemination focal point" should be a highly visible resource for ideas, materials, and contacts in a particular field of technological education. Proposals must identify a core set of institutions that will test, adapt, or implement the exemplary products and practices. Proposals might involve, for example:

- the beta-testing of previously developed materials;
- the distribution of materials via traditional and electronic publication;
- workshops for college faculty and K-12 teachers;
- mentoring activities designed to help other institutions develop new programs or adapt educational materials and curricula for existing programs;
- the development or enhancement of industry connections to guide the future education of technicians;
- activities that encourage students to pursue careers as technicians; and
- other activities to increase the awareness of products and practices developed through ATE grants.

Only ATE centers and projects that have already completed their original grants are eligible to submit proposals to become "dissemination focal points," and they must demonstrate both the need and the capability to serve in this role. The submission of a preliminary proposal is *required* for this type of project.

The ATE program anticipates making two or three *Dissemination Focal Points* awards annually.

g. Special Activities

The ATE program supports a small number of conferences, workshops, and similar activities that lead to a better understanding of issues in advanced technological education. Typically, these are short-duration events and are national or international in scope. (Note: Activities for teacher and faculty preparation and enhancement should not be submitted in this category; see Section c ["Teacher and Faculty Enhancement"] above and Section 3.a ["Teacher Preparation in Two-Year Colleges"] below.)

The submission of a special preliminary proposal is *required* for this type of project. At least nine months in advance of the planned activity, a prospective proposer should contact an ATE program officer in DUE (phone 703.306.1668) or ESIE (phone 703.306.1620) and discuss the preparation of a preliminary proposal. Following this discussion, the proposer should prepare the preliminary proposal--including a statement of the activity's objective and target audience, an outline of the activity, a description of personnel involved, and an approximate budget--and send two copies to the program officer. NSF staff will then review the preliminary proposal and advise the proposer whether or not to proceed with a formal proposal.

Formal proposals must explain the need for the special activity, specify the probable date(s) and time frame for the activity, include *Biographical Sketches* for personnel organizing and leading the activity, include a list of prospective participants, describe products to be disseminated, and lay out a plan for evaluating the activity's impact.

The ATE program anticipates making two or three *Special Activities* awards annually. Budgets for these projects typically range from \$25,000 to \$100,000.

2. ATE Centers

ATE centers are comprehensive national or regional resources that provide models and leadership for other projects and act as clearinghouses for educational materials and methods. They are typically cooperative efforts involving two-year colleges, four-year colleges and universities, secondary schools, industry, business, and government. Centers must clearly articulate a vision of technological education for the future, and they must design a workable plan for achieving that vision both during the period of NSF funding and afterwards.

Proposals for ATE centers should be based on a three-pronged alliance of support from (1) the NSF, (2) the proposing educational institution or consortium, and (3) businesses, industries, and government agencies or laboratories.

a. National Centers of Excellence

National Centers of Excellence may vary in size and disciplinary coverage but must have national impact. They typically engage in the full range of activities associated with the various types of projects described in Section A.1 ("ATE Projects") above. In particular, they are expected to develop high-quality educational materials, courses, and curricula and to provide teacher and faculty enhancement to support the utilization of these resources. National Centers of Excellence are also expected to disseminate their products through commercial publishers, journals, conferences, workshops, electronic networks, and other means.

Proposals should present a detailed plan for advancing the ATE program's mission and emphases. In particular, the proposals should lay out significant plans for:

- curriculum development (including the improvement of core SMET courses, as well as specialized courses in various technologies);
- the evaluation of products and student learning;
- the dissemination of educational materials and practices;
- the establishment or enhancement of skill standards;
- the collaboration of educational institutions with business, industry, and government (especially with regard to identifying needed technical skills, planning curricula, and establishing internships for students and faculty);
- the articulation of courses and programs between secondary schools, two-year colleges, and four-year colleges and universities;
- the preparation and professional development of secondary school teachers and college faculty (especially two-year college faculty); and
- the recruitment, retention, and placement of students, especially those from groups underrepresented in SMET fields.

The ATE program anticipates making up to two new awards for National Centers of Excellence, depending on the quality of proposals received and the availability of funds. Awards for centers are normally made for up to \$1 million per year for three years, with the possibility of renewal for an additional three years.

b. Regional Centers for Manufacturing or Information Technology Education

Manufacturing and information technology are central to maintaining the economic competitiveness of the United States in the 21st century. In these rapidly changing areas, technical education and training--much of which can be supplied by two-year colleges--will be increasingly required for all workers, both before they enter the workplace and on a continuing basis.

Modern manufacturing emphasizes such elements as lean production, flexible specialization, and quality standards, which lead to higher productivity and lower environmental impact. Technology is increasingly being substituted for manual skills, and computer and information technologies are being used more and more in design and manufacturing processes. Workers must be prepared for this new workplace, which requires broad competencies with advanced technologies--especially computer and information technologies.

Government and industry have recognized a critical need for information technology (IT) workers in nearly all sectors of the economy--communications, computer and data processing, financial services, government, health care, insurance, manufacturing, mass media and entertainment, transportation, etc.--and basic literacy in IT has increasing importance for workers outside IT occupations. Many of the current and projected openings for IT workers could be filled by people who complete associate degree programs (often coupled with relevant industry certifications).

ATE Regional Centers for manufacturing or IT education are designed to impact the 21st-century economy and workplace through comprehensive approaches to technician education. While these centers may undertake some educational materials development, they are expected to focus mainly on reforming academic programs, departments, and systems to produce highly qualified workers who meet industry's needs within a particular geographic region and who also meet national industry and academic skill standards. Each center should lead systemic reform among the institutions of a region, engaging most or all of the region's college faculty and K-12 teachers in the relevant discipline(s). The center's activities must be designed to have a clear, measurable impact on the region's workforce needs in manufacturing or IT; and the center must have mechanisms for measuring the number and quality of students who are recruited, achieve competencies in relevant areas, receive industry certifications (when relevant), participate in internships, graduate, find appropriate employment, and perform successfully in the workplace.

In conjunction with industry partners, each center should undertake activities that address:

- ***academic program reform***, such as using industry standards and other input from industry in program development, adapting and implementing exemplary educational materials and practices developed elsewhere, improving laboratories or equipment, and using distance-learning technologies to connect workplaces and two-year colleges;
- ***professional development for college faculty (including adjunct faculty) and K-12 teachers***, such as cooperative activities between faculty and teachers in technology departments and those in mathematics and science departments, exchanges of faculty and teachers among educational institutions, internships in industry, and opportunities to obtain certifications in emerging technologies; and
- ***capacity building (recruitment, retention, and placement of students)***, such as mentoring and tutoring prospective and current students, collaborating with secondary schools to ensure that students are prepared for technical programs, ensuring articulation between two-year technology programs and four-year programs, providing internships for students in industry, and utilizing parents, teachers, counselors, and industry representatives to recruit students into careers in manufacturing and IT.

Depending on the quality of proposals received, the ATE program anticipates making up to five Regional Center awards, each up to \$2 million total for three years. In addition, the program anticipates making up to 10 planning grants to fund the development of well-formulated plans for future Regional Centers. A planning grant will not exceed \$50,000 total and will have a duration of one to two years.

3. Articulation Partnerships

This new track in the ATE program promotes initiatives at two-year colleges, in partnership with four-year colleges and universities, to expand two important educational pathways. One type of articulation partnership aims to impact two-year college programs for prospective K-12 teachers, and the other type of partnership targets two-year college programs for students who continue their education in four-year SMET degree programs, especially programs that have a strong technological basis.

With leadership based at two-year colleges, these articulation partnerships should enhance the ability of two-year college students to transfer to four-year programs and should improve the quality of these students' preparation in SMET.

Depending on the availability of funding and the quality of proposals received, the ATE program anticipates making up to 25 awards for *Articulation Partnerships*. Grants are expected to range from \$100,000 to \$300,000 total for three years.

a. Teacher Preparation in Two-Year Colleges

As noted in the NSF workshop report *Investing in Tomorrow's Teachers: The Integral Role of Two-Year Colleges in the Science and Mathematics Preparation of Prospective Teachers* (NSF 99-49), many of the nation's teachers begin their professional education and complete a significant portion of their required science and mathematics course work in two-year colleges. The resources of these institutions must be utilized fully if the national need for a teaching force well-prepared in science, mathematics, and technology is to be met. Moreover, the nation's technological future depends not only on highly qualified technicians, engineers, and scientists, but also on K-12 teachers who are technologically literate and have been exposed to the advanced technologies used in the modern workplace.

The ATE program particularly encourages efforts to strengthen mathematics, science, and technology education for prospective middle school and high school technology teachers. The program also encourages projects involving opportunities for in-service teachers to become certified in mathematics, science, or technology.

Projects must involve both two-year and four-year institutions and should aim to:

- increase the number, quality, and diversity of prospective K-12 teachers in preprofessional programs at two-year colleges--especially prospective teachers of science, mathematics, or technology;
- improve the technological literacy of prospective K-12 teachers at all levels, and improve their understanding of advanced technologies used in the modern workplace; and
- strengthen prospective K-12 teachers' preparation in science and mathematics, since science and mathematics provide critical underpinnings for advanced technological education.

Projects should focus on activities such as:

- recruiting students into careers as science, mathematics, or technology teachers by developing promotional materials and enlisting parents, current teachers, counselors, and professional groups to encourage students to pursue teaching as a career;
- establishing or enhancing the infrastructure of two-year college programs for prospective teachers by improving systems of advising and mentoring, building learning communities, supporting student organizations, promoting increased diversity, etc.;
- developing or adapting high-quality SMET educational materials, courses, and methods for use in two-year college courses that serve prospective teachers;
- engaging pre-service and in-service teachers in joint activities; and
- connecting two-year college programs for prospective teachers with business and industry, laboratories, professional societies, museums, and other organizations that have a stake in SMET education.

Each project's evaluation plan must include metrics for the recruitment of prospective K-12 teachers, the transfer of those students into four-year teacher preparation programs, and the improvement in those students' preparation in science, mathematics, and technology. Project leaders should also be prepared to cooperate with longitudinal studies that track students beyond the grant period, in order to measure the number who graduate with teaching credentials, find positions in K-12 schools, and demonstrate successful performance in the classroom.

b. Articulation Between Associate's Degree and Bachelor's Degree Programs

Some two-year college graduates served by ATE projects elect to transfer immediately to a four-year college or university to continue their formal education, and many workers with two-year degrees eventually return to college to work on a higher degree.

To promote cooperation between two-year and four-year degree programs, the ATE program will support partnerships in which two-year colleges work with four-year colleges or universities to develop, implement, and evaluate model programs that enable students to make a successful transition from a SMET associate's degree program to a related bachelor's degree program. Like other ATE projects, these partnerships should also involve industry. The partnerships should aim to produce highly skilled technicians with bachelor's degrees and/or highly qualified bachelor's degree graduates in science, mathematics, or engineering who are well-prepared for employment in the technical workplace.

Projects that involve curricula central to technician education are strongly encouraged. Such projects might, for example, concern:

- students' transition from a two-year technology or science degree program to a four-year technology or science degree program from which graduates enter the workforce as technicians or technologists;
- students' transition from a two-year technology degree program to a four-year engineering or computer science degree program;
- "reverse transfer" arrangements in which students in a four-year degree program take technical courses in a two-year college either before or after graduation; or
- programs that encourage joint activities between students in programs with different educational requirements (e.g., engineering and engineering technology).

Project activities must constitute an innovative approach to articulation that can be disseminated and implemented broadly. Activities might include:

- designing and implementing new courses to create a bridge between associate's degree technician programs and bachelor's degree programs in SMET;
- creating innovative (articulated) curricula or reengineering existing educational pathways to respond to current or emerging workforce needs in rapidly changing, technology-driven sectors of the economy;
- contextualizing mathematics and science in technical courses, and integrating technological concepts into mathematics and science courses;
- offering professional development workshops, faculty exchanges, and other mechanisms to bring together two-year and four-year college faculty in the design and implementation of new courses; or
- effective marketing of degree programs and career opportunities.

Proposals should explain the rationale for the particular partnership that is proposed, describe existing barriers to effective articulation, detail a plan for overcoming those barriers, demonstrate strong institutional commitments to the new curricular arrangements that would come out of the project, estimate the project's impact on the number of students (or workers) going on to complete SMET bachelor's degrees, and describe the metrics that will be used to evaluate the project's impact on student transfers, degree production, workforce enrichment, and student learning.

B. Information About Previous Awards

The March 1999 issue of the newsletter *Synergy* (available online at [http://www.ehr.nsf.gov/EHR/REC/pubs/newSYN/March 1999/Synergy7.htm](http://www.ehr.nsf.gov/EHR/REC/pubs/newSYN/March%201999/Synergy7.htm)) profiles the ATE program and a number of active awards. DUE's Web site provides an online guide to abstracts for and other information about previous ATE awards (see <http://www.ehr.nsf.gov/ehr/duel/awards/ate/atemain.htm>). The Awards Search feature on NSF's Web site (see <http://www.nsf.gov/verity/srchawd.htm>) allows customized searches of NSF's award database. DUE's Web-

based Project Information Resource System (<http://www.ehr.nsf.gov/PIRstart>) contains award abstracts and a variety of additional information provided directly by Principal Investigators.

Information about ATE awards is also published annually in booklet form. The following editions of this booklet are available electronically via NSF's Online Document System (<http://www.nsf.gov/cgi-bin/pubsys/browser/odbrowse.pl>):

- Advanced Technological Education: 1998 Awards and Activities (NSF 99-113)
- Advanced Technological Education: 1997 Awards and Activities (NSF 98-110)
- Advanced Technological Education: 1996 Awards and Activities (NSF 97-50)

Paper versions of the most recent editions can be ordered from NSF (see <http://www.ehr.nsf.gov/ehr/duedocuments/getpub.htm>).

III. ELIGIBILITY INFORMATION

NSF's standard eligibility criteria apply (see GPG, Section I.D). Two-year colleges and other associate degree-granting institutions are especially encouraged to submit proposals, and all proposals are expected to include one or more two-year colleges in a leadership role. A proposal from an informal consortium of institutions should be submitted by one member of the consortium; a proposal from a formal consortium--such as a community college system or school district--should be submitted by the consortium.

An individual may serve as the Principal Investigator (PI) on no more than one proposal per round of competition, but may serve as a co-PI on multiple proposals.

IV. AWARD INFORMATION

Depending on the quality of proposals received and the availability of funds, the ATE program expects to make approximately 75 awards in FY2001. Grants may be awarded in a wide variety of sizes and durations, as indicated in the following table.

SUMMARY OF ANTICIPATED AWARD SIZES AND DURATIONS

Track or Sub-Track	Anticipated Award Size	Anticipated Award Duration
ATE Projects <i>except</i> Special Activities	\$25,000 to \$900,000	12 to 36 months.
Special Activities	\$25,000 to \$100,000	6 to 12 months.
National Centers of Excellence	\$2,500,000 to \$3,000,000	36 months.
Regional Centers for Manufacturing or IT Education	\$1,500,000 to \$2,000,000	36 months.
Planning Grants for Regional Centers	\$40,000 to \$50,000	12 to 24 months.
Articulation Partnerships	\$100,000 to \$300,000	36 months.

V. PROPOSAL PREPARATION & SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the *Grant Proposal Guide* (GPG) (NSF 00-2), except as noted below. The complete text of the GPG (including electronic forms) is available electronically on the NSF Web site (<http://www.nsf.gov>). 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.

Proposers are reminded to identify the program solicitation number (NSF 00-62) in the "Program Announcement/Solicitation No." block on the *Cover Sheet* (NSF Form 1207). Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

The submission of a preliminary proposal is required for *Dissemination Focal Points* and *Special Activities* projects and is encouraged (but not required) for all other types of projects (including ATE Centers and Articulation Partnerships). A subset of applicants will be encouraged to submit formal proposals. The ATE program anticipates being able to return reviews of preliminary proposals approximately eight weeks after the submission deadline.

FastLane (<http://www.fastlane.nsf.gov>), NSF's system for conducting business over the Internet, must be used to prepare and submit formal proposals; and its use is strongly encouraged (but not required) for preliminary proposals, except preliminary proposals for *Special Activities*, which should be submitted in paper form only. Software such as Adobe Acrobat, for generating PDF files, is needed to submit a proposal via FastLane. PIs who have not used FastLane before are reminded to make sure that their institution is a registered FastLane institution (see http://www.fastlane.nsf.gov/a0/fastlane_insts.htm) and to contact the institution's Sponsored Research Office (which might also be known as the Office of Grants Administration, Office of Sponsored Projects, 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 subawards in their proposal (see GPG, Section II.D.7.f.v) are reminded that the subawardee organization(s) must also have an NSF Institution ID Number (or be a registered FastLane institution) 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 preparing and submitting a proposal via FastLane are available at the FastLane Web site.

Helpful advice about the content of effective educational proposals can be found in *A Guide for Proposal Writing* (NSF 98-91), which was prepared by DUE staff to assist proposers to DUE programs. (Paper copies of the publication are no longer available.)

Formal proposals should contain the following sections/forms:

- **Information About Principal Investigators and Co-Principal Investigators** (NSF Form 1225) (see GPG, Section II.B.1)
- **Cover Sheet (including Certification Page)** (NSF Form 1207) (see GPG, Section II.D.1): In FastLane, under "NSF Unit Consideration," select "ADVANCED TECH EDUCATION PROG" as the program to consider the proposal and "DIVISION OF UNDERGRADUATE EDUCATION" as the division to consider the proposal. If the proposal is for a *planning grant* for a Regional Center, begin the project title with the words "Planning Grant for...." Mail the *signed* copy of the cover sheet to NSF in accordance with the instructions given in Section C ("Proposal Due Dates") below.
- **Project Data Form** (NSF Form 1295): The information on this form is used to direct the proposal to appropriate reviewers and to determine the characteristics of NSF-supported projects. For any audience code(s) marked in Section F (e.g., women, minorities, persons with disabilities), include in the *Project*

Description a substantive discussion of the way the project will target and affect the audience(s). *Note:* In FastLane, this form will show up in the list of forms for your proposal only *after* you have (1) selected "ADVANCED TECH EDUCATION PROG" and "DIVISION OF UNDERGRADUATE EDUCATION" as the NSF organizational units on the *Cover Sheet* and (2) saved the *Cover Sheet*.

- **Project Summary** (see GPG, Section II.D.2): This summary should be no longer than 500 words. It should be single-spaced, in a standard font with a size no smaller than 12 points.
- **Table of Contents** (NSF Form 1359) (see GPG, Section II.D.3)
- **Project Description (including Results from Prior NSF Support)** (see GPG, Section II.D.4): This section must be double-spaced (i.e., no more than 3 lines of text per 2.5 cm of vertical space), in a standard font (Times New Roman, Times, Arial, or Helvetica are recommended) with a size no smaller than 12 points. (All other formatting instructions described in GPG, Section II.C, apply.) In formal proposals, the entire section (including *Results from Prior NSF Support*) must not exceed 15 pages (double-spaced) for *planning grants* for Regional Centers and must not exceed 30 pages (double-spaced) for all other project types. Tables, graphs, illustrations, etc., are included in these page limits. It is recommended that the project description be structured as follows:
 - **Project Overview:** Summarize the project's goals and objectives, planned activities, organizational structure, and expected outcomes.
 - **Goals and Objectives:** Describe the project's aims clearly and concisely, relating them to local needs, national concerns, recent trends, other projects funded by NSF, etc.
 - **Project Plan:** Describe the project's features--i.e., the content and pedagogical style of the deliverables, the way in which they will be produced, the timetable that will be followed, the facilities and resources available for carrying out the project, the prospects for the project to have a broad impact (nationally, regionally, or within a discipline), and the prospects for the project to be sustained after the period of NSF funding. Projects involving multiple investigators and institutions must have a strong plan for project management, commensurate with the number of participants and the complexity of the project's activities.
 - **Experience and Roles of Senior Personnel:** Describe the roles and responsibilities of the PI, co-PI, and other senior personnel, and summarize the expertise that each brings to the project.
 - **Evaluation Plan:** Describe the criteria and the process for evaluating the quality and impact of the project's deliverables; the method for assessing student learning in accordance with the project's educational objectives and practices; the use of the collected information for monitoring the project's progress; the timeline for the evaluation activities; and the qualifications of the individuals who will perform the evaluation tasks or serve on an advisory committee for the project. For information about effective approaches to evaluation, see:
 - *User-Friendly Handbook for Project Evaluation: Science, Mathematics, Engineering, and Technology Education* (NSF 93-152);
 - *User-Friendly Handbook for Mixed Method Evaluations* (NSF 97-153); and
 - the Online Evaluation Resource Library (<http://oerl.sri.com>) of NSF's Directorate for Education and Human Resources.
 - **Dissemination Plan:** Describe the means through which the project's results will be disseminated to other educators (e.g., commercial publication, workshops, journal articles, conference presentations, electronic networks) and the procedure through which the success of the dissemination efforts will be determined. If the dissemination plan involves significant use of information technology, describe the procedures for maintaining the quality and currency of the material, providing user support, and publicizing the availability of materials.

- *Results from Prior NSF Support* (see GPG, Section II.D.4): Provide information about relevant prior NSF funding of the PI and co-PI(s). This subsection should only cover awards pertaining to education. Describe research awards only if they have a direct bearing on the new proposal.
- *References Cited* (see GPG, Section II.D.5): Any literature cited should be specifically related to the proposed project, and the *Project Description* should make clear how each reference has played a role in the motivation for or design of the project. Any relevant literature on research in teaching and learning should be cited.
- *Biographical Sketches* (see GPG, Section II.D.6)
- *Budget* (see GPG, Section II.D.7): Section B ("Budgetary Information") below provides supplementary guidance to that found in the GPG. A *Budget Justification*--which may be no longer than three pages, single-spaced--must accompany the budget forms and provide details about budget line items.
- *Current and Pending Support* (see GPG, Section II.D.8)
- *Facilities, Equipment, and Other Resources* (see GPG, Section II.D.9)
- *Special Information and Supplementary Documentation* (see GPG, Section II.D.10): This section is optional. If used, it must be no longer than 15 pages and should include *only* the sorts of items listed in the GPG. In particular, it should include any letters of commitment that document collaborative arrangements or pledge resources of significance to the proposal. (Do not include letters which merely endorse the proposal or which offer nonspecific support for project activities; letters of this kind are not helpful to reviewers.) FastLane's *Supplementary Documents* function should be used to submit this section as a PDF file. Place the heading "Special Information and Supplementary Documentation" at the beginning of the file. Note that any letters must be obtained in or converted to electronic format; if necessary, electronically scan paper documents and convert them to PDF.
- *Appendices* (see GPG, Section II.D.11): Appendices are allowed, but they must be concise and relevant. The total length of the (combined) appendices may not exceed 15 pages. Appendices might include, for example, a sample of previously developed (relevant) educational materials, a published review of such materials, or a draft of a proposed unit or module. Letters of commitment should be included in the *Special Information and Supplementary Documentation* section (as discussed above), not in appendices. Reviewers of proposals are not obligated to read appendices, but they may do so if they wish. FastLane's *Supplementary Documents* function should be used to submit appendices as a PDF file. If you are also submitting *Special Information and Supplementary Documentation* (see above), include the appendices at the end of this file. Begin each appendix on a new page and clearly label it "Appendix" or "Appendix A," "Appendix B," etc. Note that any documents in appendices must be obtained in electronic format; if necessary, electronically scan paper documents and convert them to PDF. Proposers should not send videotapes, computer diskettes, CD-ROMs, slides, books, etc., as appendices or supplements to a proposal.

Preliminary proposals (except those for *Special Activities*) should contain the following sections/forms:

- *Information About Principal Investigators and Co-Principal Investigators* (NSF Form 1225) (see GPG, Section II.B.1)
- *Cover Sheet (including Certification Page)* (NSF Form 1207) (see GPG, Section II.D.1): Indicate the *Division of Undergraduate Education* and the *Advanced Technological Education Program* as the organizational units to consider the proposal. (In FastLane, under "NSF Unit Consideration," select "ADVANCED TECH EDUCATION PROG" as the program to consider the proposal and "DIVISION OF UNDERGRADUATE EDUCATION" as the division to consider the proposal.) If the proposal is for a *planning grant* for a Regional Center, begin the project title with the words "Planning Grant for...." Signatures are not required for preliminary proposals; therefore, if you submit a preliminary proposal via FastLane, you need not mail the cover sheet separately to NSF.

- **Project Summary** (see GPG, Section II.D.2): This summary should be no longer than 500 words. It should be single-spaced, in a standard font with a size no smaller than 12 points.
- **Project Data Form** (NSF Form 1295): *Because a current version of this form is available only in FastLane, the form should be omitted from preliminary proposals submitted in paper form.* In FastLane, the *Project Data Form* will show up in the list of forms for your proposal only *after* you have (1) selected "ADVANCED TECH EDUCATION PROG" and "DIVISION OF UNDERGRADUATE EDUCATION" as the NSF organizational units on the *Cover Sheet* and (2) saved the *Cover Sheet*.
- **Table of Contents** (NSF Form 1359) (see GPG, Section II.D.3): A Table of Contents is optional for preliminary proposals submitted in paper form. One is automatically generated for proposals submitted via FastLane.
- **Project Description (including Results from Prior NSF Support)** (see GPG, Section II.D.4): This section must be double-spaced (i.e., no more than 3 lines of text per 2.5 cm of vertical space), in a standard font (Times New Roman, Times, Arial, or Helvetica are recommended) with a size no smaller than 12 points. (All other formatting instructions described in GPG, Section II.C, apply.) In preliminary proposals, the entire section (including *Results from Prior NSF Support*) must not exceed 10 pages (double-spaced); tables, graphs, illustrations, etc., are included in this limit. It is recommended that the project description be structured as described in the instructions for formal proposals above; the discussions of the relevant issues must be condensed to conform to the length restriction for preliminary proposals.
- **References Cited** (see GPG, Section II.D.5): Any literature cited should be specifically related to the proposed project, and the *Project Description* should make clear how each reference has played a role in the motivation for or design of the project. Any relevant literature on research in teaching and learning should be cited.
- **Biographical Sketches** (see GPG, Section II.D.6)
- **Budget** (see GPG, Section II.D.7): Section B ("Budgetary Information") below provides supplementary guidance to that found in the GPG. A *Budget Justification*--which may be no longer than three pages, single-spaced--must accompany the budget forms (NSF Form 1030) and provide details about budget line items. Budget forms for *subawards* (subcontracts) are not required in preliminary proposals. If the proposer chooses to include these forms, it is not necessary that they be signed by the Authorized Organizational Representative of the subawardee organization(s). (This deviation from the GPG's requirement that subaward budgets be signed and mailed to NSF applies only to preliminary proposals.)
- **Current and Pending Support** (NSF Form 1239) (see GPG, Section II.D.8): In preliminary proposals, you must provide information for the PI, but it is not necessary to complete the form for other senior personnel.
- **Facilities, Equipment, and Other Resources** (NSF Form 1363) (see GPG, Section II.D.9): In preliminary proposals, responses on this form may be brief.

Preliminary proposals should *not* include *Special Information and Supplementary Documentation* or *Appendices*. As mentioned above, the *Project Data Form* (NSF Form 1295) should be omitted from preliminary proposals submitted in paper form.

Because most proposals submitted in response to this solicitation will be reviewed by panel review instead of mail review, there is no need for proposers to submit a list of suggested reviewers unless an NSF program officer specifically requests it.

Certain special types of proposals described in the GPG--i.e., Small Grants for Exploratory Research (SGER) proposals (see GPG, Section II.D.12.a), Equipment Proposals (see GPG, Section II.D.12.c), and Accomplishment-Based Renewal (ABR) proposals (see GPG, Section VI.B.2)--are not appropriate for the ATE program.

Collaborative Proposals (see GPG, Section II.D.12.b) should in most cases be submitted as a single proposal. Under unusual circumstances, Collaborative Proposals involving the *simultaneous submission of proposals from different*

organizations will be accepted in the formal proposal cycle. The lead proposer must obtain advance approval from an ATE program officer to submit such a proposal, and the collaborating organizations must exactly follow the instructions for electronic submission specified in GPG, Section II.D.12.b. The project titles of the related proposals must be identical and must begin with the words "Collaborative Project," and the *combined* budgets of the related proposals should conform to the typical award sizes specified in this solicitation. These simultaneous Collaborative Proposals will be treated as a single proposal (with a single *Project Summary*, *Project Description*, and *References Cited*) during the review process.

B. Budgetary Information

1. Cost Sharing Requirements

Funds requested for equipment and other technology (see Section 2 ["Other Budgetary Issues"] below) must be matched by non-Federal funds, equipment, or technology with a value equal to the funds requested from NSF.

In proposals for *Adaptation and Implementation* projects, cost sharing at a level of 25 percent of the funds requested from NSF is required.

Consistent with Executive Orders 12876, 12900, and 13021, cost sharing/matching requirements will be waived for minority-serving institutions (historically Black colleges and universities, Hispanic-serving institutions, and tribal colleges and universities) that do not offer SMET degrees beyond the baccalaureate level (see <http://www.ehr.nsf.gov/ehr/du/programs/general/msi.htm>). Institutions eligible for this exemption must note their eligibility in the *Budget Justification*.

For the match on equipment and other technology, an institution may obligate its matching funds or receive gifts of equipment or technology 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 official award letter. This normally provides a lengthy period during which the institution must fulfill the requirement to match NSF equipment/technology 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 official award letter.

The proposed cost sharing must be shown on line M on the proposal budget (NSF Form 1030).

The amount of cost sharing must be shown in the proposal in enough detail to allow NSF to determine its impact on the proposed project. Documentation of 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 grantee'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 grant.

All cost sharing amounts are subject to audit. Failure to provide the level of cost sharing reflected in the approved grant budget may result in termination of the NSF grant, disallowance of grant costs, and/or refund of grant funds to NSF.

2. Other Budgetary Issues

NSF funds may not be used to support expenditures that would normally be made in the absence of an award, such as costs for routine teaching activities (including curriculum development) and laboratory upgrades.

In *planning grants* for Regional Centers, indirect costs may not exceed 10 percent of modified total direct costs.

Funds requested for equipment and other technology (as described below) must not exceed \$100,000 or 10 percent of the total NSF funding request, whichever is larger.

Instructional or Industrial Technology: In the ATE program, items such as computers, computer-related hardware, software, laboratory or field instrumentation, and scientific or industrial machinery, with an acquisition cost between \$500 and \$5,000 and an expected service life of more than one year, are defined as "instructional or industrial technology." Such items may be requested for use in projects, as may "equipment," which is defined (see GPG, Section II.D.7.c) as property that has an acquisition cost of \$5,000 or more and an expected service life of more than one year.

Any equipment or technology requested must be necessary and appropriate for achieving the project's objectives, and the *Project Description* must justify this need and appropriateness. Charges (including material and labor costs) for the construction of equipment or technology that would have advantages (for the project) over commercially available items are allowed. In the *Budget Justification*, any equipment or technology requested must be listed by name and probable brand, model (or version), and price (which should reflect educational discounts when available); such selections may be changed after an award if more appropriate models have become available. Neither NSF project funds nor institutional matching funds may be used for:

- equipment or technology that is not mainly for use in the project;
- replacement equipment or technology that does not significantly improve instructional capability;
- teaching aids (e.g., films, slides, projectors, "drill and practice" software);
- vehicles, laboratory furnishings, or general utility items such as office equipment (including word-processing equipment), benches, tables, desks, chairs, storage cases, and routine supplies;
- maintenance equipment and maintenance or service contracts;
- the modification or construction of laboratories or other buildings;
- the installation of equipment or technology (as distinct from the on-site assembly of multicomponent instruments--which is an allowable charge); or
- a flat percentage inflation allowance.

Any *equipment or instructional or industrial technology* requested as part of a proposal should be included in Line D ("Equipment") of the proposal budget (NSF Form 1030).

Workshops: In proposals that involve professional development workshops, it is generally expected that the home institutions of the participants will bear the cost of travel to and from the workshop. However, some travel costs may be included in project budgets. Costs for subsistence (lodging and meals) during the workshop may be included. In addition, funds may be requested for a stipend of up to \$60 per workshop-day for participants; requests for such stipends must be specific to the target audience and must be 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. The host institution is expected to cover the expenses incurred by its own faculty participants. Note that indirect costs may not be charged on participant support costs.

National Visiting Committee: For very large projects (generally those requesting a total of \$500,000 or more), the budget should include provisions for a National Visiting Committee (NVC) to visit the project on an annual basis. An NVC is a group of experts who provide advice to the project staff, assess the plans and progress of the project (and make reports both to the project leadership and to NSF), and enhance the dissemination of the project's products. Typically, ATE Projects enlist four to six members for an NVC, and ATE Centers enlist eight to ten. Although an NSF program officer will work with the proposer during the award process to finalize NVC membership and budget details, the proposal should address the use of the NVC in the project.

C. Proposal Due Dates

The deadline dates specified below do not apply to proposals for *Special Activities*.

For paper submission of preliminary proposals: A single package containing six copies of the preliminary proposal must be postmarked (or contain a legible proof-of-mailing date assigned by the carrier) no later than May 25, 2000, and sent to:

Allied Technology Group, Inc.
NSF/ATE Preliminary Proposals
Solicitation No. 00-62
4200 Forbes Blvd., Suite 106
Lanham, MD 20706-4342

For electronic submission (via FastLane) of preliminary proposals: The proposal must be submitted electronically to NSF by the Sponsored Research Office or equivalent by 5:00 p.m. (submitting institution's local time) on May 25, 2000. Signed and separately mailed cover sheets are not required for preliminary proposals.

Formal proposals must be submitted electronically (via FastLane) to NSF by the Sponsored Research Office or equivalent by 5:00 p.m. (submitting institution's local time) on October 19, 2000. The signed proposal cover sheet must be submitted in accordance with the instructions specified below.

A proposal will not be processed until NSF has received the complete proposal (including, for formal proposals, the signed cover sheet).

The PI is responsible for the completeness and accuracy of the proposal as submitted. Unless requested by NSF, additional information may not be sent following proposal submission.

Submission of Signed Cover Sheets: For formal proposals, a paper copy of the *Cover Sheet* (NSF Form 1207) with appropriate signatures must be postmarked (or contain a legible proof-of-mailing date assigned by the carrier) within five working days following electronic submission of the proposal and must be sent to the following address:

Allied Technology Group, Inc.
NSF/ATE Proposal Cover Sheet
Solicitation No. 00-62
4200 Forbes Blvd., Suite 106
Lanham, MD 20706-4342

For preliminary proposals, it is not necessary that the cover sheet be signed and separately mailed.

D. FastLane Requirements

The NSF FastLane system (<http://www.fastlane.nsf.gov>) must be used to prepare and submit formal proposals electronically; and its use is strongly encouraged (but not required) for preliminary proposals, except preliminary proposals for *Special Activities*, which should be submitted in paper form only. Detailed instructions for proposal preparation and submission via FastLane are available at the FastLane Web site (see <http://www.fastlane.nsf.gov/a1/newstan.htm>).

The Sponsored Research Office (SRO) or equivalent must provide a FastLane Personal Identification Number (PIN) to each PI to gain access to the FastLane "Proposal Preparation" application. PIs who have not submitted a proposal to NSF in the past must contact their SRO to be added to the NSF PI database. This should be done as soon as the decision to prepare a proposal is made.

Submission of Signed Cover Sheets: See the instructions in Section C ("Proposal Due Dates") above.

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.

Proposals will be reviewed against the following general merit review criteria established by the National Science Board. Following each criterion are potential considerations that the reviewer may employ in the evaluation. These are suggestions, and not all will apply to any given proposal. Each reviewer will be asked to address only those that are relevant to the proposal 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 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?

With regard to the ATE program, 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 technician education?
- Does the project have potential for improving student learning of important science, mathematics, engineering, or technology (SMET) 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 (particularly other NSF-funded projects), 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, and technicians), 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 the evidence of institutional support clear and compelling?

Broader impacts:

- Does the project address the current and future needs of industry for technicians?
- Does the project enhance the status of technician education?
- Are the proposed activities integrated into the academic program(s) of the participating institution(s)?
- 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 other institutions?
- What is the potential for the project to produce widely used products that can be disseminated through commercial or other channels? Are plans for producing, marketing, and distributing these products appropriate and adequate?
- Will the project result in significantly improved content and pedagogical preparation of SMET faculty and teachers?
- Does the project effectively address one or more of the following objectives:
 - ensure the highest quality education for those students planning to pursue SMET 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?

PIs should also address the following elements in their proposal to provide reviewers with the information necessary to respond fully to both NSF merit review criteria. NSF staff will give these factors careful consideration 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 learner 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.

A summary rating and accompanying narrative will be completed and signed by each reviewer. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers, are mailed to the PI by the program officer. 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. Most proposals submitted in response to this solicitation will be reviewed by panel review. In some instances, the panel review may be supplemented by mail reviews or a site visit, if appropriate.

Reviewers will be asked to formulate a recommendation to either support or decline each proposal. A program officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation. If the recommendation is to award funding, in most cases the program officer will contact the proposer after the recommendation has been approved by the program officer's supervisor. This informal notification is not a guarantee of an eventual award. NSF will be able to tell applicants whether their proposals have been declined or recommended for funding within six months for 95 percent of proposals. The time interval begins on the proposal deadline or target date, or from the date of receipt if deadlines or target dates are not used by the program. 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 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 an NSF program officer. A PI or organization that makes financial or personnel commitments in the absence of a grant or cooperative agreement signed by the NSF grants officer does so at its 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 NSF program division administering the program. Verbatim copies of reviews, not including the identity of the reviewers, will be provided to the PI.

B. Grant Award Conditions

An NSF grant consists of (1) the award letter, which includes any special provisions applicable to the grant 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 grant conditions, such as Grant General Conditions (NSF GC-1)* or Federal Demonstration Partnership Phase III (FDP) Terms and Conditions*; and (5) any NSF brochure, program guide, announcement, or other NSF issuance that may be incorporated by reference in the award letter. Electronic mail notification is the preferred way to transmit NSF grants 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 (<http://www.nsf.gov>). 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) (NSF 95-26), which is available electronically on the NSF Web site. The GPM is also available in paper copy by subscription from the Superintendent of Documents, Government Printing Office (GPO), Washington, DC 20402. The GPM may be ordered through the GPO Web site (<http://www.gpo.gov>). The telephone number at GPO for subscription information is 202.512.1800.

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.

Within 90 days after expiration of a grant, 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 the proposal or in earlier updates using the electronic system.

VIII. CONTACTS FOR ADDITIONAL INFORMATION

General inquiries about the ATE program may be made in one of the following ways:

- Write to the Advanced Technological Education Program, Division of Undergraduate Education, National Science Foundation, 4201 Wilson Blvd., Suite 835, Arlington, VA 22230.
- Send e-mail to undergrad@nsf.gov and refer to the "ATE program" in the subject line of your message.
- Phone the Division of Undergraduate Education at 703.306.1668 or the Division of Elementary, Secondary, and Informal Education at 703.306.1620, and ask to speak with an ATE program officer.

For questions related to the use of FastLane, contact NSF's FastLane Help Desk, telephone 703.306.1142, e-mail fastlane@nsf.gov; or Ms. Romona Truesdale, Division of Undergraduate Education, telephone 703.306.1670, e-mail duefl@nsf.gov.

IX. OTHER PROGRAMS OF INTEREST

The NSF *Guide to Programs* (which is only available electronically at <http://www.nsf.gov/cgi-bin/getpub?gp>) is a compilation of funding opportunities for research and education in science, mathematics, and engineering. General descriptions of NSF programs, research areas, and eligibility information for proposal submission are provided in each chapter. Many NSF programs offer announcements concerning specific proposal requirements. To obtain additional information about these requirements, contact the appropriate NSF program offices listed in Appendix A of the GPG.

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* (<http://www.nsf.gov/home/ebulletin>) and in individual program announcements. Subscribers can also sign up for NSF's Custom News Service (<http://www.nsf.gov/home/cns>) to find out what funding opportunities are available.

ABOUT THE NATIONAL SCIENCE FOUNDATION

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

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

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

The National Science Foundation has Telephonic Device for the Deaf (TDD) and Federal Information Relay Service (FIRS) capabilities that enable individuals with hearing impairments to communicate with the Foundation regarding NSF programs, employment, or general information. TDD may be accessed at (703) 306-0090 or through FIRS on 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 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: Reports Clearance Officer, Information Dissemination Branch, 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, NW, Room 10235, Washington, DC 20503.

Catalogue of Federal Domestic Assistance (CFDA) No.: 47.076 -- Education and Human Resources

OMB No. 3145-0058
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