

The Advanced Technological Education (ATE) Program Evaluation

Issues at a Glance

ATE Program Increases Number & Quality of U.S. Technicians

The ATE program evaluation found that *projects* (i.e., projects and centers) are strongly consistent with ATE's mission. They are also substantially productive on the ATE program key indicators: collaboration, educational materials development, program improvement, and professional development. *Projects* also give significant attention to dissemination, sustainability, and recruitment and retention.

Furthermore, there are substantial increases in course and program enrollments. Taken together, these indicate that the ATE program is successfully meeting its programmatic goals

to increase the number and quality of technicians in this country.

However, findings from available data suggest that external field-testing by *projects* of their products could be increased and improved. Data collection methods employed for evaluative and accountability purposes are also not as frequent or as useful as they could be. For example, more data are needed regarding the number of students enrolled, number of students completing or graduating, number of students that gained credit for articulated courses, and follow up on how professional development opportunities were implemented.

About ATE

The National Science Foundation's (NSF) Advanced Technological Education program is a diverse and dynamic set of *projects* intent on increasing and improving our nation's technical workforce. Since its inception in 1994, more than 400 grants have been made. While most have gone to two-year colleges, ATE also offers outreach to secondary and baccalaureate institutions. As of October 2001, about 200 *projects* are currently active across the United States.

ATE Program Goals

ATE aims to:

- * Produce more and better educated technicians for the advanced technological workforce
- * Improve the technical skills and the general science, technology, engineering, and mathematics (STEM) preparation of these technicians

Economic Empowerment

An at-risk high school student decided to come to school because what he was studying "relates to the real world—I can get a job, a good job from what I'm learning right now."

— Observation from a site visit

Sources of Evaluation Information

The information in this report is based on the ATE program evaluation findings. To date, this evaluation has included an initial descriptive report, two yearly Web-based surveys and accompanying reports, site visits, and issue papers. The issue papers make use of the data gathered in the surveys and site visits as well as the research literature. Detailed reports can be obtained at <http://ate.wmich.edu>.

Four Comprehensive Ways to Improve the ATE Program

1. Revise the NSF-ATE Proposal Guidelines and reporting requirements. Clarify expectations especially for collaboration, program improvement, sustainability, and recruitment and retention. Emphasize the importance of these issues. Require strong external field tests of *project* products and follow up on professional development activities to assure local implementation of ideas and materials.

2. Provide more guidance to the National Visiting Committees. These committees should look for and address the above issues at the *project* level.

3. Provide assistance for developing and sharing of best practices. Provide program

guidelines about how to effectively collaborate, develop high quality text and digital materials, conduct external field tests (e.g., with potential employers of the ATE graduates), sustain a *project*, collect data for accountability and evaluative purposes, and use multiple forums for dissemination. Facilitate sharing and development of these practices through workshops, Website postings, and *project-to-project* collaboration.

4. Employ evaluation and data collection more effectively. Continue to define protocols for routinely gathering data about each issue within and across *projects*. Use the data for accountability, to improve *projects*, and to share best practices.

Collaboration Widespread

ATE *projects* have established a large number of collaborative arrangements, which provide monetary support as well as other kinds of assistance (e.g., personnel and facility sharing). For every dollar provided by NSF, the *projects* reported increasing their working resources for the ATE program through collaborations by 50 cents in 2000 and by 80 cents in 2001. The typical *project* maintains

more than 15 separate collaborative efforts mostly with business, industry, and educational institutions.

ENHANCING COLLABORATION

Have clear expectations. *Project* proposals should clearly identify types of membership, duration, and expected outcomes for collaborations.

Facilitate collaboration at many levels. ATE should continue to encourage statewide,

regional, or national consortia as part of the collaboration model for large *project* awards. ATE should also continue actively facilitating center-to-project and project-to-project collaboration.

Provide guidelines. Provide guidance on “best practices” for sustaining collaborations beyond *project* funding and systematically gather data concerning collaboration sustainability.

Collaboration Works

John Deere and Company provided \$250,000 for a technologically advanced computer lab with matching funds from our College of \$350,000.
—Hawkeye Community College, AACC

ATE Projects Develop Diverse Materials

Full courses, adaptations of courses, and modules (e.g., laboratory exercises) are developed by the ATE *projects* to support the preparation of technicians, mostly at the associate degree level. Almost all materials are in use at least locally—about 1,700—and some have been disseminated beyond the local *project* for national use.

About two thirds of the *projects* use standards to guide materials development. *Projects* generally consult content experts to identify and/or verify skills that are the focus of the materials. Business and industry experts usually are not involved in the evaluation of the materials after development. Professional curriculum designers, a systematic curriculum development process, and external standards of best practices for development are only occasionally used in the development of materials.

About half of the *projects* use field testing and apply some student measure of success to validate their materials. *Project* personnel generally judge the effectiveness of materials developed based on anecdotal or indirect measures.

IMPROVING MATERIALS DEVELOPMENT

Provide resources identifying best practices in educational materials development, including NSF-sponsored workshops.

Improve review criteria. Submitted proposals should reflect quality development processes and realistic budgets and timelines.

Improve reporting. The current reporting process of funded *projects* should be revised to include reports on the materials development processes included in the framework for best practices.

ATE Materials Make a Difference

The retention rate for an alternative education program class jumped from 30 percent to 80 percent through the use of the modules developed through the ATE program.

— High school teacher at a site visit

Business Partnerships Help Colleges Recruit and Retain Students

ATE-funded instructional programs employ many student recruitment and retention activities that are likely to produce good results. Especially noteworthy are the many collaborative arrangements between colleges and business and industry to reach and bring educational programs to employees and upgrade their technology knowledge and skills. Funding for and direction of these arrangements is shared by the collaborators.

Recruitment efforts are making inroads in increasing the diversity of the workforce. Around 30 percent of enrolled students are women and more than 35 percent are minority

at the associate degree level institutions, which is higher than normal in technology programs.

Most recruitment and retention efforts appear to be piecemeal rather than comprehensive. Although these have potential for payoff, they are not crafted to be mutually supportive. Testimonials of success and promised success are abundant; however, *projects* appear to have systematically evaluated neither success in recruitment and retention efforts nor ways to improve them.

ENHANCING RECRUITMENT & RETENTION

Build a comprehensive program. Encourage *projects* to develop recruitment and retention as a system of interrelated activities so that all persons (potential students, future employers, instructors, and support staff) have a thorough understanding of the program and its integral parts.

Revise guidelines to encourage strong recruitment and retention programs.

Collect data and use it to improve retention and recruitment programs.

Business Lends a Helping Hand

A first generation college student was able to complete her associate's degree in biotechnology with the active encouragement of an ATE mentor employed in biotech.

—Observation at a Principal Investigators' meeting

Comprehensive Program Improvement Demonstrated

The ATE *projects* are oriented to improvement of science, technology, engineering, and mathematics (STEM) in baccalaureate, associate degree, and feeder secondary programs. Use of standards to determine student competencies is universal. The use of work-based education as part of the curriculum is also common, but is not always a requirement. *Projects* integrate development of “soft skills” such as teamwork and critical thinking into their programs.

Program improvement is critical to ATE’s success. About two thirds of the *projects* are involved in such efforts, which are occurring at or are in collaboration with associate degree institutions. Many *projects* are developing articulated programs across educational levels. The majority of *projects* address course development and improvement in basic STEM, field-related, and technology-intensive courses. Less than a majority are engaged in development of field-based, certification, and distance courses, with the fewest in development of distance courses. Enrollment in all programs is increasing substantially.

The improved programs provide certification or award a degree as appropriate. At the associate level, there are usually multiple educational tracks to meet the needs of stu-

dents with a variety of backgrounds and goals. There are no common mechanisms for tracking students or using these sorts of data to assess program effectiveness.

ENHANCING PROGRAM IMPROVEMENT EFFORTS

Replicate successful articulation strategies.

Use advanced pedagogical approaches.

Emphasize field-testing and encourage the involvement of business and industry in pilot and field-testing of programs.

Gather program improvement production data and analyze these data in relation to U.S. requirements for skilled technicians.

ATE Provides Real-World Experiences

The ATE project “not only prepared me with great multimedia pieces for my portfolio, it also taught me how to work in a project-based environment assuming the different types of roles a project could require, as well as how to work with people in a team environment.”

—Graduate of Pasadena City College, AACC

Faculty/Teacher Professional Development Opportunities Abundant

Cutting-Edge Opportunities

Training in e-commerce through the Northwest Center for Emerging Technologies was provided for high school teachers and community college, 4-year college, and university faculty with contributions from Microsoft and Boeing.—AACC

A myriad of professional development opportunities are provided by the ATE *projects*. Participants include secondary school teachers and two- and four-year college faculty members. Conferences, workshops, and in-service courses are the most popular modes for professional development. Sessions are universally well attended and well received.

The benefits of professional development far outweigh the costs. As a result of the ATE program, many institutions have begun to think seriously about the need to both maintain the professional development begun during the ATE program and adapt to rapidly changing technologies. A challenge for the future will be to increase the breadth and depth of the approaches to professional development.

STRENGTHENING PROFESSIONAL DEVELOPMENT

For *projects’* institutions’ administrations to keep in mind:

Increase resources. Give faculty members time to attend courses and/or reimburse them for their time. Provide sufficient incentives to retain instructors after they have acquired upgraded skills.

Stay current. Keep colleges and faculty current in rapidly changing technological areas and provide up-to-date equipment for faculty and staff members.

Dissemination Pervasive

Dissemination is pervasive throughout the ATE program. A theoretical paradigm including two concepts from e-commerce—*integrated solutions providers* and *customer relationship management*—leads to a modern definition of dissemination—“the process of knowing your clients and systematically providing them, either directly or in partnership with other organizations, with knowledge, strategies, products and support that can enable them to better solve their problems and enhance their delivery of effective technical education.”

OPTIMIZING DISSEMINATION

Strengthen proposal expectations by adapting models developed for other similar programs.

Develop and share dissemination ideas. Develop strategies for sharing practices and evaluating impact (e.g., discussions at annual PI meeting, Website postings).

ATE Disseminates

Bio-Link is a virtual ATE Center that nationally disseminates biotechnology education programs through its regional centers, curriculum clearinghouse, virtual laboratory equipment, on-line courses, on-line job bank, and participation in national biotech industry meetings.

—Bio-Link Project Description

ATE Moves Toward Sustainable Outcomes

It appears that the ATE *projects* engage in many activities that will be sustained, including institutionalization. There are many factors that support this conclusion including diverse resources brought to bear on the *projects* and distributed power. Wide participation, clear purposes, and knowledge are often evident. Challenges to sustainability include information that is not always available or used to reward effort and inconsistent marketing and promotion.

MAXIMIZING SUSTAINABILITY

Clarify ATE program goals for sustainability and determine how to help *projects* achieve them.

Use a sustainability plan. Integrate sustainability strategies into ATE *project* work from the beginning.

Collect sustainability data. Place more attention on data collection to identify *project* components that should be sustained, to learn how to improve components, to provide information upon which to base rewards, and to convince others of the worth of the components.

A Sustainable Outcome

A mother who had just finished her associate’s degree through an ATE *project* proudly pointed out that her daughter was now beginning a technician program at the local community college.

—Observation at a Principal Investigators’ meeting

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ATE Evaluation Project: A National Science Foundation Project

Any opinions, findings, and conclusions or recommendations expressed in this report are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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ATE Evaluation Project Website

- Project information
- Contact information
- Products
 - Status Report 1
 - Status Report 2
 - Survey 2001 Report
 - Other products as available

ate.wmich.edu

National Science Foundation ATE Program Website

"improvement in technological education at the undergraduate and secondary school levels . . ."

- ATE Program Overview
- Proposal Deadlines
- Program Solicitation
- Related Documents
- Contact Information for Lead Program Directors
- Award Information

<http://www.ehr.nsf.gov/ehr/ate/programs/ate/>

Bookmarks for

Future

Reference

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