Assessing the Impact and Effectiveness of the Advanced Technological Education (ATE) Program

Survey 2001: The Status of ATE Projects and Centers

by

Arlen Gullickson, Frances Lawrenz, and Nanette Keiser

The Evaluation Center
Western Michigan University
Kalamazoo, MI 49008-5237

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Contributors

Project Director ..... Arlen Gullickson

Senior Associate ..... Frances Lawrenz

Senior Research Associate/Project Manager/Data Analyst ..... Nanette Keiser

Principal Authors ..... Arlen Gullickson
..... Frances Lawrenz
..... Nanette Keiser

Technical Specialists ..... John Kapenga
..... Joerg Ahrens
..... Guido Schutte
..... Daniel Teckentrup
..... LiPing Zhang

Research Assistant ..... Gloria Tressler

Consultant ..... Wayne Welch

Editor ..... Sally Veeder

Executive Summary

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INTRODUCTION

The 2001 survey is the second annual survey of the National Science Foundation (NSF) Advanced Technological Education (ATE) program[1]. Eighty-one (81) *projects*[2] (70 projects and 11 centers) were asked to participate in this survey[3]. The purpose of the annual survey is to describe the *project*s' efforts and impacts and thereby describe the ATE program. When combined with other information and criteria, these annual descriptive findings and indices provide a basis for judging the overall impact and effectiveness of the ATE program. Findings from the survey are expected to be useful to NSF staff in preparing their annual GPRA[4] reports and making programmatic decisions. ATE *projects* are likely to use survey results to learn about the activities and findings of other *projects* and to serve their own improvement needs.

At the time the survey sample was selected in October 2000, 123 *projects* were under way (i.e., currently in their grant-funding period). The 81 included in the survey sample were all *projects* that had been active for at least a one-year period. Ninety three percent of that sample, 75 *projects* (11 centers and 64 projects), completed and submitted survey responses within the prescribed time frame (February 20-April 9, 2001). The results and findings reported in this report are based on those 75 responses. A comparison of the findings from both years of the survey is also provided.

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[1]See the *Status Report 1* for descriptive information about the ATE program and the *Status Report 2* (http://www.ate.wmich.edu) for a report of the 2000 survey findings.

[2]The term "project" has double meaning for the ATE program. It is uniformly used by NSF to refer to all entities that receive funding, and it also it refers to smaller grant efforts. The ATE program labels its largest and most complex projects as centers. To provide clarity in referencing these groups, the term projects (unitalicized) will refer to the smaller grants, centers will refer to the subgroup of larger grants, and *projects* (in italics) will be used to refer to the full group of projects and centers.

[3]Ninety-six percent of the current sample (78 of 81 *projects*) was also in the 2000 survey sample. Conversely, approximately 70 percent of the *projects* sampled in 2000 were also in the 2001 sample. The 2000 survey sample contained all 113 *projects* that were active at the time of the survey. The 2001 survey was limited to *projects* that had been active for at least one year. Therefore, as the percentages show, the 2001 sample is nearly a subset of the 2000 sample.

[4]Government Performance Results Act. For current information about NSF's response to this requirement, see its web page at http://www.nsf.gov/od/gpra/

In both years, the survey form contained nine sections. All *projects* were asked to complete three sections–one that requested confirmation of general *project* information collected from other sources (e.g., name of Principal Investigator and the nature and duration of grant), one that addressed the NSF program staff's efforts to monitor the *projects,* and one addressing several overarching and general *project* issues. Additionally, each *project* was asked to complete one or more additional sections focusing on the four primary categories of work that the ATE program supports: collaborations, materials development, professional development, and program improvement. Those *projects* that responded to the program improvement category were asked to complete the section for each educational level (secondary school, associate degree, and baccalaureate) where improvement efforts were targeted.

SURVEY FINDINGS

The summary of findings for the nature and scope of activity of the ATE program for the two years covered by the survey are presented first to provide context for the more narrowly focused work sections. How ATE is meeting its goals is summarized in Finding 1. Findings 2-5 are organized around the work categories of collaborations, materials development, program improvement, and professional development, respectively.

Nature and Scope of Activity

There is strong year-to-year consistency in the main categories of the work conducted by the *projects* (see the table on page iii). Additionally, in each year, around 70 percent of these *projects* were involved in at least 3 of the 4 work categories. More *projects* were engaged in at least 2 of 4 work categories in 2001 than in 2000 (94% vs. 85%).

Within the program improvement category, the number of *projects* that reported engaging in at least 2 or 3 levels of program improvement (i.e., secondary, baccalaureate, associate) dropped by 20 percent in 2001 (from about half in 2000). This change may be a function of both small shifts in *project* directions and respondents' misunderstandings in responding to the survey in 2000 (i.e., some appear to have responded to items at educational levels not consistent with their actual program improvement efforts).

Materials development efforts were not separated on the survey depending upon purpose (e.g., commercial distribution or program improvement). However, based on the number of *projects* that filled out this section but did not complete the program improvement section, we estimate that approximately 20 percent of the *projects* focus on materials development for commercial dissemination.

Percent of *Projects* Engaged in the Four Work Categories–2000 and 2001		
Work Category	**Year 2000 Percent of *Projects***	**Year 2001 Percent of *Projects***
Materials Development	82	83
Collaborations	75	76
Professional Development	74	77
Program Improvement	63	67

Neither Congress nor NSF has specified what number or proportion of the ATE *projects* should be engaged in each of the identified work categories. Neither have they stated the exact nature of work necessary to improve the workforce capabilities of technicians in our nation. Without such specifications, we have not addressed these issues. Instead, the five primary findings that follow are largely descriptive and serve as a baseline and trends data from which future actions can be tracked and ultimately judged.

Finding 1. The *projects* have actively addressed the goals of the ATE program.

Four general indicators of *project* health were used for this determination. On every indicator, the findings were positive in both years of the survey.

1. *Projects* engaged in work that is consistent with the expectations of the ATE program as set forth in NSF guidelines and the general mandate of Congress. With the exception of two responding projects in 2001, every survey respondent in both years reported work in at least 1 of the 4 targeted work categories. In each year, more than 85 percent were engaged in at least 2 of 4 work categories.

2. Eight general health questions addressed outcomes-based factors for three of the four categories of *project* work in both years[5]. In each year, the results were positive on these eight factors–all responding *projects* were stable or increasing on the following factors:

    - General–staff size
    - Collaborations–financial support from other organizations and direct participation by other institutions and organizations
    - Materials Development–income from center/project-developed products and use of center/project-developed products

[5]Two questions addressing professional development outcomes were added in 2001. Both yielded positive findings.

- Program Improvement–students enrolled; students placed in related technical jobs, whether they completed program or not; and students graduating or completing the program

3. When respondents were asked to describe significant unintended outcomes (positive and/or negative) of their *project's* work, most responses given in both years were positive in nature.

4. The large majority of *projects* gathered data to better direct their efforts. In each year, more than 80 percent reported conducting needs assessments, and more than 80 percent reported employing evaluations to help guide their *projects* and/or ensure accountability of their efforts.

Finding 2. ATE *projects* have established a large number of collaborative arrangements. The collaborations serve multiple purposes and provide monetary support as well as other kinds of assistance for materials development, program improvement, and professional development efforts. These collaborations indicated substantial networking focusing on improving the number and quality of technicians in the nation's workforce.

In both years, the *projects* continued to establish many partnerships that served multiple purposes and provided monetary and in-kind support for the programs. In each year, the typical (average) *project* maintained more than 15 separate collaborative efforts with business/industry or other organizations or institutions. About a quarter of the collaborations were general in purpose (e.g., to provide advice, contribute time and effort beyond advice, and/or contribute or share equipment/technology) with the large majority serving materials development, program improvement, and professional development purposes.

In each year, more than 60 percent of the *projects* reported collaborations with four or more types of institutions (i.e., business and industry, public agencies, professional societies, secondary education, associate degree level education institutions, and baccalaureate degree colleges or universities). Projects indicated that their most prevalent type of collaboration was with business and industry (around 80 percent), followed by associate, secondary, and baccalaureate degree colleges or universities (at least 50 percent for each type). All the centers collaborated with four types of groups–business and industry, associate, secondary, and baccalaureate degree colleges or universities.

Looking at both years, the *projects* consistently rated the quality of their collaborations with business and industry, public agencies, educational institutions, and other organizations for the purposes of general support, materials development, program improvement, and professional development. Projects viewed these collaborations as good to excellent, while centers saw them as satisfactory to good.

In both years, *projects* reported leveraging NSF's funds with additional monetary and in-kind contributions from non-NSF sources. For every dollar provided by NSF, the *projects* reported increasing their working resources for the ATE program by 50 cents in 2000 and by 80 cents in 2001.[6]

Finding 3. ATE *projects* have developed many materials to support the preparation of technicians. These materials include modules (e.g., laboratory exercises) that can be incorporated into coursework and full courses and adaptations of courses.

The *projects* continued to develop a large number of instructional materials. In each year, more than 1,000 of these materials were reported in use at least locally. If one presumed all materials developed were used at least on a local basis, then in each year, at least 35 percent of these materials were used at sites other than the *projects,* and 11 percent were commercially published. It should be noted that some of these materials were modules versus course development or course adaptation. Thus, *projects* may have reported modules both separately and as part of course development or adaptation materials. The large majority of materials (80%) appeared to be oriented to the associate degree level, although *projects* reported that about 18 percent of the materials were targeted at the secondary level.

Most *projects* apply sound practices to determine content and try out their materials, but could focus more attention on comprehensive validation efforts (i.e., external field testing, use of concrete evidence). The reported efforts include:

- In both years, more than 65 percent of the projects and 75 percent of the centers reported that they either obtained verification by industry regarding alignment of materials with workforce and skill needs or used applicable student and industry-based standards or guidelines to guide materials development.
- In each year, more than 50 percent of the projects and 60 percent of the centers report applying one or more of five identified student measures of success to validate their materials each time materials are developed.
- More than 80 percent of *projects* reported that they pilot or field-tested within their own *projects* each or most times.
- About half of the *projects* reported conducting external field tests.

[6]Two factors probably contributed to this increase: (a) *projects* likely tracked their collaborations better for the 2001 survey, since these *projects* knew a year in advance that they must track this data and (b) the 2001 responding *projects*, because they had at least a year's work completed, tended to have more established collaborations than some of the 2000 responding *projects*.

- When asked to describe their most compelling evidence of quality for developed materials, the large majority indicated their reliance on reviews and statements of satisfaction by users rather than on concrete evidence based on collected data (e.g., student performance data).

Finding 4. Projects and centers report (a) improvement in their technician-based programs through constructing new courses, modifying existing courses, and taking steps to better serve students in matters of recruitment, retention, placement, and diversity and (b) a high proportion of students placed in technician positions and/or continuing their higher education.

Locus of Changes. In each year, approximately two-thirds of the *projects* report involvement in program improvement efforts. Nearly all program improvement efforts (more than 90 percent in both years) reportedly had their locus at associate degree institutions, with more than 33 percent at the secondary and 10 percent at the baccalaureate levels, respectively (not mutually exclusive categories). Slightly more than a quarter of involved *projects* engaged in multiple educational levels in 2001. These figures suggest that many *projects* are developing articulated programs across educational levels, chiefly between associate degree institutions and others.

Impact on Courses. Respondents were asked to identify a specific program at one location and provide program improvement information for this program for the past 12 months**.** For these courses, *projects* reported that 70 percent of their course offerings were under development or modification in 2001, a 16 percent increase over 2000.

The types of course offerings addressed by *projects* were consistent in both years. In each year, the majority of responding *projects* addressed course development and improvement in basic SMET (science, mathematics, engineering, and technology), field-related, and technology-intensive courses. Less than a majority engaged in development of field-based, certification, and distance courses, with the fewest in development of distance courses. Introductory technology course development and improvement increased 15 percent over 2000. Participant *projects* visited for our case study conducted in late 2000 and early 2001 shared with us that the interest generated by their programs had resulted in other departments requesting access to introductory technology courses. Such influences likely accounted for some of this increase. Because each respondent reported for only one program and one location at each educational level, undoubtably these findings substantially underestimate the total development and change effort. For participating *projects*, these findings suggest that there has been a major overhaul of the SMET and other course offerings.

Degrees/Certifications and Transfer of Credits. In both years, a large majority of the associate degree institutions provided either a technician degree or certification program; in each year, more than 40 percent provided both. In 2001, the percent of secondary institutions indicating that these two options were offered doubled (35

percent vs. 17 percent). This could have been the result of the *projects* implementing articulation agreements and/or better data collection and reporting.

In each year, a large proportion of institutions provided for transfer of credit across institutional types. However, educational institutions consistently provided for better transfer of courses within than across type of institution. More than 50 percent of projects and 60 percent of centers indicated that their credits transferred to higher institutions most or all the time. In both years, more than 65 percent of projects and 70 percent of centers reported that credits could be transferred to similar institutions (e.g., from one associate degree institution to another) most or all the time.

Increasing Enrollments. Student enrollments were addressed at two levels–*project* wide and for a selected instructional program within a *project*. By both measures, enrollments increased substantially from 2000 to 2001.

- For *projects* as a whole, average enrollments reported for the past 12 months more than doubled in the secondary and associate-degree-level courses (700 in 2001 vs. 244 in 2000 for secondary; 2,300 in 2001 vs. 915 in 2000 for associate).
- When viewed for the within-*project* specified program conducted during the last 12 months, *projects* reported that their average enrollment rose substantially in 2001 (e.g., 94 to 160 students at the associate degree level). In these specified programs, the average number of program completers also increased from 43 to 58 in 2001.
- Representation of women and minorities held steady in both years. Around 30 percent of enrolled students were women, and more than 35 percent were minority at the associate degree level institutions.

Recruitment, Retention, **and Placement**. Recruitment efforts reported by the *projects* were similar in both years. Many were tied to existing efforts at the institutions where the programs were housed. *Project* responses indicated that their recruitment efforts had mixed results in matters of increasing the diversity of the workforce. Various strategies were identified, and some *projects* focused on recruiting underrepresented groups, while other *projects* reported no recruitment efforts.

In each year, more than 50 retention strategies were reported by the *projects*. Three general strategies emerged for these efforts–tutoring, financial support, and academic advising/counseling.

The proportion of students who took technician positions upon completion of their programs dropped, from 73 percent reported in 2000 to 46 percent in 2001. However, the proportion of students who continued their education remained around 30 percent (not mutually exclusive categories) in both years. Whether this drop in the proportion of students placed in technician positions was due to the recent economic downturn in the technology sector or other factors (e.g., more students in the first year of a 2-year

degree program in 2001 than in 2000; students taking jobs before completing their programs) remains to be determined. *Projects* continued to identify various activities to assist with placement or to indicate that placement support was not needed because their graduates and/or students were in such high demand.

Finding 5. *Projects* have conducted large numbers of professional development activities for faculty. These activities are well attended and well received.

Types of Offerings. In 2000 and 2001, conferences, workshops, and in-service courses remained the most popular modes for professional development. While the number of *projects* reporting remained relatively constant in both years of the survey, the reported number of these large course offerings dropped from 648 to 475 in 2001. Most of this drop can be attributed to workshops–two centers reported having 140 fewer workshops in 2001 than in 2000. The number of conferences and in-service courses remained relatively constant at around 125 and 110, respectively.

Participation. Professional development opportunities continued to attract many participants and were well attended and received. In both years, the large course offerings were well attended with a median of around 20 individuals for projects and about 130 for centers. Most participants were from associate degree granting institutions (medians of 14 from projects, 100 from centers), followed closely by secondary faculty (medians of 10 from projects, 30 from centers). Regarding how full their professional development opportunities were in both years, more than 75 percent of the projects reported they were at least at 75 percent capacity, and more than 90 percent of centers reported this level of capacity.

Satisfaction, Follow-Up, and Implementation. Over both years of the survey, *projects*' professional development participants reported high levels of satisfaction with the professional development opportunities. However, less than a majority of the *projects'* professional development participants reported trying out materials, and fewer than a third of these participants reported incorporating what they learned into their classrooms.

Most *projects* reported providing support to their participants in both years and consistency in types of support provided, which included technical assistance, materials, and financial support. In each year, fewer than half the *projects* reported asking participants' local institutions for support. However, of those who asked, the large majority reported that such assistance was provided. Most *projects* did not report direct follow-up of their professional development instruction. In both years, fewer than half of the *projects* responded to our questions pertaining to matters of trial and implementation. This suggests that a large proportion of the *projects* either failed to provide such follow-up or failed to assess the effects of their efforts.

STRENGTHS AND SUGGESTED IMPROVEMENTS

While largely descriptive, the survey's five primary findings suggest *projects* are strong and highly productive. These five findings appear to coalesce into three main points.

1. Strong consistency with the ATE program's mission
2. Substantial productivity in collaborations, materials development, program improvement, and professional development
3. Substantial increases in course and program enrollments

Along with these strengths, we note two points where we believe the ATE program can be improved:

1. *Projects* should conduct strong field tests of their products.
2. *Projects* should follow up professional development activities to assure implementation of ideas and materials at the local level and require local support as a requirement for participation in their professional development programs.

In part, these are matters of dissemination/implementation. In part, they appear to be tied to evaluation. For example, validation of developed materials is a strong evaluation matter. One also expects that *projects*, in their professional development efforts, will evaluate, collect data, and report findings that can show the extent of *project* follow-up and local support for implementation. We encourage *projects* to more effectively employ evaluation to meet these project needs.[7]

We suggest taking three steps to address the issues identified here. First, review the *ATE Program Guidelines* to be published for the coming years and directly identify these issues as matters of importance to be addressed in *project* proposals. Second, alert the National Visiting Committees to look for and address these issues when they occur at the *project* level. Third, many of these issues appear to require common or at least comparable data collection practices across *projects*. *Projects* can be encouraged to collaborate, develop, and share ideas and materials that can effectively address these concerns.

[7]Our companion site visit findings confirm survey findings. These findings indicated that the methods employed for data collection for evaluative and accountability purposes (e.g., number of students enrolled, number of students completing or graduating, number of students that gained credit for articulated courses, follow-up on how professional development opportunities were implemented) were not as frequent or as useful as they could be in assisting the various ATE *projects*.