

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

2004 Survey Results

Volume III Status of ATE Projects and Articulation Partnerships

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Executive Summary

The Advanced Technological Education (ATE) program is a federally funded program designed to educate technicians for the high-technology disciplines that drive the United State's economy. As stated in the ATE program guidelines,¹ 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.

ATE funds three program tracks: projects, centers, and articulation partnerships. This report, Volume III of the 2004 ATE Annual Survey Report, addresses findings from two of the three program tracks, projects and articulation partnerships. The report focuses on the following fundamental elements of the ATE program:

1. What is the size and scope of work for ATE projects?
2. To what degree do ATE projects apply rigorous internal practices in their operations?
3. How extensive are ATE project collaborations?
4. How productive are ATE projects in terms of the primary ATE work categories?
5. What impact are ATE projects having on students?

These questions are keyed to the primary evaluation indicators used to monitor the performance of ATE grantees. Additional questions, specifically, the relative contribution of ATE centers as compared with the ATE projects, are addressed in Volume I of this report and through other evaluation products.

The 2004 ATE Survey contained seven sections—three required and four supplementary. The three required survey sections were (1) grantee characteristics, (2) organizational practices, and (3) collaboration. Projects were invited to complete supplemental sections based on their program's efforts. These sections were directly aligned with the primary focus of ATE efforts: (1) materials development, (2) professional development, (3) program improvement, and (4) articulation agreements.

One hundred fifty-four ATE grantees responded to all or portions of the 2004 ATE Survey. Of these, 125 (81%) were ATE projects and 8 (5%) were ATE articulation partnerships; the remaining 21 (14%) were ATE centers. This large number of projects is reflective of the mix of ATE program awards, that is, a relatively large number of projects are funded in comparison to centers and articulation partnerships.

¹ Advanced Technological Education (2002). *Program Solicitation NSF-02-035*.

Size and Scope of the ATE Projects

The ATE projects and articulation partnerships are widely distributed across the United States. Most projects, 74 percent, were hosted by 2-year colleges. Projects predominantly engage in professional development for educators (81%), followed by materials development for national dissemination (68%), program improvement efforts (65%), and articulation between programs (54%). More than one-third of projects engaged in all 4 of these activities, while another one-fourth engaged in a combination of 3. These projects encompassed the complete range of ATE-specified technology fields. The predominant technological disciplines emphasized were IT/telecommunications, manufacturing and industrial technology, and "other" technological fields (which primarily emphasized teacher preparation).

Internal Practices

Seventy-six percent of projects report having at least one type of advisory committee, whether local, national, or regional; approximately \$4,000 was spent annually on advisory committee activities per project. More than two-thirds (70%) of projects have conducted assessments of workforce needs. Of these, one-fourth (25%) had conducted an assessment of workforce needs in the past 12 months, almost half (45%) reported that their workforce needs assessments had been conducted more than 12 months ago, and one-third (30%) of projects and articulation partnerships had never conducted a workforce needs assessment. Ninety percent of respondents reported having an evaluator(s), either an external or internal evaluator, or both. These projects spent slightly more than 3 percent of their total award for evaluation activities annually. A majority (98%) of projects reported engaging in at least 1 type of monitoring interaction with NSF. Most (90%) indicated that they interacted with NSF through the annual PI meeting, and the majority (89%) also indicated e-mail contact with NSF.

Extent of Project Collaborations

Nearly all (89%) projects reported having at least 1 type of collaborative partnership, whether with other ATE grantees or non-ATE institutions. A total of 3,248 collaborative partnerships were reported. Of these, 116 collaborative partnerships were reported with other ATE grantees and 3,132 were with non-ATE institutions (e.g., business and industry, other educational institutions, host institutions). Generally, each project collaborates with 3 other ATE grantees and 30 non-ATE partners. Both ATE and non-ATE collaborations provided monetary and in-kind support to the ATE projects.

Collaborating institutions and organizations provided slightly more than \$9.5 million in external support, \$4.3 million in monetary support, and \$5.2 million in-kind. In comparison, these projects received a total of \$67.9 million in NSF funding. A small relationship ($r = .294$, $p = .01$) between external support (monetary and in-kind) and award amount was found, suggesting that projects with larger NSF awards were more successful in leveraging external support. Other education institutions provided the bulk of both monetary (54%) and in-kind (57%) support to ATE projects. In addition to monetary and in-kind support, projects most frequently reported that collaborative

purposes were for general support, whether with other ATE grantees or non-ATE institutions.

Project Productivity in ATE Work Categories

Taken as a whole the ATE projects are producing large quantities of materials, providing professional development opportunities for educators, developing programs across numerous locations and education levels, serving students, and providing students pathways to higher level technician education. For each category one to two project are outliers, providing a large proportion of the impact.

- Sixty-eight percent of respondents reported developing materials in the past 12 months. These materials consisted of 2,306 courses, modules, and other materials. Of these, almost half (48%) were developed by 2 projects, which produced a total of 1,102 materials (primarily modules—print, online, and audio/video). Setting the 2 major producers aside, the average project produced about 12 material items in the past year. Our primary indicator of materials productivity—number of materials disseminated—saw similar trends; of materials distributed, a single project accounted for 16,000 (57%) of the total of 27,893. Excluding the single highly productive project, the average project disseminated an average of 134 materials.
- Eighty-one percent of respondents reported engaging in professional development activities. Of the 12,128 project professional development participants who attended 2,017 project-sponsored events, 1,870 participants were the result of 2 projects (720 and 1,150 respectively). These 2 projects reached 15 percent of the total professional development participants with only 7 combined events. Setting those 2 projects aside yields an average project per year professional development participant rate of 83 persons.
- Sixty-five percent of projects reported program improvement efforts. Almost half (48%) of projects focused their program improvement efforts exclusively at the associate level. Respondents reported offering 273 ATE-funded programs, consisting of 905 courses across 549 locations. A single project accounted for 12 percent of these programs, courses, and locations combined. Setting that 1 project aside, the typical (average) project profile consists of approximately 2 programs, 8 courses, and 5 locations. Our primary indicator of program improvement productivity, number of unique students taking at least 1 ATE-program course in the past 12 months, returned similar results; 3 projects accounted for 9,537 (47%) of the 20,080 students who have taken at least 1 course in the past 12 months. The average project reached 127 students per project.
- Articulation activities occurred both in projects funded specifically to serve articulation (i.e., articulation partnerships) and projects that engaged in articulation efforts among other foci. Of the 54 percent of projects responding, the large majority (66) were regular projects with only 6 having received funding as articulation partnerships.

Combined, these projects reported a total of 295 articulation agreements across 517 institutions, which served matriculation needs for 1,001 students in the past 12 months. Most agreements (57%) were between high schools and 2-year colleges, while one-third (31%) were between 2- and 4-year colleges and 1 in 10 (11%) were for purposes of teacher preparation—high schools to 2-year colleges. Each type of agreement served approximately 300 students. Five projects accounted for 410 (41%) of the articulating students. Of the 5, one was an ATE articulation partnership.

Three aspects suggest that articulation partnerships approach articulation differently and more productively than projects generally:

- *Articulation partnerships create fewer agreements.* On average, projects reported engaging in seven articulation agreements, while articulation partnerships reported an average of one.
 - *Articulation partnerships partner with more institutions per agreement.* Of these agreements, *projects* reported partnering with an average of 13 other institutions. Articulation partnership projects reported an average of 21 partnerships with other institutions, almost twice the number reported by projects.
 - *On average, each articulation partnership project is 3 times more productive than its project counterpart.* The average project assisted 26 students in matriculating to higher level technological education programs in the past 12 months, while each articulation partnership project served an average of 83 students.
- Regardless of how many categories of work a project engages in, high productivity is likely limited to just one. However, a project's attention to multiple categories, up to three, appears not to be a factor in project productivity. Among those projects reporting work in all four categories, only a small percentage (10%) had greater than average productivity in any category.

Student Impact

Eighty-six projects (65%) reported on student enrollment questions. Their responses indicate that more than 20,000 students participated (took at least 1 course) in their programs during the past year. Both application/enrollment and retention data indicate strong student interest in the program. During the year more than 9,661 students applied to these programs, and 8,152 new students were enrolled across all education levels. Overall, the number of students completing project programs exceeds those who fail to complete (drop out) by an almost 3:1 ratio. Program participation was greatest for associate degree students (46%), quite large for secondary students (35%), but included much smaller numbers of on-the-job (14%) and baccalaureate students (5%). Of these students, 1 in 10 was employed as a technician prior to enrollment.

Three additional factors are key program indicators:

- ❑ The program serves as an education beginning point, rather than an end point. Upon program completion nearly all students (94%) started or continued STEM education. Even for those who left the program prior to completion, more than half (57%) started or continued STEM education.
- ❑ Immediate impact on the technician workforce is visible in two ways. More than a quarter of program completers (28%) started or continued employment as technicians. Also, among those who left the program prior to completion, a third (33%) started or continued technician employment
- ❑ Participation by women and minority groups remains lower than desired. Approximately a third of the students fit into each of these groups. Thirty-two percent of ATE-program students are female and 31 percent are minority.

Overall Assessment

The introduction to this report identified five key questions or issues to be addressed. The ensuing sections reported on each of the five points. Here we provide general judgments across those five points. As reported more specifically below, we judge the program's projects'-based performance to be sound. We've judged two indicators to be fully positive, two as positive but with one or more caveats attached, and one as partially positive.

The first point produced a split judgment. The ATE program guidelines call for 2-year institutions to take the lead in ATE projects. This expectation is met; 74 percent are hosted by 2-year institutions. The guidelines also state that "projects should narrowly focus on one or more of these activities [primary work categories]." That guideline is not well met; nearly two-thirds of the projects have broad scopes, where we defined broad to be at least three of the four work categories. However, even among projects with large scopes, substantial productivity is almost always limited to a single area.

The second point is positive, but includes two general worries. ATE guidelines include a number of factors that together address issues of project management. Our findings indicated that projects generally meet these expectations for project management. These expectations include interactions with NSF program staff, needs assessments, and evaluative efforts. However, the fact that nearly a third did not base their work on needs assessment seems larger than desirable. A second point of concern is that projects on average spent 3 percent of their budgets on evaluation. That figure is well below the recommended amount of 5 to 10 percent of project budget (*EHR/NSF Evaluation Handbook*). This suggests that although project management efforts are in place, at least by two indicators, less attention/support is given to them than NSF deems optimal.

The third point is uniformly positive. Project collaborative efforts are extensive. While the survey data do not provide indicators of quality, 3 facts combine to suggest that this is a program strength. First, nearly all projects collaborate with other organizations and institutions. Second, monetarily, collaborators add approximately 14 percent to the overall ATE project budgets for the year. Third, the typical project reaches out to a very

large number of collaborators (approximately 30 non-ATE funded institutions or organizations) to achieve project objectives. These factors of involvement, added support, and reach provide a substantial basis for strengthening the productivity of the ATE program.

The fourth point, project productivity, yielded uniformly positive indicators. The projects produce large numbers of materials, engage large numbers of teachers in professional development, produce changed (improved) programs and courses in many locations, and provide articulation arrangements to facilitate large numbers of student matriculations across academic levels.

The fifth point, regarding student impact, shows that projects do reach large numbers of students to provide technician education courses and programs. These programs appear to stimulate further STEM-based study. While most students continue their educations rather than immediately beginning or continuing work as technicians, large numbers do work as technicians. Impressive as these numbers are, the two figures related to gender and ethnicity indicate that the program is not doing better now than in previous years in its attempts to bring technician education to these two important groups.

Recommendations

In large measure the ATE program's efforts related to projects appear to be on target. This suggests that the program should continue its current course. The suggestions below should be treated as items to explore rather than as mandates for change.

1. *Encourage the ATE projects to narrow their focus of work activities.* Approximately a third of the projects attempt to address all four categories of project work: materials development, professional development, program development, and articulation partnerships. That number is quite high given the program expectation that projects have a narrow focus. The lower level of success among the projects supports narrowing the focus a bit. We encourage limiting projects to three areas of emphasis at most, with clear priority given to one. Our findings suggest that strong success is usually in one area, and the added impetus may help projects plan better for success.
2. *More strongly encourage the ATE projects to conduct assessments of workforce needs.* One way to do this is to include needs assessments as part of evaluation expectations for projects. Including such needs assessments certainly can be accommodated without stressing the evaluation budgets of the projects (at least not beyond recommended NSF bounds). These assessments likely will strengthen the projects and the program as a whole, since timely knowledge of the local, regional, and national workforce needs will guide and inform project efforts across all program-related activity areas (e.g., materials development, program improvement).
3. *Encourage studies of recruitment and retention of female and minority students.* In this and previous reports we have consistently noted the difficulties in meeting the challenges of gender and ethnicity recruitment. This continues to be an area of

program underachievement. We are not sure what additional steps should be taken. We encourage study (research) of this problem. Perhaps this is an area where collaborative relationships, an area of program strength, can be employed in conjunction with this focus to improve results.