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

2004 Survey Results

Volume I
Evaluation of the ATE Program Design

Carl E. Hanssen and Arlen R. Gullickson

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

September 2004

Contributors

Principal Authors ..... Carl E. Hanssen
..... Arlen R. Gullickson

Principal Investigator ..... Arlen R. Gullickson

Senior Associate/Co-Principal Investigator ..... Frances Lawrenz

Project Manager/Co-Principal Investigator ..... Carl E. Hanssen

Research Assistant/Data Analyst ..... Chris L. Coryn

Editor ..... Sally Veeder

Executive Summary

This report presents results from the fifth annual survey of Advanced Technological Education (ATE) projects, centers, and articulation partnerships. ATE has approximately 220 active awards. Of these, 163 ATE-funded projects, centers, and articulation partnerships were asked to participate in the 2004 survey. During the survey administration period, 5 projects were removed from the sample, resulting in a final target sample of 158 grantees. Of these, 154 (97%) responded to all or portions of the survey.

Data from this and previous years' surveys show that the ATE program is being implemented as intended by its designers and that it is making a substantial impact in its target areas—materials development, professional development, and program improvement. Volumes II and III of this report detail the roles that ATE centers and projects, respectively, have played during the past 12 months in terms of their activities and productivity.

Where Volumes II and III focus on program implementation and accomplishments, this volume examines the program's primary design elements. Here the intention is to help program officers and others determine what design aspects of the program work most effectively and identify ways in which to continue to strengthen the program. *This volume does not focus on determination of merit or worth of the program itself.*

This volume of the 2004 survey report examines the ATE program from the perspective of 4 significant program design elements. These elements are described in the ATE Program Solicitation (NSF-02-035) and are enumerated below.

1. ATE primarily impacts *associate* degree-level institutions, but also is designed to impact *secondary* schools and *4-year* colleges.

2. ATE funds targeted *projects*, but also funds comprehensive *centers*

3. ATE projects and centers *collaborate* with other institutions to achieve their objectives.

4. ATE funds *articulation partnerships* that specifically create pathways to higher education for secondary and two-year college students.

The following key evaluation questions guided this report:

> Does the ATE program design, as enumerated above, have merit in terms of promoting program goals? If so, what evidence supports the design? If not, what are plausible design alternatives given the available evidence?

For this report, we limited the evidence for answering the key evaluation questions to analysis of the data collected from the 2004 annual survey. These data represent a point-in-time accounting of productivity by ATE grantees in each of the primary program activities. These data include information about program outcomes through measures of *impact* in three areas:

- materials development (number of materials disseminated and cost per material item disseminated)

- professional development (number of persons reached for professional development and cost per person reached)

- program improvement (number of institutions reached and number of students reached)

These measures were derived from items on the 2004 annual survey. As a result, none of our measures addressed quality, effectiveness, or sustainability of the efforts of ATE projects, centers, and articulation partnerships. Also, it is important to understand that measures of productivity reflect activity for the 12 months immediately prior to the survey administration period, i.e., roughly March 2003 through April 2004.

For each of the four program aspects we raised questions and looked at correlation findings that suggest answers. *Because our findings are based on relationships (e.g., correlations), they should be used with care.* However, we believe that these results provide valuable descriptive information about the program's design and suggestions for actions that can impact overall programmatic directions and results.

Location of Attention: Associate, Secondary, and Baccalaureate Impact

Question: Which education levels receive ATE program support?

Answer: The associate degree level gets most support. Impact occurs at all three levels: most at the associate degree level followed by secondary schools and baccalaureate institutions. Baccalaureate institutions are a distant third in both program emphases and impact.

Associate degree institutions by far receive the greatest attention in each of the primary program areas—materials development, professional development, and program improvement—with upwards of 80 percent of grantees working at the associate degree level. This is consistent with the Congressional mandate to the program.

A second perspective on impact across education levels is seen in the proportion of program impact in each area. Our findings indicated that 80 percent of materials development efforts and three-fourths of the students impacted are at the associate degree level. However, less than half of professional development participants and institutions impacted were at the associate degree level. In these latter categories,

impact at the secondary level was comparable to that at the associate degree level. In all categories, impact at the baccalaureate level was substantially less than at the other levels.

Question: Is the impact made by projects and centers in each program area related to the number of different education levels where they work?

Answer: It depends. Grantees engaged in materials development make a proportionally greater impact if they focus on one education level. Grantees engaged in professional development make a proportionally greater impact if they focus on all three levels; and grantees focused at two adjacent education levels are proportionally the most successful in directly impacting students.

Our findings suggest that depending on a grantee's area of focus—e.g., materials development versus program improvement—working at different education levels can be advantageous or disadvantageous. For example, materials development impact, in terms of distributing copies of materials, is proportionally the greatest for those grantees that work to develop materials at one education level. Conversely, professional development impact, in terms of number of participants, is proportionally greatest for those projects that work across all three education levels. Grantees that work at two adjacent education levels tend to demonstrate a proportionally smaller impact in materials distributed and professional development participants and a proportionally greater impact in the number of students impacted.

Type of Award (Projects vs. Centers)

Question: What is the relative impact of ATE projects and centers with respect to productivity in each of the ATE program areas?

Answer: Projects produce greater total impacts, but proportionally, centers are more productive when aggregate funding for projects and centers is considered.

Centers received a bit more than a third of total funding provided to ATE grantees—$36.3 million for centers versus $68.9 million for projects. They produced about one-fourth of the impact for the outcome related to dissemination of materials, but produced nearly half of the impact in professional development and program improvement measures. Center results are much stronger than those of projects in terms of total student impact—57 percent versus 43 percent.

Question: Are centers or projects more cost-effective in directly impacting students?

Answer: Centers appear to be more cost-effective than projects in impacting students.

We focused on direct student impact (i.e., number of students enrolled in at least one ATE-supported course) in evaluating the cost-effectiveness of projects and centers because this is the best available measure to assess whether or not ATE is making a

direct impact on the workforce. Our analysis showed that when funding for the most recent 12 month period is considered, centers impact more students per NSF dollar spent—centers are awarded roughly $400 for each student impacted, while projects receive in excess of $1,000 for each student impacted.

Question: Is the impact made by projects in each program area related to the number of different program activities in which they engage?

Answer: It depends. Projects engaged in materials development make a greater impact if their activities are more focused. However, professional development and program improvement impact does not appear to be related to the number of activities in which a project is engaged.

Given that projects, overall, appeared to make a proportionally lower impact and were less cost-effective than centers, we hypothesized that this may be due to projects attempting too many different activities given the limited ATE funding they receive. We referred to this issue as specificity of purpose. However, our findings suggest that the benefit derived from specificity of purpose is not pervasive across program areas and that it may be related to the emphasis of an ATE project. For example, projects that focus on materials development appear to be more productive in distributing their materials if they are focused on one or two program activities. Conversely, projects that focus on professional development or program improvement appear to be more productive if they focus on three or four different program activities.

Number and Types of Collaborations

Question: What is the relative impact of collaboration (number of collaborators and monetary and in-kind support received) on project outcomes?

Answer: The number of collaborators is positively related to impact, as defined in our analysis.

We found that the total number of collaborators predicts from roughly 10 percent to a third of the variance for several impact outcomes (Pearson r correlation coefficients are reported; r^2 equals proportion of variance accounted for):

Regarding Materials

- total number of copies of materials distributed by a project ($r = .31$, $p = .018$)
- number of institutions using at least one material ($r = .58$, $p = .000$),
- the self-perception that a project is successful in achieving the ATE program goal of national distribution of developed materials ($r = .32$, $p = .003$)

Regarding Professional Development

- the total number of professional development participants ($r = .50$, $p = .000$)

Regarding Program Improvement

- the total number of students impacted ($r = .31$, $p < .01$)
- the extent to which the project perceives its work as a model for program improvement ($r = .23$, $p < .05$)
- the extent to which the project perceives that its program is being broadly disseminated ($r=.25$, $p < .05$).

Neither monetary nor in-kind support helps explain variability among numbers of (a) materials disseminated, (b) persons reached for professional development, or (c) number of students reached for instruction.

Question: Is impact related to the types of organizations with which the project collaborates?

Answer: Yes.

Each of the three productivity measures is significantly related to the types of collaborating organizations (the fourth measure, institutions, was not related to numbers and types of collaborators). Materials distribution, professional development participants, and students impacted are predicted with R-squares of .69, .77, and .32, respectively. Standardized regression coefficients from this analysis indicate that the nature and strength of these relationships vary markedly across the three dependent variables. Those findings indicate that

- Projects with more collaborators among other ATE awards disseminate more materials.

- Projects with large numbers of collaborators within their host institution and among other education institutions had larger numbers of participants in their ATE-sponsored professional development activities.

- Projects that directly impacted large numbers of students had larger numbers of collaborations with other education institutions.

Perhaps the most striking aspect of these findings is that collaboration with business/industry does not help to predict any of the three dependent variables. The caveat on this is that none of the impact measures used in this analysis addressed quality, effectiveness, or sustainability. Some of our other findings suggest that collaborations with business and industry primarily serve as means to improve the quality of materials and content for instructional programs. That is, business and industry collaborations may serve other outcomes than those reported here.

Question: How can the amount of collaboration be increased?

Answer: Both award size and advisory panel investment are modest predictors of the level of collaboration.

Because the nature and amount of collaborations are positively related to higher levels of program impact, as defined in this study, we examined several organizational factors in relation to levels of collaboration—i.e., number of collaborators and the amount of monetary and in-kind support. They were (1) the total amount of grant funding, (2) the maturity of a particular grant, (3) investment in advisory panel activities, and (4) investment in evaluation. We hypothesized in this analysis that higher levels of each organizational practice indicator would be related to higher levels of collaboration.

We found that award amount is positively related to the number of collaborators ($r=.45$, $p<.05$), amount of supplemental monetary support received ($r=.26$, $p<.05$), and amount of in-kind support received ($r=.30$, $p<.01$); this is consistent with our hypothesis. Additionally, the investment in advisory panels was found to be modestly related to the number of collaborators ($r=.24$, $p<.05$); and both investments in advisory panels ($r=.30$, $p<.05$) and evaluations ($r=.30$, $p<.05$) were modestly related to amount of monetary support.

This group of factors, while small in amount of variance accounted for, does give some indication of ways to bump up collaborative efforts. For example, these findings suggest that there is merit to the argument that larger projects and centers are better able to leverage their ATE grant funds to attract additional support and that investment in advisory panels and evaluation may contribute to additional funding opportunities, perhaps through the network established by an advisory panel or the evidence of impact and effectiveness developed by an evaluator.

Articulation Partnerships as Pathways for Student Progress

To date, a relatively small number of articulation partnerships have been funded—8 of 154 respondents to this year's survey fell in this category. However, results from this year's survey clearly show that many traditional projects and centers are engaged in establishing articulation agreements even though they are not specifically categorized in this program track. We used those other projects and centers as comparison points for the articulation partnerships.

Question: What is the relative contribution of articulation partnerships, versus projects and centers, in promoting articulation of students between 2-year and 4-year colleges?

Answer: Their contribution is greater than would be expected from their small number of grants.

Articulation partnerships received 3 percent of the total funding awarded to ATE grantees that reported on the creation of articulation agreements (projects received 59 percent and centers 38 percent). However, articulation partnerships make a disproportionately large impact in terms of involving institutions (12 percent of impact)

and impacting students (17 percent of impact). This is despite having a relatively small number of agreements in place.

Question: Do articulation partnerships offer any cost benefit advantage over articulation agreements established by projects and centers?

Answer: Preliminary findings suggest that articulation projects are a good value in terms of students articulating across education levels.

We examined the cost-effectiveness of articulation partnerships, projects, and centers in terms of (1) establishing agreements and (2) impacting students. This analysis is based on our sample where articulation partnerships and projects were, on average, funded for 2.9 and 3.1 years, respectively, while centers received funding for an average of 3.3 years.

Findings show that articulation partnerships are the most cost-effective mechanism in terms of impacting students, receiving $3,600 for every student impacted versus $24,600 for projects and $20,000 for centers. However, agreements created by partnerships reportedly cost more to create—an average of $120,000 versus $93,000 for projects and $52,000 for centers. That high cost per agreement is more than offset by the much greater productivity in terms of students articulating under these agreements.

These findings support the idea that grantees that receive smaller amounts of funding are able to be more productive in a given program area by focusing on fewer activities. Of course, this was the rationale for creating a specific program track to promote articulation of students across education levels and, in this sense, articulation partnerships are unique within the ATE program in that they are expected to be narrowly focused.

Conclusions and Recommendations

Our analysis, which is summarized above and presented in more detail in the main body of this report, enabled us to draw two overarching conclusions about the ATE program design. The first conclusion addresses an issue we call “critical mass”; the second deals with collaboration. Each is discussed below along with what we believe are justifiable recommendations.

Critical mass. The concept of critical mass, as we choose to operationalize it here, refers to the intersection of funding levels and specificity of purpose. In turn, specificity of purpose incorporates two elements—program activities and location of attention (i.e., work in multiple program areas and work at multiple education levels). In theory, these concepts are inversely related in that greater levels of funding can enable broader programming at multiple education levels, while lower funding levels require greater specificity of purpose, both in programming as well as location of attention.

Our analysis supports the assertion that the concept of critical mass is an important consideration for the ATE program. Furthermore, critical mass may be more or less important for individual grantees, depending on the program activities in which a project or center chooses to engage.

The evidence for this conclusion is summarized below:

- A relatively small number of centers, which individually receive large amounts of funding but overall receive little funding, is proportionally more productive than the large number of projects, which individually receive small funding amounts.

- By a factor of 2.5, centers appear to be more cost-effective than projects in directly impacting students ($1,000 per student for projects versus $400 per student for centers).

- Articulation partnerships, which were established on the premise of specificity of purpose, make a disproportionately high impact on students given the amount of funding they receive.

- Materials development productivity is proportionally greatest for those projects engaged in one or two activities and for all grantees if they are focused at only one education level.

- Professional development productivity is proportionally greatest for projects engaged in three or four activities and for grantees that work across all three education levels.

- Direct student impact is proportionally greatest for projects that work at two education levels and for grantees that work across all three education levels.

These findings suggest that the ATE program could possibly make a greater impact if it were able to provide larger amounts of funding to each grantee and if it encouraged grantees to limit their activities and target their efforts in relation to their primary goals and objectives (i.e., materials development, professional development, direct student impact, or articulation agreements). Of course, we understand that if overall program funding levels are held relatively constant, this recommendation could mean a reduction in the number of grants awarded under the program—which may not be politically feasible.

Notwithstanding the above, there is substantial evidence to suggest that achieving critical mass within an individual grant, either through boosting funding or strategically limiting activity and targeting efforts, produces greater impact.

Collaboration. The ATE program has long stressed the importance and value of collaboration toward achieving program goals. The analysis in this report supports that

position and provides strong evidence that positive relationships exist between the number of collaborators and various measures of productivity, as defined for this report. Based on this, we recommend that ATE continue to stress the importance of collaboration, provide mechanisms to encourage and facilitate collaboration, and hold grantees accountable for establishing and maintaining positive collaborative relationships.

Coupled with the above finding is evidence that suggests collaborations with various types of institutions are predictive of productivity in different program areas. Thus, depending on a particular grantee's area of focus, it may benefit from focusing collaborative efforts on a particular type of institution. We should stress that these findings are preliminary and have been influenced by outlier data points. However, the findings also have strong face validity, which suggest that there is merit to the analysis. Given this, we would recommend that ATE share these findings with ATE grantees and investigate the nature of collaborative activities with different types of institutions to determine the degree to which some relationships are more or less beneficial given a particular program focus.

Lastly, there is evidence to support the conclusion that investments in advisory panels and evaluation are positively related to levels of collaboration. We recommend that ATE establish clear expectations that ATE grantees make dedicated investments in both advisory panel activities and evaluation. While the ATE program has long recommended and expected that grantees plan and implement these activities, there has not been a similar emphasis on what constitutes an appropriate investment in these activities. Our recommendation is that ATE grantees assign financial resources to these activities that demonstrate their commitment to these activities. For advisory panels, this may constitute budgeting for honorariums and all meeting expenses. For evaluation, this means, as a rule of thumb, budgeting between 7-10 percent of the grant for evaluation purposes.