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SURVEY 2002: THE STATUS OF ATE PROJECTS AND CENTERS

INTRODUCTION

This third annual survey[1] of *projects*[2] describes these *projects'* efforts and impacts and through them provides insights to the parent National Science Foundation's (NSF) Advanced Technological Education (ATE) program. When combined with other information[3] and criteria, these annual descriptive findings and indices provide a basis for judging the overall impact and effectiveness of the ATE program. Findings from this 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.

Presently, ATE has approximately 200 active *projects*. Seventy-six (76) *projects*[5] (67 projects and 9 centers) that were active (i.e., were currently in their grant-funding period) for at least 1 year at the time of the survey in early February 2002 were asked to participate. One hundred percent completed and submitted survey responses within the prescribed time frame (February 11-April 17, 2002). Findings based on the 76 responses received in 2002 and comparisons across the 3 years of the survey will be presented in the Survey Findings section of this report.

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[1]The first survey was conducted in May 2000 (n=113) and the second in February 2001 (n=81). The substantially smaller 2001 sample number was due to a change in our sampling rule. In 2000, all current *projects*, except those that participated in the survey walk-through pilot process, were included in the sample. In 2001, only current *projects* that had been funded for a period of at least 12 months were included.

[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 refers just 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]See *Status Report 1* for descriptive information about the ATE program. See *Status Report 2* and the *Survey 2001 Report* for the 2000 and 2001 survey findings. See the issue papers for in-depth analyses based on the surveys and site visits and organized by topic (e.g., materials development). All these evaluation products may be found at http://www.ate.wmich.edu. Findings from the advisory committee study will be posted there in the near future.

[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/>.

[5]Fifty-eight percent of the current sample (44 of 76 *projects)* were also in the 2001 survey sample. Fifty-four percent of the current sample (41 of 76 *projects*) were in the samples for all three years of the survey (2000-2002).

In all three years, the survey form contained nine sections. All *projects* were required to complete three sections: (a) basic information–confirmed general *project* information collected from other sources (e.g., name of Principal Investigator and the nature and duration of grant), (b) monitoring–addressed the NSF program staff's efforts to monitor the *projects*, and (c) Principal Investigator (PI) Overview–addressed 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 (see the category descriptions in the box below). Those that responded to the program improvement category were asked to complete a section for each educational level (secondary school, associate degree, and baccalaureate) where improvement efforts were targeted. A large and diverse project or center (i.e., one that engages in all identified types and levels of effort) would be expected to complete all nine sections. The smallest and narrowest of projects would complete just four sections.

Collaborations of *projects* with businesses, industries, educational institutions, and other organizations to achieve *project* objectives. Collaborations serve the other three work categories (materials development, program improvement, and professional development) to achieve ATE program objectives.

Materials development conducted by *projects*. "Materials" include one or more courses, modules, process models, and/or other instructional or assessment units. "Development" includes the preparation, adaptation for implementation, and/or testing of materials.

Program improvement efforts at the (a) secondary school, (b) associate degree, and (c) baccalaureate degree levels. "Program improvement" refers to multiple, related courses and/or field experiences for students at the designated education level that lead to a defined outcome such as a degree, certification, or occupational completion point.

Professional development efforts focusing on instruction and/or support provided to teaching faculty and staff to update their knowledge and skills and to train them to teach new or improved curricula effectively.

A brief description of the changes made to survey items and improvements in the survey's structure in 2002 is available in Appendix A, page 50. Descriptions of the sample, the Web-based survey practices employed (contacts, follow-up procedures), response rate information, and data analysis steps and cross-checks to ensure accuracy of findings are also included in Appendix A. A copy of the survey is also attached (Appendix B, p. 54).

SURVEY FINDINGS

While this report focuses on findings from the 2002 survey, when appropriate we also draw comparisons across the three years of the survey for the four primary work categories (i.e., collaborations, materials development, program improvement, and professional development) and the PI overview section[6].

Survey findings are presented in five sections. The first two, overview and collaborations, provide context. The overview information describes the nature and scope of activity and general program patterns. The collaboration section describes the many ways that *projects* worked with other organizations to accomplish program improvement, materials development, and professional development objectives.

Overview–Nature and Scope of Activity

The ATE program expects its *projects* to develop materials, improve their programs of instruction, and provide professional development to disseminate the model materials and programs developed. In these efforts, *projects* are expected to collaborate with business, industry, and education partners. Neither Congress nor NSF has specified what number or proportion of the ATE *projects* should be engaged in each identified work category. Neither have they stated the exact nature of work necessary to improve the workforce capabilities of technicians in our nation. Without such specifications, we did not render judgments about the adequacy of these *projects* in such matters as sufficient collaboration, adequate resources for professional development, and so forth. Instead, the primary findings for each work category are largely descriptive and serve as a baseline and trends data for tracking the ATE program's progress.

Five general indicators were used to determine the nature and extent of project activities: (1) number of work categories in which *projects* engage, (2) project stability, (3) unintended outcomes, (4) barriers and challenges to project productivity, and (5) evaluation efforts. These indicators are based on ATE objectives as found in the *ATE Guidelines for Proposal Development*. *Project*-level responses for these indicators uniformly suggest that *projects* actively address the goals of the ATE program and engage in evaluation to direct their efforts and assess their progress.

> Nearly all *projects* (99%) reported on work in at least one of the categories prescribed in the ATE program guidelines.[7]
> The large majority of *projects* are stable or increasing in measures of work and productivity.

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[6]The findings for the monitoring section are provided to NSF in a separate report.

[7]One responding *project* was an anomaly in that it completed only the three required sections.

The majority of unintended outcomes selected by respondents are positive, with partnerships/collaborations reported most often.
Listed barriers are indicative of efforts to stretch programs, resources, and relationships to accomplish desired goals.
Projects engage evaluators, conduct needs assessments, and involve advisory committees.

Work Categories

Table 1 illustrates the similarity of the nature of the work conducted by the *projects* responding to the surveys of 2000-2002. These numbers are consistent across the three years with one exception–Collaborations. As we reported in the *Survey 2001 Report*, it is our belief that the percentage of *projects* engaging in collaborations was underreported in 2000 and 2001 based on our site visit experiences. As a result, questions in the Collaborations section were revised and clarified for the 2002 survey to address this problem. Hence, the increase in *projects* reporting that they engaged in collaborations in 2002 is most likely due to these revisions.

Table 1. Percent of *Projects* Engaged in the Four Work Categories–2000-2002

Work Category	2000	2001	2002
Materials Development	82	83	86
Collaborations	75	76	89
Professional Development	74	77	78
Program Improvement	63	67	67

Table 2 provides a breakdown of the nature of work conducted by the 76 *projects*. This table also shows that collaborative relations with other organizations, including education, public agencies, and especially business and industries, are integral to conducting materials development, program improvement, and professional development work. All centers (n=9) and 88 percent of projects (n=59) reported engaging in collaborative activities.

As Table 2 also shows, most *projects* engage in several categories of work effort. Indeed, 47 percent address all 4 work categories, 82 percent address at least 3 of the 4 work categories, and 92 percent address at least 2. Note, for example, that materials development efforts are routinely conducted in conjunction with program improvement and/or professional development work (63 of 65 *projects* reporting materials development work also reported conducting program improvement or professional development work). Additionally, in each of the 3 years, at least 70 percent of these *projects* were involved in at least 3 of the 4 work categories, reflecting the complexity of these *projects*.

Table 2. No. of *Projects* Engaged in Various Combinations of Work Categories in 2002		
Work Category Combinations*	**Number of Respondents in Each Combination**	**Number of Respondents in Combination Category**
C, MD, PI, PD	36	36
C, MD, PI	9	26
C, MD, PD	14	
C, PI, PD	3	
MD, PI, PD	0	
C, MD	1	8
C, PI	1	
C, PD	2	
MD, PI	1	
MD, PD	3	
PI, PD	0	
C	2	5
MD	1	
PI	1	
PD	1	
None of 4	1	1
Total	76	76
Notes: *C=Collaborations, MD=Materials Development, PI=Program Improvement (at least one of the three levels [secondary, associate, baccalaureate] under this category), PD=Professional Development		

Because a *project* could conduct program improvement efforts for 1 or more educational levels, Figure 1 characterizes the nature and extent of the 51 *projects* engaging in program improvement in at least 1 of 3 levels. As that figure shows, the large majority (69%) worked at a single educational level, but more than 30 percent engaged at least 2 levels (e.g., secondary and associate levels). Such cross-level development efforts indicate attention to developing cross-institution-compatible programs and/or program partnerships.

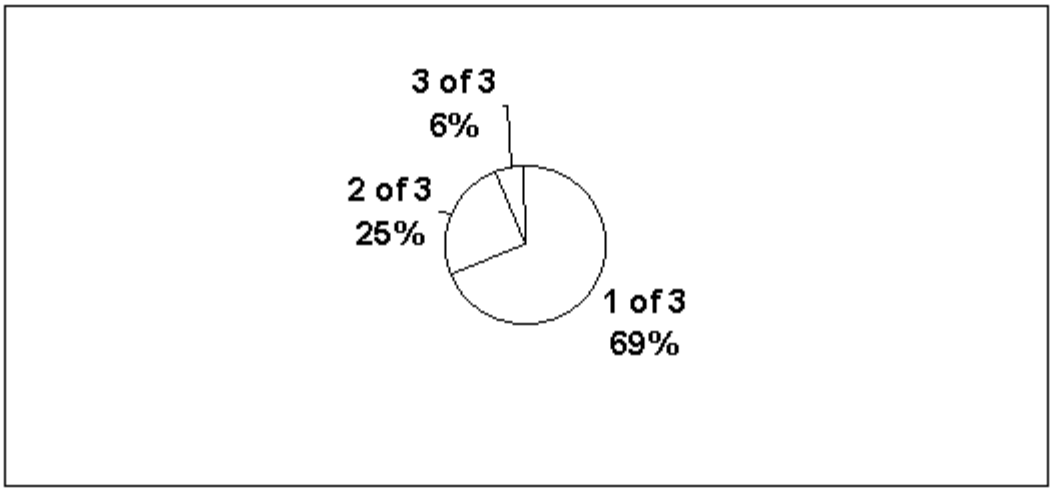

Figure 1. Percent of 2002 *Projects* (n=51) Engaging in 1, 2, or 3 Program Improvement Educational Levels (Secondary, Associate, Baccalaureate)

Project **Stability**

Project stability was addressed through nine items on the 2002 survey. Respondents were asked to rate the *project's* current status against its status the previous year on this set of factors[8]. The results shown in Tables 3 (projects) and 4 (centers) suggest that *projects* generally are thriving. For *projects*, the trend is at least stable for all nine factors. The median response is at least 4 (some increase) on five of the factors, and centers have medians of at least 4 on six factors. Though not labeled as such in the survey, the nine individual factors were chosen as indicators for the four program categories; the two tables are organized to show responses in conjunction with those categorizations. For each category, responses indicate general stability or increases in *project* productivity. It is especially noteworthy that in the important matters of participation with other institutions and organizations, use of developed products, student enrollment, and student placement, the large majority of *projects* indicate either some increase or a substantial increase.

[8]Since not all *projects* engage in the same types of activities, not all status factors were pertinent to all *projects*.

Table 3. Project Ratings of Current Status Versus Status a Year Ago (2002) (N = 67)

Factor	Substantial Decline (%)	Some Decline (%)	Stable (%)	Some Increase (%)	Substantial Increase (%)
Collaborations					
No. of collaborations (relationships with institutions/groups that provide money and/or support) (n=56)	0	3	36	45	16
Financial support from other organizations (n=46)	0	10	59	22	9
Participation in project activities by other institutions/ organizations (n=58)	0	3	36	37	24
Materials Development					
Use of center/project-developed products (n=54)	0	2	28	39	31
Program Improvement					
Students enrolled (n=50)	0	10	22	38	30
Students placed in related technical jobs, whether they completed program or not (n=30)	0	0	43	47	10
Students graduating or completing the program (n=34)	0	9	41	38	12
Professional Development					
Number of professional development opportunities (n=61)	2	3	46	33	16
Number of participants in professional development opportunities (n=58)	2	5	36	35	22

Notes: Substantial Decline (>20%), Some Decline (5-20%), Some Increase (5-20%), Substantial Increase (>20%)
* Individual item ns = 67 - no. of Not Applicable responses

Table 4. Center Ratings of Current Status Versus Status a Year Ago (N = 9) (2002)					
Factor	**Substantial Decline (%)**	**Some Decline (%)**	**Stable (%)**	**Some Increase (%)**	**Substantial Increase (%)**
Collaborations					
No. of collaborations (relationships with institutions/groups that provide money and/or support) (n=9)	0	0	44	56	0
Financial support from other organizations (n=7)	0	0	57	43	0
Participation in project activities by other institutions/ organizations (n=9)	0	0	11	67	22
Materials Development					
Use of center/project-developed products (n=9)	0	0	22	78	0
Program Improvement					
Students enrolled (n=8)	12	0	0	88	0
Students placed in related technical jobs, whether they completed program or not (n=7)	0	14	29	57	0
Students graduating or completing the program (n=7)	14	0	29	43	14
Professional Development					
No. of professional development opportunities (n=9)	11	0	33	56	0
Number of participants in professional development opportunities (n=9)	11	11	22	45	11
Notes: Substantial Decline (>20%), Some Decline (5-20%), Some Increase (5-20%), Substantial Increase (>20%) * Individual item ns = 9 - no. of Not Applicable responses					

In all three survey years, there were similar findings for six *project* stability factors as detailed in Tables 5 (projects) and 6 (centers). For all years, the *projects* were stable or increasing on these six factors, and the large majority of *projects* showed either some increase or substantial increase for the important matters of use of *project* products,

participation by institutions and organizations, students enrolled, and students placed in technical jobs.

Table 5. Project Ratings of Current Status Versus Status a Year Ago–2000-2002 (N=76 for 2000, N=64 for 2001, N=67 for 2002)

Factor	2000 n*	2001 n**	2002 n***	Stable (%) 2000	Stable (%) 2001	Stable (%) 2002	I or S-I (%) 2000	I or S-I (%) 2001	I or S-I (%) 2002
Collaborations									
Financial support from other organizations	55	53	46	60	61	59	31	32	31
Participation by other institutions and organizations	66	57	58	32	41	36	67	56	61
Materials Development									
Use of center/ project-developed products	57	45	54	26	31	28	72	69	70
Program Improvement									
Students enrolled	51	45	50	31	31	22	59	58	68
Students placed in related technical jobs, whether they completed program or not	36	33	30	44	37	43	56	60	57
Students graduating or completing the program	36	35	34	29	37	41	56	51	50

Notes: I= Some Increase (5-20%), S-I=Substantial Increase (>20%)
* For 2000, individual item ns = 76 - no. of Not Applicable Responses
** For 2001, individual item ns = 64 - no. of Not Applicable Responses
***For 2002, individual items ns=67 - no. of Not Applicable Responses

Table 6. Center Ratings of Current Status Versus Status a Year Ago–2000-2002 (N=8 for 2000, N=11 for 2001, N=9 for 2002)

Factor	2000 n*	2001 n**	2002 n***	Stable (%) 2000	Stable (%) 2001	Stable (%) 2002	I or S-I (%) 2000	I or S-I (%) 2001	I or S-I (%) 2002
Collaborations									
Financial support from other organizations	8	11	7	38	55	57	52	36	43
Participation by other institutions and organizations	8	11	9	12	27	11	88	64	89
Materials Development									
Use of center/ project-developed products	7	11	9	14	9	22	86	91	78
Program Improvement									
Students enrolled	6	9	8	17	45	0	83	55	88
Students placed in related technical jobs, whether they completed program or not	6	6	7	17	17	29	83	83	57
Students graduating or completing the program	5	9	7	20	45	29	80	44	57

Notes: I= Some Increase (5-20%), S-I=Substantial Increase (>20%)
* For 2000, individual item ns = 8 - no. of Not Applicable Responses
** For 2001, individual item ns = 11 - no. of Not Applicable Responses
***For 2002, individual item ns= 9 - no. of Not Applicable Responses

Unintended Outcomes

Respondents were provided with a checklist of items that emerged as unintended outcomes–both positive and negative–during the first two years of the survey and asked to check all outcomes that applied to their *project* work. Positive outcomes were checked more often than negative outcomes by the 65 *projects* that deemed this question applicable, as indicated in Table 7.

Table 7. Unintended Outcomes Selected by the 2002 *Projects* (N=65)

Outcome Description	Percentage of 2002 *Projects* Selecting Outcome
Positive	
Partnerships, networks, collaborations (i.e., relationships with institutions/groups that provide money and/or other support) increased beyond those planned	82%
Applications to or work for other disciplines occurred	51%
Additional funding received	46%
Other ** Teacher/writer effort surpassed expectations ** There was more interest and participation from other collaborators in the * industry and in the * education community than we had anticipated. ** Institution hiring and promoting people from grant. ** Very significant interest in projects' activities from the business community and the economic development community	9%
Negative	
Loss of staff due to business opportunities	17%
Communication or work-related difficulties with collaborating partners	15%

Notes: Asterisks (*) were substituted for specific *project* or program names. Not mutually exclusive categories.

Barriers and Challenges

In an open-ended question, 2002 survey respondents also identified up to three barriers or challenges to success that occurred in their *projects*. Most commonly, respondents cited lack of time, money, and other resources (48); struggles with communication and coordination (37); attracting/keeping faculty and other critical staff members (20); faculty having difficulty adapting to the changes needed for the new programs (9); and lack of administrative support (6). These barriers/challenges were consistent with those cited in 2000 and 2001. In 2002, the economic downturn in the technology sector was mentioned by five *projects*, and nine *projects* stated they were having difficulty recruiting and retaining students. The comments listed in Table 8 are provided to illustrate these barriers/challenges as described in 2002. Not surprisingly, the listed barriers identify many situations and conditions that are familiar to all programs that seek to change the status quo.

Table 8. Illustrative Barriers/Challenges Faced by the *Projects* for 2002

Categories	Examples
Lack of Time, Money, and Other Resources	Money for telecommunications equipment for partner schools is a huge barrier as the technology is constantly changing, and the equipment is expensive. We do not have enough staff or faculty to carry out everything we want to do. There are more opportunities than people (faculty and students) able to take advantage of them.
Communication and Coordination	Some of the partner colleges have not forged close ties with local "mentor" firms as we have encouraged them to do. These companies are small and very busy and do not seem overly interested in partnering in some cases. One of the barriers that has been somewhat difficult is to form an articulation agreement with our college, a 2-year * College and a state university. Each has their own rules to follow. Our school is locally managed while the university, as part of a state-wide system, has less flexibility. . . . We have had, frankly, very few barriers to our project, however, one thing that has delayed our application for accreditation of our program is formation of formal agreements with our industry affiliates. Legal teams must be involved in the review of the affiliation agreement on both sides of the fence (college side and industry side). Working effectively with "partners" continues to be difficult. It is difficult to develop enthusiasm and willingness to take on students to work on-site and for partners to willingly and effectively be mentors. The paperwork and time necessary to set up agreements between community colleges.

Table 8. Illustrative Barriers/Challenges Faced by the *Projects* for 2002	
Categories	**Examples**
Attracting and Keeping Faculty and Other Critical Staff Members	The PI or Co-PI left the institutions while the project was in process which led to new personnel that did not necessarily have the same vision for this project. The difficulty of keeping a good tech writer. The market pays them much more than the project can pay. Lost faculty who were trained to industry.
Faculty Issues with Adapting to Change	Resistance of faculty to implementing new materials in courses they have been previously teaching. Faculty not current in technology - needing more "instruction" when we thought they would be contributors.
Lack of Administrative Support	Politically turbulent and financially broke district with punitive working climate. We have overcome the effects of this, and project has succeeded beyond planned goals. Internal, campus politics/change in personnel at the highest administrative levels -- this resulted in change in support for the project. We did our best to inform the new leadership to offset the challenges. Still, the ownership/buy-in is less than it was before. Lack of buy-in by college/department to obligations of the project.
Note: Asterisks (*) were substituted for specific *project* or program names.	

Evaluation Efforts

Three indicators of evaluative efforts were included in Survey 2002 (i.e., use of evaluators, needs assessments, and the use of advisory committees[9]). Virtually all *projects* employed at least one method, and a large majority employed at least two (see Table 9).

Table 9. Percent of *Projects* Employing Various Evaluative Methods (N=76)	
Individual Methods	
Evaluators	95%
Needs Assessment	43%
Advisory Committees	88%

[9]A separate study of advisory committees was undertaken late in 2001. Findings and recommendations will be posted to our Web site (http://ate.wmich.edu) in the near future.

Table 9. Percent of *Projects* Employing Various Evaluative Methods (N=76)	
Combined Methods	
Evaluators/Needs Assessment	42%
Evaluators/Advisory Committees	85%
Needs Assessment and Advisory Committees	42%
All Three (Evaluators, Needs Assessment, Advisory Committees)	41%

Two questions were asked of 2002 survey respondents regarding *project* evaluations –one regarding if an evaluator had been engaged and the other asking for a rating of evaluation's usefulness. As mentioned previously, 95 percent (72 of 76 *projects*) indicated they had an evaluator. Of those *projects* having an evaluator, most (75 percent) employed an evaluator external to the *project*, but 21 percent indicated use of both external and internal evaluators. These findings are consistent with survey responses received in 2000 and 2001 (i.e., +/- 5%).

When asked to rate the usefulness of the evaluations, a new question in 2002, 31 percent of the survey respondents having evaluators rated their evaluations as essential, 45 percent as useful, 18 percent as having some use, and 6 percent as minimally useful. Hence, a large majority viewed evaluations as essential or useful to their *projects'* work. *Projects* mentioned several ways in which the evaluations were used including (a) formative purposes (i.e., to improve the *projects'* work) (20); (b) summative purposes (i.e., to show the impact or effectiveness of the *projects'* work) (4); (c) both formative and summative purposes (10); and/or (d) to assist with decision making and planning (7). Table 10 provides illustrative comments for each of these categories.

Table 10. Illustrative Uses of Evaluations the *Projects*	
Categories	**Examples**
Formative	Conducted a pilot test of the materials, pre-test, post-test, progress test, workkey test, and informal interviews. We have used the feedback from workshop participants to make some modifications in the ways in which we present the information. I use an external evaluator for on-going feedback about the quality of the *project* activities, processes, and products. He also interviews teacher participants throughout the enhancement activities to get a deeper picture of the value of their activities. He reviews all products, models, processes, and provides feedback. It seems to me this is one good way to get feedback beyond questionnaires and to maintain the integrity of the project. To conduct mid-course corrections, including adding new partners and clients. The external evaluator provided very insightful observations and comments on our progress relative to our stated objectives. We have been working on implementing the recommendations in the evaluator's report to improve our operation and the quality of our products and service. The evaluation is used as part of the TQM process. Action is taken to revise, update, correct the products and services offered by the *project*.
Summative	To determine effectiveness of workshops, implementation of curriculum, and effectiveness of partnerships with collaborators.
Both Formative and Summative	For an external record and analysis of our activities; for good suggestions as we proceed forward; reports provide both commendations for successes and recommendations for improvements; our evaluator reports to NSF, advisory/national visiting committees, and project staff and partners; evaluator is invaluable to overall project success! We use the evaluation results from the previous year's June Annual * conference in planning for the current year's conference. We also use course exit surveys and program exit surveys in planning for improvements to individual courses and programs.
Decision Making and Planning	In addition to formal evaluator duties, our evaluator has been involved in strategic planning activities, organizational changes, and a sounding board for staff members to utilize. Helped to understand relationship of what had been done to what was described in project deliverables. Therefore, helped guide actions to correct shortcomings and to develop most appropriate activities to enhance the project.
Note: Asterisks (*) were substituted for specific *project* or program names.	

Because needs assessments are viewed as an essential evaluative tool to guide *project* work, 2002 survey respondents were asked to identify if they had conducted a needs

assessment in the last 12 months. As reported previously, of the 76 respondents, 43 percent (33 *projects*) reported having completed a needs assessment in the last 12 months to serve *project* needs. Methods employed included surveys (39%), reviews of existing reports or other literature, interviews (61%), and/or focus groups (55%) (not mutually exclusive categories).

Involvement of advisory committees may also be viewed as another component of evaluation for the ATE *projects*. As mentioned previously, 88 percent (67 of 76) of the 2002 *projects* reported working with advisory committees. For these 67 *projects,* committee types included local institution or other locally based group (60%) and/or regional or national (e.g., National Visiting Committees) (66%) (not mutually exclusive categories). Activities of these committees cited by the *projects* included (a) reviewing *project* materials and/or activities, advising, evaluating, and providing feedback (28); (b) assisting with obtaining resources for the *projects* (5); and (c) assisting with the design process (e.g., design of curricula, standards, internship experiences) (9).

Sustainability and Institutionalization

In 2002, *projects* were asked to describe their plans for sustainability[10]. Eight-four percent (64 of 76 *projects*) reported at least one strategy for sustaining the activities of their *projects*. The top four common sustainability strategies listed by these *projects* were (a) seeking funding from multiple sources (e.g., sales of products, access fees for on-line databases, grants from non-NSF funders, monetary and/or in-kind support from business/industry and other partners) (30); (b) working to institutionalize the activities of their *projects* at the organization(s) housing their *projects* (22); (c) partnering, collaborating, and/or networking (13); and (d) marketing their *projects'* products (e.g., textbooks, academic workshops, corporate training, commercial publications) (10).

Seventy-eight percent (59 of 76 respondent *projects*) described at least one aspect of their *projects* that they believed likely to be institutionalized (i.e., remain in the institution after the *projects* have ended). Aspects most often included (a) materials (e.g., publications, Web sites, databases, curriculum, modules, CDs, textbooks) (21); (b) degrees, certificates, and/or credited training programs and accompanying articulation agreements (16); and (c) courses in programs (i.e., they become a part of the permanent offerings) (14).

Collaborations

From its beginning, the ATE program has expected funded *projects* to develop collaborative arrangements to promote improvement in technological education. This expectation is visible in the language from Congress about developing the program and

[10]Please see the issue paper on Sustainability for additional analysis and recommendations (http://ate.wmich.edu).

is strongly embedded in the language of the NSF solicitation for proposals. The most recent Solicitation (NSF-02-035: http://www.nsf.gov/pubs/2002/nsf02035/nsf02035.html#INTRO) makes the point in several ways. For example:

> Usually proposers should contact the Principal Investigators (PIs) of exemplary *projects* to explore the possibilities for adapting materials, evaluating materials, receiving guidance, or collaborating in other ways.
>
> 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 for ATE centers should be based on a three-pronged alliance of support from (1) NSF, (2) the proposing educational institution or consortium, and (3) businesses, industries, and government agencies or laboratories.

Consistent with those expectations, our annual surveys have requested information about *projects'* collaborative efforts. The 2002 survey responses for collaboration efforts have been organized to answer four general questions:

1. With whom do *projects* collaborate?
2. How much collaboration occurs?
3. What purposes are served by these collaborations?
4. What is the value of these collaborations to the *projects*?

Nature and Extent of Collaborations

As in the first two years of the survey, 2002 survey ATE *projects* reported they established a large number of collaborative arrangements. The collaborations served multiple purposes and provided monetary support as well as other kinds of assistance for materials development, program improvement, professional development, and other efforts.

Collaborations with other ATE *projects*. In 2002, 57 of the 76 *projects* surveyed (75%) reported collaborating with other ATE *projects*, providing synergy across the ATE program.[11] Collaborative activities included materials development

[11] These data were drawn from Item 4 of the PI Overview section, which was answered by all responding *projects*. These data were not collected in 2000 and 2001.

(57%), professional development (53%), best practices development (39%), sharing of products (70%), and sharing of best practices (74%) (not mutually exclusive categories).

Collaborations with institutions external to the ATE *projects*. As in 2000 and 2001, 2002 survey *projects* reported establishing a large number of collaborative relationships with institutions external to their *projects* (i.e., business and industry, public agencies [local, state, federal], educational institutions, and other organizations). As discussed in the introduction, not all *projects* responded to all sections, based on their respective scopes of work. For example, in 2002, 68 *projects* reported that they engaged in collaborations. Approximately 90 percent of these *projects* reported work to develop collaborative arrangements with institutions external to their *projects*. This involved a total of more than 2,000 institutions and 3,800 individuals. Sixty-nine percent (47 of 68 *projects*) reported collaborative work with at least 3 of the 4 different types of external institutions.

As Table 11 shows, the most prevalent type of collaboration for 2002 *projects* is with educational institutions (83% of projects, 100% of centers) followed very closely by business and industry organizations (80% of projects, 89% of centers). This is consistent with 2000 and 2001 findings.

Table 11. Number of *Projects* Reporting Collaborations in 2002 by External Institution Type in 2002

Types of External Institution	*Projects* Reporting Collaborations	Percent of n (%)
Projects (n=59)		
Business and Industry	47	80%
Public Agencies	35	59%
Educational Institutions	49	83%
Other Organizations	23	39%
Centers (n=9)		
Business and Industry	8	89%
Public Agencies	7	78%
Educational Institutions	9	100%
Other Organizations	3	33%

As Table 12 shows, the *projects* engaged in multiple collaborations with each type of institution. Consistent with expectations for centers, in 2002 centers reported a higher median number of collaborations with each collaborating institution type than projects did. These 2002 centers reported the highest median number of collaborations (23) for their work with business and industry institutions. Not shown in the table, the median

project listed 19 collaborative efforts (projects=18, centers=47) and engaged slightly more than 2 people per collaboration.

Table 12. Extent of Collaborations in 2002 with Institutions External to the *Projects*

Types of External Institution	Number of Collaborations per Institution		No. of Persons Collaborating per Institution Type (Median)
	Median	Range (Low-High)	
Projects (n=59)			
Business and Industry	6	1-140	2
Public Agencies	2	1-10	2
Educational Institutions	7	1-70	3
Other Organizations	2	1-10	2
Centers (n=9)			
Business and Industry	23	10-160	2
Public Agencies	4	1-10	2
Educational Institutions	20	2-80	2
Other Organizations	5	2-10	1

Monetary and in-kind support. Seventy-five percent (51 of 68 *projects*) of those completing the Collaboration section in 2002 indicated receiving monetary support, and 90 percent (61 of 68 *projects*) reported receiving in-kind support. Table 13 provides a breakdown of the sources of these support. As in 2000 and 2001, clearly, the ATE *projects* sought non-NSF support from multiple sources.

Table 13. Sources of Monetary and In-Kind Support in 2002

Sources	*Projects* Reporting Seeking Monetary Support from These Sources (of 51)*	Percent %	*Projects* Reporting Seeking In-Kind Support from These Sources (of 61)*	Percent %
Center/Project Institutions**	32	63%	41	67%
Business and Industry	26	51%	50	82%
Public Agencies	19	37%	23	38%
Educational Institutions	21	41%	44	72%

Table 13. Sources of Monetary and In-Kind Support in 2002				
Sources	***Projects* Reporting Seeking Monetary Support from These Sources (of 51)***	**Percent %**	***Projects* Reporting Seeking In-Kind Support from These Sources (of 61)***	**Percent %**
Other Organizations	12	24%	19	31%
Notes: * Not mutually exclusive categories; ** These institutions are the primary participants in the *project's* work and the primary recipients of *project* funds.				

Projects reported receiving $5.3 million in direct contributions of money and more than $5.4 million of in-kind support from non-NSF sources (Table 14) in 2002. That is, for every dollar provided by NSF for the duration of the *projects'* grant periods, the *projects* reported increasing their working resources through monetary and in-kind support for the ATE program by 19 cents during the previous year.[12]

Table 14. Monetary and In-Kind Contributions to *Projects*–2000-2002						
	Total Monetary Support 2000 ($)	**Total Monetary Support 2001 ($)**	**Total Monetary Support 2002 ($)**	**Estimated Monetary Value of In-Kind Support 2000 ($)**	**Estimated Monetary Value of In-Kind Support 2001 ($)**	**Estimated Monetary Value of In-Kind Support 2002 ($)**
Total from All Non-NSF Sources (A)	13,696,102	12,204,587	5,307,123	16,287,171	24,017,001	5,393,012
Total NSF # for Reporting *Projects* (B)	59,739,241	45,387,167	57,530,473	59,739,241	45,387,167	57,530,473
Cost Sharing Percentage (A/B x 100)	23%	27%	9%	27%	53%	9%
Notes: For 2000, n=67 (58 projects and 9 centers); For 2001, n=57 (46 projects and 11 centers); For 2002, n=68 (59 projects and 9 centers)						

[12]These monetary and in-kind figures reported are significantly lower than those in 2000 and 2001. This may be attributable to the rewording of the survey question in 2002 to clarify that these figures should reflect a 12-month period.

Collaborative purposes. As Table 15 illustrates, the collaborations with external institutions reported by 2002 survey respondents served many purposes aligned with the primary work activities of the *projects* (i.e., materials development, program improvement, and professional development), consistent with survey 2000 and 2001 findings. These collaborative purposes included

General *project* support: advice, contributed or shared equipment/technology, contributed time and effort
Materials development: development or implementation of standards/ guidelines, determining or confirming materials content, pilot testing of materials, field-testing of materials
Program improvement: student recruitment program, student understanding of industry opportunities and requirements, college/school-based instruction matters, work-based instruction and experience matters, student entry to the workforce
Professional development: faculty/staff knowledge of industry needs, opportunities, and requirements; faculty/staff knowledge and skill in discipline; business/industry representatives' knowledge of educational options and opportunities

For the two most prevalent types of collaborative institutions–business/industry and educational institutions–general support was reported as the most common purpose, followed closely by the other three purposes. This is consistent with 2000 and 2001 survey findings.

Table 15. Collaborative Purposes by Institution Type in 2002 n=68

Collaborative Purposes	Business or Industry (% of n=60)*	Public Agencies (% of n=51)*	Educational Institutions (% of n=60)*	Other Organizations (% of n= 29)*
General Support	87%	76%	87%	76%
Materials Development	75%	47%	82%	41%
Program Improvement	75%	61%	78%	41%
Professional Development	73%	51%	73%	41%

Note: * Not all *projects* collaborated with every institutional type. Therefore, each column has a different n value, and the percent values are reported in the context of the response size (n) for that column. Collaborative purposes are not mutually exclusive (i.e., one collaboration might serve multiple purposes).

Quality of Collaborations

2002 survey *projects* indicated their satisfaction with the quality of their collaborations as illustrated in Table 16. When asked to rate the quality/productivity of collaborations, on average, projects rated productivity from good to excellent for the full array of institutions. Centers, on average, rated productivity from satisfactory to excellent. These are consistent with 2000 and 2001 findings except that 2002 centers rated more of the institutions in the excellent range.

Table 16. Overall Ratings of Quality/Productivity of Collaborations-2002 n=68: 59 Projects (P), 9 Centers (C)

	Business or Industry			Public Agencies			Educational Institutions			Other Organizations		
P or C	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
P	51	3.57	.67	44	3.30	.85	51	3.51	.67	25	3.56	.51
C	9	3.33	.50	7	3.00	.58	9	3.67	.50	4	2.50	1.29

Notes: SD=Standard Deviation; Scale of 1=Poor, 2=Satisfactory, 3=Good, 4=Excellent

2002 *projects* also were asked to select which institution type had been the most effective collaborator in helping them reach their goals. For the 68 *projects* responding to the Collaboration section, 44 percent rated educational institutions as the most effective, followed closely by business/industry institutions (41%), then public institutions (12%) and other organizations (3%). This indicates that the most prevalent types of collaborators–educational institutions and business/industry–are also viewed as the most effective by the *projects*, an encouraging sign for the ATE program. These data were not collected in 2000 and 2001.

Materials Development

Materials development is a major thrust of the ATE program. The *ATE Program Guidelines* consistently set forward the expectations that developed materials be of good quality, disseminated, and used. Here the survey results are used to examine basic elements of these expectations.

Nature and Extent of Materials Developed

ATE *projects* reported developing many substantial materials (i.e., creating and/or making changes in materials that require a substantial effort) to support the preparation of technicians. These materials include modules (e.g., laboratory exercises) and courses.

As noted in the report's introduction section, materials development routinely occurs in conjunction with both instructional program and professional development purposes. Responses to this part of the survey confirm that materials development serves both purposes. Among the 65 *projects* (57 projects and 8 centers) reporting materials development efforts, nearly all (87 percent of the projects and 100 percent of the centers) developed materials for program improvement purposes (see Table 17).[13] Also, almost half of projects and three-fourths of the centers reported engaging in materials development for both program improvement and dissemination (see Table 17).That a higher percentage of centers viewed themselves as developing materials for these dual purposes is consistent with the *ATE Program Guidelines* directing centers to provide materials to larger and more widely dispersed audiences.

Table 17. Forms of Materials Development Engaged in by *Projects*-2002 n=65: 57 Projects, 8 Centers

	Percent of Projects	Percent of Centers
For Both Program Improvement and Dissemination	47%	75%
For Program Improvement Only	39%	25%
For Dissemination Only (e.g., commercial)	7%	0%
Other	7%	0%

For substantial materials, *projects* were also asked to describe the number and types under development and their stage of development. We also asked how many were being used locally, at other places, and/or how many had been published commercially. The results from those questions are provided in Tables 18 and 19. As those tables show, the *projects* are developing a large number of substantial instructional materials. The reported numbers in the draft and completed stages alone total 1,641 (2,100 reported for Survey 2000; 2,375 reported for Survey 2001).

[13] *Projects* were asked to report the forms of materials development in which they were engaged, a new survey question in 2002.

Table 18. Total Number of Substantial Materials Developed by *Projects* by Type and Stage of Development-2002
n = 65: 57 Projects (P), 8 Centers (C)

Type of Materials	Stage of Development		
	Draft	Field Test	Complete
Course Development	159(P) 7(C)	95(P) 16(C)	260(P) 54(C)
Module Development (a component that can be used in more than one course)*	355(P) 27(C)	392(P) 20(C)	384(P) 204(C)
Other	54(P) 2(C)	49(P) 1(C)	128(P) 7(C)
Total	568(P) 36 (C)	536(P) 37(C)	772(P) 265(C)

Notes: * One center reported 200 modules and 200 modules in the draft and field-test stages, respectively. The above stage of development categories *are not* mutually exclusive.

Table 19 shows that more than 900 of these materials were reported in use at least locally. This finding is closer to Survey 2000 findings (1,049 reported for 2000; 1,709 for 2001).

Table 19. Total Number of Materials for *Projects* by Usage-2002
n = 65: 57 Projects (P), 8 Centers (C)

Type of Materials	Local Use (A)	Elsewhere (B)	Commercially Published (C)
Course Development	267 (P) 32 (C)	89 (P) 14 (C)	27 (P) 0 (C)
Module Development	343 (P) 129 (C)	212 (P) 429 (C)	1 (P) 0 (C)
Other*	132 (P) 6 (C)	782 (P) 4 (C)	501 (P) 0 (C)

Notes:
* One project reported 750 "other" materials in use elsewhere and 500 "other" for commercial publication.
(A): Locally means at sites within the *project*.
(B): Elsewhere means at sites not a part of the *project*.
(A)-(C): *Are not* mutually exclusive categories

To gain an understanding of target audiences and general content of the materials, respondents were asked for descriptive information about each of up to three of their

"best" materials development efforts. In the first two years of the survey, we asked for this information for up to five materials. The information requested in 2002 included (a) type of material developed, (b) technology field, and (c) grade level information. Table 20 summarizes this information. As this table shows, the materials serve 19 separate STEM fields. Seventy-seven percent of the developed materials are oriented to the associate degree level, and 19 percent of the materials are targeted at the secondary level, consistent with 2000 and 2001 survey findings. The materials described represent 19 of 20 technology fields. While the strong orientation to the associate degree level is probably representative of all ATE materials development efforts, it is likely that the figures underrepresent the various technology fields for which materials are being developed, since newer *projects* (i.e., less than 12 months old) are not represented.

Table 20. Numbers of Materials Summarized by Technology Field & Educational Level-2002

Technology Field	Educational Level					Total By Technology Field
	E/M	S	C1	C2	CUL	
Agriculture		1	1	3		5
Biotechnology		8	6	3		17
Chemical Technology		1	4	2		7
Distance Learning				2		2
Electronics, Instrumentation, Laser and Fiber Optics		2	5			7
Engineering Technology	1		1	2		4
Environmental Technology		3	7			10
Geographic Information Systems				1		1
Graphics and Multimedia			1	1		2
Information Technology, Telecommunications		1	9	15	4	29
Machine Tool Technology, Metrology				3		3
Mathematics		1	4			5
Manufacturing and Industrial Technology	1	5	8	15		29
Marine Technology			1			1
General or Multidisciplinary			3	3		6
Other		6	1	3		10

Table 20. Numbers of Materials Summarized by Technology Field & Educational Level-2002

Technology Field	Educational Level					Total By Technology Field
	E/M	S	C1	C2	CUL	
Physics			1	4		5
Semiconductor Manufacturing		1		4		5
Transportation				4		4
Total Items Developed at Each Educational Level for All Technology Fields	2	29	52	65	4	152

Notes: Respondents were asked to list up to 3 of the "best" materials their *projects* were developing. A combination of 3 types of materials development efforts (total=152) are represented in this table (course development materials [55], module materials [61], other types of materials [36])
E/M: Elementary/Middle; S: Secondary; C1: College First Year; C2: College Second Year; CUL: Upper
For the first "best" materials development effort, 65 *projects* provided information.
For the second "best" materials development effort, 57 *projects* provided information.
For the third "best" materials development effort, 46 *projects* provided information.

Quality of Materials Development Work

The previously reported items provide some insight as to the nature and amount of the materials developed as well as their dissemination and use. The following information directly addresses the element of quality. At best, surveys can only provide proxy evidence of quality. The actual evidence (content validation, student achievement, etc.) must be collected elsewhere to be reported here. The survey solicited information about validation practices on the premise that good practices are likely to lead to good quality materials. Three general attributes of quality were assessed:

1. **Assurance of content validity.** Two items focusing on content alignment and use of standards were used to address this key concern.

    a. Industry's verification of content alignment with workforce and skill needs
    b. Use of applicable student and industry-based standards or guidelines to guide materials development

2. **Inclusion of measures to assess student success.** Good assessment measures, built into instructional materials and/or used in conjunction with the developed materials, help mark student accomplishments and can be used as guides for both instruction and accountability purposes. Three items addressed assessment measures:

a. Assessment of student success (knowledge and skills) in comparison with standards (e.g., business/industry, educational, nontechnical skill)
b. Assessment of student success (knowledge and skills) in comparison with other nonproject or nonparticipating students
c. Assessment of improved student performance in the workforce

3. **Pilot and field-testing**[14] to validate quality. For this matter, we used three items:

a. Pilot test materials
b. Field-test materials internally (i.e., within the *project*)
c. Field-test materials externally (i.e., not *project*-based locations)

In addressing these three attributes, each item asked the respondent to state the frequency with which each measure or technique was used. Responses are summarized in Tables 21-23.

Table 21 suggests substantial compliance with the use of industry or other appropriate standards to guide materials development. Based on additional data analysis, for those *projects* responding to this survey section (n=65), 75 percent of the projects (65% for Surveys 2000, 2001) and 63 percent of the centers (75% for Surveys 2000, 2001) reported that they used one of the two practices all the time. Only 3 percent of the projects almost never or never apply such developmental practices.

Table 21. Frequency of Use of Industry Standards or Other Relevant Guidelines for Developing Materials-2002
n = 65: 57 Projects (P), 8 Centers (C)

Practice	Used Each Time %	Used Most Times %	Used Less Than Half the Time %	Almost Never or Never Used %	NA %
1. Obtain verification by industry regarding alignment of materials with workforce and skill needs	63 (P) 50 (C)	21 (P) 37 (C)	4 (P) 13 (C)	2 (P) 0 (C)	10(P) 0(C)

[14] Pilot testing refers to brief, preliminary testing of materials or portions of materials and is usually done with a small number of sites. Field-testing refers to testing of materials in settings where they will be used when finalized–usually large and more in-depth than pilot testing.

Table 21. Frequency of Use of Industry Standards or Other Relevant Guidelines for Developing Materials-2002
n = 65: 57 Projects (P), 8 Centers (C)

Practice	Used Each Time %	Used Most Times %	Used Less Than Half the Time %	Almost Never or Never Used %	NA %
2. Use applicable student and industry-based standards or guidelines to guide materials development	61 (P) 63 (C)	23 (P) 25 (C)	5 (P) 12 (C)	4 (P) 0 (C)	7 (P) 0 (C)

The varied materials being developed make it appropriate to apply different student assessment methods in the development process. Table 22 reflects the use of these student assessment methods. Not visible in this table are two additional findings:

Fifty-six percent of the projects and 62 percent of the centers responding to this survey section (n=65) applied one or more of the identified student measures each time. This is consistent with Survey 2000 and 2001 findings.
Thirty-three percent of projects and 50 percent of centers make little or no use of these student assessment techniques, though they deemed them applicable.

Table 22. Frequency of Use of Measures of Student Success-2002
n = 65: 57 Projects (P), 8 Centers (C)

Practice	Used Each Time %	Used Most Times %	Used Less Than Half the Time %	Almost Never or Never Used %	NA %
1. Assess student success (knowledge and skills) in comparison with standards (e.g., business/industry, educational, nontechnical skill)	51 (P) 50 (C)	23 (P) 13 (C)	9 (P) 13 (C)	3 (P) 12 (C)	14 (P) 12 (C)
2. Assess student success (knowledge and skills) in comparison with other nonproject or nonparticipating students	23 (P) 25 (C)	21 (P) 37 (C)	7 (P) 13 (C)	24 (P) 13 (C)	25 (P) 12 (C)

Table 22. Frequency of Use of Measures of Student Success-2002 n = 65: 57 Projects (P), 8 Centers (C)						
Practice		**Used Each Time** **%**	**Used Most Times** **%**	**Used Less Than Half the Time** **%**	**Almost Never or Never Used** **%**	**NA** **%**
3.	**Assess improvement of student performance in the workforce**	23 (P) 25 (C)	19 (P) 13 (C)	9 (P) 25 (C)	12 (P) 37 (C)	37 (P) 0 (C)

Validation is always an important step in developing new materials, but it is especially so in developing materials that are intended to be widely distributed. Two primary steps are routinely taken in validating materials. The first is called pilot testing. In this process, the developers have persons or groups of persons try out the materials to ensure that they are understood, properly employed, learned, and so forth. The second, called field-testing, is routinely done when it is believed the materials are ready for dissemination. This testing ensures such things as (a) the newly developed materials can be applied by persons who are not privy to development information and (b) when used, the materials result in appropriate student learning. Field-testing is particularly important to the process because often when materials are applied outside the bounds and influence of the developers, the materials are misunderstood and/or misapplied, leading to poor student learning.

Developers were not asked whether their products performed well under pilot and field-testing conditions. Rather, they were asked only whether they had conducted these tests. As such, a positive response does not provide assurance of quality nor does lack of a positive response mean that the quality of the developed materials is poor. However, failure to carefully field-test developed materials does indicate some measure of negligence. As Table 23 shows, a large majority of *projects* reported conducting a pilot and field-test within their own *projects (*Pilot: 71%, projects; 88% centers; Field: 70%, projects; 76% centers), close to the 80 percent reported by Survey 2000 and 2001 respondents. Forty percent of projects and 50 percent of centers reported conducting external field tests each or most times, consistent with Survey 2000 and 2001 findings.

Table 23. The Extent to Which the *Projects* Test Their Materials-2002 n = 65: 57 Projects (P), 8 Centers (C)					
Practice	**Used Each Time** **%**	**Used Most Times** **%**	**Used Less Than Half the Time** **%**	**Almost Never or Never Used** **%**	**NA** **%**
1. Pilot test materials	53 (P) 50 (C)	18 (P) 38 (C)	3 (P) 12 (C)	3 (P) 0 (C)	23 (P) 0 (C)
2. Field-test materials internally (i.e., within the *project*)	46 (P) 38 (C)	24 (P) 38 (C)	3 (P) 12 (C)	2 (P) 12 (C)	25 (P) 0 (C)
3. Field-test materials externally (i.e., not *project*-based locations)	26 (P) 25 (C)	14 (P) 25 (C)	12 (P) 12 (C)	14 (P) 25 (C)	34 (P) 13 (C)

Developers' Statements of "Most Compelling Evidence of Quality"

Those *projects* that completed the Materials Development section were asked to select one item they had developed and state what they considered to be the most compelling evidence for its quality–95 percent of the respondents to this section (n=65) provided this information. Their comments suggest more reliance on reviews and statements of satisfaction by users rather than on concrete evidence of quality, consistent with Survey 2000 and 2001 findings. Two factors suggest that conclusion. First, all but 5 responses refer to personal or group testimonials (e.g., employer/industry acceptance/ endorsement of the materials [20]; interest on the part of other faculty, peers, students, and publishers [16]) about the quality of the materials) or provide only a more detailed description of the materials (21). Second, pilot and field-testing were only discussed in 6 of the responses, and 4 of those did not indicate the collection of data (e.g., student performance data) to establish the material's quality.

Program Improvement

Projects reported improving their technician-based programs by constructing new courses, modifying existing courses, and taking steps to serve students in matters of recruitment, retention, and placement.

Nature and Extent of Program Improvement

As previously noted, *projects* were funded to develop model programs of instruction at the secondary, associate degree, and baccalaureate levels. Because the general

characteristics of program improvement were comparable in many ways across these three educational levels, a general form for the program improvement survey section was prepared and repeated for each level. In 2002, minor modifications appropriate for each level were made (e.g., for the baccalaureate level, a question was added regarding whether the ATE-funded program provided a baccalaureate degree).

Respondents were asked to provide *project*-wide information for program improvement efforts. Compilation of those data show that program improvement efforts occur in nearly 500 institutions/campuses and impact over 30,000 students through more than 3,000 courses. This is a ratio of nearly 10 involved institutions, 600 students, and 60 courses for each *project* (n=51) engaged in program improvement.

Additionally, at each degree level, respondents were asked to identify one specific ATE-grant funded program at one specific location and provide detailed information about efforts for that specific case. These degree and location-specific data provide only a rough indicator of total productivity in program improvement. The specific indicators do, however, show more clearly the nature and extent of changes to involved programs: at what program levels improvements were occurring, what kinds and how many courses were undergoing development or change, how many students were enrolled in and completing various courses of study, and the extent to which course credits could be transferred to other institutions.

Fifty-one of the 76 *projects* (67%) responded to at least 1 of the 3 program improvement survey sections. These *projects* located their program improvement efforts primarily at the associate degree institutions (see Table 24). Ninety-four percent of the respondents reported program improvement efforts at the associate degree level, 31 percent at the secondary level, and 6 percent at the baccalaureate level (not mutually exclusive categories), consistent with 2000 and 2001 survey findings.

Sixty-nine percent of the *projects* (35 of 51) reported conducting program improvement exclusively at one degree level (see Table 24). The remaining 31 percent engaged in 2 or all 3 levels (these data are consistent with 2001 survey findings).

The 51 *projects* also engaged in a total of 462 such programs–76 percent at the associate level–located at 489 institutions. In terms of the actual number of programs being improved, the 6 percent of *projects* that indicated they worked at all 3 levels account for 40 percent of the total number of programs, consistent with 2000 survey findings. With rare exceptions, the programs that include baccalaureate institutions also include associate and secondary levels as well. Every program-improvement collaboration across degree levels includes an associate degree level program.

Table 24. Total Number of Programs Developed/Offered by Degree Level Type or Degree Level Combination-2002 n=51: 44 Projects (P), 7 Centers (C)		
Degree Level Type or Degree Level Combination	**Projects and Centers Reporting**	**Total Number of Programs Developed or Offered**
Secondary (Exclusively)	2(P)	11(P)
Associate Degree Level (Exclusively)	28(P) 4(C)	118(P) 81(C)
Baccalaureate Degree Level (Exclusively)	1(P)	2(P)
Secondary-Associate	10(P) 1(C)	53(P) 3(C)
Secondary-Baccalaureate	0	0
Associate-Baccalaureate	1(P) 1(C)	6(P) 5(C)
Secondary-Associate-Baccalaureate	2(P) 1(C)	78(P) 105(C)
Total	44(P) 7(C)	268(P) 194(C)

Course Development and Modification

The data in Table 25 suggest that the identified programs are being changed in major ways through the development of new courses and changes to existing courses. Of the nearly 900 courses identified as being in these programs, more than two-thirds are reported to be undergoing development or modification. These findings are consistent with 2001 survey findings and a 16 percent increase over those reported in 2000.

Program improvement efforts are distributed evenly between development of new and changes to existing courses. New courses totaled 296, of which 19 are at the secondary level, 248 at the associate degree level, and 29 at the baccalaureate level. Changed courses totaled 298 (29-secondary; 241-associate; 28 baccalaureate). On average, a *project* created or developed 2 courses at the secondary level, 5 at the associate degree level, and 5 at the baccalaureate level.

Because each respondent reported for only one program and one location at each educational level, these findings undoubtably underestimate the total development and

change effort. For participating *projects*, these findings suggest a continued major overhaul of course offerings.

Table 25. Number of Courses for *Projects* by Degree Level and Course Category–One Specified Program at One Location-2002

Degree Level		New Courses (A)			Changed Courses (B)			Unchanged Courses (C)		
	P or C	n	Total no.	Median	n	Total no.	Median	n	Total no.	Median
Secondary (n=16)	P	10	15	.50	11	27	2.00	10	10	.00
	C	2	4	2.00	2	2	2.00	0	0	.00
Associate (n=48)	P	38	206	4.00	39	206	4.00	39	222	4.00
	C	6	42	3.50	6	35	3.00	6	29	1.50
Baccalaureate (n=6)	P	4	26	3.00	4	25	3.00	3	8	2.00
	C	2	3	1.50	2	3	1.50	2	15	7.50

Notes:
Each row includes the indicated educational level and all combinations including that level. Course categories are not mutually exclusive. The ns for each category indicate those *projects* that provided a number vs. an N (not applicable) or a U (data unavailable).
A: Courses added as part of this grant
B: Existing courses that were substantially changed through this grant's efforts
C: Current **specified** program courses that existed as is prior to the start of this **specified** program

Student Enrollments

Student enrollments were addressed at 2 levels–*project* wide and for a selected instructional program within a *project* (i.e., 1 program at 1 location). For *projects* as a whole, some respondents noted that their programs were new and had not yet enrolled students. The *projects* indicated that 32,775 students were enrolled in at least 1 course in the identified *project*-based programs during the last 12 months (see Table 26). On average, each *project* reported enrolling 138 and 624 persons in secondary and associate degree level courses, respectively. These findings were consistent with Survey 2000 findings, but not the 2001 survey, which included a center outlier that reported 70,000 in enrollment.

To gain a better understanding of program size and program completions, *projects* were asked to specify the number of students enrolled in and completing a particular program during the last 12 months. At the secondary level, the average enrollment was 65 students with 25 program completers (n=11 respondents). At the associate degree level, the average enrollment was 173 students with 31 program completers (n= 42

respondents). The enrollment number for the associate degree level was a small increase over that reported by Survey 2001 respondents.

Table 26. Impact on Courses and Students by Degree Level-2002

ATE-Impacted Educational Programs	Median per *Project*	Average per *Project*	Total per Reporting *Projects*
Number of Institutions/Campuses Where ATE-Impacted Programs Offered	7 (S) 2 (A) 1 (B)	8 (S) 7 (A) 2 (B)	135 (S) 345 (A) 9 (B)
Number of Courses Impacted *Project Wide*	3 (S) 18 (A) 13 (B)	8 (S) 60 (A) 21 (B)	121 (S) 2,864 (A) 123 (B)
Number of Students Taking at Least One ATE-Impacted Course in the Past 12 Months	34 (S) 127 (A) 91 (B)	138 (S) 624 (A) 98 (B)	2,201 (S) 29,986 (A) 588 (B)

Notes:
S=Secondary (n=16); A=Associate (n=48); B=Baccalaureate (n=6) (Each represents that educational level and all combinations including that level).

Degrees/Certifications and Transfer of Course Credits

A large majority of associate degree institutions provided a degree (85% [n=48]), certification (58% [n=48]), or both (56% [n=48]). These findings are consistent with Survey 2000 and 2001 results. For secondary institutions, 56 percent (n=16) provided certification opportunities some or all of the time.

One issue in the education of technicians is the transferability of training. Someone trained at the secondary school level may want to move to a different school or may want to continue training at a higher level. Removing the structural impediments that slow students in moving through the educational system may increase the numbers of people choosing to become technicians and facilitate training at different levels.

For the most robust level–associate degree institutions (n=48)–73 percent of *projects* reported that their institutions transferred course credits to similar institutions most or all of the time, consistent with survey findings in 2000 and 2001. This finding along with the information provided in Table 27 suggests that the programs are striving to develop transferability of credits. As might be expected, there is more transferability within type of educational institution than across (e.g., 73% of associate degree level institutions

[n=48] provide for transfer to similar institutions vs. 48% by these same institutions for transfer to baccalaureate institutions).

Table 27. Credit Transfers to a Higher Degree Level Institution by Type-2002						
	Secondary (n=16)		Associate (n=48)		Baccalaureate (n=6)	
	Freq.	Percent	Freq.	Percent	Freq.	Percent
None	3	19	1	2	0	0
Some	6	38	19	40	3	50
Most	1	6	14	29	1	17
All	5	31	9	19	0	0
Don't Know	1	6	5	10	2	33
Note: Each column includes the indicated educational level and all combinations including that level.						

Ethnic and Minority Representation

Table 28 shows reported estimated enrollments in the technical programs at the secondary, associate, and baccalaureate degree levels, for one program at one location. At best, these estimates are crude indicators because many *projects* did not provide data for some of the variables, since they often do not have access to this information (e.g., number seeking ADA accommodations). In several cases, *projects* noted that they were just beginning their programs, and no students would be enrolled until the fall term. Note that in the case of minority and white students, which one would expect to total to 100 percent, the total falls short for the three degree levels. On an overall basis, these findings are consistent with those of Surveys 2000 and 2001. Representation of women and minorities held steady in all years. At the associate degree level institutions, around 30 percent of enrolled students were women, lower than a national 2000 study finding that 57 percent of all enrollees in community colleges were women (National Center for Education Statistics, 2001). However, STEM-type programs like ATE historically have a lower enrollment rate for women. For example, in 1996, only 19 percent of those enrolled in engineering programs at the undergraduate level were women (American Association of Engineering Societies, 1996). Similarly, about 32 percent of freshmen intending to major in science and engineering in 1996 were women (University of California, 1995). About 30 percent of ATE enrolled students were minority, similar to the finding of 33 percent reported by the National Center for Education Statistics (2001).

Table 28. Proportion of Students Enrolled in Academic Programs During the Past 12 Months by Special Status Characteristics and Degree Level-2002			
Special Status Characteristics	**Secondary Level (n=16)**	**Associate Degree Level (n=48)**	**Baccalaureate (n=6)**
Female	16%	26%	18%
Minority (Hispanic or Latino, American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or other Pacific Islander, Multiracial)	46%	29%	29%
White	47%	42%	65%
Percent of Students Who Requested Accommodations Under the Americans with Disabilities Act	2%	1%	1%
Note: Each column includes the indicated educational level and all combinations including that level.			

Recruitment and Retention

Respondents were asked to indicate all applicable recruitment and retention strategies they employed in general and then specifically for underrepresented groups (e.g., minorities, women, people with disabilities), two new questions in Survey 2002. Eighty-seven percent (66 of all 76 *projects*) reported using recruitment/retention strategies in general; 76 percent (58 of all 76 *projects*) reported using these strategies specifically to recruit/retain underrepresented groups. Table 29 illustrates that the strategies employed for general use and underrepresented groups were similar for a majority of the strategies. The most often reported strategies were the use of written materials, Web sites, college fairs, and campus visit programs.

Table 29. Comparison of Recruitment/Retention Strategies Employed by *Projects* for General Use and Underrepresented Groups-2002

Strategy*	Percentage of *Projects* Reporting Strategies for General Use (n=66)**	Percentage of *Projects* Reporting Strategies for Use with Underrepresented Groups (n=58)**
Written Materials (e.g., brochures, newsletters)	86%	79%
Web Sites about the Program	80%	71%
Presentations by Invited Speakers	61%	50%
College Fairs at Secondary Schools or Other Locations	57%	59%
Campus Visit Programs	57%	55%
Summer or Academic Workshops for Students (e.g., career awareness)	33%	29%
Summer or Academic Year Workshops for Teachers	61%	41%
Work-Related Experiences for Students (e.g., a day on the job, internship)	44%	41%
Targeted Workshops	35%	34%
Financial Aid (e.g., scholarships, work study)	44%	41%
Tutoring	27%	29%
Articulation Agreements	53%	38%
Counseling	45%	43%
Other (e.g., conference presentations, local newspapers, networks)	32%	33%

Notes: * Not mutually exclusive categories
** 10 of all 76 *projects* deemed the question not applicable for general purpose recruitment/retention strategies, 18 of all 76 *projects* for underrrepresented group strategies.

Placement of Program Completers

Table 30 provides a snapshot *project* estimate of the proportion of students who (a) took technician positions upon completing a program or (b) continued their education based on individual *project* reports for one program at one location. This snapshot suggests that there is a reversal of expectations among graduates at the secondary and associate degree levels. Approximately two-thirds completing the secondary degree plan to continue their STEM education. Completers of associate degree programs, at almost that same rate, plan to take technician positions.

> At the associate degree level, 67 percent of the students who completed their programs were identified as taking a technician position[15]. Thirty percent planned to continue their STEM education, consistent with 2000 and 2001 survey findings. Similarly, the Bureau of Labor Statistics (1992) reported that about 30 percent of students who complete 2-year programs continue on to 4-year schools. These are not mutually exclusive categories.
> As would be expected with a secondary program, the large majority expected to go on to school (i.e., of those that had completed their programs, 69 percent were expecting to continue their STEM education similar to findings from another national study of high school graduates [Bureau of Labor Statistics, 2002–62 percent were enrolled in college the following fall][16], and 28 percent were employed).

Table 30. Reported Proportion of Program Completers Who Take Jobs in Technology or Continue Their STEM Education by Degree Level-2002

	Secondary (n=16)	Associate Degree (n=48)	Baccalaureate (n=6)
Technician Positions	28%	67%	92%
STEM Education	69%	30%	23%
Average Number of Student Completions per School Program	25	31	29

Note: Each column includes the indicated educational level and all combinations including that level (for one specified program at one location).

[15]This is consistent with 2000 survey findings (there was a dip in 2001 to 46%)

[16]Among the 2.5 million members of the 2001 high school graduating class, 62 percent were enrolled in college the following October (Bureau of Labor Statistics, 2002).

Six of 70 *projects* reporting on the program improvement survey sections noted that placement of students was not applicable to their particular improvement efforts. One indicated that its programs had not yet started. The remaining *projects* identified a variety of placement activities as illustrated in Table 31.

Table 31. Example *Projects'* Steps Taken to Place Students in Workforce Positions-2002
We are currently working with local employers to establish work experience/internship programs for students enrolled in the * degree program.
Participated in online resume posting and job posting Web site specifically for our students.
We are surveying and talking to regional employers to find placement for our students.
We work closely with partner institutions and businesses. We also maintain a Web site that list jobs and job-seekers.
College placement office. Personal contacts by faculty with prospective employers. Networking by students themselves.
Students are among the only group with formal training in * installation and maintenance. This makes them highly marketable.
We require our students to participate in an industry externship and have found that these experiences have assisted with job placement. In addition, we have implemented a student/industry workshop where students and industry reps are involved in a team building workshop. The workshop also includes a career awareness component and some job recruitment.
Job placement for all two-year degree programs is required as part of the state accountability policies. Placement of 80 percent or greater is required to maintain state funding for degree programs, i.e., faculty salaries, equipment, etc. Faculty, counselors, and Work-Based Learning personnel are required to place students completing and/or graduating in each major.
Notes: Asterisks (*) were substituted for specific *project* or program names. Some items were edited to correct spelling.

Professional Development

Projects conducted large numbers of professional development activities for ATE faculty (e.g., high school teachers, community college faculty) and staff members at the secondary, associate, and baccalaureate levels. Survey respondents indicated that these activities were well attended and well received.

Nature and Extent of Professional Development

The survey section on professional development included six items that inquired into the following:

- The number of professional development opportunities and number of participants
- The numbers of participants from the different educational levels
- How full the professional development opportunities were
- The sorts of support provided to professional development participants
- Percentages of participants who engaged in implementation behaviors after participating in professional development
- The outcomes resulting from the professional development opportunities

Fifty-nine of all 76 *projects* (78%) provided information about their professional development activities over the last 12 months. As would be expected, however, not all *projects* were engaged in all types of professional development, so the numbers of *projects* reporting activities varied substantially across items and components of items.

Projects reported that in the last 12 months, 931 professional development opportunities were supplied to 7,406 faculty and staff members at the secondary, associate, and baccalaureate levels. Table 32 shows that conferences, workshops, and in-service opportunities remained the most popular forms of professional development, although one project indicated extensive use of on-line courses. Conferences were defined as a multiple track selection of workshops or presentations; workshops as a single track, 1-to-3 day directed learning experience; and in-services as a course or seminar longer than a 3-day directed learning experience.

Projects reported providing a total of 579 large-group offerings, a number about midway between the numbers reported by Survey 2000 and 2001 respondents. These offerings were divided among conferences (112), workshops (369), and in-service courses (98). Additionally, much smaller numbers of *projects* provided internships for faculty and other learning activities. Substantial numbers of participants attended the 3 types of sessions for the large-group offerings with medians for attendance ranging from 6-23 for projects and 22-148 for centers, consistent with 2000 and 2001 survey findings. As these numbers suggest, center-reported large-group activities tended to include more participants.

Respondents indicated that their professional development offerings were well attended. The 50 projects reported that almost two-thirds of the opportunities were at or near full capacity–62 percent reported they were at 76-100 percent of full capacity (24% at 51-75 percent of full capacity, 14% at 50 percent or less of full capacity). Similarly, for the 9 centers, 67 percent were at 76-100 percent of full capacity, and 33 percent at 51-75 percent of full capacity. Based on the 3 years of survey data–even though the labels for this survey question were somewhat reworded in the 2002 survey–it can be concluded that the trend of well-attended professional opportunities continues.

Table 32. Conference Opportunity and Participation Rates in the Past 12 Months (Projects [P] and Centers [C])-2002

	Number of Opportunities			Number of Participants		
	Reporting (n)	Range	Median	Reporting (n)	Range	Median
Conferences	35 (P) 9 (C)	0-20 (P) 0-5 (C)	2 (P) 1 (C)	35 (P) 9 (C)	0-200 (P) 0-200 (C)	6 (P) 45 (C)
Workshops	42 (P) 7 (C)	1-105 (P) 3-20 (C)	2 (P) 13 (C)	39 (P) 7 (C)	0-524 (P) 42-497 (C)	23 (P) 148 (C)
In-Service for Faculty	30 (P) 6 (C)	0-27 (P) 0-4 (C)	1 (P) 1 (C)	28 (P) 6 (C)	0-225 (P) 0-83 (C)	12 (P) 22 (C)
Internship	24 (P) 4 (C)	0-25 (P) 0-1 (C)	0 (P) 1 (C)	24 (P) 4 (C)	0-15 (P) 0-10 (C)	0 (P) 1 (C)
On-Line	23 (P) 2 (C)	0-225 (P) 0-0 (C)	0 (P) 0 (C)	20 (P) 2 (C)	1-265 (P) 0-0 (C)	0 (P) 0 (C)
Other	6 (P) 2 (C)	0-30 (P) 3-7 (C)	5 (P) 5 (C)	5 (P) 2 (C)	0-75 (P) 91-255 (C)	14 (P) 173(C)

The numbers of participants were also broken out by educational level (i.e., level at which participants were teaching). These data are presented in Table 33 and show that the 2-year colleges recorded the largest participation rates, both in terms of median and total numbers of participants, followed closely by secondary faculty, consistent with 2000 and 2001 survey findings.

Table 33. Range and Median Numbers of Participants by Educational Level and Numbers of Projects (P)/Centers (C) Reporting-2002

Educational Level	*Projects* Reporting (n)	Number of Participants (Range)	Number of Participants (Median)
Secondary	43 (P) 9 (C)	0-180 (P) 0-313 (C)	11 (P) 20 (C)
2-year	45 (P) 9 (C)	0-214 (P) 11-347 (C)	14 (P) 150 (C)

Table 33. Range and Median Numbers of Participants by Educational Level and Numbers of Projects (P)/Centers (C) Reporting-2002			
Educational Level	***Projects* Reporting (n)**	**Number of Participants (Range)**	**Number of Participants (Median)**
4-year	38 (P) 9 (C)	0-324 (P) 0-45 (C)	3 (P) 11 (C)
Other	20 (P) 7 (C)	0-31 (P) 0-31 (C)	1 (P) 12 (C)

Use of Implementation Strategies

Sound professional development requires more than just presenting new ideas. These ideas must be accepted, and participants must be able to take home and implement what they have learned. Our survey form asked respondents to report their findings on these matters. Table 34 presents the percentages of participants reported by the *projects* as engaging in various implementation strategies. As the table shows, a strong majority of participants indicate satisfaction with all professional development activities except with on-line courses. Even for the most restrictive option (percent who have incorporated the materials or ideas into their course or program), the average is typically high.

Across professional development activities, more people indicated satisfaction with the activity than having a plan to use ideas/materials presented. Fewer yet indicated they would try out the activities or fully incorporate them into their course or program. Note, too, that consistently less than half the *projects* that reported conducting professional development activities reported follow-up data on implementation. For example, 35 projects report conducting conferences, but only 12 reported on whether their participants tried out the technology, materials, or major ideas. The low *project* response rates for these questions mean the averages should be viewed as very tentative indicators.

Across all three years of the survey, there have been consistently low response rates for these questions about follow-up of professional development participants. This suggests that a large proportion of the *projects* fail to follow up with participants to assess the effects of their professional development efforts (e.g., inquire into implementation and incorporation activities). In the 2002 survey, this matter was more fully explored.

Low response rates on matters of follow-up led to a new question in 2002. From that item we learned that 75 percent (44 of 59 *projects*) follow up with participants in one or more ways. Most often they survey participants (73%). As suggested above, they must typically query participants about satisfaction rather than matters of implementation. Other forms of follow-up include letters or email (70%), personal contacts by phone or in person (54%), and newsletters (32%).

Table 34. Participant Feedback on *Project*-Sponsored Professional Development Activities (Projects [P], Centers [C])-2002

Professional Development Activity	Indicated Satisfaction with the Activity		Indicated Intention to Use the Technology, Materials, and/or Major Ideas Presented		Tried Out the Technology, Materials, and/or Major Ideas at Least Once in the Classroom		Fully Incorporated the Technology, Materials, and/or Major Ideas into Their Course or Program	
	Av. %	n	Av. %	n	Av. %	n	Av. %	n
Conferences	71% (P) 90% (C)	17 (P) 6 (C)	64% (P) 89% (C)	18 (P) 5 (C)	40% (P) 69% (C)	12 (P) 4 (C)	41% (P) 82% (C)	9 (P) 3 (C)
Workshops	87% (P) 89% (C)	27 (P) 6 (C)	68% (P) 89% (C)	28 (P) 6 (C)	49% (P) 63% (C)	19 (P) 5 (C)	36% (P) 82% (C)	16 (P) 3 (C)
In-Service	61% (P) 98% (C)	15 (P) 3 (C)	60% (P) 93% (C)	15 (P) 3 (C)	31% (P) 95% (C)	14 (P) 1 (C)	36% (P) 95% (C)	11 (P) 1 (C)
Internship for Faculty	78% (P) 100% (C)	9 (P) 1 (C)	73% (P) 100% (C)	10 (P) 1 (C)	55% (P)	9 (P) 0 (C)	47% (P)	6 (P) 0 (C)
On-Line	33% (P)	5 (P) 0 (C)	32% (P)	5 (P) 0 (C)	26% (P)	5 (P) 0 (C)	21% (P)	5 (P) 0 (C)
Other	100% (P)	1(P) 0(C)	88% (P)	2 (P) 0 (C)	40% (P)	2 (P) 0 (C)	50% (P)	1 (P) 0 (C)

Notes: Percent values reported in the table cells are averages of percents reported by projects and centers. Reported ns are the number of projects and centers that reported on the professional development activity.

Less than half the *projects* (41% of 59) ask participants' local institutions for support, consistent with 2000 and 2001 survey findings. Eighty-six percent (51 of 59) of the *projects* provided support to their professional development participants as indicated in Table 35, which also contains the breakdown from the first 2 years of the survey. The most common type of support for 2002 was materials (90% of the 51 *projects* providing support). The next most common was technical assistance, which was provided by 78 percent of these 51 *projects*. The 2002 survey included additional options, and respondents indicated using these forms of support: follow-up activities (e.g., stipends, Web site) (72%); email (67%); and newsletter (35%).

Table 35. *Project* Support for Professional Development Participants–2000-2002			
	2000 Percent of *Projects*	**2001 Percent of *Projects***	**2002 Percent of *Projects***
Technical Assistance	74	71	78
Materials	67	69	90
Dollars	45	45	57
Equipment	29	33	35
Notes: Not mutually exclusive categories For 2000, n=67 (58 projects and 9 centers) For 2001, n=58 (47 projects and 11 centers) For 2002, n=59 (50 projects and 9 centers)			

Outcomes of Professional Development

This section of the survey contained one open-ended item that stated "Please comment on your program's effectiveness. That is, briefly describe what faculty can do now as a result of participation in professional development activities that they could not do before. If possible, please provide an example."

As in 2000 and 2001, the responses to this item were very similar across *projects*. The most commonly noted categories reported by 85 percent of the *projects* (50 of 59*)* were course improvement, knowledge of technology, increased understanding of industry, and opportunity for networking. Table 36 provides a qualitative grouping of the items, each with some sample responses.

Table 36. Outcomes Categories and Examples of Outcomes-2002	
Categories	**Examples (excerpts from *project* responses)**
Course Improvement	Faculty use more effective teaching methods such as active/collaborative teaching and learning. Improved methods retain students, particularly minorities and females, at a greater rate than traditional methods. Example: ATE graduation rate at one 2-year college has ranged from 55%-67%, compared to 16%-20% for non-ATE students traditionally. Faculty acquire skills in the development and use of activity-based learning using the module architecture developed by our *project*. We feel, based on participants reactions at and after the workshop, that they are better able to use applications and activity-based materials in their classes. We have examples of faculty working within their departments to change their developmental * programs specifically to make use of curricula which embody this approach.

Table 36. Outcomes Categories and Examples of Outcomes-2002	
Categories	**Examples (excerpts from *project* responses)**
Increased Knowledge of Technology	Professional development has enhanced faculty knowledge regarding the development of distance learning modules and other grant deliverables such as the adaptation of projects for classroom use. The professional development opportunities offered for faculty have been an essential component of moving forward to accomplish project goals.
Increased Understanding of Industry	Faculty are able to directly incorporate industry-relevant content by using industry-relevant examples. The materials are complemented with industry co-developed multimedia and learning activities to encourage the faculty to incorporate active learning into their teaching methodologies. For example, in a hands-on troubleshooting workshop, faculty experience troubleshooting on real industry tools and in some cases, are able to work in an industry-equivalent cleanroom environment. This experience they could not obtain any other way.
Networking	Because the simulation created under the project has been completely developed collaboratively, we consider the network of community college faculty who have come together to create the curricula to be faculty development. They have learned from each other about new pedagogical approaches and how to design and implement a simulation. Community college faculty and high school teachers have received training in industry specific skills. They have materials that can be used to teach students who will be employed in the * industry. They also have a strong network of professionals to communicate with and to share materials and solutions to problems.
Notes: Some items were edited to correct spelling. Asterisks (*) were substituted for specific *project* or program names.	

STRENGTHS AND SUGGESTED IMPROVEMENTS

The findings presented from this and previous surveys provide both baseline and trends information for tracking the ATE program's progress. These findings, which are consistent with information obtained from our site visits, suggest several program strengths as well as one area of needed program improvement.

Strengths

As the data show, the program gives most emphasis to materials development, slightly less to professional development, and less yet to program improvement in terms of numbers of *projects* engaged in each of these areas. Those emphases are consistent with the logic of the program. That is, most materials development efforts serve either professional development, program improvement, or both. Similarly, program improvement efforts also routinely entail professional development to improve faculty

and staff skills to teach new content or to teach content in new ways. In each area, work of the *projects* is consistent with *ATE Program Guidelines.*

By a variety of measures across the program (e.g., number of collaborative efforts, the number of materials developed, students reached or graduated, number of professional development opportunities), the program consistently has a large impact. This productivity is fully consistent with the *ATE Program Guidelines* and NSF and Congressional expectations that provide the impetus for the program.

Specifically, *projects* report substantial work and activities in each identified area (collaborations, materials development, program improvement, and professional development). These efforts can be viewed as significant strengths of the ATE program. Below we have identified five major points that attest to these strengths.

1. The *projects* actively addressed the goals of the ATE program as stated in the *ATE Program Guidelines* and other supporting documents.

   The following five general indicators were used for this determination. Four of these indicators have been included in all three surveys, the fifth was new in the 2002 survey. On all four indicators previously used, the findings were positive in all years of the survey. Findings were also positive for the fifth indicator included this year.

Indicator 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. In each of the 3 years, at least 70 percent of the *projects* were involved in at least 3 of the 4 work categories, which reflects the complexity of these *projects*.

Indicator 2. Six general health questions addressed outcomes-based factors for three of the four categories of *project* work in all three years (Note: Two questions addressing professional development outcomes were added in 2001 and retained in 2002, with positive findings). In all years, the results were positive on these six factors–all responding *projects* were stable or increasing on the factors (see Tables 5 and 6, pp. 9-10).

Indicator 3. When respondents were asked to describe or, as was the case in 2002, indicate significant unintended outcomes (positive and/or negative) of their *project's* work, most responses given in all survey years were positive in nature.

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

Indicator 5. The large majority of the *projects* took steps to sustain or institutionalize *project* work and its accomplishments. More than 80 percent reported

taking one or more steps to sustain *project* work beyond the funding period. Nearly 80 percent identified one or more aspects of the *project* accomplishments that would be "institutionalized" (i.e., remain in their institutions after the *projects* end).

2. The program encourages and achieves collaboration among educational institutions, with business and industry, and with other organizations to achieve the programmatic objectives.

3. The ATE program produces a large amount of materials that in turn serves program improvement and professional development needs.

4. Associate degree institutions lead ATE's program improvement efforts. These improvement efforts have a broad reach–impacting large numbers of institutions and students and changing the structure and content of instruction on affected campuses.

5. *Projects* have conducted large numbers of professional development activities for faculty and staff. Consistently,

    These activities were well attended.
    Participants expressed high levels of satisfaction with these activities.
    Projects provided materials, technical, and monetary support for participants.

Project-based efforts to sustain and institutionalize work and accomplishments, together with the five strengths noted above, suggest that the ATE program is likely to produce favorable residual effects at the funded institutions (i.e., effects that last beyond the period of funding). Tracing actual events (e.g., postfunding outcomes) and documenting actions at the local *projects* (e.g., number of articulation agreements completed) could provide more concrete bases for this judgment.

Suggested Improvements

Along with these strengths, we note an area of needed improvement: quality assurance. The ATE program (i.e., *projects*) gives much greater emphasis to developing products and delivering services (e.g., professional development activities) than to quality assurance (e.g., validation). This press for productivity over attention to quality assurance is visible in findings for both materials development and professional development (No survey items broached this issue in matters of program improvement). This press is also consistent with *ATE Program Guidelines* (e.g., in 2002) that speak directly and frequently to the nature of activities that will be supported, such as adaptation, design and implementation, preparation and professional development, internships and field experiences, and broad dissemination. The press is also understandable given the relatively short periods of time that *projects* have to deliver on

their promises. For example, three years is a short time to develop curricular materials and provide student-achievement-based evidence of their viability.

While the three annual surveys have not and cannot provide direct information about quality of outcomes and products, these surveys do consistently show that most *projects* do not substantiate their products and services through strong evidential procedures[17]. Because the discrepancy persists, today it is a bigger worry than it was two years ago.

We encourage the ATE program to both strengthen the program guidelines to call for stronger validation evidence and to support and assist *projects* in designing effective evaluations to obtain such evidence.

For example:

1. *Projects* can and should conduct stronger external field tests of their products.
2. *Projects* can and should tailor their professional development follow-up activities to more often include the assessment of implementation of ideas and materials at the local level (Willingness to participate in and provide such information could be a requisite for participation in the professional development activity).

Additionally, we suggest that the ATE program alert the National Visiting Committees to look for and address these issues when they occur at the *project* level.

Finally, we note that the ATE program's annual principal investigators' meeting in 2002 will focus on evaluation and assessment practices. That attention appears to be an important step in the right direction and hopefully will produce better practices among funded *projects*.

[17]Our companion site visit findings confirm the 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*.

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APPENDIX A

Survey Instrument and Methods

Survey Instrument and Methods

The purpose of the survey was to better understand the nature of the ATE *projects* and to begin to address the effectiveness of these grants. As in 2000 and 2001, the survey was Web-based. Seventy-six *projects* (67 projects and 9 centers) were asked to participate in the 2002 survey. These *projects* were selected for inclusion in the sample because they were active as of October 31, 2001 (i.e., currently in their grant-funding period), and had either a funding start date prior to March 1, 2001, or a funding renewal date on or after this date. The March 1 date was chosen as the cutoff date for new *projects* to ensure that *projects* in the sample had 12 months of data available when responding to the survey questions in February 2002.

The 2002 survey consisted of nine sections. As in the 2000 and 2001 surveys, six sections addressed the "work" categories, with "Program Improvement" divided into three parts to address three educational levels (secondary, associate, baccalaureate). Sections also were devoted to basic information (i.e., demographic information), monitoring, and the status of the *projects* (PI overview).

Significant changes were made to the survey instrument used in 2002 based on feedback from those PIs who completed the survey in 2000 and 2001. Steps were taken to reduce the length and complexity of the survey and hence the time needed to collect data and respond to the survey. Additionally, our staff met with NSF representatives and a group of PIs in May 2001 to review the survey item by item. At the annual meeting of ATE PIs held in Washington, DC, in early October 2001, PIs were given an opportunity to provide comments on the revised survey. Instructions were clarified, and the number of open-ended questions reduced. Checkbox questions based on categories that had emerged in the first two years of the survey (e.g., Questions 6 and 9 in the PI Overview Section) were used to replace many open-ended questions. To minimize the burden of the survey, including on-line time, the remaining open-ended questions continued to be optional. Some questions for which data were not easily available or were overly complex were simplified. For example, in the Collaboration section, the PIs attending the focus group pointed out that most *projects* could provide total amounts for monetary support and in-kind support from their collaborators, but not for each category of collaborator (e.g., business/industry, public agencies, secondary schools). Each Program Improvement section was made more relevant to its degree level (e.g., secondary) through the elimination and/or rewording of questions to reflect the appropriate degree level. Although many changes were made, a remaining central core set of questions allowed us to analyze data across the three years of the survey. Please see Appendix B, p. 53, for a complete copy of the survey.

The Web-based interface and related features were also updated to enhance user friendliness and speed. An online helpful hints (i.e., survey procedures, definitions) document was also made available via email and on our Web site.

After accessing the Web site, which contained the survey, *project* PIs were asked to complete the required sections of basic information, monitoring, and the PI overview. The remaining six survey sections were optional and were to be completed only if they were relevant to a *project's* work. If sections were not relevant—for example, a *project* was not involved in materials development—*project* PIs were asked to deactivate the unneeded sections by designating the sections as not applicable. Data were gathered from February 11, 2002, through April 17, 2002.

Survey Sample and Process

On December 1, 2001, and January 3, 2002, we notified, via email, the *project* PIs of 67 projects and 9 centers that met our inclusion criteria (i.e., currently in their grant-funding period as of October 31, 2001, and had either a funding start date prior to March 1, 2001, or a funding renewal date on or after this date) regarding the forthcoming survey. We asked them to verify their email addresses and check their browsers to ensure that they could access and complete the survey when the final form of the survey was released. Telephone calls were made to those not responding to these emails. On February 8, 2002, Dr. Teles of NSF emailed the PIs requesting their participation in the survey. On February 11, we contacted the *project* PIs via email and requested their assistance in providing data for the Web-based survey. In this email, the purposes of the survey were described; and the Web address for the survey, the user names, and passwords were provided to enable access to the survey. Reminder emails were sent on February 18, March 13, and April 8. On April 8, Dr. Teles also emailed *projects* that had not yet logged into the survey. Telephone calls were made to those not responding to these various emails.

We originally planned to close the survey on April 15; but due to a technical problem with the survey, we extended the deadline by 2 days. At the close of the survey on April 17, 2002, 100 percent of the *projects* (76 *projects*–9 centers and 67 projects) completed all applicable and required sections, submitted them, and closed their surveys as requested[18]. Because our response rate was 100 percent, we concluded that the findings were generalizable to active *projects* in the ATE program. The data gathered from the 76 *projects* closing the survey are included in this report.

Data Analysis Steps and Cross-Checks

Nine numeric and nine text files were imported into SPSS and Excel, respectively. These files were saved in their original and in their converted formats. For the SPSS files, data dictionaries were created and applied to the converted formats. These files were then saved under new file names. Data verification steps included randomly selecting nine surveys, printing them, and comparing them, item by item, to the import

[18]Four *projects* experiencing firewall problems completed a Word document version of the survey. These were keyed in, submitted, and closed by our staff on the Web-based version and verified by these *projects*.

files, both numeric and text. Additionally, all data files were examined for outliers, and phone calls to *projects* were made when appropriate. To audit data analysis procedures, several tables in this report were randomly selected and then reviewed for accuracy by an individual who did not perform the original data analysis.

APPENDIX B

Survey 2002
(Word Document Version as Provided to Survey Respondents Unable to Use the Web Version)