NJCATE

Blueprint for Change

Mechanisms and Strategies for Implementing Change in Advanced Technological Education

This project is supported by the National Science Foundation Advanced Technological Education Program.

OCTOBER 2002

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Mechanisms and Strategies for Implementing Change in Advanced Technological Education

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This material is based on work supported by the National Science Foundation Advanced Technological Education Program under the grant NSF DUE-0002767. Any opinions, findings, conclusions, or recommendations expressed in this material are those of the authors and do not necessarily reflect those of the National Science Foundation.

Foreword

Since 1993, the Advanced Technological Education (ATE) program, sponsored by the National Science Foundation (NSF), has been a force for change in the educational community. By promoting science, mathematics, engineering, and technician education at a national level, the program has consistently aimed to fortify the ranks of the labor force and provide our nation with world-class technicians. Its broad-based initiative, directed at two and four-year colleges as well as secondary schools, is designed to revitalize national technician education in the face of today's climate of global competition.

There are currently 12 ATE centers of excellence across the country and over 400 current and completed ATE projects, which have produced a broad variety of innovative materials and practices in technician education. Each project or center acts as a catalyst for activity and change within its school or institution with the expectation that its actions will ripple out into the larger community.

Executive Summary

The ATE program of the NSF has made tremendous progress in response to the challenges of educating the technical workforce for the 21st century. While substantial benefits of enhanced student outcomes and workforce development have been realized by the many ATE projects and centers of excellence, the results of these efforts need to be further extended to other two- and four-year colleges which are potential beneficiaries of ATE reform successes.

In 2000, the NSF ATE program funded this project to develop a comprehensive plan for identifying the mechanisms and strategies that would provide a "Blueprint for Change" for the process of institutional transformation through innovation, and also encourage and support the wider adoption or adaptation of educational innovations that exemplify ATE program purposes. These mechanisms and strategies should result in the wider engagement of the technician education community in the process of reform, increasing the impact of the ATE program on student success and workforce development. From the perspective of this planning project, the programs and practices that best exemplify ATE program purposes are those that have become institutionalized.

The New Jersey Center for Advanced Technological Education at Middlesex County College received the planning grant "Blueprint for Change" (BFC), with Jack Waintraub, Executive Director of NJCATE as the Principal Investigator. A planning committee was organized that consisted of representatives from ATE centers and projects, industry leaders, a researcher and an evaluator as well as other stakeholders. The committee's first step was to examine a selection of topical publications relating to the process of change among institutions of higher learning. From that mindset and starting point, the committee conducted two meetings. The objectives for the first meeting were to:

- Identify rationales and motivations for undertaking institutional transformation through innovation
- Identify essential program components in innovative technical education that have broad institutional impact (not necessarily from the ATE program)
- Develop a method to identify those ATE projects exemplifying essential program components or "best practices"

After its first meeting in the fall of 2000, the committee designed an online survey that ran from December 15, 2000, to January 31, 2001. The survey's target participants were all the current and past project and center Principal Investigators from the NSF ATE program. Eighty-nine PIs participated, responding to a wide range of questions designed to foster an understanding of the process of educational reform in the ATE program.

Meeting for a second time in the spring of 2001, the committee reviewed a draft report which highlighted survey findings and synthesized the collective knowledge and experiences of ATE projects and centers. With that as ammunition, the committee was then able to identify the five most critical factors cited by ATE PIs that reflect the conditions under which their projects operate or operated. They are, in order of importance:

1. The leadership at their institutions actively supports the implementation of the ATE project.
2. The project incorporates several integrated components; e.g., curriculum with faculty development, instructional materials with curriculum development.
3. The ATE project goals are aligned with institutional goals.
4. The partnership strategy of the project is based on articulated partner issues and needs.
5. Partners contribute resources to the development and implementation of the project.

By identifying and understanding what ATE PIs find to be the most crucial factors for successful projects and centers, "Blueprint for Change" encourages the wider adoption or adaptation of educational innovations that exemplify the ATE program purpose. To deepen their understanding of these "success factors," the BFC committee conducted additional follow-up one-on-one telephone interviews with a sample group of PIs who had responded to the survey. The committee's final task was to make recommendations for future actions.

The recommendations of the committee fall under seven categories that provide a structure for future ATE programs. These recommendations will help guide PIs through the process of creating successful projects that result in measurable change. The categories are:

- Project alignment with institutional goals, institutional support (i.e. administration buy-in)
- Building and maintaining viable internal and external partnerships
- Resources (i.e. money, time, and staffing)
- Measuring success
- Teaching and learning
- Drivers for change
- Sustainability

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Introduction:
Blueprint for Change, A Map for the Future of Advanced Technological Education

"Blueprint for Change," planning grant # 0002767, was designed to identify the critical success factors and best practices of PIs within ATE projects and centers in order to make recommendations for change and innovation. Its purpose was to broaden the impact of the ATE program with a greater number of projects and a higher degree of success among those projects, thereby creating meaningful change.

Building on the success of the ATE program over the past eight years, "Blueprint for Change" has drawn out the most critical factors and best practices of ATE innovators. These best practices can be collectively understood and implemented with the goal of becoming institutionalized as fundamental elements of the ATE system. The aim of the project is to create a roadmap, a guide that will make it possible to involve more institutions in ATE programs and to provide information leading to higher levels of project success.

The ATE program grew out of the need to create a better-prepared technological workforce in the face of global competition. To accomplish this, broad and sweeping change was needed. It could not occur in pockets of reform but rather uniformly and at an institutional level. "Blueprint for Change" capitalized on the experiences that reformers have had in successfully implementing model programs by learning from their gains, and, in turn, providing support to new ATE projects through training and technical assistance for potential applicants.

By identifying critical success factors and major barriers to success, and learning from them, we position the NSF's ATE projects for even greater success. It is only with wide dissemination that the ATE program can effectively engage the larger technical community and, therefore, the educational community's overall student population.

> *"Undergraduate education in science, mathematics, engineering and technology has seen many successful reforms in recent years. Yet these successes also highlight the difficulties associated with broader change . . . Innovations that could make a difference in other settings remain confined to a single institution, department or instructor."*
>
> – From Analysis to Action, 1996

Findings

GENERAL FINDINGS

Five factors critical to the success of ATE projects and centers emerged as prime issues in achieving positive outcomes in ATE projects:

1. ***Project Planning*** - For many PIs, planning was a major issue, especially for those who lacked experience, and in particular, for those who had expressed that the resources they needed to complete the project were often understated or not fully understood.
2. ***Building Partnerships*** - It was the partnerships, most notably with industry, that helped sustain centers and projects with their support, and this support came in many forms. Some partners offered input as to curriculum components; others offered facilities or equipment or professional leadership within the community. In all cases, when the partnerships were established and their support made available, PIs considered them essential.
3. ***Project Management*** - This was an issue for many PIs due to their lack of experience with project management. Meeting deadlines, managing faculty, ensuring faculty and administration buy-in all offered challenges.
4. ***Assessment and Evaluation*** - Although assessment plans are written into the grant, many PIs had difficulty in following those plans with concrete, measurable outcomes. Few consulted with an external evaluator, and many of those who did were not satisfied.
5. ***Institutional Alignment and Educational Reform*** - Most of the projects were clearly aligned with the goals of their institution.

Even in the most positive self-assessments in which PIs rated their projects or centers as successful, the need for resources such as money and time were still factors. Not surprisingly, project PIs highly valued their working partnerships with industry and with other educational institutions.

Project PIs who had the most experience with ATE grants fared the best as far as being effective ATE grant administrators. They had learned the hard way that the grant requires a good project manager. Those without experience suffered from a lack of time and the desire for more assistance on the project—for instance, in handling logistical issues such as budgeting and staffing.

Assessment and evaluation was a major issue and, overall, attention to this area was greatly lacking. Clearly articulated evaluation standards and benchmarks are the basis for data collection, and project revision emerged as one of the conditions of lesser significance under which the PIs operated their projects. Furthermore, the post-survey follow-up telephone interviews revealed that this lack of assessment is a true concern for these PIs. Few had external evaluators or evaluation tools, and they found this very problematic. The more experience with ATE projects a PI had, the less this problem emerged.

SURVEY DERIVED

Overall Findings

Of the 89 center and program PIs who responded to the survey, 61 were from two-year institutions; 11 were from four-year schools; and 17 represented other types of institutions.

Schools with 3,000 to 10,000 full-time enrolled (FTE) students in credit programs represented 35, or 39% of all respondents. Colleges with fewer than 3,000, declared 22 or 25%, and those with more than 10,000 FTE represented 23 or 26% of all those who responded to the survey. The remaining 10% did not respond.

For institutions responding about unduplicated non-credit enrollments, eight, or almost 9%, reported theirs as under 3,000, 12 (13%), as 3,000 to 10,000, and 18 (20%) as over 10,000.

Grant status broke as down as follows: 35 PIs reported that their grants were renewals; 34 were new grants; and 20 were completions.

Project Foci

Keeping in mind that many projects and centers have multiple foci, survey respondents claimed the following as their primary project/center focus:

- 82% (73 respondents) - "Curriculum and Educational Materials Development"
- 74% (66 respondents) - "Teacher and Faculty Enhancement"
- 55% (49 respondents) - "Dissemination"
- 46% (41 respondents) - "Adaptation and Implementation"
- 38% (34 respondents) - "Articulation Partnership"
- 33% (30 respondents) - "Laboratory development"

Grant $ Allocation

In terms of grant money, the dollar amounts were divided as follows: four of the respondents reported grant funding below $ 99,000, 37 reported between $100,000 and $499,999, 22 between $500,000 and $999,000, and 23 received between $1M and $5M.

Most Meaningful Issues

The PIs ranked, in order of importance, the most meaningful issues in their decision to undertake an ATE project:

1. The demand from employers
2. New technologies
3. Student demand for career training

Most Critical Factors

The five most critical factors cited by ATE PIs that reflect the conditions for which their project operated were, in order of importance:

1. The leadership at their institution actively supports the implementation of the ATE project.
2. The project incorporates several integrated components (e.g., curriculum with faculty development, instructional materials with curriculum development).
3. The ATE project goals are aligned with institutional goals.
4. The partnership strategy of the project is based on articulated partner issues and needs.
5. Partners contributed resources to the development and implementation of the project.

Least Critical Factors

The ATE PIs cited the following five factors as the least critical in reflecting the conditions in which their projects operate or operated. It is important to understand that the PIs were not asked to distinguish how or why these factors became less significant, they were just noted as less critical (which potentially raises interesting questions, such as: Did the PIs not plan for these events? Did each project's evolution not allow for them to occur?):

1. Teaching and learning at their institutions have changed significantly because of the ATE project.
2. There is broad support for and engagement in the project by faculty at the institution.
3. Project goals were designed to lead to institutional transformation.
4. Clearly articulated evaluation standards and benchmarks are the basis for data collection and project revision.
5. Unforeseen barriers to success have been overcome in the implementation of the project.

WHAT WOULD THEY DO DIFFERENTLY?

More Time

Many respondents answered they would do "nothing" differently, with several claiming it was too soon in the process to tell. The most repeated response was "more time" where particular aspects of that response emerged. Some spoke about time in general terms of wishing for more time to finish the project. Others would have arranged for more time in order to start the planning process earlier. Still others wanted more time to organize. In one example, a PI stated that "one year was insufficient." Another, having wanted to better plan to have more time in the beginning, cited the need for "more intensive up front work with educators and employers." Still another lamented not having had enough time to "organize," and, ideally, would have wanted "to commercialize earlier."

More Money

Some PIs said that marketing, evaluation, and faculty work for their projects were all under-budgeted. Several wanted to "ask for more funding" and also expressed the concern of under-funding leading to "project failure or token project accomplishment." They also wanted to manage existing funding more efficiently through better budgeting. "I would get specific training in how to manage the grant budget," noted one PI.

Stronger Partnerships

Partner institutions play an extensive role in the support of any project. There was a feeling among some PIs that they should have gotten stronger ties and more solid commitments from their industry partners in the beginning. Once partnerships were established, PIs would have preferred to "require more responsiveness of the partners." In the PIs' minds, that entailed "ensuring that partners were fully committed to the…project goals and that they would be active and involved."

SUCCESS ENHANCEMENTS

The greatest positive effect on the success of the PIs' projects was, without a doubt, their partnerships. By far it has been the working partnerships between industry and academia that have most helped tap hidden resources and build permanent working teams. PIs raved about their industry partners who supply funding, utilize their materials, lend them credibility and even "do battle" in support of projects.

It was apparent to the committee that the commitment and support of internal and external partnerships was pivotal to the success of projects and centers. With that in mind, they drew the following conclusions:

- Successful partnerships are ones that are developed early with meaningful involvement of partners.
- Projects need to identify similarities and differences of strategic intent of partners. Many of the PIs who responded lacked a plan to sustain their partnerships or measure their effectiveness.
- It is essential to allow funding to capture growth and evaluation in the development of partnerships.
- Furthermore, projects and centers need enough partners who must be willing to support change.
- In educational partnerships, appropriate engagement of faculty beyond the project team and among the institutions involved is a factor in success.

PROJECT GOAL ALIGNMENT

Project and center PIs who indicated that there was goal alignment between their projects and their institutions reported their projects as more successful. They concluded that:

- Projects for curriculum or instructional materials development should include a clear mechanism for use in the classroom.
- Project goals should be clear and measurable.

PROJECT MANAGEMENT

Those PIs who were experienced in project management showed the most success. It may be that in the management of a center or project, the operational manager does not necessarily have to be the PI who obtained the grant. One thing became clear: the need for equal attention to the design and execution of the project. For example, a managerial plan should be clearly articulated in the written proposal.

When PIs were asked to rate the success of their project or center on a scale of 1 to 5, 1 being most successful and 5 being least successful, numerous PIs reported their center or project as being very successful or successful. A small percentage remained neutral, while an even smaller number reported their projects as less successful. None responded with least successful. Overall, the reported success of these PIs is exceedingly high.

BARRIERS TO SUCCESS

Most of the barriers to success cited were so diverse that they could not be easily organized into defined categories. Apparently, problems that arise are as different and particular to ATE projects and centers as their missions and the people who lead them.

Among the most often cited barriers was under funding. PIs reported problems with field testing, student data collection, and outreach to potentially interested individuals due to limited amounts of resources. Next on their list was a lack of follow-through from various entities such as industry partners, administrations, and other departments within their institutions. Further down the list they noted the lack of time to complete projects. Last among these critical factors were specific problems with partnerships such as time conflicts, lack of cooperation, and a lack of commitment.

EXPERIENCE BASED

Institutional and Industry Leadership

The committee agreed that leadership is a key factor in that institutional leaders must accept responsibility for achieving and maintaining alignment. This occurs when all organizational elements have explicitly agreed to ATE project objectives and goals. This agreement is essential and denotes ownership by stakeholders and is manifested by their active participation. This participation must be consistent, as continuity requires activities that will sustain and expand impact beyond the initial implementation phase.

Within the project, faculty development is crucial, as is development of an integrated curriculum and a communication process that allows for a defined method for collecting, disseminating and sharing project information. When partnerships that include a demonstrated ownership of agreed goals and objectives are in place, there should be a higher likelihood of project success.

In looking beyond the project, committee members concurred: Institutionalization of practice, personnel commitment, an incremental plan, and consistency of purpose for sustaining and extending practices are all essential components. ATE best practices should be viewed as a resource in the process of transformation.

The committee determined some of the critical factors and components in their own experience. As external factors, industry as a partner and a driving force was universally recognized. The committee agreed that partnership strategies needed to be mutually beneficial and based upon the needs of business and its problems, and that the educational elements of the programs should address these issues. A project's product must be the student entering the workforce.

How is it possible to attain specific information to fulfill these needs? Strategic input from industry is necessary and the flow of that information needs to be continuous. A contact or "champion" with full buy-in must be made and sustained at the partner industry. Furthermore, the best method to gather information from industry and the role of the specific business in the community must be identified. Ideally, a cycle of success among student, school and industry will exist.

Technology

New technologies also play their part to influence successful projects. Evolutionary development of existing science/technology or a radically different area of technology can be springboards to project success. The application of this technology–be it industrial or educational–and the response to it in terms of the institution's role and the timing of the response can be critical factors.

Other Issues: Poor Delivery Systems, Metrics

Certain issues are bound to arise with the initiation and execution of an ATE project. What appears to be insufficient funding could actually be a lack of delivery systems (i.e., communication and cooperation among the various institutional administrative entities). This is especially important for two-year colleges, as they may not have the established networks or a culture that supports grant funding. Other issues that may arise and cause problems include: Non-mutually beneficial partnerships, unclear lines of authority within the project, poor accountability of partners, or the lack of methods for sustaining or measuring the project effectiveness. The committee viewed metrics as an essential project component. Final outcomes should include data identification and collection agreements with partners. Project goals should be measurable.

The impact of teaching and learning should also be measurable. The committee noted an inconsistency in that teaching reform was not necessarily cited as an institution or project goal. The committee agreed that there should be an impact on teaching and learning. Are PIs not placing an emphasis on teaching and learning or are they simply not measuring its impact? These issues need to be addressed.

Recommendations

PREAMBLE

The following recommendations are based upon the consensus of a twelve-member committee in conjunction with the survey results and follow-up questionnaire. Before undertaking the task of outlining these recommendations, the committee sought first to understand the process of change in institutions of higher learning. They extensively surveyed ATE PIs and did follow-up interviews with a selection of them. Only after they had listened to the heart of the ATE community's needs did they form these recommendations that are designed to smooth the progress of future ATE programs in the process of change.

1. Project Alignment with Institutional Goals, Institutional Support, i.e. Buy-in

ATE projects and centers rely on their institutions for support, and project alignment with the goals of their institution is an essential component of this support. Through the survey, it was not clear that alignment was a critical factor for PIs. By conducting a follow-up questionnaire, it became apparent that this ideal was understood to be a key element, that not only were project and center PIs interested in goal alignment but many were out in front taking the initiative towards it with the full approval of their institutions.

Recommendations

- *Administrative support should be clearly articulated in the written proposal* — A clear understanding on the part of the administration of the type and level of support is essential and will create a stronger commitment when the project is implemented.

- *The administration has to be actively involved early on in the implementation of the project and should have a clearly defined role in addition to overseeing the project* — Administrators who are active members of the project team have a unique expertise they can contribute and can champion the project as insiders within their respective institutions and the community at large.

2. Building and Maintaining Viable Internal and External Partnerships

Practically all of the surveyed PIs agreed, regardless of their level of success, that meaningful partnerships are an essential component of any ATE project. Partnerships with industry are invaluable in providing strong links to the community, supplying funding, materials, work environments and more. The PIs also saw academic partners from other institutions and internal support from their own institutions as highly valuable.

Recommendations

- *Partnerships should be developed early with meaningful involvement of partners* — Partners who are involved very early on (in the proposal stages) and who have clearly defined tasks, are more likely to remain actively involved in the project.

- *Partnerships should be built on a win-win strategy* — Partnerships should address the needs of all parties with mutual benefits and a sense of ownership in recognizing everyone's contributions.

- *There must be enough partners to accommodate change* — It is essential that the partnership include a sufficient number of partners that can provide the needed mix to achieve the objectives of the project. A mechanism for replacing partners who do not meet their responsibilities should be provided.

- *Continued partnerships need a plan to be nourished* — A plan for sustaining partners with a well-defined changing role as the project evolves is beneficial in supporting and growing the partnership.

3. Resources: Money, Time, and Staffing

Many of the PIs perceived a shortage of resources. Projects and centers with grants ranging from $100,000 up to $5M claimed equally that they did not have adequate resources or sufficient time to complete their projects. Much of the shortfall in money, time, and staffing was attributable to issues with project management. In other words, if ATE projects could function with maximum effectiveness, regardless of grant amounts, then the process would improve even beyond its current success.

Recommendations

- *Provide training and technical assistance in project planning for potential applicants to the ATE program* — There is a need for potential and current PIs who do not have experience with ATE or working with grants to be trained and/or mentored in these areas. This could be a role for the ATE centers.

- *Provide pre- and post-award training and technical assistance in project management* — Many project PIs have limited or no administrative experience and could benefit greatly from specific training. This would also be a role for the ATE centers. In some cases the PI might not be the best person to manage the project.

4. Measuring Success

In the online survey, we asked PIs to rate their perceived success with their project or center. In speaking with PIs during the follow-up questionnaire, many regretted not having a system in place that would provide good feedback. Evaluation plans are written into grants; however, many PIs had difficulty in following those plans. Many did not use concrete measurements. Few consulted with an outside evaluator and, of those who did, many were not satisfied with the results.

Recommendations

- *Goals and outcomes should be measurable; metrics should be an integral part of the project* — The evaluation process needs to be addressed from the beginning to avoid issues in the final stages of the project.

- *Final outcomes should include data identification and collection agreements with partners* — Concrete measures should be part of the partnership agreement and should be specific as to what data is going to be collected, by whom and when.

5. Reform of Teaching and Learning

Committee members anticipated that this would be a major concern for those interested in creating change in technician education. Through the follow up questionnaire the committee found that PIs concur that they are leading the path to educational reform at their institutions; however, this sentiment was not reflected in the survey results. Some committee members concluded this disparity was due to the wording of the survey question and that most likely, the PIs questioned did not view teaching and learning merely as a component of the ATE program, but rather, as its essence. Still, others maintained that the data should be taken at face value, which would indicate that PIs did not consider this a major factor. In either instance, the committee members concluded that ATE commitment to reform in teaching and learning should continue to be emphasized.

Recommendations

- *Projects for curriculum or instructional materials developed should include a clear mechanism for use in the classroom* — A direct link should exist between project goals and student learning.

- *Faculty should be encouraged to move towards integrated and activity-based contextual learning* — Modules can be developed with competency based outcomes and cross discipline and departmental responsibility. This will help create an industry driven curriculum for student success in the job market.

- *Faculty should be assisted in embracing the concept of change* — With appropriate faculty development, identified incentives, and partnerships developed across departments, it will be easier to create an environment that supports change.

6. Drivers for Change

There are forces that come into play when change occurs. Several drivers for change were identified as the major influences that cause change at the institutional level.

Recommendations

- *There should exist a continuous loop among employer, institution and student as the demand from employers is key to change* — Create a continuous cycle of information, discover champions or contacts at the partner companies, and identify the institution's role in the local area.

- *Projects and centers should be leading the way when it comes to the changing face of technology and must respond to the current needs of industry* — Industry needs technical employees with up-to-date knowledge. It is up to technician educators to understand the applications of new technologies, create a role for the institution in response to them, and critically time the response to the new technologies.

- *There should be a response to student demand for career training* — Students expect their institutions to bring them the specific kind of education and training that industry requires.

- *Professional development should be provided* — Knowledge and skill enhancement are necessary in enabling technician education programs to stay current and respond to changes in the workplace.

7. Sustainability

Projects and centers need a strategy for continued sustainability, as grants are not an endless resource. PIs should be aware of the long-term implications of the project on their institution and how they can plan to be a force for change long after the infusion of initial funding.

Recommendations

- *Activities should be implemented that will sustain and expand impact beyond the initial implementation phase, as best practices will ideally become institutionalized* — Those projects whose practices have become institutionalized create a lasting impact.

- *Personnel should be committed to continuing the activity* — The need for commitment of faculty, staff and the administration is essential and must not be a singular event but a lasting responsibility.

- *There should be an incremental plan in place* — Project teams should be flexible and modify project plans based on the growth and evolution of the project.

Conclusion

There has been significant progress through the Advanced Technological Education program in driving innovative projects towards success and helping to shape the future of technician education. With that in mind, this planning grant's objective of reform and institutionalization of best practices draws out the most critical factors or best practices of ATE innovators. "Blueprint for Change" acts as a guide that will help make it possible to involve more institutions in ATE projects and to provide information leading to even higher levels of project success.

There is the potential to build stronger ties to industry with lasting partnerships, ensure more directed use of NSF funding, and encourage the wider engagement of the technician education system with the goal, as always, of enhanced student outcomes and workforce development.

In moving towards a "Blueprint for Change" the programs and practices that best exemplify ATE program purposes are those that have become institutionalized. The strategies and recommendations presented in "Blueprint for Change" should result in the wider engagement of the technician education community, thus increasing the impact of ATE. In short, "Blueprint for Change" should encourage the broad sweeping change that has defined the ATE program by institutionalizing those practices that bring about change. The findings and recommendations cited within this report are those of the Blueprint for Change committee, and not necessarily those of NSF.

APPENDICES

Process Description

GETTING TO THE HEART OF INSTITUTIONAL CHANGE

"Blueprint for Change" recognizes the essential project components (best practices) in innovative technician education and the process of actualizing change to encourage the wider adoption or adaptation of education innovations that exemplify ATE program purposes.

The project synthesized the collective knowledge and experience of ATE PIs, all with varying degrees of success, and was able to identify essential components (best practices) of technician education reform. What are the requisite conditions that facilitate change and what principles come into play when change occurs? By understanding these essential components of all types of projects and centers, the "Blueprint for Change" committee was able to identify what works and what does not work in ATE projects. Identification is but the initial step; knowledge of what works must then be translated into appropriate action and successful implementation.

The first step in creating this map was to identify and synthesize the collective knowledge and experience of successful ATE projects and centers. To execute the project, the New Jersey Center for Advanced Technological Education (NJCATE) organized and led a planning committee comprised of representatives with a wide range of experience. They came from ATE centers and projects, academia, and industry. Specifically, the team consisted of the following:

- Four ATE center PIs
- Three ATE project PIs
- Two industry leaders
- One researcher
- One evaluator
- One professional association leader
- One at-large technical educator

Members of the planning committee met twice, each time for two days. The participants' broad spectrum of experiences and perspectives were essential to begin to create a view of the inner workings of the ATE system and understand how the process of institutionalized change occurs. The meetings had distinctly different agendas based upon the needs of the project.
The committee's first task was to review selected articles and papers discussing systemic change in industry and education as well as the concepts and practices promulgated under ATE projects. The committee also drew on its members' considerable experiences with ATE, industry, and institutions of higher learning. Next, the committee developed a survey that was distributed to all ATE PIs with current and completed projects, the results of which were then analyzed for best practices. A telephone survey with selected respondents was used as a follow-up and a draft report of the findings was prepared.

The 2001 annual ATE PI conference was organized around the theme of "Blueprint for Change" and several sessions were based upon the "Blueprint for Change" draft report of the survey findings.

Meeting 1: October 29-30, 2000, Washington D.C.

The planning committee convened initially to identify what they believed to be the most critical issues in project success. The participants broke out into two groups to discuss the overarching principals and institutional drivers for implementation of ATE that translate into change. The committee then decided that a survey aimed at all past and current ATE Principal Investigators would help illuminate what PIs felt were the most critical factors in conducting an ATE project.

THE INSTRUMENT FOR DATA COLLECTION: AN ONLINE SURVEY

With the target survey population in mind, and the essential success factors outlined, the committee then developed an in-depth survey to help determine what ATE PIs felt were the most crucial issues involved the success of their projects or centers. Survey questions focused on how PIs decided to undertake an ATE project, what factors drove the project to success, and what were the critical issues in terms of obstacles to success.

The final version of the survey consisted of 24 questions, including ranking, multiple choice and open-ended questions. It was distributed online via an Internet survey company and ran from December 15, 2000, to January 31, 2001. The survey was mailed electronically to 250 PIs with 89 completed responses and a 35.6% response rate. A draft report of the results was distributed to committee members for their review.

Meeting 2: April 3-4, 2001, Washington D.C.

One of the committee's major goals at this meeting was to understand the meaning behind the data compiled in the draft report based upon the completed surveys. Another was how to provide information that would lead to higher levels of project success. To the committee members, increased ATE project success, with more institutional involvement in those projects, was the best recipe for greater overall institutional change.

The members agreed that there were several factors essential to the success of ATE projects that emerged from the survey:

- Project Planning
- Building Partnerships
- Project Management
- Assessment and Evaluation
- Institutional Alignment and Educational Reform
- Reform in Teaching and Learning

LOOKING DEEPER INTO THE ISSUES

Based upon the online survey data, the committee determined it would create a follow-up survey from a sample of respondents. The objective was to conduct telephone interviews with a selection of PIs to gain a deeper understanding of their views on initiating and conducting a successful ATE project, or discover what would have made their project more successful.

TELEPHONE INTERVIEWS

The objective of the follow up telephone interviews was to gain a deeper understanding from a cross section of PIs about their views on initiating and conducting a successful ATE project, and to discover what would have made their project more successful. The PIs chosen for the follow-up interview represented projects and centers of different sizes and with varying amounts of grant funding.

Survey Data

ANALYSIS OF SURVEY COMPARATIVE RESPONSES

Comparative responses by: institution type, student body size, centers vs. projects, grant funding amount, and success self-assessment

Two-year schools

When surveyed and asked what was the most important factor in their decision to undertake an ATE project, PIs from two-year institutions replied, "demand from employers." They also replied that two highly important factors reflect how their projects operate or operated: The project incorporates several integrated components (e.g., curriculum with faculty development, instructional materials with curriculum development), and partners contributed resources to the development and implementation of the project.

The factors they identified as being the least significant were that teaching and learning have changed significantly because of the ATE project, and that project goals were designed to lead to institutional transformation.

They also noted that if they were to begin their projects today, they would have allowed for more time. PIs from two-year institutions wanted more time at the beginning of their projects to solidify partnerships and to organize, and more time at the end to finish. They also would have liked to budget their funding better and to obtain stronger commitments from their partnerships. Although insufficient resources were cited as an issue, this could be interpreted as a budgeting issue as well.

PIs from two-year institutions most often noted that their partnership with industry was a key or vital factor in their success. Next, they cited partners in general as an important success factor, followed by the dedication and hard work that went into building the project team. They also mentioned the support of other colleges and institutions and faculty input as success factors. The biggest barriers they faced were insufficient resources and a lack of support in general. Problems with the administration surfaced as an issue. Undeterred, a vast majority of all those surveyed thought of their project as either successful or highly successful.

Four-year schools

The biggest motivation for four-year schools in undertaking a project was the issues associated with student enrollment (i.e. under-prepared students, student attrition, and declining enrollments). For these institutions, the partnership strategy of the project was based upon articulated partner issues and needs. Furthermore, the leadership at these institutions actively supported the implementation of the ATE project.

The lowest priority issues were that teaching and learning had changed significantly because of the ATE project, and that project goals had been designed to lead to institutional transformation.

If they were to begin their ATE project today, the majority of PIs from four-year schools said that they would have done nothing differently, while many still would have preferred stronger partnerships followed by more time. Insufficient resources were again cited, as was the need for better planning in general.

Four-year college PIs said that the enthusiasm of team members and those involved in the project as well as the general support they received were major success factors. Faculty input was valued along with industry partners and the support of other colleges and institutions.

Four-year college PIs cited a lack of sufficient funding as their number one barrier, again suggesting that better planning and more thoughtful budgeting might have led to greater success. Second were their problems with partners, followed by a lack of enthusiasm and insufficient time to complete the project, possibly resulting from not beginning it soon enough, which they also mentioned.

Four-year PIs emerged with the highest self-assessment of their achievements. They largely rated the success of their projects as most successful and successful. A small percentage rated themselves neutrally, and none chose unsuccessful or least successful. This perhaps reflects the more common occurrence of four-year institutions of receiving grant funding and having the infrastructure, administration support and PIs to plan and deal with that funding.

Other institutions

According to responses from other institutions, the primary reason for beginning an ATE project was the need for faculty professional development. The most important factors for which these projects have operated are that the leadership at these institutions supports the implementation of the ATE project and, secondly, that partners contributed resources to the development and implementation of the project. These PIs cited as least significant that clearly articulated evaluation standards and benchmarks were the basis for data collection and project revision, and that teaching and learning had changed significantly because of the ATE project.

Other institution PIs noted that if they were to begin their project today, they would allow for more time, followed by more involvement from high school teachers. They mentioned insufficient funding as a factor, and would have liked a stronger initial focus. Finally, the top respondents said they would not have changed a thing.

The most positive aspects of the project for other institution PIs were their industry partnerships. Also important were the input of high school teachers and the support of other colleges and institutions. Barriers included, again, the lack of sufficient funds.

Size of Student Body

Under 3,000 FTE students in credit programs ..... small

3,000 to 10,000 ..... medium

Over 10,000 ..... large

In small colleges, a majority of PIs felt that the leadership at their institutions actively supported the implementation of the ATE project. That the partnership strategy of the project was based on articulated partner issues and needs was also significant to them.

Conversely, the impression that teaching and learning did change significantly because of the ATE project and that clearly articulated evaluation standards and benchmarks were the basis for data collection and project revision were not cited as critical issues. If they were able to do things differently today, these PIs would want stronger commitments in general and more time to complete the project work. Again, this is probably a question of better planning. The most critical success factor for these PIs was their partnership with industry. That was followed by the input of other PIs, the support of other colleges and institutions, and the teamwork of the members on the project.

PIs from small institutions cited a lack of support and funding as equally significant barriers to the success of their projects. About half of these PIs self-assessed their project as most successful and successful combined, while almost half chose neutral. They felt that their projects incorporated several integrated components (e.g., curriculum with faculty development, instructional materials with curriculum development). Their ATE project goals were aligned with institutional goals. However, the PIs did not rate as critical issues the idea that the project goals were designed to lead to institutional transformation or that unforeseen barriers to success had disrupted the implementation of the project.

What would these PIs have done differently? In small institutions, the most often cited response was to begin earlier followed by a need for sufficient funding. These PIs claimed industry partnerships were the most critical factors in their success. That was followed by partnerships in general, the input of faculty, and the teamwork of the project members.

PIs from medium-sized institutions again cited the lack of funding as the primary factor, with staffing issues second as barriers to success. A majority of these institution's PIs rated their projects as successful, a slightly smaller percentage as most successful, a minority as neutral or less successful, and none as least successful.

Partners contributed resources to the development and implementation of projects in large schools, and the leadership at these institutions actively supported the implementation of ATE projects. PIs stated that the project goals designed to lead to institutional transformation was not a critical factor, nor was teaching and learning at their institutions being changed significantly because of the ATE project at larger institutions.

What would these PIs do differently if they had the opportunity to begin again today? In large schools, the majority said they would have done nothing differently. Many of the responding PIs would have had a stronger initial focus; still others needed more time, stronger partnerships and better budgeting.

In large schools, the most important factor in their success was, again, industry partnerships, followed by the enthusiasm of project members, the input of high school teachers and the support of other colleges and institutions. The greatest barriers in the success of these projects for these PIs were a lack of time and problems with partnerships.

The largest institutions claimed the most success. Almost all of these rated their projects as most successful or successful. Only a tiny faction identified as unsuccessful. None claimed the neutral category, nor did any choose least successful.

Centers

The principal factor for both center and project PIs to undertake an ATE project was demand from employers. For the ATE centers, the goals of the project were designed to address employer needs. Center PIs stated that components of their ATE project have been adopted by other institutions. This directly relates to the survey statement that reflects the conditions in which the project operates or operated. Unforeseen barriers to success had been obstacles to project implementation. A majority of respondents noted that significant changes in teaching and learning at their institutions due to the ATE project was not a critical factor, even though in the follow-up survey, respondents said it was.

If center PIs could begin anew, they would secure stronger commitments from partners and other project supporters of their projects, as well as sufficient funding and more time for completion. Still, their partnerships with industry remain the main factor in the success of these centers, on par with partnerships in general and the teamwork of project members.

Barriers centers faced included problems with institutional administrations and a perceived lack of experience, sufficient college ties, enthusiasm, resources and support systems in general that would have enhanced program implementation. Some also claimed that they faced resistance to change from colleagues and others in the community.

Centers rated their success as follows: about 50% as highly successful; approximately 25% as successful; a smaller percentage as neutral; a minority as less successful.

Projects

Projects showed slightly different results than centers. For instance, the leadership at project institutions supported ATE goals. Additionally, these projects incorporated several integrated components (e.g., curriculum with faculty development, instructional materials with curriculum development).

The PIs surveyed would like to have improved upon their project if they had the opportunity. If they could do it again today they would allow for more time. That response was evenly balanced with those who would do nothing differently. Still other PIs would try to create stronger partnerships, and budget their grant money better.

When asked what were the critical success factors in their projects, PIs responded overwhelmingly that their engagement with industry and other partnerships was instrumental in helping make their project a success. They also cited, albeit as a distant second, input from faculty, support of other colleges and institutions, and teamwork. In project barriers, again lack of funding surfaced as the number one impediment, followed by lack of support, lack of time, and problems with partnerships. Overall, projects received positive success ratings, with the majority of PIs claiming their projects as highly successful and successful. A small number rated their projects as neutral and an even fewer as less successful. The following key explains the rating system used:

Success factors 1 to 5

1 ..... most successful
2 ..... successful
3 ..... neutral
4 ..... less successful
5 ..... least successful
(not chosen by any of the survey respondents)

Those PIs who rated their own programs as being most successful were primarily concerned about demand from employers in their undertaking of an ATE project. The most critical factor for how their project operated was the partnership strategy of the project being based upon articulated partner issues and needs. They also cited partners as critical to their success in their contribution of resources and in the development and implementation of the project.

What were the lowest priority critical issues for these most successful PIs? Clearly articulated evaluation standards and benchmarks as the basis for data collection and project revision was not high on the list, nor was significant change in teaching and learning at their institutions. As reflected in their self-assessments, most successful PIs would not have done anything differently in executing their projects. They found that industry support was the most critical factor leading to project success. Support from other partnerships and colleges was instrumental as well.

The major barriers for these PIs were a lack of time to finish the project and lack of faculty and administration support. Problems with partnerships also arose as a factor.

Those who rated the success of their project at 2 (successful) cited new technologies as the most important issue in implementing their projects. The most critical factors for these PIs were that the project incorporated several integrated components (e.g., curriculum with faculty development, instructional materials with curriculum development), and that partners contributed resources to the development and implementation of the project. Project goals were designed to lead to institutional transformation. They rated teaching and learning at their institutions changing significantly because of the ATE project as the least critical factor.

For those who rated their projects at 3 (neutral), the need for faculty and professional development was the primary factor in beginning the project, along with a demand for increased effectiveness in use of organizational resources. The most critical factor among these ATE PIs for the conditions in which their projects operate or operated was that the partnership strategy be based upon articulated partner issues and needs. Additionally, the leadership at their institutions actively supported the implementation of the ATE project.

Teaching and learning at these institutions having changed significantly because of the ATE project, and project goals being designed to lead to institutional transformation, were given least priority in the list of critical factors.

For those PIs who self-assessed their project at 4 (less successful), demand from employers was the most important issue in their undertaking of an ATE project. Regarding how the project operates or operated, the most critical factors among these PIs were that the goals of the project were designed to address employer needs and that project goals were designed to lead to institutional transformation.

Teaching and learning at these institutions having changed significantly because of the ATE project and the existence of broad support for and faculty engagement in the project at the institution emerged as the lowest priority in critical factors.

A common issue arose for all the PIs, regardless of their perceptions about their success with their ATE projects. Across the board, to one degree or another, they wanted more time to complete their projects. From this common issue we can infer that the need for more time was actually the end result of the need for better planning at the beginning of these projects. In the 1 and 2 categories, PIs commonly responded that they would have done nothing differently.

Common threads ran throughout responses regarding the lowest priority critical factors. All of the respondents from success factors 1, 2, 3 and 4 agreed that teaching and learning at their institutions having changed significantly because of the ATE project was a critical factor of low priority. In categories 1,2, and 3, all respondents agreed that project goals designed to lead to institutional transformation was also a critical factor of low priority.

As critical success factors emerged, so did another common theme. Industry support was an important factor in the success of all these projects. Additionally, partnerships in general—whether with industry or academia—were positive factors. The support from other colleges for success categories 1 and 4 was also important. Obviously, regardless of their perceived success, one cannot discount the value of industry partnerships in an ATE project.

Categories 1 and 2 mirror each other as far as the barriers to executing a successful ATE project. They have nearly exact similarities; for example, respondents in both categories regarded the lack of time to finish a project, and the lack of faculty and administration support as barriers. Problems with partnerships also arose as a factor for both 1 and 2 category respondents. Some PIs in these categories claimed that there were no barriers to their success. In success categories 3 and 4, responses differed. A lack of funding was most significant for those who replied in 3. In 4, a lack of enthusiasm and focus and problems with staffing were cited.

Responses arranged by amount of grant $

Less than $99,000 ..... small
$100,000 to $499,999 ..... medium
$500,000 to $999,000 ..... large
$1M to $5M ..... very large

PIs from projects and centers receiving medium, large and very large grants ranked demand from employers was primary. The main response from those receiving small grants was student demand for career training.

That the leadership at their institutions actively supported the implementation of the ATE project, and that the ATE project goals were aligned with institutional goals were the most critical factors for those projects with small grants. For medium-sized grant recipients the most critical factor was that the partnership strategy of the project be based upon articulated partner issues and needs.

In larger grants critical success factors were that the ATE project goals were aligned with institutional goals and that the project incorporated several integrated components (e.g., curriculum with faculty development, instructional materials with curriculum development).

In very large grants the goals of the project were designed to address employer needs. An additional critical factor was that the project incorporate several integrated components (e.g., curriculum with faculty development, instructional materials with curriculum development).

The lowest priority critical factor at every grant level was that teaching and learning at the project or center institutions had changed significantly because of the ATE project.

Also a common theme, at all funding levels, was that these projects should have been allowed more time for completion. For medium and very large grants, many PIs said they would do nothing differently. PIs of very large grants said "better planning" was their main issue. However, considering the vast differences in the amount of the grant awards, it is interesting that better planning or budgeting was a concern for all.

As far as the most positive factor in the projects' success, in small grants, no one single issue emerged. In all other categories, partnerships with industry had the most significant positive effect.

In small grants, a lack of enthusiasm and problems with partnerships emerged as significant barriers. In medium-sized grants insufficient funding and lack of support were great issues. In large grants, again, insufficient funding and time were the biggest barriers. In the very large grants, problems with the administration proved a major hurdle.

The amount of money awarded in a grant is not a barometer for which grantees will be successful in their projects. Those who received very large grants did not rate their projects any more successful overall than those who received medium sized grants. Those with small grants acknowledged moderate success, as did those with large grants.

Readings

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Leadership Abstracts, Mark D. Milliron and Ernest R. Leach, League for Innovation in the Community College

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Surveys

BLUEPRINT FOR CHANGE SURVEY

Please fill in the shaded areas with an X or an appropriate response

Institutional Profile

Name of Institution:			
2 year		School District	
4 year		Other	

Enrollments

FTE Students in Credit Programs:						
Under 3,000		3,000 to 10,000		Over 10,000		
Unduplicated Non-Credit Enrollments:						

Project Profile

Project / Center Name:				
Type: Center		Project		

Project / Center Status:						
New		Renewal / Continuation		Completed		

Project Dates:			
From		To	
If this is a renewal/continuation, what was the original project start date?			
Total Funding			

Project/Center Focus (check all that apply)			
	Adaptation and Implementation		Curriculum and Educational Materials Development
	Teacher and Faculty Enhancement		Laboratory Development
	Dissemination		Articulation Partnership
	Other:		
Primary Discipline			

Contact Information

Name	
Title	
Address	
Telephone	
E-mail	

Survey Information

1. Rank in order of importance, from 1=most important to 9=least important, each of the following in your decision to undertake an ATE project

	Rank
1. Demand from Employers	
2. Student Demand for Career Training	
3. Demand for Increased Effectiveness in Use of Organizational Resources	
4. New Technologies	
5. External Performance Standards	
6. Internally-Defined Performance Standards	
7. Need for Faculty Professional Development	
8. Student Enrollment (under-prepared students, student attrition, declining enrollment)	
9. Other:	

2. For each statement, please put a check in the box that most accurately reflects the conditions in which your project operates, or if your project has ended, operated.

	Strongly Agree	Agree	Disagree	Strongly Disagree	NA
1. The leadership at my institution actively supports the implementation of the ATE project.					
2. There is broad support for and engagement in the project by academic administration at the institution.					
3. There is broad support for and engagement in the project by faculty at the institution.					
4. The ATE project goals are aligned with institutional goals.					
5. The ATE project is viewed as a resource for educational reform and transformation at my institution.					
6. Teaching and learning at my institution have changed significantly because of the ATE project.					
7. The partnership strategy of the project is based on articulated partner issues and needs.					
8. Partners contributed resources to the development and implementation of the project.					
9. Employers are actively involved in the implementation of the ATE project.					
10. The goals of the project were designed to address employer needs.					
11. Project goals were designed to lead to institutional transformation.					
12. Components of the ATE project have been adopted by other institutions.					
13. Project development and implementation include a plan for collection, analysis and dissemination of quantifiable data.					
14. Clearly articulated evaluation standards and benchmarks are the basis for data collection and project revision.					
15. Revision to project goals, objectives and activities are made based on the results of data collection.					
16. The project incorporates several integrated components; e.g., curriculum with faculty development, instructional materials with curriculum development.					
17. Unforeseen barriers to success have been overcome in the implementation of the project.					
18. Strategies are in place to sustain and expand project impact beyond initial implementation.					

1. If you were to begin your ATE project today, what would you do differently?

_____

_____

_____

_____

_____

_____

2. What factors or conditions had the greatest positive effect on the success of your project?

_____

_____

_____

_____

_____

_____

3. What factors or conditions presented the greatest barrier(s) to the success of your project?

_____

_____

_____

_____

_____

_____

4. On a scale of 1 to 5, please rate the success of your project in achieving your goals with 1=most successful and 5=least successful: _____

BLUEPRINT FOR CHANGE FOLLOW-UP QUESTIONNAIRE

1. Project planning

Many respondents who reported successful project outcomes still had time, money and planning issues...

- How do you feel about your project plan, was it adequate enough to reach your goals?

_____

_____

_____

- If so, what factors contributed to creating a successful project plan?

_____

_____

_____

- Could you have used more help up front?

_____

_____

_____

Building Partnerships

According our respondents, many indicated that the quality of partnerships had significantly contributed to the planning and implementation of projects.

- What did you do to create such good partnerships?

_____

_____

_____

- Or, what could have been done to make these partnerships work better?

_____

_____

_____

2. Project Management

For many community college PIs, project management was an issue, particularly in managing budgets and resources and keeping partnerships real and viable.

- What would have helped in managing your project?

_____

_____

_____

3. Assessment and Evaluation

Some of the respondents hadn't adequately planned for the assessment and Evaluation process.

- Did you feel adequately prepared?

_____

_____

_____

- Did you get outside assistance such as an evaluator?

_____

_____

_____

4. Institutional Alignment and Educational Reform

We are trying to understand how these ATE projects fit in with their institutions' goals or plans in curriculum and use of technology in instruction as well as attitudes towards teaching and learning.

- How do you see your project in relationship to these areas at your institution?

_____

_____

_____

- Do you feel that you are in step with the direction that others at your institution are going?

_____

_____

_____

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