Improving Technical Education: Opportunities for Physics Educational Researchers

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What is the NSF Advanced Technological Education (ATE) Program?

Purpose of ATE

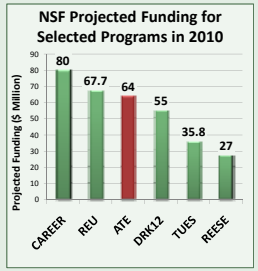
Increase the number and quality of U.S. **scientific and technological workers** through improvement of technological student programs.

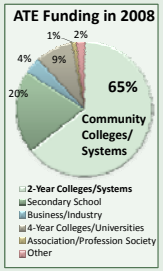
What do ATE Centers do?

- Create/disseminate educational materials
- Provide professional development
- Develop collaborations with industry
- Create technology career pathways

Centers by Targeted Technology Field

- Advanced Manufacturing Technologies
- Agricultural and Environmental Technologies
- Biotech, Chemical and Process Technologies
- Engineering Technologies
- Information and Security Technologies
- Micro- and Nanotechnologies
- Learning and Evaluation





Example of an ATE Center:
National Aerospace Technical Educational Center

Since 2002, SpaceTEC and its partner colleges have provided

Educational events, over 28,385 individuals attended.

A National Aerospace Technician Education **curriculum** offered at partner institutions, which collectively enroll over 700 students each year.

78 **faculty development** workshops, over 1,900 educators attended.

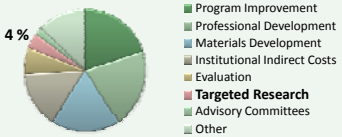
95 **professional development** events, over 3,200 technicians attended.

More Educational Research Needed Within ATE

As the ATE program has grown, so has its need for different forms of data on program impacts. The program's targeted research track reflects a desire on the part of NSF to know much more about the results of this investment, the products and productivity of projects and centers, the issues they face, and proven strategies for accomplishing program objectives.

Current Allocation of ATE funds

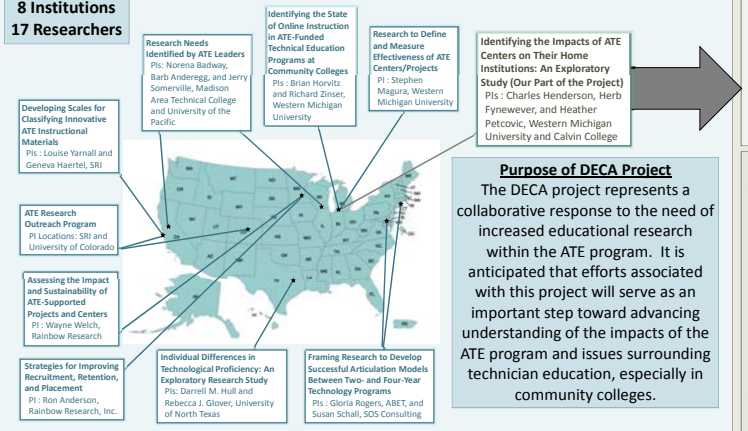
Targeted Research Track is **Underutilized**



Discovering the Educational Consequences of ATE (DECA) Project:

A Pilot Project to Jumpstart Education Research Within ATE and to Develop Models for Linking Researchers to ATE

DECA Projects
8 Institutions
17 Researchers



Purpose of DECA Project

The DECA project represents a collaborative response to the need of increased educational research within the ATE program. It is anticipated that efforts associated with this project will serve as an important step toward advancing understanding of the impacts of the ATE program and issues surrounding technician education, especially in community colleges.

www.decaproject.com

Identifying the Impacts of ATE Centers on Their Home Institutions: An Exploratory Study

Project Goal

Identify the impacts of mature national ATE Centers on their home institutions.

Why?

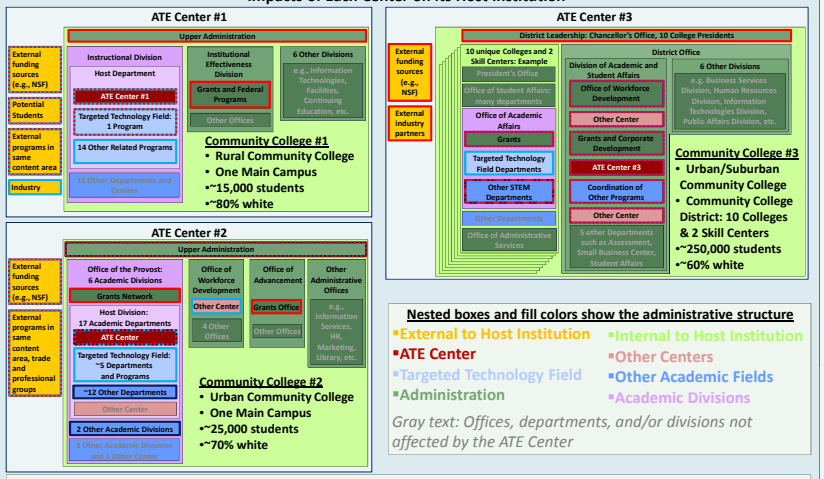
- Improve awareness of possible local impacts and ways to increase impacts. Important for: existing centers, potential host organizations for new centers, NSF.
- We hypothesize that centers with strong and visible local impacts are more likely to have center activities sustained beyond NSF funding.

Research Methods

- Case studies of 3 Mature National ATE Centers that vary in location and targeted technology field.
- 2-day site visits to each Center.
- Interviews with 13-17 stakeholders at each site (center staff, participating faculty, non-participating faculty, administrators).
- Within case and cross case analysis.

Preliminary Results

Impacts of Each Center on its Host Institution



Nested boxes and fill colors show the administrative structure

- External to Host Institution
- ATE Center
- Targeted Technology Field
- Administration
- Internal to Host Institution
- Other Centers
- Other Academic Fields
- Academic Divisions

Gray text: Offices, departments, and/or divisions not affected by the ATE Center

Box outline color shows impacts

Direct Impacts

- Improvements within the targeted technology field (*e.g.* enhanced program reputation, increased student recruitment and/or retention, faculty professional development, improved equipment, additional funding, etc).

Indirect Impacts

- Enhanced external funding for the college or areas outside of the targeted technology field
- Pedagogical and/or curricular innovations outside the targeted technology field
- Collaborations with departments or other entities outside of the targeted technology field

Impacts	ATE Center #1	ATE Center #2	ATE Center #3
Intensity of Direct Impacts *Within targeted technology field*	High	Medium	Medium
Intensity of Indirect Impacts *Outside of targeted technology field*	Low	Medium	High
Characteristics	**ATE Center #1**	**ATE Center #2**	**ATE Center #3**
Location of Center *In institutional hierarchy*	Department Level	Department Level	District Office Level
Diversification *Outside of targeted technology field*	Low	Medium	High
Local Connections *Within college but outside technology field*	Low	Medium	High
Industry Connections *Outside industry connections*	High	High	High

Conclusions

- Diversification is a key to strong indirect local impacts, and also likely a key to sustainability.
  - Connections with other parts of the institution were important for diversification. These connections often resulted in collaborative projects, additional external funding, and stronger indirect impacts. This network of connections and diversification of center activities beyond the targeted technical field might be key to sustaining a center once NSF funding ends.
  - At all centers, awareness of the existence of the center and its activities on campus were quite low. It is possible that efforts to increase local branding and raise the profile of the center and what it has to offer could lead to increased collaboration.
  - The location of the center within the organizational hierarchy was related to the strength of local impacts. We speculate that the high level of Center 3 within the organizational hierarchy helped it to have stronger indirect impacts; since it was not structurally associated with a particular department or technology field, it gained better access to other parts of the organization that were at a similar high level – and could then impact the lower levels.
  - The physical location of the center may be a factor limiting both impacts and diversification. In all three cases, isolation from the rest of campus was seen as a problem by some interviewees.
- Partnership with industry is a key to strong direct local impacts. These helped to keep the centers up-to-date with the latest technology and trends in the industry. In many cases, industry also donated equipment and/or provided modest additional funding. Thus, programs and courses associated with the centers can offer cutting edge instruction.

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