PROGRAM IMPROVEMENT EFFORTS FOR THE ATE PROGRAM

APPROACHES AND RESULTS IN IMPROVING TECHNICAL EDUCATION PROGRAMS BY ATE CENTERS AND PROJECTS

Lester W. Reed, Jr., Ph.D.[1]

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

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[1] Lester W. Reed, Jr., Ph.D. has more than 25 years experience in the area of technical education. For 14 years he served as the Senior Vice President of a comprehensive technical College with over 50 technical associate-degree programs. Currently, he is a Professor of Education and Senior Associate at the Western Center for Community College Development at Oregon State University. During the last six years, he has served as the external evaluator for an ATE Center of Excellence and various projects.

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Executive Summary

Program Improvement Efforts for the ATE Program

Approaches and Results in Improving Technical Education Programs by ATE Centers and Projects

The NSF ATE program is the Congressionally mandated governmental focal point for creating a U.S. world-class technical workforce through education. Based on the Congressional charge, ATE established developing model instructional programs in advanced technology fields as a major program objective. Although secondary schools and four-year colleges have a role in accomplishing this objective, two-year colleges are the major focus in increasing the pool of skilled technicians.

The term *program improvement* is viewed by the Western Michigan University's (WMU) evaluation project at The Evaluation Center as a process of comprehensive curriculum development and associated improvements that results in the production of cutting-edge skilled technicians. This process is a combination of efforts that address changes to the multiple aspects of a technical degree or other technical award program. These include identifying and integrating industry standards and workplace competencies; creating instructional module/course changes; adding rigorous STEM content; implementing work-based education components; facilitating equipment modernization; integrating appropriate pedagogical approaches; increasing minority participation; providing faculty development; etc. Activities that are associated with direct course/instructional improvement are referred to by WMU's evaluation project as *Materials Development* and, when pursued as part of an integrated effort to develop new or upgrade existing technical programs, is a major component in program improvement. The major difference between program improvement and materials development is that ATE *projects* involved in program improvement are engaged in materials development as well as other comprehensive activities such as standards development, faculty professional development, and recruitment/retention activities; and the program results in the award of an appropriate degree or certificate of accomplishment to program completers.

To evaluate ATE's effectiveness in the process and results of *program improvement*, a construct was developed. The elements of the construct are listed below:

1. A curriculum development and implementation process
2. Normally led by a community college
3. Revises or develops an educational program
4. Consists of an organized sequence of classes, laboratories, and work-based educational experiences
5. Prepares diverse student populations with the knowledge and skills required for employment in a specific advanced technological field
6. Is available to students over a significant period of time

7. Emphasizes STEM standards, communication skills, critical thinking, advanced technology courses, workplace competencies, equipment use, teamwork, and perseverance
8. Leads students to an appropriate degree, certification, or occupational competency point
9. Provides industry with an increased pool of competent, advanced technicians
10. Can be located at secondary schools, two-year colleges, or four-year colleges or universities
11. Structured to obtain maximum articulation of educational experiences

The above construct is lengthy and, in some ways, a complex melding of components and outcomes. However, a simpler construct would not provide an adequate framework for the exploration of best practices and ATE-funded *projects'' performance in improving their curriculum programs. Using data from surveys, field visit reports, and program documents, a point-by-point analysis of ATE *project* performance is provided in the paper. A summary of this analysis follows:

- Basically, the program improvement *projects* are meeting the identified developmental aspects of the ATE program.
- Overall, the *projects* involved in program improvement are oriented to improving STEM in their programs, and in the case of associate degree programs, in feeder secondary programs.
- The improved programs reflect use of general mathematics, science, and communications across the technical curriculum component.
- Use of standards to determine student competencies are universal, and when the work-based standards are not available, programs work with business and industry to identify them.
- The use of work-based education as part of the curriculum is also standard, but is not always a requirement.
- Projects integrate development of "soft skills" such as teamwork and critical thinking into their programs.
- The improved programs provide certification or award a degree as appropriate.
- At the associate level, there are usually multiple educational tracks to meet the need of students with a variety of backgrounds and goals.
- Articulation of the transfer of prior learning experiences between community colleges and their four-year counterparts are the norm.
- There is very limited articulation involving granting advanced standing of students between secondary and community college programs.

The conclusion reached is that the issue is not the development of model instructional programs, but the lack of data on their performance. Data are lacking on the following key aspects of program improvement results:

- The absence of formalized pilot and field-testing involving business and industry prevents verification of the programs' effectiveness and limits revision to meet the original or new program/course objectives.

- Limited documentation of courses likewise limits dissemination and adaptation by other programs.
- Approaches to reaching a diverse student population via appropriate pedagogy is not documented in curriculum materials, and the effective use of these approaches is unknown.
- Data on performance by program completers (either on the job or in continuing education) is not routinely gathered or analyzed, nor are plans to do so evident.
- Only limited data are available on the number of completers reaching industry.

The deficiencies outlined above will have to be addressed before ATE's program improvement effort can be fully evaluated. To assist in addressing these deficiencies, a series of recommendations are provided for ATE program managers:

1. Continue the increased emphasis on disseminating products that are developed by ATE *projects* and develop a protocol for measuring the impact of these efforts, since materials development is integral to program improvement
2. Place greater emphasis on pilot and field-testing of the materials developed for the programs by the *projects* and encourage the involvement of business and industry in these activities
3. Define minimum standards for documentation of materials, and require *projects* to meet or exceed these standards
4. Encourage *projects* to identify, document, and use advanced pedagogical approaches to meet the learning needs of a diverse population
5. Fund *projects* that develop replicable strategies for increasing articulation between secondary schools and associate degree colleges, which provide secondary students with advanced college standing
6. Define the protocol for routinely gathering program improvement outcomes data (including those in underrepresented populations and resulting from product dissemination), and analyze these data in relation to the U.S.'s requirements for skilled technicians
7. Develop and fund longitudinal evaluations of the performance of those who complete improved programs
8. Continue to fund external evaluation of the ATE program, including on-site visits, to determine an independent measure of the impact of efforts to increase skilled technicians. As part of the evaluation effort, data-reporting methodology should be refined and standardized to increase the usefulness of these data.

A recommendation for program improvement *projects* and a suggested approach to evaluation of these *projects* are also included in this paper.

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