Abstract

One objective of the three-year NSF-funded grant titled “The South East Advanced Technological Education Consortium, SEATEC,” is to train faculty to identify and address the technical needs of area industry, upgrade curriculum to meet these needs, produce work-based case studies that apply active collaborative learning and team building concepts, improve student oral and written communication skills, and ultimately produce better prepared graduates that will meet challenges in today's global economy. This paper describes some of the activities of the SEATEC grant and provides a summary of its very promising outcomes that may revolutionize engineering and technology education. It also outlines an innovative approach to curriculum development and delivery that improves engineering and technology education and revives interests amongst students pursuing these programs.

Introduction

The SEATEC grant is actually a continuation of an earlier two-year NSF-funded grant titled “Tennessee Exemplary Faculty for Advanced Technology Education, TEFATE.” The primary objectives of the TEFATE grant were: a) to address the increasing demand for a skilled workforce by the fast developing telecommunication industry and b) to create a process for the development and dissemination of a technology-based curriculum that is both readily accessible and responsive to innovation and industrial needs. A coalition of five two-year technical colleges in Tennessee with representatives from four-year universities, secondary schools, business and industry in Tennessee, Kentucky, Georgia, and Alabama was formed under TEFATE. The purpose of the coalition is to develop a group of faculty who would provide leadership in curriculum development and delivery in emerging technology fields.

Several major outcomes of the TEFATE grant will positively impact engineering and technology education in general and will significantly improve technology programs at the participating institutions in particular. These outcomes are now being tested for dissemination nationally and worldwide and are available at the SEATEC website http://www.nsti.tec.tn.us/SEATEC. These include:

1. The development of twenty-five work-based case studies in the areas of telecommunication, computer networking, and network administration. These cases were tested in various classrooms and are being revised for dissemination.

2. A comprehensive Internship Guide that helps faculty in other institutions in planning, applying, and using industrial internship experiences effectively in the classroom.

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3. A comprehensive Faculty Development Guide that provides a model and the steps necessary for the personal development of any technology or engineering faculty.

The current SEATEC grant builds on the success of the TEFATE approach to curriculum development, which involved direct industrial cooperation and partnership, by expanding the scope of the case study approach to include all technical and engineering fields. NSF funds the grant for a period of three years totaling approximately $1.8 Million.

**SEATEC Goals**

The SEATEC goals are:

1. To provide national leadership for the development and implementation of case-based instruction in technology and engineering education.

2. To provide opportunities for continuous and appropriate professional development of participating faculty.

3. To assess the effectiveness of the case study approach in teaching technology-related curriculum.

4. To nationally disseminate information related to SEATEC activities, materials, and results, including outcomes of the use of case studies in field-test setting.

The SEATEC consortium consists of five teams (Fig. 1) that include multi-disciplinary college faculty members, industrial partners, university partners, and high school tech-prep teachers. Each team identifies the skills and competencies required by the area industry using one or more of the following methods:
**I. Industrial Site Visits:** Each team visited over 20 industrial sites. Team members identified the technical skills needed by observing the operational activities at each site and by discussions with the technical and managerial staff of each company. Follow-up visits were also conducted in some cases to address more specific questions. These visits helped the teams gain the essential understanding of how their various disciplines are integrated into the workplace.

**II. Faculty Internships:** The mission of the TEFATE and SEATEC internship programs is to assist in faculty development and to prepare each faculty to utilize team-oriented and cross-disciplinary approach to curriculum development and delivery. In this manner, faculty internships served both the academic and the business communities by producing better prepared graduates. A comprehensive document outlining the internship process, benefits, suggested before, during, and after the internship activities, and ways to assess internships is available from the SEATEC website: [http://www.nsti.tec.tn.us/SEATEC](http://www.nsti.tec.tn.us/SEATEC).

**III. Conducting DACUM (Develop a Curriculum) Studies:** Several DACUM studies were conducted ([http://www.uis.edu/~iscc/dacum.html](http://www.uis.edu/~iscc/dacum.html)) in order to develop a list of core tasks and skills for the computer networking and telecommunication fields. Each study uses the expertise and experience of the technical staff from several regional and national industries in order to identify the competencies and skills needed from current and future employees. The result from each study was a DACUM chart that includes a matrix of duties and tasks and the required knowledge/skills, tools/equipment/supplies, and worker traits/behaviors. One of the outcomes of the studies was an extensive list of tasks from all data sources. The list can be obtained from the SEATEC website.

**IV. Industrial Partners:** Each team has two or more industrial partners that provide continuous support and consultation as well as direct involvements in curriculum development.

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**SEATEC Outcomes – Year one**

The first year of SEATEC was a very productive and rewarding year. It included two workshops, two forums, various industrial site visits, case study field-testing, several new and more mature case study models, faculty development activities, business partners meetings, and numerous publications and presentations!

The first workshop focused on implementing case studies in technology education and the effective use of multimedia in case study presentation. Two professional development forums involving nationally recognized speakers were conducted afterwards. Forum one was titled “Characteristics of an Effective Case Study” and forum two was titled “Strategies for Using Case Studies in Teaching and Learning.” Two panels of well-recognized case study experts addressed questions and concerns regarding the preparation and use of cases in technology education. The two forums were followed by knowledge mining activities led by the Learning Technology Center at Vanderbilt [http://peabody.vanderbilt.edu/ctrs/ltc/](http://peabody.vanderbilt.edu/ctrs/ltc/), through which SEATEC faculty members shared their thoughts with the panels of experts, industrial partners, as well as other members. Finally, the 1999 summer workshop bore the fruits of this activity-filled year during which eight new case models were completed and presented. The new cases are truly a “second generation” cases that are more complete and improved. They represent the main components of the proposed models or “kits” that will be available for any faculty who wishes to create her/his own cases. Cooperative education, team building concept, and cross-disciplinary approach were embedded in each model, which includes a sample case study as well as other supporting materials. Each case includes ten major components, these are:

1. A set of objectives.

2. Assessment tools/techniques.

3. A “real-world ” business application.

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4. A math component.
5. A science component.
6. A technical writing and oral presentation component.
7. A technical focus.
8. A comprehensive Instructor's Guide.
9. An identification of the target audience, student group, course, or class topic.
10. Suggestions for extending the case to different levels or groups.

In addition to the above-mentioned workshops and discussion groups, SEATEC members participated in numerous industrial site visits that exposed the participating faculty to the latest technological practices and advances in area industry and provided the basis for the new work-based case studies.

The Learning Technology Center at Vanderbilt [http://peabody.vanderbilt.edu/ctrs/ltc/] was also contracted to assess the case study approach in technology education. The plan includes a literature survey, a procedure for evaluating case studies, assessing the progress in case study model development and, ultimately, assessing the effectiveness of the case study approach in teaching technology students. The developed cases were posted on the web and also printed for distribution across the globe. Each team identified the courses where field-testing will be conducted. Formal evaluations were performed throughout the year and indicated very positive results by both students and faculty. The tested cases are being modified in order to fit the newly developed model and to correct for any shortcomings.

For the purpose of disseminating the SEATEC outcomes, numerous papers have been published and presented in various international, national, and regional conferences. The SEATEC web site has been also created for the electronic dissemination of materials related to the grants. In addition, a videotape outlining the use of case studies in technology education was prepared and is available to interested parties.

**Summary**

SEATEC will continue to address the need to increase the number of technologically prepared workers by creating models for the development and delivery of work-based case studies to be used in engineering and information technology programs. SEATEC will become a resource for technological educators in two-year colleges, high schools, and universities by collecting and disseminating models for development and implementation of case studies in technology education. Students in these programs will benefit through exposure to case studies developed by inter-disciplinary faculty teams who have identified real-world problems during industry internships and site visits. These teams will provide students with exciting work-based problems that introduce and reinforce new technological applications, as well as build foundation knowledge in mathematics and science. Educators in other technical fields, such as basic physics education, are encouraged to apply the lessons that SEATEC is learning to develop case study problems focused on their disciplines.

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