TEAMING AND COMMMUNICATIONS IN ENGINEERING TECHNOLOGY CURRICULUM

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In 1993, due to declining enrollment in engineering technology at Trident Technical College in Charleston, SC, a course was developed to help increase the retention of students. EGR 103, Preparation for Engineering Technology, was designed as a bridge course between pre-Engineering Technology and the Engineering Technology courses. The rationale was to supply basic skills that would enable underprepared students to succeed in their Engineering Technology courses. The course was first taught in the Fall of 1993. The faculty of the Engineering Technology department identified Engineering Technology skills and topics in which these students were deficient. These topics were not being covered in the Developmental Studies courses in which the students were registered. The topics and skills included in the course were concepts and terminology used in Engineering Technology, use of a scientific graphing calculator, problem solving techniques, and the SI system of measurement. Also included was a discussion of what Engineering Technology is and how it differs from Engineering; the requirements of the various Engineering Technology majors and the careers available to graduates of Associate and Bachelor degree programs. In 1996 an opportunity presented itself for a re-evaluation of the skills and topics being taught in EGR 103. The National Science Foundation Advanced Technological Education grant was awarded to the South Carolina Technical College system in the Fall of 1995. Faculty members of the South Carolina Advanced Technological Education Initiative (SCATE) grant were organized into teams representing each of the sixteen technical colleges in the state of South Carolina. SCATE was created to address the need for well-trained technicians. The SCATE grant provided release time for faculty to develop new and innovative courses. A primary focus of SCATE was to create an innovative new Engineering Technology core curriculum to meet future needs. One of the ways to improve the Engineering Technology curriculum is to integrate key skills. In the Summer of 1996, five members of the SCATE team from Trident Technical College were granted release time to revise EGR 103 course content to reflect the new emphasis on team building, co-operative learning and communication skills that are in demand from industry and education.[1] The remaining two team members were granted release time to study and develop assessment methods.

Course revision

In the revised version of this course some of the topics were retained: Units and measurements; graphing; calculator skills and treatment of significant digits are topics that elude the underprepared student. Four additional topics were either added or revised extensively: 1) career exploration and planning; 2) team communication skills; 3) oral communication skills and 4) written communication skills.

Career exploration and planning

The career exploration and planning took place in four phases. First, the differences and similarities among engineers, engineering technologists and engineering technicians were compared and contrasted in lecture. The required academic preparation, expected working conditions and the curricula offered at Trident and nearby institutions were also covered.

Second, a follow-up homework assignment had each student research his or her chosen field of study and prepare a short written report defending that choice. A search of a career database, SIGI+, was a required part of the assignment.

The third assignment in the series required the student to prepare a plan for his or her academic career. Each student was supplied with a semester by semester plan devised for the normal student. The normal plan assumes the student enters in the Fall term with adequate reading skills and is prepared for College Algebra and English Composition. The plan lists all course prerequisites and the term(s) offered. Since this course was designed specifically for the underprepared student the normal plan is inappropriate. The student is expected to devise a plan to complete his or her degree in a reasonable amount of time given the availability of course offerings and taking into account any personal restrictions. Considerable emphasis is placed on this project to eliminate the belief that an Associate's degree is ALWAYS completed in 2 years.

The fourth and final phase of career exploration takes place near the end of the semester after the student has acquired increased oral and written communication skills. Each individual interviewed a person in a local industry. The industry person was someone with a position to which the student might aspire in 3 to 5 years.

Team oral communication skills

Students were placed into teams at the beginning of the semester. They were taught team skills, roles and responsibilities. Towards the middle of the semester, they were given a team oral presentation assignment. They researched a new technology: an innovative event, product, research or theory in Engineering Technology. Teams brainstormed on topics and decided on a specific field to research (i.e. Civil, Mechanical, Electronics or Chemical Engineering Technology). Students were taught the basics of creating an oral presentation focusing on Engineering Technology concepts.

The students were taught how to choose a topic that would interest their audience, not be too technical and to choose one which could be covered in the time allotted. Lectures also covered how to create and organize an oral presentation. Students were taught how to create main points based on chronological, spatial or topical patterns of organization. Students were also taught how to put a presentation together with an introduction, main points and conclusion. Techniques for delivering an oral presentation were also covered. Based on what they learned in class, they created a team oral presentation. Teams chose a topic, organized and researched the topic and established their own responsibilities for each aspect of the oral presentation. They decided who would perform each part of the presentation, who would present visual aids and how they would transition from one team member's section to another. Teams had 10-15 minutes to present their information and were graded as a team. Each team member was required to participate in the oral presentation.

Individual oral communication skills
Teams were still utilized in this assignment, but the major responsibility for the presentation fell on individual presenters. The assignment required teams to decide on a field of Engineering Technology to investigate. Team members were then asked to do an information-gathering interview of an individual actively employed in that field. Students were taught the basics of informational interviewing and given a review of how to present those findings to an audience.

The lectures focused on how to prepare for an informational interview, which differs greatly from an employment interview. Students received instruction on what type of questions to ask and what type of questions not to ask. They also learned that an informational interview allowed them to ask questions that interested them and that involved their field of Engineering Technology: questions about travel opportunities, length of regular workdays, technical and non-technical skills needed and what a typical employer in that field required of a new employee. This assignment gave students the benefit of a practice interview experience and a contact person to assist them in the networking process.

As part of their career exploration, students interviewed members of local industry. Each student was required to find an appropriate interviewee, contact him or her for an interview, conduct the interview, prepare an oral presentation covering the information given to them by their interviewee and write a synopsis of the presentation. Students presented their findings in teams based on their chosen fields within Engineering Technology. Each student 1) was responsible for presenting his/her own information, 2) had 8-10 minutes to present their findings and 3) received a separate grade.

Written communication skills
Laboratory reports were written, handed in and graded. Lab work was performed in teams, but each student was responsible for writing his/her own lab report.

Teams turned in typed synopses of their oral presentations. These synopses included the specific purpose of the presentation, an outline of the organization (introduction, main points and conclusion), a bibliography of researched sources and a description of the roles each team member performed for the assignment. Team members also filled out a team evaluation form where they gave written feedback on their team members and the team process.

The individual oral presentations also required a typed synopsis with a title page which included the name, title and company of the person they interviewed, location of the interview and date and time of the interview. The synopsis also included an outline of the oral presentation, including a bibliography.

Assessment
Two members of the SCATE Trident team assessed the results of the newly redesigned EGR 103 course. NSF has made it clear that it regards assessment of results as a necessary and desirable part of the projects it funds. Assessment not only allows project participants to review their own successes, it also provides a means to measure those successes against control groups of past performances. Assessment also allows participants to find weaknesses in new programs in order that they may be identified and corrected. Furthermore, it provides NSF with material for review when future funding is considered.

Methodology

To avoid conflict-of-interest, the course was assessed by two faculty members who had not actively participated in the design, teaching or administration of the course. The assessment task was divided into three separate parts: 1) the students' assessment of the course s success in fulfilling their needs, 2) the instructors' assessment of the success of the course and 3) tracking students of this section of EGR 103 as they continue their progress through the Engineering Technology curriculum.

Students' assessment

The students' assessment of EGR 103 was divided into two categories: informal periodic assessment (which was actually carried out during the course of the semester by the teaching faculty) and formal periodic assessment (carried out by assessment team members). All student assessment of EGR 103 was anonymous. At various times during the semester teaching faculty would run a quick assessment of a day's activities by asking students to respond on sheets of paper with pluses and deltas written upon them. Under plus each student would indicate what he or she thought had gone well during the activity. Under delta each student would indicate what he or she felt needed additional attention on the part of the instructors. At various points during the course one of the assessment team members would visit the EGR 103 classroom and hand out surveys for the students while the teaching team would leave the room. These surveys were closely modeled on similar surveys given to the students of the integrated Engineering curriculum of Mesa Community College in Mesa, Arizona. The first page of questions on these surveys attempted to place the students in terms of age, gender, number of hours employed per week, number of hours devoted to work for the EGR 103 class per week, etc. The subsequent three pages were then devoted to a series of statements about the course itself. The students were asked to circle a number corresponding to how they felt about each statement--1 was "strongly agree," 2 was "agree," 3 was "disagree," 4 was "strongly disagree," and 5 was "not applicable," or "I don t know." During the Fall Semester of 1996 the formal assessment was carried out twice. Future plans are to increase the number to a minimum of four times a semester.

Instructors' Assessment

The teaching team assessed the course in two ways (other than by the final grades that they awarded to the students). Twice during the semester, teaching team completed an instructor s version of the same survey administered to the students. They also kept weekly journals of their impressions utilizing the plus/delta format. The faculty assessment (like all student assessment) was carried out anonymously. General results were reviewed and made available to the entire teaching team though only the assessment team is privy to individual responses.

Tracking

A system has been established to track the progress of the EGR 103 students as they progress through the rest of the Engineering Technology curriculum. It will be interesting to determine how many of the original fourteen students remain in Engineering Technology versus how many discover, via EGR 103, that they should explore different career paths. In addition, the future performance of those who stay in the program will be monitored. The assessment team has identified student control groups consisting of members of EGR 103 classes of past semesters. A comparison will be made of student retention and student success rates between the team-taught EGR 103 and the conventional version of the course.

Conclusion

The SCATE team from Trident Technical College regards EGR 103 as a work in progress. Refinements will be made over the years at least partly based upon the conclusions that drawn regarding the ability of this newly designed course to fulfill the needs of Trident Technical College Engineering Technology students. This work was supported in part by NSF grants DUE 9553740 and DUE 9602440.

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2) Teams in Engineering Education, Bellamy, L., D. L. Evans, D. E. Linder, B. W. McNeill and G. Raupp, report to NSF Grant USE 9156176, Student Teaming and Design , 1994.

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