Assessing Program Objectives for TC2K

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Abstract

This paper outlines the policy, procedure and management adjustments of an Electronics Engineering Technology (EET) program implemented in order to measure early career program objectives for TAC of ABET TC2K accreditation. This program participated in TAC of ABET's pilot study for outcomes-based assessment (TC2K) and was reaccredited in 2001. These changes included developing a set of policies supporting outcomes-based management of the EET program, strengthening constituent input including the industrial advisory committee and implementing appropriate management changes. This paper will detail those items as well as note the difficulties and unsuccessful strategies encountered by the program.

I. Introduction

This paper is an account of the changes that a small EET program completed in an attempt to measure early career program objectives for TAC of ABET TC2K accreditation. A discussion of these changes will include the philosophy of the faculty, some of the supporting policies and procedures as well as program management changes that were made. The goal is to offer colleagues in similar programs some concrete examples of how to implement the required documentation for TC2K purposes. This account should be of use to the Engineering Technology community because our program was one of two electronics programs that participated in the 2001 pilot studies conducted by TAC of ABET in its conversion to TC2K.

II. Pittsburg State University's EET Program

Pittsburg State University is a small institution in the state of Kansas' Regents system. With an enrollment of about 6,000 students, the university has colleges of liberal arts, education,

business, and technology. The EET program has an approximate enrollment of sixty and is one of five disciplines comprising the Department of Engineering Technology. The department also houses programs in Construction, Construction Management, Manufacturing, Mechanical, Plastics and a Graduate ET program making it one of the largest departments on campus with over 500 students and almost 30 faculty members.

The rural somewhat isolated environment and absence of local high-tech industries present significant funding and educational challenges for our EET program. Additionally, institutional funding support is sparse. The entire program is run on an annual operating budget of under $10,000, which includes professional development, equipment repairs and supplies. However, the three-person faculty is relatively self-directed, and functions well as team.

The program's effectiveness and quality tended to be high. This was due to the dedication of its staff and students rather than any systemic institutional effort at academic quality. We do not imply that there have been no problems for the program. Several years ago the program was severely rocked with the sudden departure of a faculty member. The loss of a third of the staff was a serious impact, but the departure also offered a chance to implement changes in the organization and personality make-up of the program.

III. Background – Preparation for TC2K

Prior to the upheaval of losing a faculty member, the EET faculty had been examining an idea to strengthen the overall program. We viewed our sequence of senior design courses as quite beneficial in preparing our students for their future jobs. We wanted to harvest some of these experiences and incorporate them into our first EET course so that we could have more competitive students throughout their stay in our program. This objective suggested that we recast the introductory course, which currently included both EET majors and non-majors. Another vexing problem was the lack of flexibility in upper division courses. The chain of prerequisites built into our curriculum at that time was too restrictive. Also, we were fighting a tendency in our students to forget lower-level course concepts. The discussions in faculty meetings led us to believe that we could solve both problems with one additional course. We were looking at a model that would require a gateway course at the end of the sophomore year. Passing this gateway course would open all upper division courses to successful students. The gateway course would consist of a battery of exams based upon key concepts in the core curriculum of courses taken in the first two years. The remaining faculty began the process of legislating all of these curriculum changes through the faculty senate.

Upon our acceptance of the invitation to participate in the pilot accreditation visit for TC2K, a one-year countdown started. Our first examination of the criteria resulted in a misleading estimate of the amount of work required. In examining the criteria, we believed that we were already in substantial compliance. We were focussed on the immediate tasks of rebuilding the program with a new faculty member and legislating the aforementioned curriculum changes. The knowledge that we would be meeting with members of the TAC commission at the Engineering

Technology Leadership Institute conference the October prior to our accreditation visit, allowed us to justify delaying an in-depth study of our conversion task. The loss of two months of preparation time would prove not to be helpful.

Not all conversion work was delayed. During that time, we began reviewing our program's basic goals. What would seem to be an almost trivial task actually consumed several faculty meetings. Considering the program's role, scope, and reconsidering how the curriculum supported this basic structure were all discussed. Nothing revolutionary arose from this review process as our limited resources dictated little beyond a cursory examination of the evidence. However, it was time worth spending as it gave our new faculty group a chance to develop a coherent EET program view. Another useful outcome was reaffirming the curriculum contents with regional industry needs.

By the end of the year, guidelines for TC2K self-study[2] were available from TAC of ABET. It was now becoming clear how much work remained to be accomplished. In addition to the self-study guidelines, representatives from each of our five Engineering Technology programs were invited to attend TAC of ABET's pilot visit evaluator training session in January of 2001. We were afforded the opportunity to shadow our program's visitors as they made their preparations to train for TC2K style evaluation visits. During this event, we became acutely aware of the parallels between TC2K and ISO 9000. Our faculty group began a more intensive set of reviews to determine how we were going to satisfy the dictates of TC2K criteria one through six. As the professional societies that constitute ABET had not finalized criterion seven language, we were not to be held to this last criterion in the pilot visit. In one sense, we had started a six-front battle. Much time and effort went into defining the procedures we needed and into preparing blueprints of our new processes supporting the six criteria. While all of this had to be addressed, it would end up being an inefficient use of our limited time. It would have been better had we concentrated our efforts on criteria one and six. However, this would not become apparent to us until the time of our accreditation visit in the fall of 2001.

IV. Supporting Policies, Procedures and Management Changes

In reviewing ISO 9000 style operations [3 –10], it was immediately obvious that we could not emulate all of the tenets of this set of standards. There was no way we could match the corporate resources available to pursue formal ISO 9000 type operations in an academic setting; however implementing a comprehensive plan for continuous improvement was a task we had to address. Our assignment would be one of modifying the model to fit our particular circumstances while still satisfying the ISO 9000 flavor of TC2K. We needed a structure that was not cumbersome yet would allow us to adequately document our processes and our continuous improvement plans. We discovered that TC2K hinged primarily on criteria one and six. In fact, criterion one would prove to be central to the whole process with criterion six as its main support. While we did not know it at the time of the evaluator training session, TAC of ABET would begin to view criteria two through five as leading indicators for future program health. In fact, criteria two through seven would take on the label of "enablers" for criterion one. As such, a better use of

our time during that spring semester would have been to concentrate all of our efforts on criteria one and six. Of all of our six battlefronts, those two would prove to be the most crucial in our TC2K accreditation efforts.

Somehow, we were going to have to forge a structure to address program measurement evaluation and documentation requirements with insufficient staff time. What resulted from our efforts was a 'Policy and Procedures Manual' for managing the EET program. While too long to include in its entirety here, portions are included for reference. The entire document may be requested from the author via e-mail.

The following excerpt addresses our management of student outcomes; of particular interest is item 6.3, which addresses early career program objectives, the subject of this narrative.

"Policy and Procedures for EET Student Outcomes

6.0 EET shall maintain a list of outcomes for all of its graduates. The list of outcomes shall include all of the EET specific course experiences, topics, and proficiencies deemed necessary to insure a minimum acceptable quality level for all graduates.

6.1 EET shall use its set of major courses as the primary tools to achieve outcomes. Each course shall have expected outcomes listed. The current EET Student Outcomes list is attached as Appendix D.

6.2 EET faculty shall collect specified data or metrics from all appropriate courses to measure outcome achievements. The metrics will be collected for review by faculty on an annual basis. Faculty as part of the annual review will identify metrics collected. The metrics collected and their courses are detailed in Appendix E.

6.3 EET shall rely upon the procedures maintained by the Engineering Technology department for measuring and evaluating longer-term alumni performance goals."

The current instrument the Department of Engineering Technology uses to assess alumni performance goals is an 'Exit Survey' coupled with a follow-up survey of the same information within 1 to 5 years following graduation. Any longer time period than that and the individual's success or failure is more attributable to post graduation experiences rather than their attendance at Pittsburg State University. The current PSU exit survey is included below with some minor edits for space consideration, the complete unedited instrument may be obtained by e-mailing the author.

"FALL 2003 SENIOR EXIT SURVEY

In order to continuously improve our existing programs it is important to collect information from our graduating seniors. This assessment tool will be used to provide feedback to the various programs and to the department in our continuous improvement efforts.

Name: _____(optional)

Major(check appropriate box):

□ Construction ET	□ Construction Management	□ Electronics ET
□ Manufacturing ET	□ Mechanical ET	□ Plastics ET

EMPLOYMENT INFORMATION

Have you accepted a job or do you have a firm job offer? □ YES □ NO

If Yes:
Name of Company: _____

Type of Work: _____

Location of Company (City/State): _____

Title of Your Position: _____

Starting Salary:

	□ Under $30,000	□ $30,000-35,000	□ $35,000-$40,000
□ $40,000-$45,000	□ $45,000-$50,000	□ $50,000-$55,000	
□ $55,000-$60,000	□ over $60,000		

How did you make initial contact with the company? (Select any that apply)

□ PSU Career Placement	□ PSU Faculty	□ On-Campus Interviews
□ PSU Intern Program	□ Family Business	□ PSU Alumni Contact

□ Other (describe): _____

PROGRAM/DEGREE ASSESSMENT
Please assess the following items relative to your experience at Pittsburg State. Use the following scale: (5 = Excellent, 4=Above Average, 3=Average, 2=Below Average,1=Poor, NR=No Response). Highlight or circle your response.

A.	Overall Experience	5	4	3	2	1	NR
B.	Faculty in your major	5	4	3	2	1	NR
C.	Satisfaction with career opportunities	5	4	3	2	1	NR
D.	General Education @ PSU	5	4	3	2	1	NR
E.	Math/Science @ PSU	5	4	3	2	1	NR
F.	Advisement @ PSU	5	4	3	2	1	NR
G.	Facilities @ PSU	5	4	3	2	1	NR
H.	External/industry support for program	5	4	3	2	1	NR
I.	Coverage of basics/fundamentals in your program	5	4	3	2	1	NR

J.	Coverage of specific knowledge in your program	5	4	3	2	1	NR
K.	Exposure to appropriate tools/equipment	5	4	3	2	1	NR
L.	Appropriate applications of math in your courses	5	4	3	2	1	NR
M.	Appropriate application of computers and software	5	4	3	2	1	NR
N.	Appropriate applications of science (physics/chemistry)	5	4	3	2	1	NR
O.	Appropriate applications of engineering/technology	5	4	3	2	1	NR
P.	Appropriate applications of materials/material science	5	4	3	2	1	NR
Q.	Appropriate applications of methods/processes	5	4	3	2	1	NR
R.	Proper process of conducting an experiment/research	5	4	3	2	1	NR
S.	Proper process of analyzing and interpreting data	5	4	3	2	1	NR
T.	Proper application of applying results to improve process	5	4	3	2	1	NR
U.	Emphasis on creativity in design process/design activities	5	4	3	2	1	NR
V.	Level of team activities/team working	5	4	3	2	1	NR
W.	Appropriate types/levels of problem analysis & solving	5	4	3	2	1	NR
X.	Level and quality of written communication activities	5	4	3	2	1	NR
Y.	Level and quality of verbal communication activities	5	4	3	2	1	NR
Z.	Understanding of need for lifelong learning	5	4	3	2	1	NR
AA.	Understanding value of professionalism	5	4	3	2	1	NR
BB.	Understanding value of ethics	5	4	3	2	1	NR
CC.	Understanding social/societal responsibility	5	4	3	2	1	NR
DD.	Understanding/respect for diversification/diversity	5	4	3	2	1	NR
EE.	Understanding of global/international issues	5	4	3	2	1	NR
FF.	Commitment to quality	5	4	3	2	1	NR
GG.	Commitment to timeliness	5	4	3	2	1	NR
HH.	Commitment to continuous improvement	5	4	3	2	1	NR

COMMENTS

A. Program Strengths

_____

B. Program Areas Needing Improvement

_____

C. Most Valuable/Applicable Courses

_____

D. Least Valuable/Applicable Courses

E. Faculty Strengths

F. Faculty Areas Needing Improvement

G. What could the Department/College/University do to improve the program?

H. Additional Comments:

"

The data from this survey is collected and aggregated by the department, then made available to each program. The next question was what to do with this data? While preparing for our TC2K visit we noticed that what was consistently productive in yielding workable approaches to our outcomes-based reformatting was the time that our faculty could devote exclusively to the tasks. While productive, these sessions were carved out of very busy schedules and came with a cost to our routine activities. The mechanism that we adopted for data review and improvement was adding a new ritual to our yearly schedule, a focused retreat to measure progress, review curriculum issues, analyze the data gathered and set future plans. Performing these functions in a venue away from offices and classes seems to be a productive mechanism, allowing us a chance to focus on the data and devise adequate solutions to address issues that arise from that analysis.

Modification of this instrument and process is ongoing as the Continuous Quality Improvement (CQI) process mandates. Future possibilities include creating a Web based survey instrument with automatic data collection and some analysis performed electronically in a package such as Excel. Phone based surveys utilizing student employees to call past graduates and even automated voice system options have also been explored.

V. Advisory Committee Role

The PSU EET faculty has always believed in a strong role for the industrial advisory committee and has had one in place since the inception of the program more than 30 year ago. The marks of the advisory committee are exceedingly prevalent throughout our curriculum and program. The advisory committee has been evaluating student work in the form of capstone projects from the seniors for more than 2 decades now. We saw the constituent input mandates contained in TC2K as an opportunity to strengthen this already active group's role within our program. The policy and procedures document referred to earlier addresses this by including a section specifically documenting the role of the advisory committee. That section is included below.

"Policy and Procedures for EET Industrial Advisory Committee

5.0 EET shall maintain an industrial advisory committee to serve as program advisors and to represent industry constituent input to the management process.

5.1 The EET Industrial Advisory Committee shall maintain its own charter and procedures.

5.2 The Advisory Committee membership shall reflect the regional industrial constituents that hire program graduates. Committee size shall not be reduced below ten members.

5.3 The Industrial Advisory Committee shall meet at a minimum of once per year.

5.4 The Industrial Advisory Committee shall own the set of outcomes describing program graduate attributes and experience set.

5.5 The EET program shall maintain records, minutes, and documents for the Industrial Advisory Committee. Committee documents are attached as Appendix C."

The charter and by-laws for the existing advisory committee were updated and accepted by the committee. A portion follows but the complete document may be obtained from the author.

"The Pittsburg State University Electronics Engineering Technology program affirms the necessity and desirability of input from our industry constituents. This advisory function is a key element in obtaining high quality and competitive graduates. To ensure continued opportunities for such counsel, a committee formed of industrial representatives is hereby chartered. This committee, known as the Advisory Committee for Electronics Engineering Technology at Pittsburg State University, is charged with the task of advising the Electronics Engineering Technology faculty on such matters as the attributes of program graduates, curriculum composition, equipment inventory, changing industry expectations and technologies, program opportunities, and student opportunities. This committee is empowered to issue advocacy statements and opinions concerning Electronics Engineering Technology to the administration of the university."

To illustrate the type of productive interaction that happens at our advisory committee meetings, the following brief excerpt from the last meeting in November 2003 is included. This discussion created an action item per the guidelines in our policy and procedures manual and will result in useful data being collected.

"The committee reviewed the current EET objectives and goals. Steve Hefley mentioned that the hardest goal to obtain was to get the students to become life long learners. He stated that the faculty has no control over if the student wants to continue their education or not. A discussion covering the difference between 'objectives', 'outcomes' and various other ABET terminology ensued. Randy mentioned that goals and objectives must contain measurable attributes. The committee suggested the idea of composing a short email survey and distributing it to the employers of recent PSU EET graduates to see if the graduates are meeting their needs in the industry. The committee emphasized that the survey be short because everyone is 'surveyed to death already.'

Survey questions could include:
Is the employee still employed by the company?
Have they moved to a higher-level position since they were hired?
Do you plan on retaining this employee for several more years?

The committee accepted the goals and objectives as published."

VI. Notes on What Did Not Work

In this section some of the counterproductive elements our program faced in attempting to reformat as an outcomes-based operation are listed.

- Communication Disconnect - Our program, located in rural Kansas, does not have many opportunities for contact with other EET programs. A more concerted effort to participate in the ongoing discussion concerning TC2K would have made our process more effective. This undoubtedly lowered our efficiency causing us to 'reinvent the wheel' on occasion.

- Insufficient Resources - The amount of time and the number of people directly involved in our conversion were marginally adequate. Reconstruction of this magnitude should be spaced over two years and involve some release time to be highly effective. We used no release time and tried all of our conversions in less than nine months, including a summer.

- Previous Accreditation History – In some ways, our past experiences with previous TAC of ABET accreditation proved a hindrance. We tended to adhere to custom and did not capture fully the magnitude of the changes occurring. Starting with a clean slate, while not practical in most cases, would undoubtedly yield a cleaner transition to TC2K.

VII. Notes on What Did Work

After reviewing some of the difficulties we've faced, it is important to share some of the items that we found very productive.

- Teamwork – First and foremost was the presence of a well-knit faculty team dedicated to conversion to and measurement of CQI. When we first began to examine the TC2K criteria, we saw advantages for our students and decided to undertake this task. Without this commitment, our efforts would have resulted in some paper effort without the underlying structure necessary for real outcomes-based program management.

- Teamwork – This is so important, it deserves a double listing. The entire program faculty must be onboard for this to work effectively.

- Annual Faculty Retreat – The most productive time in our process occurred when our entire group was fully engaged. We were most effective in developing a comprehensive plan attempting to incorporate the spirit of outcomes-based management by being removed from distractions and focused on the task at hand.

- Curriculum Review – Parallel with the planning for TC2K was a review of the current curriculum. This allowed us to remind ourselves of the interconnections we had previously established. Periodic review and continuous improvement elements will allow us to keep a coherent curriculum.

VIII. Epilogue

Actually, this section is not an epilogue, as the process being described is not finished nor ever will completely be finished. The practice of continuous improvement mandates that we will be continually reinventing and refining our processes.

The central question raised by all of the above is "Did we develop a successful model?" The EET faculty feel the answer to this question is a qualified yes. We continue to actively develop our new model of operation. In a real sense, success can only be measured at the time of our next visit. If the outlined changes are standard operating procedure at that future visit and we have demonstrable benefits derived from all this, we will proclaim success.

Our hope for now is that this material and our first efforts will be of value to the Engineering Technology community as others prepare for this new style of accreditation. Prior versions of this work were presented to the ASEE National Conferences in 2002 [11] while in due process and in 2003 [12] following the final statement from ABET. Support for some of these conversion activities came from the NASA/Kansas Space Grant Consortium and the National Space Grant program [13,14].

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X. Biographic Information

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Randy Winzer received his BS in Electronics Engineering Technology in 1989 and an MS in Engineering Technology in 2002 from Pittsburg State University. He has been an assistant professor with the Electronics Engineering Technology program since 2000 and currently serves as program coordinator. He has several years of experience supporting information technology for outcomes based education in public schools.