

Accreditation Preparations of a Collaborative Mechanical Engineering Program under ABET EC 2000

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The University of Kentucky (UK) Engineering Extended Campus Programs in Paducah had their initial accreditation visit from ABET evaluators in Fall 2002. The programs were initiated in 1997 and consist of bachelor's degree programs in Mechanical Engineering and in Chemical Engineering. Murray State University and Paducah Community College collaborate with UK in offering curricula that culminate in B.S. engineering degrees awarded by the University of Kentucky. The preparations and events surrounding the initial accreditation visit will be discussed, with a focus on three particular areas: 1) the unique collaborative arrangement between the three distinct institutions and its impact on the accreditation process; 2) the necessity to appropriately distinguish a program under ABET criteria when it is at a location far from the main university campus, but shares a curriculum and an academic administrative structure with the main campus; and 3) issues encountered in pursuing initial accreditation for a new program under ABET EC 2000 criteria.

I. Program Origin

The engineering manpower needs of Kentucky had largely been provided for many years by the University of Kentucky College of Engineering (Lexington). As the state's land-grant institution, it produced its first engineering graduates in the 1880's. The University of Louisville established its engineering school in 1924, and became part of the state university system in 1970. These two schools offered the only accredited engineering programs in Kentucky in the early 1990's. Both of these institutions are over 200 miles east of the heavily industrialized Jackson Purchase region of Western Kentucky. Many of the industrial plant managers in this area were concerned about their difficulties in hiring and retaining qualified engineers for their plants. A lack of engineering continuing education resources and a lack of engineering employees from the region were cited as significant barriers to continued economic development in the region.

The culminating event that drove the region to push for an engineering school in western Kentucky dealt with the possibility of the region losing its largest employer. The Department of Energy had long operated gaseous diffusion uranium enrichment facilities in Paducah, KY and in Portsmouth, Ohio. The uranium enrichment plant has been the largest employer in western Kentucky since it opened in 1952, with a current average pay scale on the order of \$40/hour. The Department of Energy initiated a search for a next-generation replacement plant site in the late 1980's. Before ultimately canceling the search, DOE informed the Paducah representatives that

the lack of local engineering education was a negative factor in their consideration for locating the new plant. Local leaders began to develop a plan to improve continuing education opportunities for engineers employed at the plant and to increase the number of engineers for employment from the region. Some employers reported attrition rates of over 25% per year, where engineering graduates from major universities in the Midwest would return to their home state to continue their careers. After an extended political battle regarding what institution would be the provider of engineering education in western Kentucky, the state legislature charged the University of Kentucky with establishing engineering programs in chemical and mechanical engineering in Paducah. The university was required to collaborate with Paducah Community College and Murray State University in the delivery of these programs.

II. Program Structure

Although the history of this program has been previously documented^{1,2,3}, a bit of the program organization and the chronology of its development will be given here to establish the importance placed on program accreditation from the very earliest discussions. The University of Kentucky Extended Campus Program in Paducah is a unique collaborative effort, linking three separate state institutions to provide students the opportunity to earn an engineering degree without leaving their home region. This collaborative arrangement led to some unique issues with ABET during the accreditation process.

The statute that established the state funding for these programs called for a cooperative arrangement with Paducah Community College (PCC) and Murray State University (MSU). PCC would be responsible for lower level instruction culminating in an Associate of Science degree. Block transfer of these credits to UK fulfills the general studies requirement of the UK degree. Murray State University faculty members teach upper level math, chemistry, and general engineering courses. Some MSU engineering faculty members received a joint appointment with UK, enabling them to teach certain courses as UK courses. Three MSU faculty members teach ME courses in Paducah, typically one course per semester. PCC was permitted to continue teaching lower level engineering courses that they had offered before the program initiation. The program is hosted on the campus of Paducah Community College in an \$8.4 million building constructed from locally generated funds.

The degree that the Paducah students work toward is a Bachelor of Science in Mechanical Engineering awarded by the University of Kentucky. The academic supervision of the program is conducted by the Mechanical Engineering Department in Lexington, while administrative responsibility begins with a site Director who reports to the College of Engineering's Associate Dean for Commonwealth and International Programs. The ME director of undergraduate studies (in Lexington) is responsible for approval of all transfer students and approving any deviations from the published curriculum.

The UK faculty members in Paducah are appointed to the ME department under a special title series. This appointment enables a focus on instruction with reduced research expectations. The special title series position was relatively new to engineering but was necessary due to the absence of graduate students, research facilities and equipment at the Paducah program. The

Paducah ME faculty members are expected to engage in research activities, but to a lesser extent than their Lexington colleagues due to the extra challenges posed with working with graduate students 250 miles away.

In order to facilitate ABET accreditation at the earliest possible date as required by the state legislature, the curriculum of the Lexington program was adopted for the Paducah program in its entirety. It was anticipated that due to the possibly different constituencies of the Paducah program, the curriculum could be modified independently of the Lexington curriculum once the program was in place and producing graduates. The apparent lack of differentiation between the Lexington and Paducah programs became a significant issue during the accreditation visit.

The mechanical engineering program in Paducah produced its first four graduates in May 2000. The chemical engineering program did not have its first graduates until May 2001. The two programs currently have a total enrollment of about 30 chemical engineering students and 85 mechanical engineering students.

III. Accreditation Preparations from the Outset

A resolution by the (Kentucky) Council on Higher Education, the CHE (predecessor of the current Council on Postsecondary Education), on November 13, 1995, called for a Regional Center to be created in the Purchase Area of Kentucky, within which UK, MSU, and PCC could construct cooperative educational programs to serve the needs of western Kentucky. The framework guided the cooperative programming in mechanical and chemical engineering. The resolution specified that the “program should be limited to modest UK College of Engineering extended campus programs” and that “no free-standing bachelors programs in engineering should be permitted.” It further specified that the principle program partner with UK must be MSU. Lastly, the Council resolution stated that “(F)ailure by UK to achieve ABET accredited status for these two programs should result in program termination” (CPE, 1995). Without an understanding of the ABET accreditation process, nor the challenges in offering programs through multiple institutions, the state’s higher education leadership essentially prescribed the direction that the Paducah programs were to follow.

With the goal of achieving accreditation status at the earliest opportunity, College task forces began discussions immediately among ABET-EAC staff and Lexington-based College faculty with significant experience with ABET processes and with EC2000 evaluator training. In 1996, an experienced EAC visitor was retained by the CHE for advice about program development and accreditation.¹ The consultant concluded that there were two means to request

¹The reader is reminded that in 1996, there were very few cooperative, multi-institutional programs in engineering, nationwide, and none hosted on the campus of a two-year institution. The only known engineering program remotely similar to the Paducah program were under the purview of Washington State University (Richland, WA), visited by UK administrative personnel during early stages of Paducah program development. Since that time, other innovative engineering programs with origins similarly tied to regional economic development and with administrative structures that are similarly complex are under development at the University of Missouri-St. Louis, Georgia Tech (Savannah, GA), and at the University of West Florida (Pensacola, FL).

review for accreditation: (1) as part of the established programs at Lexington, or (2) as distinctive programs at Paducah but linked to and guided by the UK College of Engineering. The consultant strongly advised that the College request accreditation in the second format; as distinctive programs serving unique constituents in a region distant (400 km) from the College's other engineering programs. In either case, it was clear that this set of "cooperative" programs² could be set into motion under the auspices of the UK College of Engineering and under a single dean and with a chair shared between Paducah- and Lexington-based programs.

From 1994-2000, during the ramp-up phase of program development, much discussion, debate, and no small measure of community angst ensued. The news media in Paducah, Lexington, Louisville, and Murray closely covered the controversy about funding and accreditation for the new programs. The repository of news items on the subject, maintained at UK for posterity's sake and for review by prospective new-hires into the program, is voluminous and contains numerous lead articles and feature editorials replete with accusatory statements, exaggerations and extrapolations, and, unfortunately, too few rational, balanced statements of fact. Included were quotes attributed to university presidents and chief academic officers, deans and associate deans, faculty involved in early development efforts, chief industrial supporters of the programs, a CHE executive, and even the serving Kentucky governor. Headlines ran the gamut from "Communication, trust absent" (Gardner, 1994), "Paducah, Murray mired in fight over engineering school plans" (Muhs, 1994), "UK-Murray rift imperils funding for universities" (Carlton, 1995), finally to "MSU offers engineering support" (Bartleman, 1996) and "All parties back Paducah engineering education plan" (Muhs, 1996). The controversy over whether the programs would be designated as free-standing, linked, or as extensions of existing programs on the main campus was consistent with the rancor over discussions among economic development leaders, local politicians, and college and university presidents that began *circa* 1990.

Most of the disputes over the program establishment and administration have now largely disappeared. The improved relations can probably be attributed to the following: (1) the acceptance of a Statewide Strategy for Expansion of Engineering Education, which was adopted by the CPE in July 2000, and serves to guide future expansion of engineering programs in Kentucky; (2) the successful track record of collaboration among UK, MSU, and PCC, as evidenced by the current status of the Paducah baccalaureate programs; (3) the removal of the community college system from UK, and the placement of thirteen of these institutions into a State system in 1998; and finally, some may assert, (4) the change in leadership of all three partnering institutions. The chronology of events is offered as simple milestones in Table 1.

The UK decision was to guide program development efforts in such a way as to reasonably expect the programs to be ultimately viewed as distinct from their Lexington-based sister programs by virtue of their differences in location (4.25-hour drive); facilities (all laboratories, classrooms, and library facilities are Paducah-housed), faculty (nearly all instruction is provided live and on-site by Paducah- or Murray-based faculty; student demographics

²By CPE definition a "cooperative" program is "under the sponsorship of a single institution but contains elements of resource-sharing agreed upon by one or more other institution(s) or organization(s) when offered on the campus of the non-degree granting institution."

(approximately 95% of students are PCC transfers); and administration (all academic policies, procedures, and personnel review processes are consistent with those on the main campus, with local, on-site administration provided via a local site director, who also serves as a regular-series faculty member in mechanical engineering). Consideration by ABET of the new programs as “distinct” (but not “separate” or “free-standing”) gives the faculty in each discipline the prerogative to respond to local stakeholders’ input to make changes to the curricula over time, while not necessarily impacting the sister program. At the outset, however, the Paducah-based programs are both mirror images of the Lexington counterparts, with opportunities for deviation limited to the students’ selection of technical electives. Lastly, but not insignificantly, faculty approval of the programs in Paducah was predicated not only on a funding stream distinct from the Lexington programs but also that the programs would be designed with distinct accreditation as the aim. This approach is consistent with the regional nature of the programs, and is also consistent with the long-term expectations of the educational stakeholders in the region to have baccalaureate engineering programs in western Kentucky that are of high quality, are responsive to local industry needs, are aligned with local economic development efforts, and, of great importance to the Paducah community, are managed and controlled by UK.

With the need for quick accreditation, certain ABET EC2000 activities were initiated well before all the faculty members were even hired. A day-long retreat was held at a local state park to involve all the participating institutions in some early planning, as well as to bring each up to speed on the new ABET criteria and processes. Surveys of the student body were conducted to determine their parents’ educational backgrounds, their career expectations, commuting distance, access to a computer at home, etc. These surveys were intended to help characterize the student body, since no one actually knew who would attend the programs before they actually began to enroll.

One unique challenge of the Paducah programs dealt with the composition of the faculty. With the exception of the program director, all were assistant professors and had never been involved with preparation for an ABET visit. Joint faculty and staff meetings were conducted to introduce them to the new EC2000 criteria, and to begin discussions of educational objectives for the programs. After several such meetings, it became clear that initial educational objectives should not deviate significantly from the Lexington program. The curricula in Paducah and Lexington were identical, the student admission criteria were identical, and graduate expectations were expected to be similar (until proven otherwise after Paducah graduates were in place). It was decided that both Paducah programs would initially adopt the same educational objectives as the Lexington programs, with the ability to deviate in the future as the needs of their local constituents might dictate.

One issue was recognized between the completion of the self-study and the evaluation visit. While a complete evaluation plan was described in the self-study, it was not clear how each of the various processes interacted. One faculty member translated the description in the self-study into a fairly complex and detailed flow chart, which was then summarized in a single page of text. Additionally, a form to be used for course evaluation was proposed and combined with the flow chart as part of a supplement provided to the evaluator.

IV. Accreditation Issues Raised during the ABET Visit

The accreditation visit report indicated no deficiencies with the program. Two institutional weaknesses were noted. One weakness resulted from a transfer credit issue involving a chemical engineering student. The other resulted from the perception that the Paducah program was not adequately distinguished from the Lexington program in the university bulletin and on the student transcripts. The transfer credit issue is a procedural situation, and should be resolved by having certain written guidelines in place to address the situation that caused the weakness. Additional distinguishing material has been submitted for the next university bulletin. From this point on, both the Lexington and the Paducah degree program listings will be shown separately in the bulletin, though the common curriculum will not be duplicated but only referred to in the Paducah section. If the curricula begin to diverge, then the Paducah curriculum will also be shown in the bulletin. All local recruiting materials have always prominently promoted the Paducah nature of the program. Since there is no student recruitment from the main campus for the Paducah programs, nothing other than the bulletin was addressed.

The issue of program differentiation on the student transcripts is not as simple as it may appear. For instance, consider a synchronous distance learning course involving students at multiple sites. Whose course should be listed on the students transcripts? Is it a Paducah course if the instructor is in Paducah when the students are in Lexington, or is it a Lexington course? Should the same designation appear on the transcripts of students at each site? If such detailed differentiation were attempted, it would likely result in considerable confusion to anyone trying to scrutinize the transcript, and deter students from taking distance learning courses. Rather than attempt a course-by-course differentiation, the transcripts were modified to show the Paducah campus designation where the degree program name was listed. The degree program was listed twice, once at the beginning of the transcript, and one at the end where the degree was awarded. We have begun the process of stipulating a two semester “residence” requirement at either campus in order to determine the program designation on the transcript. Though there has been no student to transfer to the Lexington campus in their last semester to get a “Lexington” degree, such actions could occur if a rumor began to circulate that certain companies would not hire Paducah grads, or some other negative connotation were attached to the “Paducah” degree.

A program weakness was cited in the area of statistics and linear algebra. The curriculum had no required course in either area, even though almost every graduate takes a linear algebra class as their math elective. This weakness stemmed from the courses that involved the use of statistics and linear algebra, but did not have those subjects stipulated in the course catalog descriptions or in the course outcomes. While the ABET visitor acknowledged the satisfactory content of student work in these areas, it was stated that without it being included in the course description and outcomes, such coverage was subject to instructor preference. The course descriptions and outcomes have been modified to appropriately reflect the coverage of the math topics in these areas. These course modifications will equally apply to the Lexington program, and perhaps prevent a similar issue from being raised at the time of their next general review.

There were two concerns raised by the program evaluator. The first involved the fact that the ME faculty had approved changes to the program educational objectives in May before the

visit, but that the self-study report had focused on the original objectives. Now that the Paducah Engineering Advisory Committee has had an opportunity to provide input on the new objectives, they are being appropriately published and disseminated. The other concern dealt with a perceived high student/faculty ratio in the ME program. With about 85 ME students and four on-site ME faculty members, this number may indeed seem high. However, inclusion of the three Murray faculty members that teach one course each semester (about 1.5 FTE), the fact that the first thermodynamics and statics courses are taught by PCC, and the availability of Lexington faculty to teach courses in Paducah by interactive TV were not considered. The comparison of teaching loads for the Paducah ME faculty will be compared to their counterparts on the Lexington campus to demonstrate the relative comparison of faculty loads. While a small program cannot offer the wide range of technical electives that can be provided by programs with large enrollments, teaching loads of two (and occasionally three) courses per semester are not considered excessive on our campus for someone with a 70% distribution of effort in classroom instruction.

A concern in the chemical engineering program will also be reflected in changes impacting the ME program. The university has a policy that a student must complete 30 of their last 36 credit hours in residence in order to receive the degree. Since the Paducah program is collaborative, in many cases the students continue to take some of their general studies courses (from PCC) in their senior year. In addition, the upper level math and chemistry courses are taught as MSU courses, and so show up as transfer courses even though they are taught on site in Paducah. The college level student records coordinator had become familiar with these situations and had not even raised the issue. However, the ABET visitor felt that someone scrutinizing the student transcript would not understand the collaborative nature of the program, and could become concerned about a lax standard for awarding the degree. We have since adopted a written policy regarding the inclusion of courses from PCC and MSU as being included in the 30-of-36 rule.

V. Conclusions

It will always be a challenge to receive quick accreditation of new programs that have been started from scratch on a new campus. The task of establishing new facilities, hiring new faculty and staff, recruiting students, and establishing all the operating parameters of the new programs are time consuming activities. In addition, starting the ABET outcomes and assessment initiatives are also time consuming and may be new to the faculty members. The need to evaluate student outcomes from the first few graduates requires having all the assessment processes established even while the program may still be rapidly evolving. Accreditation issues must be given significant consideration before the first student walks through the door.

The efforts of the UK faculty and staff in Paducah regarding accreditation preparation were aided by not having to start completely from scratch with regard to curriculum, educational objectives, and administrative regulations. The uniqueness of the Paducah program will no doubt become more apparent over time. The objectives and assessment processes can evolve to meet the local needs by having the accreditation separate from the main campus program. The remote program should be prepared to clearly demonstrate at the time of the accreditation visit how it is different

from the main campus program, and therefore can be justified in receiving its own accreditation. Despite all the efforts of the faculty and staff at the remote site, they may still be subject to accreditation actions resulting from issues controlled by the main campus. Continuing close cooperation between the main and the remote campuses will be required to permit the outcomes oriented ABET accreditation process to be effective in producing an ever improving educational environment.

Based on experiences at the University of Kentucky’s extended campus in Paducah, we would recommend that other institutions considering establishing a branch program in engineering use the following checklist:

- 1) Determine the potential student population and demographics as accurately as possible.
- 2) Communicate with all parties (including partnering institutions) the accreditation status that will be expected (distinct versus under the main campus program).
- 3) Begin with the main campus curriculum. There are enough challenges with starting new programs without starting from scratch on the curriculum too.
- 4) Try to make both degree programs fully equivalent. This will prevent the perception of getting an “easier” degree at one location, and also prevent unnecessary student transfers because of a perceived higher value of one degree over the other.
- 5) Faculty at the branch program will have numerous disadvantages relative to their main campus colleagues, including access to graduate students and research labs. Faculty time will be drawn into many supporting activities that are not normally given priority on a larger research campus. They should not be forced to compete directly with their main campus colleagues that received hefty startup packages and lighter teaching loads.
- 6) Be prepared to initiate surveys and other assessment activities as soon as graduates are available. Even if the process is not perfect, you will be higher on the learning curve when there are more graduates from which to gather data.
- 7) Stay off the front page of the local newspapers during early program development. Front page headlines have little recruiting value, and present opportunities for confrontation or disputes by competing institutions or individuals in an uncontrollable venue.

Table 1. Accreditation-related Chronology of Events (exclusive of routine ABET preparations).

November 15, 1995	CHE (Council on Higher Education) adopts resolution creating a Regional Center, under which academic programs can be created.
March 1996	Kentucky General Assembly adopts resolution and budgets \$200,000 for initial program development.
Summer-Fall, 1996	Three meetings of a 20-member New-Program Task Force, membership of which includes program faculty, provosts and chancellors, deans and associate deans, and an EAC consultant retained by the CHE.
October 20, 1997	First hire into the new programs, Director of Student Services.

January 14, 1998	First class meets in Crouse Hall (Science and Engineering Building).
July 1, 1998	Program (local site) director assumes duties.
August 16, 1998	First on-site faculty member hired in special-title series (Chemical Engr.).
October 1998	UK programs in Lexington undergo ABET visit under EC2000, one of first fourteen institutions in the U.S. to be evaluated under the new criteria.
August 11, 1999	Paducah ABET Planning Committee Meeting, Kenlake State Resort Park, attended by representatives from UK, MuSU, and PCC: ABET 2000 overview.
January 2000	Final decision made to seek accreditation as “distinct” programs.
May 2000	First Paducah Mechanical Engineering graduates.
August 2000	Faculty staffing complete.
November 6, 2000	Workshop on Engineering Education for Kentucky, Frankfort, KY: discussions among State educational leaders and CPE representatives concerning application of distance learning technologies; includes a telephone conference call with ABET’s Director of Accreditation.
May 2001	First Paducah Chemical Engineering graduates.
December 4, 2001	“Mock” ABET visit by experienced ABET evaluator and team chair.
April 17, 2002	SACS (regional accreditation team) visit to Paducah’s Extended Campus; splinter group includes former ABET President.
October 13-15, 2002	ABET program visit, Engineering Extended Campus Programs, Paducah.

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