THE INTERFACE

IEEE   ASEE

An Industrial Perspective on "The First Professional Degree"

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IEEE Committee on Engineering Accreditation Activities

In the last several months the background radiation (e-mail traffic) on the subject of the "First Professional Degree" has increased significantly. It could be that dark matter is not uniformly distributed in space and there is a particularly large presence around my e-mail inbox. In any case, the presence has become so intense that I no longer can ignore it, so I will devote my last article in *The Interface* to the subject. Yes, for those who are counting, I have only been contributing to *The Interface* for a year. I have been elected to represent IEEE on the ABET EAC, so I must (by policy) give up my position as Chair of the IEEE CEAA committee! I must say I have never worked with such a dedicated and professional group of volunteers.

When I first started looking deeper into the subject of the first professional degree, several different pointers went to the same document: *ASCE Policy 465 – a Means for Realizing the Aspirational Visions of Civil Engineering in 2025* (Russell, Galloway, Lenox and O'Brien). This document, when carefully reviewed breaks into 4 sections: 1) Abstract: Clearly focused on issues of civil engineering professional practice. 2) Historical Perspective (first two pages and the last half page): Paints the entire engineering profession with the same broad brush. 3) The remainder of the Historical section and the main text focuses on the specific issues related to civil engineering with an ongoing theme of licensure. 4) Conclusion: Alternates between broad-brush paragraphs and civil engineering-specific items.

So it seems civil engineering has many challenges. I personally can't argue or support that point given my own background in electrical and computer engineering. I however, find no justification to paint all of engineering with the same issues as civil engineering. I suppose that at this point I should make it clear that I spent my entire career in a Fortune 50 company, and I am a Licensed Professional Engineer in North Carolina.

First, let's look at the subject of licensure. While I certainly understand the over riding need for licensure for civil engineering and related fields, there are really very few electrical engineers who need licensing and essentially no need for computer engineers to be licensed. I believe that this issue, itself, is the primary one in this whole debate. At one end of the spectrum, the civil engineer needs to be licensed most of time, and at the other end of the spectrum electrical and computer engineers rarely need to be licensed. Certainly this has been the case for civil engineering for a long time, while in the case of electrical and computer engineering, this has dramatically changed in the last 30 years.

As an undergraduate at Oregon State University, I remember walking down the halls of the EE building and seeing essentially all the name tags on the office doors proclaiming: Ph.D., P.E. Certainly today the P.E. recognition is the exception, with one older professor telling me he took his P.E. off his business card, because too many people thought that it had to do with Physical Education (true story!). So, some of engineering has moved past licensing as being important. Though, I certainly haven't heard of any calls for them not to be called "Engineers"!

Certainly there has been significant evolution in the curricula for electrical and computer engineering, with the addition of many areas of specialization, e.g. digital signal processing, computer architecture, wireless systems, etc., while there have also been deletions. There are universities where you can get an ABET accredited electrical or computer engineering degree without having taken thermodynamics or electro-magnetic fields and waves, a heretical thought 30 years ago.

So the net is, at least in the areas of electrical and computer engineering, the curricula have seen significant change over the last three decades. This has apparently occurred, without major complaint from the industries that academia ultimately serves. Personally, I was involved with hiring engineers from 1979 – 2003 and never heard an issue with curriculum quality or the ability of new hires to deal with the challenges posed by

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state of the art product development activities in my part of the universe.

On the other hand, the five-year programs currently being discussed, while offering little to some areas of engineering have some serious downsides and an interesting "unintended consequence". On the downside, I have been in many discussions about the lack of female and minority candidates in our hiring programs. My academic colleagues have pointed out the challenge of attracting first generation females and minorities to collegiate engineering programs and generally agree that a five-year program will not improve this situation.

The unintended consequence is even more interesting. If universities go to a 3+2 educational format, there will, by definition, become a marketplace for individuals with three-year degrees. Given the popularity of various certification programs such as those sponsored Cisco and Microsoft, a valid

argument can be made that a three-year degree, plus appropriate certifications, either provided internally by a corporation, or externally, may be quite appealing to industry who would probably benefit from less expensive starting salaries.

This would leave academia, in some fields, with only three quarters of today's student bodies and at least some "engineers" probably with lower starting salaries. Very truly, this would certainly be a major unintended consequence.

Finally, and most disconcerting from an electrical and computer engineering point of view, this whole subject area is being driven by those outside of our profession. It is also primarily an academic debate without significant input or influence from the "customer" base" in industry.

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Education Society at 50 – Looking Back, Moving Forward

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The IEEE Education Society and I have something in common – we both turn 50 this year. The mid-century milestone is often marked by a party or other celebration, but it also can provide the motivation for reflection and planning. So it is this year for the Education Society.

We will kick off a year-long celebration of the Education Society's Fiftieth Anniversary at the 2007 Frontiers in Education Conference, October 10-13 in Milwaukee, Wisconsin. Friday, October 12, will include multiple events focusing attention on EdSoc's milestone. Dr. Leah Jamieson, IEEE

President and Dean of Engineering at Purdue University, will present the FIE keynote address that morning, emphasizing the globalization of engineering and the important role of engineering education. Given that IEEE sponsors over 500 conferences each year, it is quite an honor to have the current IEEE President as the keynote speaker. Having heard Dr. Jamieson's recent plenary speech at the ASEE Annual Conference, I am confident that her presentation at FIE will be both engaging and thought provoking.

That evening, the Education Society will host a Gala Cele-

bration and Awards Presentation, open to all FIE attendees. In addition to the annual awards recognizing those who have made significant contributions to our Society and profession, this event will include presentations looking back at many of the individuals and events that have shaped EdSoc's history. The Gala will be a great opportunity to reconnect and reminisce with friends and colleagues, while enjoying drinks, hors d'oeuvres, and dessert.

Throughout 2007-08, there will be additional activities and events planned to celebrate the anniversary, drawing to a close at FIE 2008, October 22-25 in Saratoga Springs, New York. For more information about both the 2007 and 2008 Frontiers in Education Conferences, check out the website at **www.fie-conference.org**

While it is important for us to look back and recall our heritage, it is perhaps even more crucial that we take the necessary steps for the Education Society to move forward into its next half-century. Much has changed within the Society and within IEEE during the past decades. The key question we must address is, "How does the Education Society provide services that add value and meet the needs of our members?" During its June meeting, the Society's Administrative Committee adopted a set of principles and actions to guide us through reshaping EdSoc to better meet the needs of its members.

I won't bore you with all of the details here; you can go to the EdSoc website at **www.ewh.ieee.org/soc/es/index.html** to read my presentation. Except for the fact that most of our members are academics, we are a diverse group; roughly half of our members live outside the United States, we span the range from students to retirees, and cover the full spectrum of types and sizes of academic institutions. We need not only to expand our presence within universities – shouldn't every faculty member who joins IEEE also choose to join EdSoc? – but find ways to connect with and provide value to our partners in industry, pre-university education, and other settings.

At the June AdCom meeting, I presented a strategy that addresses four key issues:
- A revamped organizational structure to provide strategic focus and greater opportunities for global member representation.
- An expanded range of member services and operations, building on our existing strengths and creating new opportunities.
- Fully utilizing our financial resources in a responsible manner to support the Society's goals and provide value to our members.
- Developing new partnerships with other societies and organizations, both within and outside IEEE.

By the time this issue of *The Interface* issue is published, we will have groups studying many existing and potential member services and emphases, including publications, conferences and meetings, recent graduates, women in engineering, pre-university members, student activities, and Society chapters. These committees are being asked to identify current and potential members who have an interest in each area, determine their needs, create concepts for how EdSoc might meet those needs, and suggest methods (and budgets) for doing so.

It's one thing to plan to move forward, but actually accomplishing it can be a much more difficult feat. To be successful, we need broad-based involvement of the EdSoc membership – after all, who knows better than you how EdSoc can provide service and value to you? During the coming months, there will be multiple opportunities for you to contribute to the planning process and I ask that you take advantage of those chances. If you have specific ideas that you would like to contribute or, even better, you would like to volunteer to participate on one of the study groups, please contact me by email at **j.hughes@ieee.org**.

I look forward to meeting many of you at our Gala Celebration and other FIE 2007 events. It is my hope that our shared reflections on the past will prove to be merely the prelude to an even brighter future for the IEEE Education Society.

ABET and Accreditation: Is the Current System Working?

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Introduction

I have been involved with ABET and engineering accreditation since 1990. During the past five years I have been an ABET evaluator for the IEEE. I have also participated in formal and informal evaluation of ABET-preparation efforts in many schools, mostly in the Northeastern U.S.

I have formed strong opinions about the current accreditation process; its short-comings, as well as the positive changes to engineering education it has encouraged. This article records my *impressions* of the accreditation process and its impact on the profession. In short, I think that ABET's post-2000 criteria have led to significant positive changes to engineering education. These changes have been most pronounced with respect to the increased emphasis on non-technical aspects of education. However the changes have come at a large financial cost. I also believe one unintended, indirect (and undesirable) consequence of the new criteria is a decreased emphasis on scientific education. Additionally, I believe the current ABET accreditation process is in danger of becoming mechanical and routine, descriptions that had been

applied to the process it replaced in the late1990s. I am also convinced the assessment processes followed by most universities has a built-in conflict of interest as programs assess themselves.

My background and a history of the post-1990 ABET accreditation process

Accreditation, in my view, has gone through three phases during the past fifteen years. These are well-described by outlining my involvement with the ABET process.

1. In the early 1990s, I led a program (Engineering Physics) through accreditation using the "old" accreditation criteria. The old process emphasized a student's completion of a countable number of courses related to basic science and mathematics, engineering and humanities/social sciences. Preparing for an accreditation visit was a mechanical process and a relatively simple task.

2. In 1999, as Chairman of the University of Pittsburgh's Department of Electrical Engineering (now ECE) I guided our department through the then new criteria based on objectives, outcomes and assessment. In 1999 the distinction between objectives and outcomes was not well-communicated by ABET. Our program's objectives were closely related to ABET outcomes 3a-k, and our outcomes were also closely linked to 3a-k. My observation is at that time many institutions followed a similar tack. Most of our assessment vehicles relied on surveys.

3. In 2005 I participated as a faculty member in our reaccreditation effort using the now standard criteria. By 2005 ABET had done a good job of defining objectives and outcomes and making clear the distinctions between the two. Although, our institution thought through program objectives (goals for our graduates several years after graduation), outcomes were now a direct restatement of ABET 3a-k. My observation is this approach to outcomes/objectives is now nationally quite common. Assessment in our department is now based on a combination of surveys and on direct evaluation of student work (most prominently of senior projects.)

The present ABET accreditation process: Observations

Many of the late-1990's changes in the accreditation process were occasioned by industrial perceptions of the inadequacies of practicing engineers. Many of these perceptions were related to non-technical skills; some related to the insufficient engineering design experience of new engineering graduates.

It had become clear engineers needed more than technical aptitude to survive professionally and to prosper in a changing global economy. Ethics, team work, the global impact of engineering and communications skills as well as other outcomes now enumerated in ABET 3a-k were not given adequate attention at many schools before the new accreditation process was put in place. Today almost all institutions recog-

nize engineers require a skill set that extends beyond science and engineering. The increased emphasis on these so-called soft skills is the most important consequence of EC-2000. A second consequence of the "new" criteria was an enhanced emphasis on design in the engineering curriculum. I believe the changes in engineering education prompted by changes in the accreditation process are as dramatic as any seen post-Sputnik (1957).

Changes in accreditation requirements have come with large financial costs. My department's preparation for the 1999 ABET visit was time-consuming and expensive. In a talk I gave at a national meeting of ECE department chairs, I estimated our department had spent >\$100,000 on preparation for the ABET visit and our School of Engineering had spent many times that. One of the greatest drawbacks of the current ABET process is the huge investment in time required to assess engineering programs and to prepare for an ABET visit. My hope was this expense would be associated only with a first visit under the post-2000 criteria. Alas, at my institution, and at others I have queried, the manpower burden of ABET has not reduced with time. It has often been suggested to me the assessment process done right is not expensive; if an institution collects data and analyzes it continually, the manpower required is much reduced over that required if much of the analysis is done during the year or two preceding an ABET visit. I am skeptical. Continual collection and analysis spreads costs over a multi-year period but does it reduce them?

All changes have unintended consequences. One unintended consequence of the new ABET criteria is a declining emphasis on science education. The separation of engineering from science is now more pronounced that anytime in my long career. The relationship between scientists and engineers has, in my view, begun to resemble that which existed before World War II—engineers generally did not have a deep understanding of science but relied on tables, handbooks and experience to apply science to practical problems. The development of the war's two most important *engineering* achievements (radar and the atomic bomb) were led by physicists, not by engineers. Engineering education pre-World War II was scientifically inadequate. When I was young, the Soviet launch of Sputnik (1957) led to a reemphasis on science in engineering education. The science education of engineers in the three decades post-Sputnik was strong.

I wonder how the next generation of engineers will cope as technology changes. Will engineers educated today discover they are short on the understanding of the theoretical, scientific underpinnings of engineering? ABET's emphasis on engineering design has contributed to a lessening of science in the curriculum. Needed design courses were added, often leading to a reduction in required science courses in the fixed 120-125-credit engineering curriculum. Many of my students now view science as nearly unconnected to engineering. Similarly, an unintended consequence of ABET's emphasis on soft skills is also a de-emphasis on science education. I am often surprised at suggestions from students of engineering projects that have no basis in science. This lessening of sci-

ence education has occurred in spite of the fact that ABET's formal mathematics and basic science requirement has not changed in many years.

The current evaluation process was developed, in part, to avoid the mechanical responses that accompanied the earlier assessment process but I think that we are moving toward a mechanical response that mimics the old system. Most objectives are generic, outcomes are most often a restatement of ABET 3a-k (Many programs reason: If ABET is going to assess 3a-k, why do anything much different?) Assessment is becoming mechanical—a look at student performance in a course or two, surveys of employers, alumni and students. I am very skeptical of how much guidance these techniques provide in identifying needed program changes.

A related, important problem with faculty-created assessment tools is faculty members aren't generally skilled in formulating meaningful assessment vehicles. Educational assessment is a specialty not unlike many engineering specialties. The development of assessment techniques is a task best left to specialists, not to typical engineering faculty members. One school I recently visited talked about hiring a University Assessment Officer. There is a growing interest in outcomes-based assessment throughout educational circles and the hiring of a person skilled in the process seems a desirable thing.

Faculty-based assessment has a built-in conflict of interest. Almost all universities want their undergraduate engineering programs to improve. However, all want to be accredited for a full six years. No school wants to go through this process twice in a six-year period. There is a conflict between a school's desire to use assessment to improve its program and its desire to please ABET. Most institutions use only a few assessment vehicles to improve their programs, but use a far larger number to satisfy ABET. Most institutions believe a few assessment techniques are meaningful but most over assess because they are concerned about ABET's reaction. Most IEEE-trained evaluators know more than engineering school faculty members about the assessment process. Most are well trained but I think many would react unfavorably to a paucity of assessment results, i.e., if only the useful ones were reported. In my view, assessment would be much improved if professional societies would recommend best assessment practices with as much detail as possible. The IEEE, for example, could commission the development of assessment vehicles to be used by most (all?) ECE programs.

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From the ECE Division of ASEE

S. Hossein Mousavinezhad, IEEE Education Society MD Chair
Victor Nelson, ASEE ECE Division Chair
Satish Udpa, Division Past Chair

We want to thank all the reviewers, session chairs and other organizers of the ASEE ECE Division's technical program, ASEE 2007 Annual Conference, Honolulu. Dr. **Dennis Silage** of Temple University (Program Chair) worked long and hard to make the program this year a success.

We also want to thank faculty members, Deans and Chairs of the ECE/CS Departments for their continued support of IEEE, ASEE and other related professional societies. With increased budget pressures it is important to allow time/resources so faculty and graduate/undergraduate students can actively participate in conferences, workshops, seminars and serve in elected offices of these important professional societies. While IEEE membership continues to grow, there is concern that in different regions/sections or some societies there may not be enough interests to continue offering professional opportunities, in the form of conferences, tutorials, technical/business meeting and other related events so that members can continue their lifelong learning, education and updating of needed hard/soft skills. It is exciting news to hear

that student membership (in general) is growing but we need to make sure there is enough support at the highest level in universities, industry, government and business for professional societies such as IEEE and ASEE.

One particular project is the Seventh IEEE International Conference on Electro/Information Technology (eit2007) hosted by Illinois Institute of Technology in Chicago, May 17-20, 2007. This relatively new conference has been able to provide a forum for researchers and business, government and industry investigators to exchange the latest technical knowledge in the fast growing disciplines within electrical/computing engineering and closely related fields. Keynote speakers (**Zadeh, Adeli, Shahidehpour, Walczak, Leto**), technical sessions, tutorials/workshops and exhibits provided an opportunity for more than 150 people from the Central Midwest and other IEEE regions to get together and continue the exchange of technical/professional information in the fields of electro/information technologies. We appreciate the support provided by IEEE Region 4, Motorola, North American Color,

National Instruments, PTC (mathcad), Mathworks (matlab), John Wiley, Shure, Ansoft, Altera, IIT (Chicago), Western Michigan University (President **Diether H. Haenicke**), and Idaho State University (Dean **Richard T. Jacobsen**). The 2008 e IT Conference will be hosted by Iowa State University (call for papers will be forthcoming). Windsor University will be the host of the eit2009 Conference.

The education society continues its activities in all regions of the IEEE. **Mousavinezhad** is scheduled to make a presentation to the Kerala Section in India (they have been very active in GOLD) during his visit there to participate (invited talk) at the International Conference on Global Software Development, hosted by PSG College of Technology, Coimbatore, July 26-28, 2007. He will also offer a tutorial on digital signal processing during the conference and visit the S. R. Engineering College in Warangal.

Nelson (Division Chair) reports that the 2007 ECE Distinguished Educator Award was given to Dr. **Sarah A. Rajala**. Sarah is now James Worth Bagley Chair and Department Head, Electrical and Computer Engineering, Mississippi State University. Before that she was Professor of Electrical and Computer Engineering at North Carolina State University, and Associate Dean for Research and Graduate Study. She also served as Associate Dean for Undergraduate Studies and Academic Affairs. Sarah is a Fellow of the IEEE and a senior member of the Society of Women Engineers. Her research area is image and video processing. She has received numerous awards including the Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring, the Outstanding Engineering Educator of the Southeastern Section of the IEEE, Sigma Xi Young Researcher Award, and election to the Academy of Outstanding Electrical Engineers and Council of Alumnae at Michigan Technological University. Sarah earned her BS in Electrical Engineering at Michigan Tech

University, and her MS and PhD at Rice University. She has served ASEE in a variety of ways, including a term on the Board of Directors. She is a program evaluator for both ASEE and IEEE for ABET, and presently serves on the Engineering Accreditation Commission, representing ASEE.

The 2007 ECE Meritorious Service Award was presented to Dr. **Hossein Mousavinezhad**, of Western Michigan University, where he is Professor of Electrical and Computer Engineering. He chaired the department from 1995 until 2004. Hossein is a past chair of the ECE Division and continues as ListServe Manager for the Division, a responsibility he has assumed for many years. Hossein earned his BS in Electrical Engineering at the National Taiwan University, and his MS and PhD at Michigan State University. He is a senior member of IEEE, and received a Third Millennium Medal from IEEE in 2000. He organized the 2004 Spring Conference of the North Central Section of ASEE, and also served as Secretary and Vice Chair of the Section. In 1994 he received an ASEE Outstanding Campus Representative recognition. He has organized a panel discussion session (Teaching and Learning with Technology) during the ASEE Annual Conference since 2002. Hossein joined Idaho State University as EE Department Chair on July 1, 2007.

In conclusion, we welcome recommendations on how the ECE Division could better serve ECE faculty and students, also any ideas regarding how we can increase membership in the Education Society.

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ECE Department Heads Weigh in on ABET

Mark J. T. Smith, Purdue University, President
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Electrical and Computer Engineering Department Heads Association

The Electrical and Computer Engineering Department Heads Association (ECEDHA) is taking a more proactive position on ABET accreditation. In contrast to ABET discussions held in previous years, ECEDHA has started to collect data and provide better feedback to ABET organizers.

ECE department chairs and heads pay a great deal of attention to the ABET accreditation process, ensuring their programs remain compliant. As ABET requirements continue to evolve, keeping current remains a must for electrical engineering (EE) and computer engineering (CmpE) program administrators. In this regard, ECEDHA plays an active role in serving

its membership by hosting special ABET workshops and panel sessions during annual meetings, a practice in place for more than a decade.

In addition to formal sessions, ECEDHA provides an informal setting where department chairs and heads can network, compare notes, and—of course—share ABET war stories. Some of the hallway war stories were so interesting that they motivated a special session in 2006 titled *ABET Update: Recent Visitation Experiences*. Over the years, one hears different accounts of ABET experiences from fellow heads and chairs, the most memorable of which tend to be negative.

Recognizing the relatively small sample size associated with anecdotal hallway data collection, it is hard to infer with any confidence how ABET is viewed nationally by ECE chairs and heads. Moreover, if we decided as a community that aspects of the ABET review process were in need of reform, what could we do, and what should we do? These unknowns, to some degree or another, led to a special session—ABET: The Costs and Benefits—during the last ECEDHA annual meeting, held in St. Augustine, Florida, in March 2007.

One goal of that session was to explore among heads and chairs the level of satisfaction with the accreditation process, recognizing that as an organization ECEDHA is positioned to influence positive change. Organized and moderated by **Pamela Leigh-Mack**, ECE department chair at Morgan State University, the session included special guest speaker **Gloria Rogers**, associate executive director of ABET Inc.; panelist **William B. Hudson**, ECET department chair at Minnesota State University, Mankato; panelist **Ashok Iyer**, ECE department chair at Virginia Commonwealth University; and panelist **Ed Schlesinger**, ECE department head at Carnegie Mellon University.

To set the stage, Dr. Mack presented results from a pre-meeting e-mail survey she conducted to ascertain the perspectives of ECE heads and chairs regarding ABET evaluation. Of the responses received, some did include positive remarks about the process, such as
- the ABET process made us think more clearly about what students are learning,
- it helps in improving the program curriculum, and
- the ABET principle of continuous improvement is a win.

And, not surprisingly, there were also negative remarks concerning ABET assessment, which included
- very low benefit-to-cost ratio,
- the time involved impedes improvement, and
- the overhead required is overly burdensome.

A clear central issue that emerged from the survey was the perceived high cost associated with implementing the ABET-compliant assessment.

Gloria Rogers addresses ECEDHA members during the session titled ABET: The Costs and Benefits. Seated from left to right on stage are Mark C. Johnson, Purdue University (providing interactive technical support); Pamela Leigh-Mack, Morgan State University (moderator); Bill Hudson, Minnesota State University, Mankato (panelist); Ashok Iyer, Virginia Commonwealth University (panelist); and Ed Schlesinger, Carnegie Mellon University (panelist).

Speaking next, Dr. Rogers addressed explicitly the issue of reducing assessment costs and maximizing benefits. Her implicit premise indicated that the cost of assessment at many institutions is high, but that this is a consequence of implementation. Attendees (see photo) listened attentively as she outlined several strategies to make the assessment process more efficient and effective.

At the onset schools should consider carefully and understand what they want to evaluate, as this makes a difference in the assessment methodology. For example, the approach to determining the degree to which a program contributes added value would not be the same as the approach used to determine the average level of student mastery at the end of the senior year. Similarly, assessment methods used for individual students would be different from methods used for departments or programs. If, for instance, the goal is to determine student eligibility for graduation, each and every student should be assessed individually—and probably in a comprehensive way with respect to course materials. As for programs, input data from every student in every class is not necessary. Nor would it be necessary to track every conceivable program-related metric. Instead, appropriate sampling of appropriate metrics can be employed to obtain aggregate information at a fraction of the cost.

Assessing program outcomes remains one of the most time-consuming aspects of the ABET process. As stipulated in criterion 3, each program must assess at least outcomes a-k. However, Dr. Rogers pointed out that it is not necessary to assess every outcome every year. Rather, a limited set of outcomes can be considered each year. Moreover, schools may determine that some outcomes need less attention than others; thus, the frequency of examining those outcomes might be less. An efficient outcomes assessment process requires defining clearly the outcomes and employing a manageable number of performance indicators. Schools should exercise caution to not expend more effort than needed in collecting data. Again, appropriate sampling can save time and energy.

Following Dr. Rogers' presentation, session panelists Hudson, Iyer, and Schlesinger each made remarks about ABET assessment efforts at their respective schools. The panel session was well received by ECEDHA members, with many good suggestions presented.

Taking advantage of having a room full of ECE department heads and chairs, Dr. Mack took the opportunity to collect data related to the topic of discussion, polling the audience electronically using wireless digital response units (a.k.a. clickers). The clickers allowed the audience to respond to questions and view tabulated responses in real time. Attendees answered three sequential questions posed in the form of statements. Using their clickers, they responded on a scale from 1 to 6 where
   1 = strongly agree
   2 = agree
   3 = neutral
   4 = disagree
   5 = strongly disagree
   6 = not applicable

The first question asked individuals if their programs bene-fited from moving to the ABET outcomes assessment approach. Approximately 51% of respondents agreed that their programs did benefit, 21% disagreed, and 24% were neu-tral, as detailed in the graph below.

My program benefited from ABET
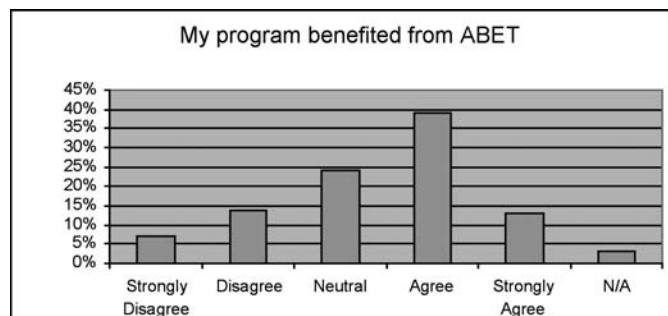
From this, one might conclude outcomes assessment has moved accreditation in the right direction, and that if con-tinuous improvement within ABET is working, more schools will respond affirmatively in the future. Given the most cited objection reported in Dr. Mack's pre-meeting survey was the high overhead associated with assessment, the second question asked whether attendees felt the bene-fits of outcomes assessment outweigh the costs. As indicat-ed in the plot below, approximately 44% felt the overhead was too high, while about 29% felt the cost of assessment was justified.

Benefits of assessment outweigh the costs
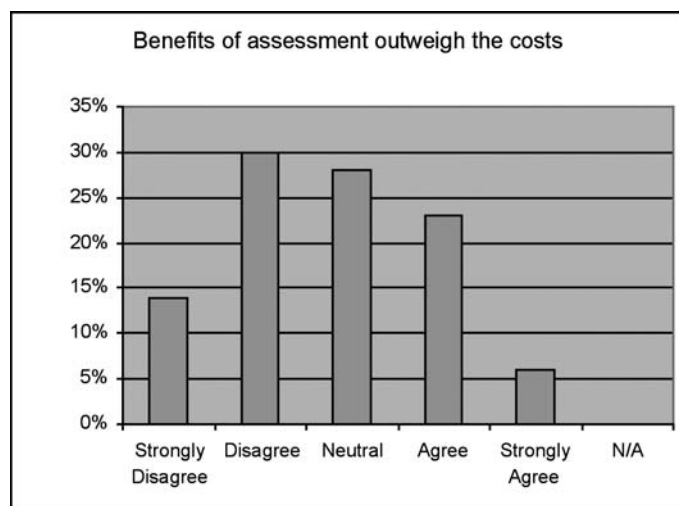
Given the relatively high percentage of respondents who cited assessment overhead as an issue, measures to reduce overhead (like those presented by Dr. Rogers) would appear particularly relevant. Consequently, the third and final question was especially interesting. Attendees were asked if, after listening to the session presentations, they now believed that they were doing "too much" to sat-isfy ABET requirements. Respondents were somewhat split in their opinions with approximately 28% acknowl-edging that they were doing too much, 34% feeling the opposite, and the rest neutral. The detailed breakdown is shown below.

Doing too much to meet ABET requirements
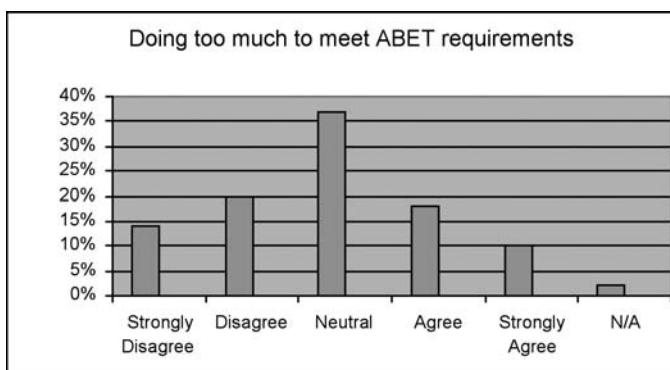
We conclude from this that many programs may be able to enact changes that will lighten their assessment load.   To the extent this is true, ECEDHA has an opportunity to assist in communicating and fostering acceptance of best practices in assessment efficiency.

ECEDHA is fortunate to have a number of current and past members who are active and influential in ABET accreditation circles. One such individual is Dr. Mack, who organized and moderated the ABET session. She has served as an "at large" member on the ECEDHA Board for two consecutive terms and is a member of the IEEE Educational Activities Board (EAB) Committee on Engineering Accreditation Activities (CEAA). Although her term on the ECEDHA Board comes to an end this year, she will continue to be an important propo-nent of ECEDHA's accreditation efforts. We are also grateful to our panelists for their remarks and to Dr. Rogers for her presentation and for listening to the concerns of ECEDHA members. During the upcoming year, we will build on these discussions and attempt to address some of the remaining challenges.

ECEDHA Activities

The Summer Board of Directors Meeting will be held at the Inn and Spa at Loretto in Santa Fe, NM—a departure from Jackson Hole, the host location for previous meetings. This is a planning meeting for the coming year and will focus on preparing the program for the Twenty-Fourth Annual ECED-HA Meeting, March 14-18, 2008 in San Diego (Coronado), CA. **Gerry Kane** will be in charge of organizing the program. The Board members for this year are President **Mark Smith** (Purdue), Vice President Gerry Kane (Tulsa), Secretary Trea-surer **Issa Batarseh** (Central Florida), Senior Past President **Ken Connor** (RPI), Junior Past President **Jon Bredeson** (Texas Tech), **Terri Fiez** (Oregon State), **Gary May** (Georgia Tech), **Wayne Bennett** (Clemson), **Horacio Marquez** (Uni-versity of Alberta), and **John Janowiak** (IEC). Also attending the Board meeting will be IEC staff members **Kathy Ricker** and **Melissa Swartz**, who provide extraordinary organization-al support and assistance to ECEDHA.

The Open Forum at the last Annual ECEDHA Meeting held March 2007 was done in a different manner than in the

past. Wireless digital response units—also known as "click-ers"—were provided by Mark Smith and Mark Johnson (Pur-due University) and were used during the Forum. The clickers allowed questions to be posted quickly and enabled tabulated responses to be displayed before the audience in real time. This was a learning experience for all involved, as there is an art to using clickers effectively. But certainly using the click-ers was much more effective than the old *show-of-hands* for-mat employed at previous meetings.

Over the years, ECEDHA has developed good relation-ships with its counterpart organization in Canada. Gerry Kane attended the Canadian Department Heads Meeting (CHECE/DGEIC) in Vancouver, British Columbia on April 23. The April meeting was collocated with the 2007 Canadi-an Conference on Electrical and Computer Engineering, a practice that has been in place for a number of years. The next CHECE/DGEIC meeting will be in Quebec City in Fall 2007. CHECE/DGEIC is currently chaired by **Horacio Mar-quez**, professor and chair of ECE at the University of Alber-ta. As chair of CHECE/DGEIC, he also serves on the ECEDHA Board.

ECEDHA continues to promote regional department meet-ings, which are valuable since they generally allow for closer interactions among attendees. The eight regions (seven in the US plus one in Canada) and their activities are listed on the ECEDHA Activities webpage. Some regions, like the South-west and Southeast, have been very active for many years. Some like the Northeast have only recently begun to meet

again on a regular basis. Most regional meetings take place on a university campus, which gives the host department a great opportunity to showcase its programs and facilities. We strongly encourage all members to attend their regional meet-ings, which, for the first time in a few years, will be held in all US regions.

ECEDHA will continue to examine the image of ECE, par-ticularly with respect to students making professional career decisions. Without a doubt, the world is changing as are per-ceptions about the ECE profession and both affect our future. We hope to take major steps this year toward addressing issues related to perception and stimulating curricular revisions that will result in more well-rounded future engineers for a world that has become flat.

In closing, we encourage all schools with electrical and computer engineering programs to renew their ECEDHA membership for 2007 as soon as possible. The strength and effectiveness of ECEDHA depends on continuing broad par-ticipation from a wide variety of ECE departments across the United States and Canada. We benefit greatly from the pro-gram diversity reflected in our membership and look forward to exchanging thoughts and experiences at the next annual ECEDHA meeting.

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Federal Intervention Required in Accreditation Process

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The best of America's colleges and universities continue to set a standard for excellence and research that remains the envy of the world. However, the foundations of our system are eroding – becoming too weak to sustain our economy and quality of life. Countries like China and India are making significant progress in educating thousands of scientists and engineers at a time that many programs in America struggle to find qualified applicants.

One of the core conclusions of the Department of Education (DOE) Commission on the Future of Higher Education (aka the Spellings' Commission after DOE Secretary **Margaret Spellings**) was colleges and universities need to do a much bet-ter job measuring and proving they are successfully educating their students. The DOE has taken an aggressive approach to corrective action – attempting to use federal regulation to change the behavior of colleges and accreditors. The federal rule making process on accreditation appears to be a central part of the DOE's strategy for carrying out the recommenda-

tions of the Spellings' Commission.

The DOE followed up on the Spellings'Commission report by empanelling a committee of negotiators — accreditors, state officials, public university leaders and its own staff members — to contemplate possible changes in the federal rules that govern accreditation. Negotiations during four panel meetings were controversial throughout – coming to naught with many college leaders (as well as some key members of Congress) questioning the DOE's legal authority to consider some of the changes it has sought.[1] In addition, the State Higher Education Executive Officers (SHEEO), among others, are now question-ing the wisdom of the DOE's aggressive approach. [2]

In a recent article, "Government Should Stay Out of Accreditation," **A. Lee Fritscher**, a professor of public policy at George Mason University and former assistant secretary for postsecondary education at the Department of Education and a former president of Dickinson College, said: "Involving accrediting agencies or the federal government in evaluating

and regulating teaching and learning is an unhealthy departure from traditional arrangements. Outside involvement in those activities runs the risk of curbing the innovation and high levels of creativity that have been the hallmarks of American higher education for decades." [3]

It has always been my understanding that the federal government exists to promote and defend America's national interests and well being — doing those things when, for whatever reason, the states have not done, refuse to do, or, are unable to do themselves. Now is one of those times. Let me explain:

Taken as a general guideline, Fritscher and others who oppose federal intervention such as **Larry Arnn**, president of Hinsdale College, are correct in the sense that federal intervention should be a last resort.[4] Indeed, there are exceptions to this guiding principle. A salient example of a requirement for federal intervention in the accreditation process is the compelling need to defend America's system of higher education system from the negative impact of overly commercialized college athletics and its attendant cancer-like academic corruption. Paraphrasing Fritscher, federal intervention would help curb the innovation and high levels of creativity that have been the hallmarks of the academic corruption related to intercollegiate athletics in American higher education for decades.

For all too long colleges and universities have been self reporting graduation rates, and now Academic Progress Rates for their so-called student-athletes who were/are in ostensibly accredited degree programs such as the general studies degrees described by **Jon Solomon** in his article, "Athletes make academic end run." [5] Solomon found general studies and 'Jock' majors prevalent in Alabama schools during the newspaper's investigation this past fall. No doubt, similar 'diploma-mill-like' degree tracks have been engineered for athletes in other states by members of their school's academic support center staff. Likely all have been accredited by regional accrediting organizations.

Unfortunately, fundamental public priorities recede to the background when institutions compete for status on national rankings based on student selectivity, faculty prestige and the success of their athletic teams. And just what does the DOE's negotiating panel and its National Advisory Committee on Institutional Quality and Integrity (NACIQI) have to say about that? [6]

Breaches of academic integrity exist at multiple levels in America's higher education enterprise where integrity can be compromised by schools intent on winning at any cost. Rubber-stamp accreditation by weak, or, intimidated accreditation organizations make the breaching task a no-brainer for big-name schools. As **Walter Byers**, who served as NCAA Executive Director from 1951 to 1987, said when speaking of a college's reporting on the necessary progress that has been made on the rehabilitation of at-risk high school graduates: "Believe me, there is a course, a grade, and a degree out there for everyone." Academic corruption in big-time college sports demands federal intervention in accreditation.

School administrators seem to believe outcomes assessment and strict accreditation are none of the government's business – ignoring the fact all schools benefit from government programs in one way or another. The NCAA and its member schools use the Family Educational Rights and Privacy Act (FERPA) to shield academic corruption from public view — avoiding disclosure of any information that could prove damming or embarrassing, especially in the case of the academic performance of their athletes. This corruption not only allows them to sustain their phony 'student-athlete' ruse with its derivative tax-exempt status, but also to recruit, sign, and roster academically unqualified blue-chip athletes requisite to fielding professional-level teams for their moneymaking sports entertainment businesses.

Without an independent outcomes assessment of student learning, the government has to take a school's word on Graduation Rates and Academic Progress Rates for their athletes. If schools are ever going to produce, collect and publish meaningful information about student outcomes, accreditors need to force them to do so. Why? Because the NCAA will not require their member schools to do it. Sadly, neither will the states, all too many of which over-identify their state's stature with the state schools' success in big-time athletics. Disclosure of aggregated (Buckley-compliant) outcome assessments on the athletes in their football and basketball programs would expose the NCAA's student-athlete scheme to the light of day – jeopardizing the tax-exempt status as an institution of higher education.

Schools should require their athletes to perform as real students – maintaining them as an integral part of their student bodies where academic standards of performance for athletes are the same as for the general student body. However, that won't happen unless and until disclosure is mandated by the government – the DOE via more stringent accreditation guidelines or by the Congress via a demand for tangible evidence justifying the NCAA's tax-exempt status. [7-9]

It is time for more explicit minimum standards for the knowledge and skills required for different degrees to be set. As SHEEO's **Paul Lingenfelter** says, degree-granting institutions should be held accountable "for rigorous academic standards resulting in demonstrable student achievement." This is precisely the outcomes approach taken by **ABET** in their "Criteria for Accrediting Engineering Programs." [10]

Thus far, the DOE and NACIQI have avoided getting involved with academic corruption in big-time college sports. However, momentum is building in Congress to investigate how universities with big-time sports programs use their tax-exempt status to pay multi-million-dollar coaches' salaries and build extravagant athletics facilities. **Sen. Charles Grassley** of Iowa, the senior Republican and past chair of the Senate Finance Committee, has asked the Congressional Budget Office to investigate the tax-exemption issue.[11]

In the meantime schools will continue to provide weakly-accredited degrees to academically undeserving athletes while thousands of students who want to go to school to learn are denied access. Also, absent congressional rulemaking, federal tax policy will continue to force parents, students, and other American taxpayers to help foot the bill for multimillion-dollar academic (elegibility) centers and coaches' salaries, tax breaks for wealthy boosters, 'stadium wars,' and other artifacts

of the big-time college sports arms race.

Notes

1. Lederman, Doug, "Lack of Consensus on Lack of Consensus," Inside Higher Ed, June 4, 2007, http://insidehighered.com /news/2007/06/04/accredit

2. _____, "Back Off on Accreditation, States Urge U.S.," Inside Higher Ed, May 25, 2007, http://insidehighered.com/news/2007/05/25/sheeo. This essay is based in large part on the author's comment, "Questioning the wisdom of backing off," posted May 31, 2007 at InsideHigherEd.com.

3. Fritscher, A. Lee, "Government Should Stay Out of Accreditation," The Chronicle of Higher Education, p. B 20, May 18, 2007.

4. Arnn, Larry, "Hands Off Higher Education," The Wall Street Journal, May 12-13, 2007.

5. Solomon, Jon, "Athletes make academic end run," The Birmingham News, Oct, 29, 2006.

6. Splitt, Frank G., "Who Accredits Alternative Ed Programs for College Athletes?," http://www.thedrakegroup.org/Splitt_Alternative_Ed.pdf

7. _____, "The U. S. Congress, Higher Education, and College Sports Reform," April 2007, http://thedrakegroup.org/Splitt_The_Interface.pdf

8. _____, The Congressional Challenge to the NCAA Cartel's Tax-Exempt Status, http://thedrakegroup.org/Splitt_Congressional_Challenge.pdf

9. _____, "Recommendations for Sports Program Transparency and Reporting at the NCAA and Its Member Institutions," May 4, 2007, http://www.thedrakegroup.org/Splitt_Recommendations_for_Transparency.pdf

10. ABET, "Criteria for Accrediting Engineering Programs," http://www.abet.org/Linked%20Docu...PDATE/Criteria%20and%20PP/E001%2006-07%20EAC%20Criteria%205-25-06-06.pdf.

11. Fain, Paul, "Senator Questions Colleges' Tax Breaks," The Chronicle of Higher Education, p. A26, April 13, 2007.

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Meeting the Growing Demand for Engineers and their Educators 2010 – 2020

International Conference, Munich, Germany, 9 – 11 November, 2007
Location: ArabellaSheraton Grand Hotel, Arabellastrasse 6, Munich, Germany

The migration of engineering work to developing nations, coupled with the rising demand for engineers worldwide, has had considerable impact on the global market for engineers. This situation is further aggravated in many countries by shortages of qualified science, math, and technology teachers at the primary and secondary levels, with these subjects often taught by general practitioners – when they are taught at all.

Discussion:
Will we be able to recruit and train enough engineers to meet the technical challenges facing our society? Do we have sufficient numbers of teachers properly prepared to educate future engineers and other technical professionals in the 21st century?

Participants:
IEEE and VDE will join Engineering societies, industry representatives, pre-university education leaders, institutions of higher learning and policy makers to discuss strategies for addressing the looming shortages of engineers and technical educators worldwide.

Objectives:
In bringing together representatives from these diverse public and private sectors, the summit seeks to:
• Establish and expand partnerships and open channels of communication among the constituent organizations
• Make recommendations to the relevant organizations based on best practices identified and agreed upon by the conferees
• Develop action plans that help those countries and educational sectors most in need of solutions to implement the recommendations

Expected outcomes:
• Agreed upon a set of action items
• Development of roadmaps for instituting best practices identified by the conferees
• Identification of opportunities for future collaboration on these issues

Agenda:
• Presentations held by leading figures from industry, academia, and government
• Moderated panel discussions and group work
• Poster session and other opportunities for sharing ideas

Registration fee:
Early Registration 238 € (On/Before August 15, 2007)
Late Registration 297,50 € (Between August 16 and October 17, 2007)
On-Site Registration 357 € (VAT is built into fee)

For more information about conference program, registration, hotel arrangements or paper submission, **Please visit the conference web site: www.ieee.org/go/demandsummit**

From your Editor

Bill Sayle
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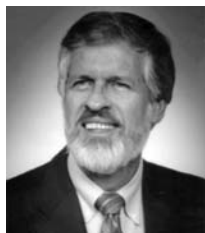
Well it's certainly becoming an interesting summer here in the northern hemisphere. In the USA flooding in central Texas is offset by extreme drought and watering restrictions in Georgia and much of the Southeast.

Here in Metz, France, where I am once again spending the summer at Georgia Tech's European campus, Georgia Tech—Lorraine, we are experiencing one of the coolest (high temperatures in the teens Celsius or low 60s Fahrenheit)and rainiest summers in memory. However, in April, the temperatures here were in the high 20s Celsius (80s Fahrenheit) and rain was almost nonexistent. Thus, one could say spring and summer were reversed. I'll leave the rest of the discussion about climate change to you experts.

This issue of *The Interface* features some interesting articles on the cost/benefit of engineering program accreditation by ABET. Two articles (**Falk, Smith & Bredeson**) are concerned the cost does not justify the benefit of outcomes assessment. Another article (**Noel**) asks the question of whether a fifth year for the basic accredited engineering degree is really necessary. Of course, the cost/benefit of a fifth year of college education would stir up considerable controversy by the parents, universities, industrial partners and other stakeholders. These discussions are healthy for our profession and will likely continue for some time.

In this issue, **Frank Splitt** raises the question of whether the federal government should intervene in institutional accreditation. Like many of us, Frank is concerned about the price paid by the general public and student-athletes for the big-time athletic programs.

I hope your summer or winter (depending upon your hemisphere) is going well. Just remember, Fall/Spring is coming soon! And, October is time for the ASEE/IEEE *Frontiers in Education* Conference. This year the conference will occur 10-13 October 2007 in Milwaukee, Wisconsin, USA. Next year's conference will occur in October 2008 in Saratoga, New York, USA. These conferences are an excellent time to network with like-minded colleagues. For more information, visit the FIE web site at

http://www.fie-conference.org/

The 2007 Frontiers in Education Conference (FIE 2007) continues a long tradition of disseminating innovations that improve computer science, engineering, and technology (CSET) education. FIE is a major annual international conference devoted to improvements in CSET education. It is an ideal forum for sharing your ideas, learning about new developments in CSET education, and interacting with your colleagues.

Globalization has dramatically changed engineering. Global engineering teams design products for global markets. Knowledge has no borders in a world where information flow is digitized and sent worldwide in seconds. A core requirement of engineering globalization is an understanding of how the different cultures of the global marketplace shape product development, multi-national engineering teams, and consumer expectations. Engineering education must address this issue with innovative solutions including new pedagogies; new approaches that improve student learning of technical skills and cultural skills; improved methods of distance education; study-abroad components; curricula reform; and partnerships between academia, industry, government, and K-12 educators.

Recent FIE conferences have addressed the borders between people and the impact that global hiring will have on engineering graduates. This year, in the city of Milwaukee—a city where Old World craftsmanship meets the New World of the information age—the FIE conference planners are especially interested in continuing the dialog about globalization with contributions that address the essential technical skills, cultural skills, learning skills, and curricula that will be required of graduates entering the global workplace.