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# ON THE ROLE OF ENGINEERING EDUCATORS IN THE ARAB GULF STATES: A NEW PERSPECTIVE

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**ABSTRACT.** Engineering education in the Arab Gulf States ((Saudi Arabia, Bahrain, Kuwait, United Arab Emirates, Qatar, and Oman) faces significant challenges as it seeks to meet the demands on the engineering profession in the future. Engineering faculty, the juniors in particular, need to expand their technical knowledge and develop new competencies to further their technical and professional development. The paper explores ways to effective professional development of Region's engineering educators to enable them to assume the roles they are entrusted with. In this respect, the paper focuses on: (i) the cognitive processes that faculty would follow as they grow and learn more about teaching and learning, (ii) the discipline-based industrial/practical experience they need to acquire in their locale to add to their repertoire as "practitioners" of engineering, and (iii) the institutional initiatives, including: administrative support, encouragement and resources. What is needed is to create a change in culture within the institution, the department, and the college, i.e., to generate a comprehensive and integrated set of components: clearly articulated expectations, a reward system for good teaching aligned with expectations, and opportunities for professional development to occur. The ultimate goal is to identify what Region's engineering educators and their institutions can do to generate more responsive forms of education that improves the quality of student learning.

## 1. INTRODUCTION

The paper amplifies thoughts, highlighted earlier,<sup>(1)</sup> on professional development of faculty members teaching engineering subjects in the Arab Gulf States, and argues that good teachers are those who keep up with new developments in their areas of specialization; and, at the same time, learn new approaches to teaching and learning.

Traditionally, engineering research and teaching have been approached in very different ways. To prepare for research we undergo years of rigorous training, both in scientific knowledge and in methods of gaining new knowledge through experimentation, analysis and modeling. To prepare for teaching, most of us acquire the same knowledge, but, except for a stint as teaching assistants, we receive almost no training in how to impart it to students. Fortunately, there is now a well developed science of human learning that has been very explicit in the ways in which students should learn, and how teachers should teach<sup>(2,3)</sup>. Further, they address different learning styles<sup>(4,5)</sup>, focus explicitly on communication, team, and leadership skills,<sup>(6,7)</sup> and stress on educating students for life by helping them to learn how to learn.<sup>(6,8)</sup>

"Skilful engineering teachers" are those who are committed to the profession, and, at the same time do possess knowledge in three domains: engineering knowledge (i.e., their main disciplinary expertise and its related areas), pedagogical knowledge (i.e., how students learn, effective pedagogies in achieving learning goals), and pedagogical content knowledge (e.g., how best to demonstrate procedures, relate concepts, and correct students' misconceptions).<sup>(9)</sup>

However, expertise in any domain is usually developed over time through determination, personal effort, and years of practice- and teaching is no different! It is a skill that can be acquired and improved with the right information, practice, and corrective measures through proper feedback.

Young faculty (recent graduates with PhDs) who decide to get into teaching, and embark on it with hardly any prior preparation or training, except perhaps when they served as TA's in a class or two, have faced some disappointments. They have found themselves, often, unable to cope, and many began to view teaching as an unpleasant "chore" they have to put up with. These frustrations, unless properly addressed, would result in serious consequences, such as: opting out, changing jobs, or else continue to face problems and eventually become demoralized, thus adversely affecting outcome. Given this rather unpleasant situation, how may young faculty, in general, and those of the Gulf States in particular, overcome these difficulties and survive in this maelstrom of uncertainty? What is the role of the institution in assisting young faculty to overcome the hurdles?

The paper focuses on issues and concerns that beset the majority of young engineering faculty in the Arab Gulf States at the start of their academic career, and argues that the introduction, early on, of "well thought out" professional development strategies of engineering educators, would raise their self-confidence as teachers and help in equipping them with the tools they need in disseminating knowledge. This does not mean that learning/teaching does not go on in Gulf colleges; I think that a great deal does! But there is every reason to believe that introducing a higher level of professionalism would enable junior faculty to create and sustain a more powerful form of engineering education for the Region. The author has, in prior publications,<sup>(10, 11)</sup> addressed many of the relevant issues on the subject and its proliferations. It should also be stated that: what transpires in this paper is likely to be of use to engineering educators in other regions of the Arab World; particularly where a new culture that values and emphasizes good teaching and student learning, has taken hold.

## 2. RELEVANT COGNITIVE PROCESSES FOR FACULTY DEVELOPMENT

The primary focus in this paper is on the development of young engineering faculty members in the Arab Gulf Region and the cognitive processes that faculty should follow as "they get immersed" in teaching and other related academic functions. In this regard, they most likely find their way and progress through *seven* incremental stages of development. While the amount of information available can be overwhelming to any young instructor, the path forward is traversable with the advice of experienced academics and colleagues, available to help with the journey.

### i. Emulate a Role Model

At their very start, young engineering faculty begin to remember their teachers; and if their memories do not fail them, they sketch out the dominant positive characteristics of those they wish to emulate, and attempt to follow their previous teachers' way of teaching as they recall from their students days. Following the footsteps of their *role model* is often reflected in young faculty classroom disposition, attitudes, teaching activities, and may, in some instances, overshadow their true personality. Eventually, they will come to grip with the fact that imitating their teachers is no solution; and begin their "sole-search" by redirecting efforts towards: self realization and fulfillment, improving their own skills, and redefining their own role in the teaching/learning arena.

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## ii. Enhancing their Teaching Skills

When young faculty begin to get some negative feedback on their class performance, coupled with a “gut feeling” that their handling of the teaching material is not up to desirable standards; they begin to ponder the question of how to select strategies to improve their teaching, i.e., to learn about the “nuts and bolts” of teaching. At this stage, they may ask how they can make their lectures more interesting, how they can engage students, how can they prepare more suitable exams, and how best to use in-class delivery methods to enhance their teaching effectiveness. At some point, young faculty will realize that they need to be selective in what they chose as a preferred strategy and may need guidance from a senior faculty with proven experience. Eventually, they will realize that a gap exists between students’ performance and their own expectations as teachers. To narrow the gap, young faculty need to move to the next level: examine what constitutes effective teaching; what defines deep-level learning and what characterizes proper faculty and students roles in the teaching/learning process.<sup>(12, 13)</sup>

## iii. Comprehend the Principles of Teaching and Learning

While learning about teaching techniques helps instructors to become more effective in course delivery and related protocols, understanding the *basic principles* of learning and how they impact teaching in general would help them create new and more powerful forms of learning.<sup>(14)</sup> The problem may not be that the instructor lacks the experience or is a poor lecturer, but rather that lecturing may not be the most appropriate way of engaging students in the learning process. The principles of learning focus on fundamental issues such as: how people learn, how students process information, how prior knowledge impacts learning, and the varied ways different individuals learn. Because students have different learning styles, some teaching methods are effective for some students but ineffective for others. Various models of learning styles preferences have been described By Rita Dun.<sup>(5, 15, 16)</sup> The following statements, add meanings to the concept of learning style from different perspectives.

- Each student has an individual learning style that should be acknowledged.
- Learning style, a function of heredity and experience, and develops over one’s life span.
- Learning style is a combination of affective, cognitive, environmental, developmental, and physiological responses that characterizes how a person learns.
- Information processing, fundamental to learning style, improves with practice.
- Teaching individuals through their learning style strengths, improves their achievement, self-esteem, and attitude toward learning.
- Every person is entitled to instruction and counseling compatible with his/her style of learning.

To incorporating some or all of the elements listed above in an “engineering” course, in which one is already faced with too much material in too short a time, is daunting to experienced teachers- let alone young and inexperienced faculty members. The challenge is exciting to any instructor who wishes to “humanize” the teaching and learning process, and reconcile within one’s self that: he/she is teaching students rather than “unloading” teaching material in accordance with a time schedule.

## iv. Focus on Active Learning Strategies

Here we proceed onward from general issues of learning to more specific questions about learning goals, including: the different kinds of knowledge that would constitute significant learning for students. Researchers have categorized knowledge under different headings:

*declarative knowledge* (defines and describes), *procedurals knowledge* (how may learners use declarative knowledge), *structural knowledge* (how concepts in a domain are interrelated), and *contextual knowledge* (when to access selected principles and when to use certain procedures).<sup>(17,18)</sup> An important question is: what *active learning* really means and why research supports the notion that the more active the students are the deeper their understanding would be.<sup>(19, 20)</sup> The core elements of active learning are student activity and engagement in the learning process. *Active learning* is often contrasted to the traditional lecture where students passively receive information from the instructor. In short, *active learning* requires students to do meaningful learning activities and think about what they are doing.<sup>(19,20)</sup>

There are some pitfalls for young faculty; in particular those who pick up an article or two to learn how *active learning* works and how they may apply it to enhance their teaching. Faculty adopting an instructional practice with the expectation of seeing results similar to those reported, need be aware of the practical limitations of such studies. Educational studies, by and large, relate what worked, for the population examined and the prevailing conditions at the time of the study. Claiming that faculty who will adopt a selected method will see similar results in their classrooms is simply unrealistic. Despite these problems, young engineering faculty should be strongly encouraged to examine the literature on *active learning*. Some of the documented material on active learning is compelling, to say the least, and should stimulate young faculty to think about teaching and learning in nontraditional ways, leading, in due course, to their adoption of an *active learning* strategy.

#### **v. Align Activities with Assessment & Integrate Components**

To optimize on course resources, learning activities should be aligned with assessment by developing activities that support declared goals and student learning, often referred to as *educative assessment*.<sup>(9, 21)</sup> This would include decisions on how to provide information on students' strengths and their mastery of course material, as well as guidance on how to proceed with learning activities to insure compliance with defined goals. Students will eventually need feedback on their performance that allows them to move forward as learners, and deepens their understanding of the subject matter. This feedback could come from the instructor, their classmates, their own self-reflection, or a combination of the three.<sup>(21)</sup>

Another important factor in the optimization process is to integrate the different course components (learning goals, teaching/learning activities, feedback, and assessment), in such a way that the course becomes "well-knit" while the various components support and complement each other in a coherent manner, i.e., the sequencing of learning activities, feedback, and assessment should build energy, engage students, and allow learning to develop as the course proceeds.<sup>(9)</sup>

#### **vi. Affirm the Human Dimension of Education**

At its core, teaching is an action with a profound human dimension. Teaching is about making some kind of "dent" in the world so that the world is somehow different than it was before you practiced your craft.<sup>(14)</sup> Knowing the kind of dent you want to make means that you want to ask yourself the fundamental question: What effect am I having on students and on their learning? Asking this question helps when one is faced with the need to make choices, and the choices one makes, connect to the overall aims one is pursuing as a teacher. At times of uncertainty, students will draw strength from teacher's passion, understanding and conviction. Therefore we do need to understand our own - and our students'- passions, motivations, and life experiences.

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Instructors should demonstrate that they are thoughtful people, and possess a carefully developed and deeply felt conviction about teaching in general and their specific role in the process, in particular. Demonstrating that they know where they are going, and why they believe it is important to take students there, imbues the students with a sense of confidence. Students would then realize that they are under the guidance of someone who is experienced, insightful, and above all, committed and does care! Having a clear sense of where the journey is leading and a deeply held belief in the importance of embarking on it, are attributes that come strongly into play when students feel lost, afraid, and confused along the way. <sup>(14)</sup>

### **vii. Build Trust with Students**

Underlying all significant learning is the element of trust. Trust between teachers and their students is the affective glue that binds the educational relationships together. Not trusting teachers has grave consequences for students. They are unwilling to submit themselves to the perilous uncertainties of new learning. The more profound and meaningful the learning experience is to students, the more they need to be able to trust the teacher. What make teachers more trustworthy in students' eyes are two components: teacher *credibility* and teacher *authenticity*. Teacher *credibility* refers to teachers' ability to present themselves as ordinary people with something to offer to students. Teachers who have *credibility* are perceived by students as possessing depth and breadth of knowledge that far exceeds students' own. It is the competence that students do expect of their teachers, to help them come to grips with complexities and uncertainties that many do experience when exposed to unfamiliar territory <sup>(14)</sup>.

*Authentic* teachers are, those that the students feel they could trust. They are real human beings with passion, frailties, and emotions. They are perceived as whole persons, say what they feel and do what their conscience directs them to do. In more specific terms, students see four types of behavior as evidence of *authenticity*: (i) teachers' words and deeds are congruent; (ii) teachers admit having made a mistake publicly when they do so, acknowledge fallibility, and refrain from bragging and self-praise; (iii) teachers allow aspects of their personality, outside their role as teachers, to be revealed to students; and, (iv) teachers encourage learners to express their views openly, and are willing to change their practices as a result of students' input and suggestions. <sup>(14)</sup>

Research has shown that various dimensions of students' personal growth does occur during students' college experience, and that college educators impact this growth and development, positively or negatively, often not being aware of their actions and related consequences. <sup>(22)</sup> Educators should realize, at the very start of their academic journey, that students would be influenced by teachers' actions, dispositions, and attitudes. Students may also be concerned that the learning methods that the instructor favors are entirely inappropriate or that the criteria applied to judging their efforts are unfair. In response to these legitimate concerns, the instructor should demonstrate to students that he/ she knows what he/ she is doing. Students would feel reassured that the instructor has chartered a clear path forward and is sure that what is happening is valuable and in the interest of the students and their learning.

## **3. PROFESSIONAL PRACTICE AND ITS ROLE IN FACULTY DEVELOPMENT**

Concurrent with equipping young engineering faculty with pedagogical knowledge in the teaching/learning arena; attention ought to be paid to young instructors' growth, interaction, and development in their engineering field, i.e., their declared area of expertise. It has been said that "engineering instructors are engineers first and instructors second", which implies

that keeping pace with development in their fields enhances their abilities as engineers, and bolster their role in the teaching/learning domain (i.e., they become better teachers by gaining practical experience).

No one would dream of building a medical school without an explicit mechanism to encourage teaching staff to keep up with their practice of medicine. If engineering is also a real-world profession, its teachers, particularly the young, should be encouraged to practice engineering through design, development, manufacturing, and testing of real products and services. The one-day per week consulting rule does encourage this, but the reality is that these activities are, unfortunately, frowned upon, largely because they tend to distract instructors from their main functions, i.e., their teaching, research and service to the department and the college. On-campus facilities and institutional arrangements such as consulting and enterprise incubators should be investigated by appealing to other professional models, i.e., medicine, law, etc. Some of these activities are at the very least self-supporting, and would, if properly planned, shed funds that could be used to support academic endeavors.

I believe there are feasible action plans that should be adopted to pave the way for potential collaboration between industry and academe. These would include:

**First**, Seeding and propagating the idea, that gaining practical experience enhances young instructors' teaching competence without adversely affecting his/her research capability. A faculty member should strive to do both! (be a good teacher and a researcher at the same time). Simply stated, the prevailing perception that effort should be spent mostly pursuing research and research funds, and that time and effort spent enhancing one's teaching competence does not count toward promotion and tenure, need to be changed! The positive relationship between having practical experience and faculty's performance, commitment, and positive attitude toward the classroom environment, requires university administrators to "rethink" their current hiring, promotion and tenure policies. Sufficient weight be allocated to practical experience, and to begin a change in norms that have favored research over teaching.

**Second**, Initiating and supporting efforts to educate graduate students, early on, about the benefits of acquiring industrial experience, and its relevance to their future careers when they become faculty members. Encourage them to get in touch with industry at large, have a connection with someone on the inside, and plan to get involved with the practice when they do graduate. This notion of reaching out to industry at an early stage is foreign to the halls of the engineering academy in the Region, and likely to meet cultural resistance. Nonetheless, if we are pragmatic and desire to do a better job in equipping our students with the "tools of the trade"; then, we need to alert our graduates (future engineering teachers) to the need of developing proper and enduring connections with the industry.

**Third**, Reaching out to the industrial sector, in an attempt to form symbiotic partnerships between local industry and academia through: capstone projects, theses work with practical overtones, and applied research in selected domains, is extremely desirable and beneficial. The surest way to having working college-industry relation is to come to a mutual understanding that both would gain from such a relationship.<sup>(23)</sup>

The discussion noted above may remain academic and difficult to implement, unless preceded by specific steps borrowed from the world of business. These steps include:

- "Rethink" students–faculty roles beyond the egocentric model building with the precept that the ideal educational output and the ideal student is one just like me!

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- Identify customers' needs on two fronts, their future manpower needs, and the support services that they are likely to require (e.g. technical consultation, applied research, testing, monitoring, etc.), now and in the future.
  - Reorganize internally to streamline, and redirect efforts to integrate with external clients, particularly those industries that hire graduates and use institution's services.
  - Privatize portions of the College (if at all feasible) to eliminate red tape, and allow the industrial partners to make more effective use of college resources. Contracting or transaction costs are often a major barrier to cooperation between different parties, and many university-industrial activities run aground on the shoals of intellectual property rights. In efforts that are educational in nature it would do the universities well to remember that industries are the *sine qua non* of real engineering activities. Be broad minded and think long range!

In this vein, the major problems of local industries along with their potential solutions should be focused on, properly framed, and identified in open forums. This would help to set the stage by: disseminating information, generating technical debate, and examining potential solutions from different perspectives. Invariably, it has to be a team approach, and among the major players are the young instructors.

#### **4. INSTITUTIONAL ROLE**

Colleges of engineering would excel at teaching and learning when the majority of their faculty develop and achieve a reasonable level of pedagogical knowledge, and at the same time, are able to enrich the learning process by bringing in their own engineering experience into the classroom. Achieving a relatively high standard of teaching competence requires individual faculty commitment and dedication to the process, clear vision of the path forward, self-discipline, and time and effort to acquire the desired skills and the relevant practical experience. Irrespective of individual faculty member own initiative and commitment to the process, institutional support and faculty leadership is absolutely necessary for achieving success and reaching the desired level of teaching competence. There are several action items that institutions of the Gulf States need to adopt with the aim of impacting young faculty development, i.e., to see faculty grow as professional educators, over time.

##### **i. Correct Misconceptions**

To start, the institution should strive to change the mind set that has gripped academe in the Region for years. First of all, the prevailing antiquated model of good teaching and proper learning needs to redefine the roles of faculty and students in the educational process. There is every reason to believe that the institutions of the Gulf could, by introducing a higher level of professionalism, make both what the students are doing and what faculty members are doing with their students substantially more effective. Also, the institution should try to rectify views and dispositions of many, inside and outside academe, who are of the opinion that young faculty, upon graduation with their PhD's, have learned it all! i.e., acquired all that it takes to embark on the job, and their competence need not be challenged or questioned. Therefore, (from their perspective) the professional development faculty members require is self-generated and self-propelled; and the institution need not interfere or help, unless unusual circumstances demand it.

## **ii. Provide the Necessary Environment and Support Services**

Faculty, and in particular the “beginners”, may feel good about themselves, their class performance, and their handling of the subject matter they are entrusted with, but are not prompted to explore alternative perspectives, venture into new skill areas, or scrutinize critically those habitual assumptions underlying their thoughts and actions. To live in a *cul-de-sac* may be comfortable, for some time, but could be self defeating long range. Faculty are sometimes so enclosed within their narrow frames of reference that they are the last to recognize that these may be misleading or even harmful. The most important thing that could be done to lift the faculty member out of the “rut” is to offer alternative perspectives, fresh ideas, and critical reflections. At this juncture, the viable role of the institution in providing the proper environment for professional development of its faculty is key to achieving success and fostering a positive change. Today, all of the institutions in the Gulf have a teaching/learning center that offers campus-wide faculty development programs. Most programs offer workshops that focus on a wide range of topics, such as designing courses, creating *active learning* opportunities, effective grading procedures, understanding how students learn, and using instructional technology effectively; in essence, sharing valuable classroom strategies and showing the realm of possibilities by offering these workshops. These programs do take their cues from institutional initiatives, but unfortunately, engineering faculty participation has been minimal.

## **iii. Instigate a Constructive Dialogue**

In order to provide the necessary, well-thought out support services and learning opportunities for faculty in general and the young ones in particular, a constructive dialogue between faculty and administrators (planners, decision makers, and financial officers) should precede any scenario and/or action plan under consideration. Faculty should rightfully identify current barriers, including time and resources needed for new activities (what can be unloaded to make room for new things?), the need for opportunities to learn (having access to: seminars, workshops, conferences), approval to try novel ways of teaching without risking low evaluations at the start, and access to instructional consultants and experienced teachers to serve as advisors and mentors. Consultants help faculty examine what they want students to learn and explore what materials, and teaching strategies will most effectively support their learning goals.

## **iv. Reward Good Teaching**

Administrators should strive to make effective teaching and instructional development higher institutional priorities. Many faculty would participate in professional educational development when the institution begins to reward good teaching or learning about good teaching. It is difficult to buck the trend that has continued to reward faculty for writing grant proposals, doing research, and writing for publication. To counter this tendency, provosts, deans and chairs should reexamine the institution’s infrastructure (especially the faculty incentive and reward structure) as it affects faculty attitudes and behavior. Using incentives to encourage young faculty to increase their commitment to teaching would definitely help; but continuing to hire new faculty whose primary emphasis and interests is in research, inevitably reinforces existing cultural norms that has favored research over teaching for a very long time.

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## **v. Facilitate and Support Faculty in Acquiring Relevant Practical Experience**

Encourage faculty members, particularly the young, to get involved with the practice in their locale, and devise equitable system(s) that allow faculty members to gain the experience they desperately need, in order to keep up with developments in their areas of specialization. Thus asserting that faculty members “with practical experience under their belt” would, in general, make better teachers. Administrator and decision makers, in general, should investigate ways for helping new faculty members gain industrial experience by spending a semester on-site at a cooperating industry, using summer release time to work within industry, or allow for a dual appointment, say fifty-fifty, i.e., fifty percent at the College and fifty percent at an industry nearby. The legal and organizational details of these schemes deserve closer benchmarking.

The above noted action items do require a change in prevailing culture accompanied by firm conviction and commitment on the part of academic leaders and decision makers, including senior faculty, department heads and deans. Attention must be paid to initiating and managing change. Three processes are key to attaining success: (i) arrival at plans/scenarios that have been scrutinized and received wide acceptance, preferably from the bottom up, (ii) learning how to initiate and sustain significant change efforts, and (iii) devising effective means of assessing the impact of change on the new culture. There are today many change models and a robust literature that academic leaders can draw from. This literature includes: models of change<sup>(24)</sup>, recommendation on “culture-embedding” processes<sup>(25)</sup>, factors that may help in changing people’s minds<sup>(26)</sup>, and advice on how leaders could make culture more explicit.<sup>(26)</sup> However, any significant change in the *status quo* can only be brought about through the leadership of visionary administrators, appropriate support, and faculty members’ willingness to learn. All three could come as a result of a new culture that values the future role of young faculty in the educational process, i.e., to enhance the effectiveness of teaching/learning of engineering students in Region’s colleges of engineering.

## **5. CONCLUSIONS**

The engineering profession in the Arab Gulf states currently faces many challenges that need to be addressed to insure that future engineers have the required capabilities they need to perform well in a world driven by rapid technological advancements, diminishing resources, and the creation of new disciplines at the interfaces between engineering and sciences. At the center of it, is the engineering educator who is the major player, the instigator, and the facilitator of learning. If engineering colleges want to introduce meaningful change in how engineering education should be practiced, faculty members (the young in particular) will need a new perspective that: i) validates why learning about teaching is important; ii) provides them with opportunities to engage in what and how to learn about teaching, e.g., a systematic way for continued development; iii) enables faculty to gain the practical engineering experience they require to become better teachers of engineering; and, iv) propagates a positive and dynamic culture that values good teaching and introduces meaningful change in how engineering education is to be practiced.

The paper offers a new way to think about the development of the professional engineering educator. It focuses on the cognitive processes that faculty most likely follow as they get immersed in teaching. The headlines of these processes are noted in Table 1.

Table 1: The seven cognitive stages (processes) that faculty members are likely to follow

- Emulate a Role Model
- Enhance Teaching Skills
- Comprehend the Principles of Teaching and Learning
- Focus on Active Learning Strategies
- Align Activities with Assessment and Begin to Integrate Course Components
- Affirm the Human Dimension of Engineering Education
- Build Trust with Students.

Achieving high level of professional pedagogical knowledge and competence is essential but hardly sufficient for an engineering faculty member to assert his/her role as a facilitator of an engineering subject matter. To teach certain engineering subjects you need the depth and breadth that comes only through the practice of engineering. There is much that the “practice” could add to one’s repertoire as a teacher. However, at some point, many members realize that being an academician severely limits your chances of gaining the practical experience that they desperately need to bring industrially relevant design, and many other aspects of the practice, to the classroom. In this context, it is imperative that engineering faculty be encouraged to reach out to the industrial sector in order to arrive at a workable and equitable circumstance that allows the faculty member to gain the practical experience he/she requires, to enhance their role as engineering teachers. Some of the action plans that would help in developing properties/connectedness with the industrial sector in their locale, and encourage young faculty to add practical experience to their repertoire, are listed in Table 2.

Although Region’s colleges of engineering have some degree of freedom, however, changing their trajectories is often difficult. To change the “mind set” of those who are entrusted with decision-making is complex and may require long time to happen.

For the reforms in engineering education advocated in this article to be enacted, the author believes that the culture of engineering colleges needs to evolve to the point where the changes referred to will be reinforced by an explicit set of expectations, a support structure, and a compatible faculty reward system that values good teaching. Leaving change up to individual faculty without a supportive culture, e.g., without reward systems that value teaching as a scholarly task on par with research, does not work!

Piecemeal efforts- an initiative here a workshop there- may result in pockets of improvements but would fall short of changing the prevailing norms, values, and behavior within the institution as a whole. What is necessary to bring about a change in culture is to have a comprehensive and integrated set of components: clearly articulated expectations, a reward system compatible with those expectations, supportive leadership, and opportunities for the professional development to occur.

Table 2: Action plans to instigate and facilitate industry/academe relations in the Region

- Propagate the idea - on and off campus - that gaining practical experience enhances teaching competence
- Allocate sufficient weight to industrial experience when hiring new faculty
- Initiate and support efforts to educate graduate students(the future faculty members) about the benefits of acquiring industrial experience and its relevance to their future teaching career
- Search for proper ways to connect with the industrial sector in the Region with the aim of forming symbiotic partnerships through: capstone projects, theses work with practical overtones, and applied research projects in selected domains
- Allow the industrial partners to make use of College facilities and its human resources in tackling technical and managerial issues of concern to the industrial sector, locally and regionally.

When the institutions of the Region mount these strategic important initiatives, thus leading to effective professional development of the engineering educator, then future generations of engineering students will have a better and more relevant education. An education that provides them with the knowledge, skills, and aptitudes they will need to tackle complex engineering problems that the Region is likely to face in the future.

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