BEST PRACTICE IN CATALYZING CONTINUOUS REFORM IN ENGINEERING EDUCATION

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Abstract - As we all know, engineering education has to keep up with changes in today's world. Therefore, all stakeholders (academic leaders, industry partners, students, NGOs, society in general) need to be proactive in understanding what are the economic/society needs and constantly adapt strategies to better develop the engineering professional that will contribute to the development of new ideas as well as solve local, regional and global problems. In other words, how to form the "locally pertinent, globally competent" engineer. Engineering schools need to also assess and evaluate continuously to make decisions to improve. But given the conservative history and nature of higher education, innovation/reform does not come easy. The system has existed virtually unchanged for centuries. So, how can engineering schools engage in a reflection, adapt, change path? How can faculty, deans, department chairs promote innovation, continuous formative and outcomes assessment to make informed decisions to better achieve its mission in society? How can all stakeholders work together in this process? This paper proposes answers to these questions and discuss a unique model, followed by an international team of experts in mentoring engineering institutions around the world, to understand the why, how, who, and what of engineering education innovation. It shares concrete examples of the process being followed as well as the outcomes of innovation. These examples can help other institutions catalyze similar roadmaps for better serving their constituents.

***Keywords**: engineering education, innovation, mentoring, best practices, engineering competencies*

INTRODUCTION

Many higher education institutions, especially engineering schools, are either revisiting their mission and strategies or are thinking about doing so. This may be the result of one or multiple factors that have to do with both internal (e.g., resources constraints, enrollment, retention) and external pressures (e.g., industry needs, government regulations, accreditation). Many of these reforms include continuous assessment of outcomes for quality improvement. Going about reforming a system that has been in place for hundreds of years does not come easy. Again, the highly conservative higher education culture permeates across all sectors making the process more difficult. Issues and questions like these surface: Why change when we are excellent? We have done it like this and it works, why change? Why do we have to listen to what industry says? I have been teaching like this, the same way I was taught. Nobody is making me change. Facing these pressures academic leaders find themselves in a crossroad with no other path to take but that of facing reform head on, reflect on current state, understand what society needs and analyze alternate pathways to finally make decisions to innovate to better serve stakeholders [1].

OBJECTIVES

For the last few years a group of engineering (and associated disciplines) professors and industry experts

who have dared to change themselves, the way they teach, deans who championed major transformations in their colleges, to Silicon Valley entrepreneurs and industry leaders who have nurtured and expanded academic partnerships have come together to assist engineering (and associated disciplines leaders) in their transformation processes. These individuals have dedicated their lives to improve higher education, especially, engineering education, many are world recognized educators with prestigious awards and recognitions. They have transformed themselves, their institutions and higher education – and are making themselves available to help others through similar transformations. The paper describes the mentoring approach being used with institutions as well as examples of the outcomes that have resulted from the guiding process.

METHODS

Executive coaching/mentoring brings best practices and guidelines in helping leaders excel at what they do [2]. The coach/mentor group follows a process that is designed as unique, one-on-one individualized to benefit the leader and his/her organization. It works with goals jointly defined by both the leader and the organization, and use methods and feedback data to develop the leader's capacity for current and future leadership. The coaching is guided by a coaching partnership to achieve maximum impact and the highest level of learning, not only of the leaders but also of the academic/staff community they want to include. At a high level perspective, the method used follows a simple pattern: 1) assess the institution/college/program needs, 2) together with leaders, help develop their innovation/reform plans to address those needs, and 3) accompany/mentor the academic leaders through the implementation phases, through: high value meetings/brainstorming sessions, focused seminars and workshops, individual and group consulting/mentoring and efficacious and agile follow-through via email and conference calls. Once the institution leaders communicate an understanding of their needs, a group of experts is assembled and an initial agenda for meetings, brainstorming sessions, seminars and workshops in the areas of interest is put together. The agenda is amply discussed based on desired outcomes, time and resources constraints and other issues. High emphasis is placed on learning effectiveness, outcomes assessment, industry/employer partnerships and faculty development. The first visit occurs under a congenial, open atmosphere, both sides, mentors and mentored, open to change the flow, scope and content of topics. Homework is requested of all participants to further scope their understanding their knowledge as well as make them aware of important issues pertaining to engineering education in the 21st century. Tasks are also assigned to the institution with frequent follow up via email, phone/skype conference calls. The mentoring process also includes motivating institutional leaders to write up their experiences and publish/present a paper in a national, regional or global conference.

RESULTS

The paper will include a description of the mentoring process for innovation of five (5) institutions or alliances of institutions with which the group of mentors have worked. A brief description of each institution's motivation and challenges, innovation areas and plans, and the reform general outcomes will be included.

CONCLUSION

Engaging an academic reform is not a simple task and involves many stakeholders. Being accompanied by a group of experienced professionals in the innovation /reform of engineering education has proven successful for a group of institutions worldwide. The process and examples described in this paper may be of assistance to other institutions wanting to walk a similar path.

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