

On Becoming an Important and Constant Contributor: Deepening Our Culture of Innovation

by

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Executive Summary. Olin College was created for the purpose of developing a new paradigm for engineering education and to influence others through a culture of innovation and continuous improvement. This paper provides an update on our efforts to respond to the growing requests from other institutions for help in the advancement of engineering education and identifies several further steps needed to become an “*important and constant contributor*” to the broader innovation agenda. These steps include the further development of an internal culture of continuous improvement, the development of a strategy for enabling periodic wholesale reinvention, and the education of Olin graduates to become serial innovators in whatever field they choose to pursue.

Established with a Clear Purpose. The voluntary decision by the F.W. Olin Foundation in 1997 to dissolve and to create an entirely new and independent college with the remainder of its resources was an extremely rare event. The Foundation set out their reasons for this unprecedented decision in the Founding Precepts for the College, as follows:

*“With respect to the Foundation’s reasons for establishing the College, let it be said that the Foundation does not seek to establish a generic undergraduate engineering college—one that will simply offer programs similar to many others around the country. Olin College is intended to be different—not for the mere sake of being different—but **to be an important and constant contributor** to the advancement of engineering education in America and throughout the world and, through its graduates, to do good for humankind¹.”*

True to this precept, Olin College focused intense effort in its first years on creating a new model for engineering education that addressed all the major concerns at the time of the founding of the school. This new model was the result of a complete rethinking of engineering education from the ground up, and is significantly different from that of more mainstream institutions².

Our new educational model and underlying learning culture have begun to generate significant levels of attention in the media and from other academic institutions. In fact, the most common adjective used by the media and external visitors to describe Olin College continues to be “*innovative*.” Visitors seem to be referring both to the people Olin has attracted and to the learning environment that has been established here.

A Definition of Innovation. It is important at this point to provide some definitions that will help guide our thinking about innovation. For the purposes of this discussion, I will define “*creativity*” as the process of having original thoughts and insights. Then “*inventiveness*” may be defined as the process of having original thoughts and insights that have value. Finally, “*innovation*” may be defined as the process of having original thoughts and insights that have value, and then taking initiative to implement the new ideas in ways that touch many people’s lives. Perhaps the true hallmark of a highly successful innovation is that after its introduction, it spreads rapidly and pervasively so that within a relatively short period most people cannot even remember what life was like before the invention was introduced. In other words, it changes the way many people live.

¹ Franklin W. Olin College of Engineering, Founding Precepts document, second paragraph.

² A summary of the distinctive features of the Olin educational program is available in a short document entitled: OLIN AT A GLANCE (SUMMER 2009)

By these definitions, Olin's new approach to engineering education does not yet qualify as a large scale innovation. While the Olin learning environment is quite different from that in the mainstream (and therefore potentially "*innovative*"), clearly our impact is limited to a small population and a tiny percentage of engineering graduates nationwide. To become a highly successful innovation, many other engineering schools must adopt elements of our philosophy and learning culture. We have a lot of work to do before we can claim to have contributed a highly successful innovation in engineering education outside our campus borders.

Contributing to Advancement of Engineering Education Elsewhere. The November 2008 meeting of the President's Council was specifically devoted to this topic³. Last November's paper outlined the substantial efforts we had devoted at that point to achieve this goal, and also noted some evidence that these efforts are beginning to bear fruit. Judging from the increase in the number of visitors to Olin since then, the increase in the number of invitations to speak at major conferences, and the increase in the number of invitations to partner with major engineering schools seeking to make improvements in undergraduate education, it appears that Olin College is already on the "*must see*" list for those who are interested in innovative engineering education⁴. Last year's paper also noted a number of challenges we face in pursuing this goal. We asked for advice on how best to pursue the goal of catalyzing change in engineering education nationally and internationally.

The principal advice we received last year was that we need to develop a serious coordinated effort to address this external mission. Without such coordination, the time and effort required to respond to requests from off campus for special tours, workshops, and academic partnerships might develop into a major distraction from our responsibility to maintain an excellent learning experience for our students and a sustainable environment of professional development for our faculty and staff.

The Initiative for Innovation in Engineering Education (I2E2). It is important to note that we recently responded to that advice by establishing the *Initiative for Innovation in Engineering Education* at Olin College. The Initiative will be led by Professor Lynn Andrea Stein, with goals and objectives that are described in a recent memo to the community⁵. The overall goal of the Initiative is to provide coordination, leadership, and a single point of contact for both internal and external conversations aimed at fostering innovation and change in engineering education. In the near term, the Initiative will provide an initial point of contact for potential new collaborators, seek external funding, and plan and execute workshops, meetings and custom programs in response to external requests. In the longer term, the Initiative will aim to arrange personnel exchanges (fellowships, and other visits—to Olin and by Olin community members to other institutions) that will further enrich our own on-campus conversation. However, in order to be effective, the Initiative will require significant external funding to support these activities at a professional level. (Mr. Ron Guerriero has been appointed the Director of Business Development for the Initiative.)

³ Somerville, M., Stein, L.A., and Miller, R.K., "*Reaching Outside the Oval: Strategies for Catalyzing Change in Engineering Education*," Franklin W. Olin College of Engineering, Needham, MA, November 2008.

⁴ To illustrate the growth in influence and opportunity facing Olin, the University of Illinois at Urbana-Champaign (UIUC) approached Olin in September 2008 to seek a partnership in order to begin experimentation with the adoption of some aspects of the Olin educational model on their large campus. Last month we formalized an agreement to extend our partnership with UIUC for another two years due to the success in the first year. In addition, last November at the President's Council meeting, Jim Plummer, Dean of Engineering at Stanford University, suggested that Olin should consider establishing a summer workshop for engineering faculty members at other institutions to experience the learning environment at Olin. He said he would encourage his faculty members to attend such a workshop at Olin to accelerate the improvements to engineering education that are currently underway at Stanford. Furthermore, Dean Cherry Murray of the School of Engineering and Applied Sciences at Harvard University recently visited Olin and asked for our involvement in her efforts to renew the undergraduate program in engineering and applied sciences at Harvard.

⁵ See attached memo dated October 24, 2009 to all members of the Olin Community.

Deepening Our Internal Culture of Continuous Improvement. Our commitment to continuous improvement of the educational model is well established, and a framework for continuous improvement is in place. Each year we hold a faculty retreat that has included a review of the effectiveness of our educational model, and proposals for improvements are developed based on all available assessments and thorough faculty discussion. This process has already resulted in significant change and reinvention of several aspects of the educational model. We currently have a commitment to the principle that the curriculum should “expire” periodically⁶, requiring a deliberate review and action to revise and reinstate it. The faculty have also established a standing committee on curricular effectiveness to continuously monitor and suggest improvements in the educational program. I believe that this comprehensive framework and commitment is rare and distinctive among engineering schools. In fact, our comprehensive program to monitor and continuously adjust and improve the learning model was recently documented in a case study by faculty studying models of educational innovation at Harvard Medical School⁷.

However, there is much more work to be done to achieve a robust internal culture of continuous improvement. We face constant pressures to conform to conventional educational models, budgetary pressures which strongly favor avoiding risk and extra cost, and the need for reliable metrics to drive our decisions in many areas.

As we have worked to develop a pervasive culture of continuous improvement and change, we have discovered that change is almost always inconvenient, inefficient, and laden with risk. Failure is more common when experimenting with new ideas than with sustaining proven ones. In addition, it consistently takes more time and resources to sustain a culture of this type. This creates constant challenges in implementation and maintenance of the continuous improvement program, especially in the face of the global financial crisis and the resulting pressure for the reduction of costs. The pressure is strong to relax our commitment to continuous improvement in order to reduce expenditures in the short term.

Furthermore, as the institution matures, we are bound to face a subtle but powerful attitudinal shift which will work against our need to remain open to substantial change. In 1999, I had the opportunity to visit with Dr. Joseph B. Platt, the Founding President Emeritus of Harvey Mudd College in Claremont, CA. In discussing the precious opportunity to create a new learning model from a blank slate that both Harvey Mudd enjoyed in the late 1950s and that Olin College enjoyed in 1999, he shared an insight with me that has great validity and relevance for Olin College today. He said:

“There is no more powerful force for conservatism—than having something to conserve!”

--Joseph B. Platt, Founding President, Harvey Mudd College

When Olin College was brand new, it had no identity, no legacy programs, nothing to lose by trying new ideas. Openness to change was relatively easy—it didn’t “cost” us very much in terms of letting go of cherished programs or ideas. However, in the last ten years we have established several programs that we now believe are essential to the definition of who we are. These include Candidates’ Weekend, the Design Stream, Expo, and SCOPE (and possibly others). As a result, it is a much more difficult proposition today to imagine rethinking our educational model than it was in 1999—because it requires us to consider the elimination of these successful programs.

⁶ Our current plan is for expiration to occur every seven years.

⁷ Constance Bowe, MD, et al., *Case: Franklin W. Olin College of Engineering*, Harvard Medical School (2007).

It is exactly for this reason that the establishment of a strong internal culture of continuous improvement is so challenging today. Although we have always been committed to developing this culture and—as noted above—we developed an institutional framework to encourage it several years ago, the risk is high that as time passes we will find it increasingly difficult to embrace substantive change. This is particularly true when the change needed will result in an increase in effort and time to teach a subject that is currently taught in a manner that is less demanding.

In order to guide our efforts to improve, it is essential that we work to establish and improve our metrics for assessing the outcomes. It is hard to over-estimate the power of a simple and effective metric to change the conversation and guide the investment of resources. It would appear that the potential exists for the development of one or more new metrics that could both guide our internal program development and also influence other institutions. For example, a metric that could reliably assess the effectiveness of design education or creativity in engineering could be both useful and influential⁸.

In general, much more could and should be done to develop a robust internal culture of continuous improvement at Olin College. This would require financial resources to fund a deliberate and comprehensive program to support a substantial increase in the level of internal experimentation. Components of such a program might involve a temporary reduction in teaching load for some faculty members, summer internships for students involved in testing new concepts, equipment, staff support, travel, supplies, etc. in order to enable a substantial increase in the level of internal experimentation at Olin. The involvement of visiting faculty members with expertise in the area of educational assessment and metrics, creativity and innovation in engineering, and other areas could help Olin continue to stay on the cutting edge.

Incremental Improvement vs. Wholesale Reinvention. Improvement can occur in (1) a steady, incremental fashion, (2) an episodic, quantum fashion, or (3) a combination of both. Olin's initial launch is an example of an episodic event in which wholesale reinvention occurred in a short period of time. Our current efforts are primarily aimed at developing procedures that assure steady, evolutionary improvement each year.

However, unless we also anticipate and plan for the eventual need for wholesale reinvention, it is likely that Olin may one day become as resistant to change as other, more traditional universities. To avoid this, we need to establish a systematic improvement process that allows for and encourages such radical change when appropriate. Since the initial launch of Olin was only a few years ago, we haven't yet taken the time to develop this in detail. The development of a strategy to guide our efforts in this area is a first step. Unless we develop a deliberate strategy, it is likely that a future decision to reinvent the program may be the result of forces external to the College.

Preparing Future Generations of Serial Innovators. Perhaps the highest calling for Olin College in the area of innovation is to prepare future generations of serial innovators—engineers that understand the process of innovation and are effective at applying it in various applications throughout their careers, wherever they work. It is one thing to succeed once in developing a successful innovation. It is another thing altogether to develop the ability to innovate systematically in multiple environments and repeated applications. To do this successfully, it is necessary to fully understand why an innovation was successful. This usually requires application of quantitative reasoning, experimentation, and reliable metrics to determine the effects of variations of each of the important variables in a process in order to fully understand why it was successful. Without this level of understanding, it is hard to estimate the degree to which simple good fortune may be responsible for the success. But the rigorous preparation in

⁸ Babson College and the London Business School co-developed the Global Entrepreneurship Monitor (GEM) in 1997. GEM measures the overall level of entrepreneurial activity within a national economy, and has since become widely influential. This metric both guides the discussion on developing economies and also enhances Babson's influence in the world of business education.

natural science and mathematics required of all students at Olin provides an exceptional foundation for this level of understanding, and should enable Olin graduates to excel in this area, provided we focus on this aspect of systems thinking and continuous improvement process engineering. If Olin succeeds in developing graduates who are known as serial innovators, we may succeed in becoming an important and constant contributor to advancement in the entire field of engineering—not just engineering education.

Conclusion. Olin College has made an excellent start on developing an innovative model for engineering education. Now we need to aim high and dedicate ourselves to the challenge of catalyzing improvement in the quality of engineering education at larger institutions. We need to deliberately aspire to becoming “...an important **and constant** contributor to the advancement of engineering education in America and throughout the world...” Furthermore, we should aspire to teach our students this process of continuous improvement so that they might understand how to become systematic innovators in their careers. A systematic innovator is one that not only succeeds in creating a one-time innovation, but is capable of doing this time after time in various environments and different challenges. If we succeed in doing this, Olin may become known as an important source of innovation in engineering—not just in engineering education.

Questions for discussion:

1. What is the best way to make the difficult decision to abandon a proven but moderately successful program in order to switch to a newer, but unproven one that appears to have the potential for even better outcomes? Can such decisions be made by consensus? Can they be implemented without it?
2. What are some key characteristics or factors that lead to a successful program of continuous innovation in a non-profit, service enterprise? Where can we find successful models in this area that we can learn from?
3. How best can we nurture the risk-taking and creative experimentation that drives most successful innovation (e.g., IDEO's "fail early, fail often" motto) while simultaneously maximizing the potential for highly successful, large-scale innovations (e.g., "Big Ideas")?

Olin Initiative for Innovation in Engineering Education

Sent: Saturday, October 24, 2009 10:45 PM

From: Richard K. Miller

TO: Faculty; Staff; Students; Alumni; Parents

To all members of the Olin Community,

As stated in our Founding Precepts, Olin College was intended to "*be an important and constant contributor to the advancement of engineering education in America and throughout the world.*"

To support this purpose I write to announce the formation of a new Initiative for Innovation in Engineering Education at Olin College. Professor Lynn Andrea Stein has agreed to serve as the founding Director of the Initiative, and Mr. Ron Guerriero will serve in a supporting role as its Director of Business Development. Due to the importance of this Initiative and the complexity of internal and external relationships involved, I will provide personal supervision of the Initiative until it becomes well established. Lynn, Ron and I will work closely with Steve Schiffman, Gill Pratt, and Mark Somerville.

The overall goal of the Initiative is to provide coordination, leadership, and a single point of contact for both internal and external conversations aimed at fostering innovation and change in engineering education. In the near term the Initiative will provide an initial point of contact for potential new collaborators, seek external funding, and plan and execute workshops, meetings and custom programs in response to external requests. In order for this Initiative to succeed it will need the involvement of a number of Olin faculty members, and the programs within the Initiative must contribute to the professional development of the faculty involved.

In the longer term, the Initiative will aim to arrange personnel exchanges (fellowships, and other visits—to Olin and by Olin community members to other institutions) that will further enrich our own on-campus conversation. In order to achieve our purpose it is important that these activities be better organized and that Olin be better recognized for its efforts to innovate in engineering education.

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