"Entrepreneurship: the T in STEM"
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STEM, that is, Science, Technology, Engineering, and Mathematics, is a hot topic in labor force development, both at the federal and at the local level. Hot topic translates into funding. So, how might a member of the Nebraska Economics and Business Association (NEBA) engage with STEM?

That labor force concern has as its primary focus STEM college graduates. But, attrition from STEM fields during K12 draws the bulk of attention. Additionally, demographic realities being what they are, the absolute number of labor force participants needed in STEM fields as college graduate makes it nearly impossible if the current diversity patterns in STEM fields continue. Accordingly, STEM concerns are infused with labor force diversity concerns.

While some NEBA members clearly have a K12 focus, for example, those focusing on economic education, most NEBA members focus on college education. That said, more NEBA members still might wish to increase their K12 STEM focus. Your college's K12 STEM focus can serve as a recruiting commitment to bolster your successes with building the freshman classes with the academic preparation you desire. Since nearly all NEBA members rely upon quantitative analysis they are dependent upon their student's skill level with mathematics. For that reason alone more NEBA members ought to take a STEM interest in K12.

That topic, however, is outside the scope of this paper. This paper will focus on the T in STEM.

Speaking quite broadly, what is STEM depends upon who is answering the question; and for what purpose. That is, what is "science" etc. varies by perspective. However, since STEM originated from a National Science Foundation (NSF)¹ concern and targeted response, and since many others are following NSF's lead, for example the National Aeronautics and Space Administration (NASA)² takes a strikingly similar approach, this paper will follow NSF's lead. Also, this approach is the sweet spot when seeking external funding to support your college's STEM efforts.

To NSF the science of STEM means basic science a la Boyers³ basic, applied, pedagogy approach to classifying segments of research. The engineering of STEM is applied science. And, the mathematics of STEM is the language of science. While

¹ http://www.nsf.gov/nsb/stem/
² http://www.nasa.gov/offices/education/about/index.html
specific tools of mathematics, for example statistics, are subsumed within that M, the NSF concern is with the willingness to master as well as the actual mastery of mathematical skills.

Surely, you noticed I skipped over T, the technology, of STEM, the focal point of this paper. First, there is basic science. Then, engineers apply that basic science. Fascinating as that all is, that is all cost without any focus on profit. Technology is taking that application of basic science to market. Engineering is science that has been moved off of the bench and onto the test pad. Technology is science brought to market. Thus, T, technology is about entrepreneurship, that is, profitable science.

All NEBA members have some connection to entrepreneurship. It might be how to account for intangibles making a material contribution to creation of a going concern. Or, it might be managing personnel toward creativity using deferred compensation. Or, it might be identifying and persuading markets not yet knowing they have an unmet need or want (read: demand) for a product innovation (e.g., iPod; the cloud) or a process innovation (e.g., e-commerce). Or, it might be valuation of erratic and uncertain cash flows. Or, it might be market structure evolutions. All of business and economics engages with entrepreneurship and thus with the T, the technology, of STEM.

AACSB International (Association for the Advancement of Collegiate Schools of Business)\(^4\) has issued two white papers on this topic. In 2010 Business Schools on an Innovation Mission\(^5\) was released. Partially in response to the gauntlet laid down in that 2010 report, in 2012 came the reply Business Education Transformation for America (BETA)\(^6\).

BETA\(^7\) urges schools to place commercialization of innovation at the very core of their curriculum and pedagogy. That is, to embrace the T of STEM as the core of an AACSB school. BETA does so both to foster national competitiveness and excellence in business education. BETA recommends directly engaging business students in the enterprise of business, especially at the nexus of innovation. BETA urges two tasks to accomplish that central placement: internships and capstone case study.

**Quality is a cost** that ought be borne if profitable. BETA recommends, unabashedly, high quality internships and high quality business cases. Many of the Deans authoring BETA are from well-endowed schools. And, sometime it takes money to make profit. And, sometimes sweat equity substitutes for cash.

BETA wants **high quality internships**. If the student is encountering mere make-work or paper shuffling, then that is much worse than not helpful. BETA expects the college to make sure the student is embedded as an active participant in some attribute of innovation. Rightly, BETA notes that innovation often is underfunded, and that creates an opportunity for a win-win-win solution for the student, the business, and the college. Below, we will explore strategic leveraging of internships to serve other institutional goals.

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\(^4\) [http://www.aacsb.edu](http://www.aacsb.edu)
\(^7\) Note, BETA was authored by a self selected subset of about 10% of the AACSB Deans. AACSB is acting as the publisher, not the author, of BETA. Thus, these BETA suggestions are of those Deans and are not suggestions of AACSB.
A well run internship program would simultaneously serve multiple educational objectives. The first objective, obviously, is student learning. But learn what? Does the internship provide a purely redundant exposure to a shiny doodad add-on; or, is the internship an indispensable exposure to a critical component of the total education? If the former, then why bother; and, if the latter, then are you sufficiently attentive? BETA champions the latter. BETA sees academic rigor as indispensable to a high quality internship. BETA expects the faculty to be engaged, not just the student.

The idea is to require the student to make a shift similar to the basic to applied science as the student takes the classroom learning into the business world. Since a specific business context is sure to present challenges beyond the general education of the classroom the faculty are to tailor the student’s education for the specific business context. Obviously, those NEBA members from smaller colleges will have a comparative advantage and a comparative advantage in this task. It’s easier to tailor education for a junior class of 50 students than it is to shift from a ready-to-ware design for a junior class of 500 students.

BETA repeatedly stresses centrality by stressing that all students complete an internship and a business case. Personally, I think that is profoundly foolish. The bottom 10% of your graduating class is more likely to burn a bridge than to build a positive reputation. Your business allies expect the college to engage in quality control and only deliver the best. It’s one thing for a prospective employer to see your worst as one of many job applicants. It is quite another thing for an employer to see your worst as the only representative of your college.

The very many secondary objectives for internships easily could aggregate to an institutional importance far most significant than the obvious first objective of student learning. That would demand a strategic commitment. So what are some of those secondary objectives?

Recruitment and retention are Siamese twins buzz words oft trumpeted by academic administrators and politicians. Internships can drive up both recruitment and retention. Students (and parents) know that internships generate job offers, and can be more than studying for a final exam. That attracts them. And, their right. Which helps keep ‘em.

When internships are viewed solely as a poor substitute for classroom education faculty are not particularly enthused. But, faculty are likely to be more interested if students garner genuinely distinctive educational opportunities while institutional financial stability is achieved.

BETA recommends all students also complete a capstone case study focused on entrepreneurship. Not just any type of case, but a real case, not a fictional case. And not just any real case, but a real start up. Ideally, BETA encourages an interdisciplinary team that, at a minimum, includes both engineers and business students. But, wait. There’s more! Schools are to host competitions with businesspersons as judges. With prizes of start-up cash.

As note above, the BETA Deans are from well-endowed schools. Also as noted above with respect to internships, with respect to business cases, keep ’em asking for more is much better than exceeding their desire for mediocre. To fit in your resource base, especially that scarcest of inputs, your business allies volunteer time, limiting business case participants to your very best students would be quite wise.
Regardless of the intensity of your school’s embrace of BETA’s approach to business education, it is likely that your school utilizes internships. Do you do that wisely? That is, do you do so strategically?

**Demographics** appear to threaten education both in STEM and in business. Collegiate education increasingly is becoming female. But, both the fields of STEM\(^9\) and business\(^10\) are disproportionately male. Thus, collegiate recruitment is becoming a greater concern, both for college administrators and employers.

A clear concern is the "**Workforce Paradox**" of sustained high unemployment and many employers clamoring for employees. There is a mismatch of skills. The skills unemployed workers with to supply are not the skills being demanded by employers. Also, the "shortage" of STEM workers in the pipeline is not an absolute shortage, it is a relative shortage. There has been and there will be more STEM graduates than STEM job openings. But, all production processes (including education) generate a fraction of its total output that is not entirely satisfactory. The current STEM labor force is in "shortage" and will get worse in the foreseeable future.

Individual local employers as well as trade associations will be interested in forming **strategic alliances** with K12 and with higher education to maximize the STEM workforce pipeline. Both States and localities will gain a domestic comparative advantage and avoid an international competitive disadvantage if those jurisdictions form effective STEM strategic alliances. **Identify the needs of the allies** the university is seeking. Learn (e.g., from Chamber of Commerce; environmental scan; etc.) their interests and needs. Focus on alignment of interests rather than ease of initial contact. The target will listen much better if the discussion is about alignment of needs. Make clear what is desired (i.e., time and money) from the target; focus on getting the time rather than the money first. Once you have the manager’s time, the money will follow.

Industry invests. A human resource manager seeks to create a virtuous cycle. **Hard skills** (read: content knowledge of STEM) must be included in the university’s output or the university is worse than of no help to the business. A university that also develops the student’s soft skills (for example, leadership) gains the competitive advantage of industry investing in that school. **Soft skills** are the prime focus of internships; and, internships are the business’ prime mechanism for investing in the university. While **fewer than all interns get jobs**, nearly all jobs go to interns.

The quality of a strategic alliance can be greatly improved if it is with a **trade association that has a major member as a local employer**. Access to internships and to job offers increases significantly, and economic islands experience greater recovery of graduates later in their work life cycle (read: come home). Such an alignment also facilitates faculty research agenda synchronization and executive education opportunities. Field trips foster student uptake of soft skills. It shows the students the forest. Field trips tend to stimulate student interest by helping to transform a career from an abstraction into "something I could do".

The Association for Quality Control (www.ASQ.org) will help you achieve this.

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8 http://nces.ed.gov/fastfacts/display.asp?id=98
9 http://www.prb.org/Articles/2007/CrossoverinFemaleMaleCollegeEnrollmentRates.aspx

www.aacsb.edu/publications/businesseducation/2012-Data-Trends.pdf