

ME 489 Practices of Modern Engineering

Group Assignment 3

A plan for Transforming Engineering Education at Texas A&M University

Due March 8 (soft and paper copies)

The TAMU Dwight Look College of Engineering (COE) released its Strategic Plan (SP)¹ for 2011-2015 (attachment from <http://engineering.tamu.edu>). The plan identifies key issues and sets forth actionable goals, strategies and indicators for five key areas. One key area is undergraduate education. The plan stresses that “meeting the commitment to the State of Texas demands **more than just** preparing *problem solvers* that will enhance the economic development of the State.”

The Plan reflects on the global landscape and dramatic pace of change in science and technology, recognizes the attributes for modern engineering education and practice, and provides a transformative roadmap to educate young engineers on a foundation of *experiential learning, drawing on solid research findings and best professional practices.*

The COE, having an overarching commitment to the *culture of excellence* (<http://vision2020.tamu.edu/the-twelve-imperatives>), has as its main goal to transform TAMU into the “*institution of choice*” for innovations and breakthroughs for the engineering challenges of the 21st century (<http://www.engineeringchallenges.org>).

Read (individually) and as a group discuss the attached COE SP. In particular, read critically the Overview (p. 9) and the Plan for Focus Area 1: UG Academic Experience (pp. 10-14). You², as a student, have both a responsibility and a stake to evaluate the SP goals, strategies (how to implement goals), and indicators (how to measure their attainment).

As a group, evaluate Goal 1.1, and prepare a (no less than) 400 word (longer OK) essay addressing to the following questions:

- Why is a transformation in UG engineering education needed? Why now?
- Why does the TAMU-COE want to become an *institution of choice*?
- What does it mean achieving *experiential learning*? How well the TAMU UG education has prepared you on this goal?

¹ Strategic Plans are common to all organizations and institutions (families, corporations, universities, governments). SPs are important because they recognize shortages and/or opportunities; identify paths for future growth or just mere survival, outline strategies to achieve the transformative goals, and identify the means for their consecution. Successful SPs must involve all parties associated with the main purpose of the organization; for the COE: students, faculty, employers and the State.

² I assume that, as a stakeholder of your education, you are fully aware of the COE SP. The Plan has been in preparation for several years. Student organizations (ASME Chapter for example) have played an important role in assisting to shape the SP.

- d) What are the planned activities for students to gain *critical thinking*? How well the current UG education has prepared you on this aspect?
- e) Why is engagement in “research” important in a transformative UG education?
- f) Why is important to *learn how to learn*? And how to assess (measure) a commitment to *lifelong learning*?
- g) Does the SP gives the means or specifies how (in terms of credit hours) the transformative education will take place?
- a) As a corollary, how as a practicing engineer you will help TAMU, your alma mater, to educate effectively students (perhaps your own children) to meet contemporary challenges, be prepared for global competitiveness, create innovations and produce discoveries, etc.

Your lecturer; not only a teacher, but also a former student, a parent and an employer, has particular interest in learning your informed opinion on how you see your own education and that of generations to come.

The assignment intends to make you aware of institutional challenges and changes; and for you to participate in their implementation.

Thanks for your attention

Luis San Andrés
MEEN 489 Lecturer

THE BETTER TEAM

The constant evolution of technology today requires that any engineering program improve and transform itself in order to keep from falling behind. This is especially true of undergraduate programs, the starting point for the majority of the world's engineers. With advancements in computers and more competition from other countries, "traditional" U.S. engineering jobs of crunching numbers and making basic decisions will be replaced. Literature earlier this semester pointed to the quick, cheap production of engineers with great technical skills across Asia. Skilled technicians like this require the meaning of the term "engineer" to take on a more important meaning: someone who not only has the necessary technical skills, but can also apply critical thinking, interpersonal skills, and business savvy to advance themselves, their company, and their country. **The present teaching format is quite frankly unable to keep up with the real world and students need to be challenged to "develop content mastery in the context of compelling real-world environments"** [1]. The focus on grades and repetition in some classes can require very little thinking from students. **Engineers now must be able to think on a larger scale and be able to readily convert science into practical solutions to current or forthcoming problems.** If Texas A&M, as a university, doesn't embrace the changing times, its education, and therefore the engineers it produces, will eventually become obsolete. Furthermore, if we, as future engineers, don't ensure that we will engage in lifelong learning, our jobs will be in jeopardy for the same reasons.

The Dwight Look College of Engineering is committed to becoming an "institution of choice" in developing the "innovations and breakthroughs that address the engineering challenges of the 21st Century" [1]. The easy problems have been solved; it is the "Grand Challenges for Engineering" as stated by the National Academy of Engineering that are essential for future engineers to tackle. These "Grand Challenges" push engineers to make solar energy economical, prevent nuclear terror, reverse-engineer the brain, provide access to clean water, and develop many more world-improving innovations. Texas A&M University also wants to become an institute of choice so it can grow as a university and attract more high-quality students. Professors want Texas A&M University to become more prestigious not only for them, but also because they see a need for better education.

Experiential learning involves being challenged with real world scenarios and having the opportunity to invest time into solving a real problem, a strong focus at Texas A&M. Experiences in labs and classes have provided a solid foundation of experimental learning. Most labs are productive, allowing students to see real world applications of the technical content taught in lectures. The many team-based projects undoubtedly assist in developing cooperative skills that are needed in the work place. Presentations allow for students to practice public speaking. **Unfortunately, design classes and electives that allow focused innovation are unavailable to students until their later college years.** Enabling earlier forays into innovation could allow students to focus on learning about topics and developing skills they prefer to focus

on, setting the stage for developments by current engineering students and recently-graduated engineers.

Planned activities to increase critical thinking include more hands-on courses, incentives for professors to develop the course, mentorships between upperclassmen and underclassmen, create open-ended assignments, improved classrooms, and resources that support innovative learning [1]. The courses and material do not determine the critical thinking required by students, but the professors do with the problems they create and the commitment they make to show the application of their particular topic. **The idea of creating a “thick spine of experiential learning” by adapting earlier courses to encourage creativity and critical thinking is a noble goal, but seems unrealistic. Most professors already seem to struggle to teach all of the information required and adding “experiential” work may hinder them further.** A class that has already been compressed to fit in more material, MEEN 260, is a bit overwhelming and disliked by most students. Introducing more engineering-based courses early could be beneficial, but it shouldn't compromise a solid technical foundation. A transformation in TAMU Engineering to conform to today's society may create a need to extend an undergraduate degree to more than 4 years. However, developing an education-focused core faculty, creating teaching mentorships by upperclassmen, challenging students to critically think, and make decisions will enhance the education at Texas A&M University.

Research is certainly important for technological advancements and pulling together the topics learned in classes and addressing a real life problem. Goal 1.1 encourages education based on “solid research findings”. **While the basics of engineering that are currently taught to all engineering students are based on past research, very little comes from new developments in the engineering world, let alone research performed by our own professors.** By increasing the focus on new innovations and mentor relationships between students and teachers, Texas A&M can produce engineers who are familiar with research and development, and are ready to apply that experience to the engineering world.

To help other students and the Aggie family, alumni can emphasize the importance of continued education and maintaining an awareness of one's surroundings. Although it is important to know your technical field, of equal or more importance is recognizing how the world around you is changing, what you need to do to maintain your job, and meet new needs. By utilizing the Aggie network, engineering programs can bring in successful graduates who have used their schooling and experience to encourage new advances in technology. Demonstrating how the hard work required of engineers can pay off will serve as motivation for students to revolutionize the modern world.

[1] Dwight Look College of Engineering 2011 – 2015 Strategic Planning Committee, “Strategic Plan 2011-2015”. Fall 2010 pg. 8-18

Transforming Engineering Education

In 1997 when President Ray Bowen was responsible for “Vision 2020”, Texas A&M (TAMU) started investing heavily in transforming the Dwight Look College of Engineering (COE). A strategic plan (SP) was developed by the COE to outline these objectives: undergraduate academic experience, graduate academic experience, research portfolio, faculty and staff development, and K-14 Engagement[1]. This paper focuses on the undergraduate academic experience.

A transformation is needed in undergraduate (UG) engineering education to keep up with the fast-paced world and technology. It is needed now, because during the past few decades, the way corporations do business has drastically changed to a global environment and TAMU engineers need to adapt to this new environment. TAMU-COE also wants to become an “institution of choice[1].” This means that instead of many students choosing TAMU for its value and non-rigorous admission, the COE wants students to come because of the top quality of education that students will receive.

An “experimental learner” must be involved in the practical problems and learn from the experience gained from these problems. The TAMU UG education has not prepared its students well, because the labs associated with classes do not do a good job relating their objectives to real world problems. Also, when there is a lab, the experiment it is often well defined and already set up to run. Planned activities for “critical thinking” are more hands-on courses from start to finish in the engineering curricula. This would require real word applications to be integrated with classroom material. The current UG education has not prepared its students well on this aspect, because almost all of the problems are well defined and there is only one solution.

Senior design classes are a good step forward, but more labs and courses need this approach to really help students engage in critical thinking.

Engagement in “research” is important in a transformative UG education, because it provides students with hands-on experience, inspires UG students to become graduate students, promotes critical thinking, and will help set TAMU apart from other universities. It is also important to learn how to learn since innovations throughout the world are happening at an increasingly fast rate. If engineers are to keep pace with this current trend they will be required to enhance their knowledge and skills throughout their careers. An engineer’s lifelong learning will be assessed by their employers and how well they are advancing in their career.

Next, the SP references the possibility of an endowment to fund the development of hands-on courses. These courses would be evaluated by UG students to gauge the effectiveness of the enhancements. It is important for a practicing engineer to impart the skills learned in their job to students to help develop their education and encourage them to learn. In order to help these students, practicing engineers should volunteer to either teach classes or give presentations on their jobs. Students will learn from these engineers the expectations in the work force.

Texas A&M University is always trying to enhance the education it gives students and wants to be an institution that students think of when they think of top quality education. Therefore, a SP is needed to define what direction the COE wants to go and it continually needs to be refined just like an engineer needs to be engaged in lifelong learning.

References

- [1] Strategic Planning Committee Members “Strategic Plan 2011 – 2015,” Dwight Look College of Engineering, <http://engineering.tamu.edu/media/50259/dlcoe%20strategic%20plan%202011-2015.pdf> (accessed March 8, 2011)

A&M TEAM

Technology is rapidly changing and new graduates need to not only keep up with the fast pace, but be faster so they can contribute to new discoveries and innovations. A&M wants to produce engineers who can benefit society with both their discoveries and strong work ethics. American engineers are more expensive to hire than others so they need to find ways to justify the extra expense.

A&M wants to foster a mindset for critical thinking. To do this the engineers need to be able to do more than solve isolated problems. Engineering education needs to be about more than technical skills, it needs to encompass the broader skills to implement new technologies and ideas in a timely manner. The education reform wants to link discovery and application. A&M wants to become the 'institution of choice' for researchers because it has the best opportunities.

Experiential Learning is referring to a method of learning through direct experience. The motivation behind this change in engineering education is to provide a "thick spine" of experiential learning throughout all four years of student's education. Currently I feel that the Mechanical engineering program is lacking in this area. Only the last year of my education has been real world application and experiential learning.

Several activities that are planned to enhance students critical thinking are mentorship programs, open ended design problems, and more hands on courses. The desire is to promote programs for upperclassmen to present demonstrations in class that provide a physical understanding. More design problems will allow students to think more creatively and apply skills they have learned. More hands on courses will allow students to learn at a deeper level. Overall the current undergraduate program has promoted critical thinking but could use more design problems and more hands on courses.

Only a select few on engineering careers will actually use knowledge such as "Mohr's Circle" and "three degree-of-freedom dynamic systems." The goal of an education is not the procedural methods used in the corporate world. Engineering is much too broad to cover in a four-year education. Instead, undergraduate study teaches students how to "learn to learn." Learning does not conclude upon graduation. Engineers should be committed to lifelong learning. *Schools can help foster this idea by developing the students' passion for engineering in classes such as *Special Topics in Engineering*.*

Undergraduate research, however, provides an opportunity for undergraduate students to develop the "thick spine." Although professors are pushing to emphasize higher steps in the Bloom's Taxonomy, *much of the graduate research is focused on the lower levels of "knowledge" and "understanding."* *Undergraduates typically do not go as deep into the field of research as the graduate students do, but research allows the undergraduates to be exposed to the higher levels of thinking, including "applying," "analyzing," and "evaluating."*

The main problem that the Strategic Plan seems to run into is in its vagueness in terms of implementation. The ideas presented are definitely sound. However, where does one begin? There needs to be a set start point of which classes will be the first to be added, deleted, or changed in some

way. Teachers, while pushing innovation, seem to get stuck in their old ways and do not like to be changed. The exact changes have to be set in stone for them to truly ever happen. There needs to be a set plan of exactly which classes in what way will be changed for anyone to look at the plan as more than a good theory that is un-implementable.

Once I become a practicing engineer I plan to help my alma mater by giving back in every way I can. Financially is one obvious choice, but more importantly I plan to give back by donating my time. I would love the opportunity to come back and talk to the undergraduate engineers about the real world and possibly make a difference in their plans for their future in engineering fields

Works Cited

Bennet, G. Kemble. *Strategic Plan 2011-2015*. Publication. Texas A&M University, Fall 2010.
Web. <<http://engineering.tamu.edu>>.

The TAMU Dwight Look College of Engineering released its Strategic Plan for 2011-2015. The Strategic Plan identifies key issues and sets actionable goals, strategies and indicators in five key areas [1]. One key area is undergraduate education. This paper seeks to address the many questions that have risen in regards to the Strategic Plan.

A transformation in undergraduate engineering education is needed because research has shown that engineering abilities are developed through practice with feedback. Application of creative skills such as design and innovation needed in the "real world" are not always nurtured and emphasized in the traditional academic model. Through the "spine" of courses engineers take from freshman year until graduation, the University wishes to better prepare the students for post-college opportunities.

The Texas A&M College of Engineering wants to become an institution of choice because of the exposure and benefits it brings. Increasing the college's prestige among other universities in the world will allow it to attract better students and faculty. With this increase in talent the university hopes to generate more revenue and become more renowned for developing innovations that shape the future.

Why not strive to be the best?

Experimental learning can be defined as learning through experience. The goal of achieving experimental learning can be accomplished through the observation and utilization of engineering principles in real world applications. **The TAMU UG program does a good but not great job of creating an environment that promotes experimental learning. Labs give students the chance to use equipment and principles learned in class, but they are usually tedious and uninteresting. Creating more interesting assignments will help spark students' interests and encourage learning.**

Critical thinking, as an engineer, involves knowledge of theory, reasoning, innovation, clarity and understanding of implications. Texas A&M University uses dilemma-based and scenario-based problem-solving with student teams, assisted by simulations and demonstrations, to promote critical thinking. Planned activities for students to gain critical thinking include; student-supported and –reviewed grant programs for hands-on courses, course assignments formatted to allow the student to define the problem before creating the solution and supplying physical space, such as labs and machine shops that support ideation, analysis, quantifying results and developing creative solutions. [3] I believe that the current undergraduate education has significantly prepared me for the critical thinking challenges faced in industry. For example, MEEN 381, MEEN 489 and ENGR 482 expose students to problems current engineers face and how to obtain solutions [2]. In MEEN 404 students had to identify a problem, develop their own experiments and analysis to produce results. All the labs, for instance MEEN 464 and 364, allow students to use critical thinking to solve open-ended application-based problems. In MEEN

401 and 402 we are exposed to real-world problems and have to work as a team to develop solutions. The combination of the mechanical engineering curriculum has properly developed our critical thinking skills.

Engagement in research is important in a transformative UG education because it provides students educational experience no matter which profession they choose, especially students who may pursue graduate studies and a research career. By having assessments to measure “achievement of professional skill and competencies,” students will be able to understand the importance of learning how to learn; that every class taken each semester is another progressing step of preparation for engineering in the real world. **With skill and competency surveys, students will be able to easily see their progress and realize how they have better “learned to learn” throughout school.** With such a large job marketplace, it is impossible to prepare every student for every profession, thus learning how to learn and being able to apply this to the real world is important for each individual and an essential part of the strategic plan. Practice with such learning outcome surveys will allow graduates to be able to apply this same assessment concept throughout the rest of their lives, and be able to measure how their commitment to lifelong learning has advanced at any time.

Goal 1.1 of the Texas A&M Universities Strategic Plan involve the transformation and creation of a “spine” of courses throughout the entire degree plan of an engineering student that is heavily focused on experimental learning. This involves a lot of real-life, hands-on type of problem solving that is to be implemented into the current degree plan for Texas A&M Engineering Students. Within Goal 1.1, **the plan never states the specifics in terms of actual credit hours and specific courses that will be inserted into the degree plan.** However, the goal does go into slight detail describing that this transformation will involve both completely new courses as well as the modification of older courses to fit the changing needs of the modern engineer. Based on this description, it can be assumed that the current degree plan used today will see an increase in the number of hours required by the degree plan once the new courses that will help create this “spine” are introduced here at Texas A&M.

Once we all become former students and Texas A&M Alumni members, there will be many ways for us to support and aid our former school in educating the future engineering students. One of the ways that we can do this is to come back and speak to the students in person like many other former students and aggie engineers have come back to do for us in the MEEN 381 course. The course is required of all students and consists of a weekly presentation from a former student or practicing engineer giving his/her advice to all of the soon to be former students and practicing engineers. Another way that we can help the department is to get involved with the Mechanical Engineering department

and become members of the board that aids in setting and modifying the engineering curriculum as others have done in the past.

Works Cited

- [1] Bennett, Kemble B. *Strategic Plan 2011-2015*. College Station: Texas A&M Engineering, 2010. Print.
- [2] *Department of Mechanical Engineering - Texas A&M University*. Web. 08 Mar. 2011.
<<http://www.mengr.tamu.edu/>>.
- [3] Juzaitis, Chair, Ray. "Texas A&M Engineering." *Strategic Objectives*. (2010): 12-16. Print.

Team Classic Style

The *Strategic Plan 2011-2015*¹ (SP) is a stimulating document, in that it tries to detail methods for transforming contemporary engineering education. Specifically, and seemingly more pertinent, the SP identifies ways to “transform” the undergraduate education at Texas A&M University.

In order to justify this “transformation” in undergraduate education, the SP claims that there has been a trend “towards globalization and the creation of a ‘knowledge-based’ economy”. It also remarks on the “shrinking world” and the “global village”, terms that have become such prevalent buzzwords in recent times, further describing the globalization of engineering. **As an undergraduate engineer, it is hard to disagree with the thought that the world economy is more interrelated than ever before. This is especially evident in classes outside of the Dwight Look College of Engineering, where the idea of a “shrinking world” is accepted and even lectured on.**

This makes it necessary that undergraduate engineers receive an education that is befitting to the “global village.” Swift action is called upon these same engineers whom will soon be graduating to become something beyond a “tinkerer.”

The SP also describes the College of Engineering’s desire to become an “institution of choice.” In particular, the College of Engineering wants to continue to produce individuals who can be competitive in today’s technologically dynamic world. Further, it wants to be seen as an institution – rather, to *be chosen* as the institution – that can provide a tier-one education and experience to people who desire a commitment to “lifelong learning.”

Similar to the ever-present “shrinking world” notion, *experiential learning* is another phrase that has become quite widespread. It is the idea that learning stems from hands-on projects that challenge and enable the student to integrate classroom lessons with project experiences. This concept helps students to think of innovative ways to solve the worldwide engineering dilemmas. Many believe there is too much of a gap between the classroom and the laboratory. For those with experience in undergraduate research, it is easier to say that “experiential learning” is more easily achievable through research than it is without having participated in research. In that light, if the College of Engineering is to evoke “experiential learning” it must undoubtedly reassess methods for doing so.

The SP has designated processes to help in critical thinking, and consequently experiential learning, by proposing a vertically integrated design project that spans across the entire undergraduate experience. While this idea is novel to current engineering students, critical thinking is difficult to procure. The current educational system does not offer many opportunities for undergraduates to exercise critical thinking skills or even develop them, as most classes are structured around books that hardly offer practice problems that are comparable to a “real-world” challenge. Aside from this, a single project cannot encompass all the variety and conflicts offered in an engineering education. It would be hard to integrate the topics of fluids, dynamics, and materials into one project. Also, it may be difficult to further learn teamwork skills and compatibility with different people if there is only one project to be worked on.

Undergraduate research is one way to expose students to “real-world” challenges. As engineering professors are seemingly cognizant of contemporary engineering issues, they almost certainly are working on ways to combat these issues. Undergraduates should take advantage of these opportunities to proverbially “broaden horizons” while also

gaining experience in having an employer-employee relationship with the professor that can, at times, emulate the type of relationship found in the “real-world.”

The benefits of undergraduate research also include teaching undergraduates to “learn how to learn.” It challenges undergraduates to look at results and question what they mean and finally (with advisor assistance) to come to conclusions regarding the results. The SP identifies indicators that deem success in this endeavor; in short, altering existing curriculum to meet contemporary engineering practices through organizational studies, observing engineering education similarities in peer institutions, and positive feedback from students who have completed their education at Texas A&M University¹.

While the SP is ambitious in the motivation to radically transform engineering education at Texas A&M University, it does not offer a clear plan of how to effectively reach this goal. While it extends undergraduate research and vertically integrated undergraduate projects as methods for helping to achieve this “transformation”, it is almost *too* focused on the big picture without having devised a structured approach. It even alludes to the addition of new or the adaption of existing curriculum, it is unclear what should comprise the “spine” coursework.

Finally, as a future engineer, it is important to share the knowledge gained from real-world experiences, as exemplified by David Wisler in his article titled *Engineering – What You Don’t Necessarily Learn in School*. Further, presentations given by current practicing engineers allow for invaluable insight to everything from handling mistakes in industry to the proper treatment of your coworkers. This kind of knowledge can only be gained by through industry experience, and is something that no engineering student at Texas A&M University has the opportunity to learn in the current undergraduate engineering education model. It is important to be willing to give presentations and insight, and to visit your alma mater to teach students in a way that perhaps an engineering professor cannot.

References

¹Strategic Planning Committee. "Strategic Plan 2011-2015." *Strategic Objectives*. Fall 2010. College Station, TX: Texas A&M University, 2010. Print.

Team Gilligan's Blade – Engineering Education Reform

Undergraduate engineering education creates problem-solvers. Engineering work builds creators. Mixing the two will produce technically proficient, innovative engineers.

At Texas A&M University in 2011, undergraduate mechanical engineering students take approximately forty courses. Only portions of five courses focus on design and creation. Thus, engineering students spend less than ten percent of their time learning to define problems and plan solutions. To shift students' focus, projects should replace approximately one-fifth of the exams in the undergraduate curriculum. Tests do not always reflect students' understanding, and have an incomplete scope.

The College of Engineering (COE) should also address “building block” courses in math and engineering during the freshman and sophomore years. Many students feel lost and disinterested in these subjects because they fail to see any future use. A strong mentorship program might overcome this lack of perspective. Engineering seniors could give presentations to underclassmen informing them about the importance and usefulness of certain topics they are learning about. Students in senior design courses would explain to younger undergraduates how they have applied the subjects they have learned over the last 4 years. These senior students would provide tips to succeed in engineering and inform students of potential pitfalls in their work. In addition, recent graduates from Texas A&M engineering should be required to give presentations to undergraduates to help prepare them for the real-world. These pointers would be invaluable to undergraduates, giving them the edge necessary to succeed in school as well as the workforce.

As a very good “capstone” of the new education strategy in the COE, there should be courses in the curriculum that involve research. Undergraduate students would find another great source for “experiential learning” and a very beneficial first look into the type of work one would perform in graduate school (Strategic Plan 2011-2015, 2010).

Critical thinking is also a very important aspect about Texas A&M's COE becoming more effective in educating engineers. For example, the strategic plan advises facilitating grants that support courses focused on “experiential learning” as well as increasing the number of assignments that involve problem definition and design. (Strategic Plan 2011-2015, 12). Before senior design courses, only Mechanical Measurements (MEEN 260), Dynamics and Vibrations (MEEN 363), and Numerical Methods MEEN 357 have required one to think critically. On the other hand, Texas A&M has very well equipped labs that facilitate real-world learning.

It is very important to “learn how to learn”. As the Strategic Plan mentions, it would be a good idea for departments to implement ability assessment throughout our college careers and develop plans for us

to more effectively learn. Students would be better prepared, aim towards higher goals, and be more motivated to pursue a “lifelong learning” (Strategic Plan 2011-2015, 2010).

The Strategic Plan is a great first step in communicating the strategies that should be taken in order to deliver a more effective education at the Texas A&M Dwight Look College of Engineering. It is important that it has been given the proper support. However, there should be more diffusion of it within the students, and small but visible changes should be readily seen so engineering students stay engaged in the change.

Reference:

“Strategic Plan 2011-2015. Strategic Objectives”. Texas A&M Engineering. 2010.

Team LAST PICK

Texas A&M University prides itself in building leaders of tomorrow with the skill set and integrity to handle the issues of today. The world is becoming a much smaller place through the widespread use and acceptance of technology. For Texas A&M University and our country as a whole there is a need to adapt, change, and improve with a smaller budget. Proper planning limits poor performance (? LSA); therefore Texas A&M needs to maintain a competitive edge in the global village. Texas A&M University is driven to create qualified graduates that meet and exceed industry needs. This reputation will in turn make A&M a first choice university for potential engineers.

The majority of the undergraduate education is dominated by basic engineering fundamentals which often stray away from open ended problems. The number of courses that stress design and innovation are limited due to the need for a strong understanding of the fundamentals. To keep Texas A&M University an institution of choice there is a need to add experiential learning experiences in a wider variety of classes as opposed to just the capstone courses. The “Thick Spine” of experiential learning outlined in the strategic plan calls for design based opportunities throughout the undergraduate courses (Bennett 11). An important aspect of experiential learning is critical thinking, and A&M’s College of Engineering is creating more open-ended problems “Through which students must first define the problem before creating the solution” (Bennett 12). Critical thinking applications are lacking in lower level classes which focus more on standardized testing.

The undergraduate education is also the first step for future in academia. For those students pursuing such a goal, undergraduate research provides experience for the graduate level

education. It also develops analytical and testing skills needed for design and innovation in the industry.

Success in any workplace demands a commitment to learning. The moment a blocker in football stops moving his feet, he is beat by the opposing lineman. An engineering education works in the same fashion. The moment a student gives up learning like the blocker stopped moving his feet, the student will lose. The intense amount and wide range of information taught in undergraduate education is to develop a student's ability to learn. This increase in the ability to understand multiple concepts will help develop the engineer quickly in the field. The experience gained in the field will become more valuable than the information taught in school.

The strategic plan does not specify the exact changes in credit hours and curriculum but they do specify in detail the implementation plan. This plan would include teaching mentorships, more innovative course assignments, and hands-on courses to develop innovation techniques and increase critical thinking in classes.

To stay involved in the education system after graduation a former student could host company sponsored events and challenges, provide company funding for advanced projects and extracurricular activities, and become involved in the development of the engineering curriculum.

While Texas A&M University is trying to prepare us for our future after graduation, there are still a few flaws. Although we do learn how to learn, there are fundamental flaws in some of the curriculum. The underclassmen courses focus way too much on standardized testing as opposed to application of what we have learned and problem solving. The core strength of an engineer is the ability to problem solve, which is why I believe that an extremely high GPR is

sometimes overvalued by the student. It is very important to become socially involved in the University as well as scholastically involved. This is another major flaw in the engineering school at Texas A&M University. There are hardly any social organizations directed toward engineers compared to the business school which is a direct result of being so research oriented (??). Being a successful engineer involves being both technically and socially proficient. The engineers that have both of these skills will be able to reach their goals, which is why Texas A&M University should focus more in this area when it comes to curriculum.

LSA I am afraid I don't understand the closure

References

Bennett, Kamble. "Undergraduate Academic Experience." *Strategic Plan 2011-2015 Strategic Objectives*. 10-14. Print.

Team LeftOvers

College of Engineering Strategic Plan

Every institution requires dedication to development, an appreciation for change and a willingness to continuously evolve to avoid the perils of stagnation and impotence. In Texas A&M University's Strategic Plan for 2011 through 2015, Dr. Kemble Bennett, Dean of the Dwight Look College of Engineering, outlines what he believes is necessary for Texas A&M University to become the "institution of choice for those striving for innovations and breakthroughs that address the engineering challenges of the 21st century." [1]

As discussed in our first essay and during many lectures, the need for change in the current model of education is obvious. The world is producing more and more engineers, with engineers from other countries willing to do the same work for far less than American engineers. American engineers must differentiate themselves from Chinese and Indian engineers or they will face significant reductions in pay. Already, without this reduction in pay, far too few students in the United States pursue a career in engineering. Thus, American engineers must take additional roles to maintain current pay levels. Further, our education system must prepare engineers for the challenges and opportunities that they will face in industry.

In Great Achievements of the 20th Century, the National Academy of Engineering [2] outlines the most important engineering solutions developed in the past 100 years. These solutions are all employed, nearly universally, in the industrialized world. It is difficult to imagine the world today without them. Now, the National Academy of Engineering has listed fourteen "Grand Challenges for Engineering" that the world must face in the 21st century [3]. Clearly, any individual, company or country that is first to one of these solutions will possess a competitive advantage. In addition, a university known for developing these individuals will draw greater funding, better students and more respect. Texas A&M University must compete with other universities around the world in much the same way that individual engineers must compete in a global market.

Currently, the Dwight Look College of Engineering does a poor job preparing students for any of the fourteen engineering challenges directly. However, the goal of Texas A&M should not be to teach us the current solutions. The fourteen challenges were identified specifically because no adequate solutions currently exist. Rather, Texas A&M should aim to prepare students with the proper mindset and instill them with an appreciation for knowledge generation that will lead to their success in the future. Texas A&M University does prepare students very well in this way.

The plan outlined by Dr. Bennett aims to put a larger emphasis on project-based learning in the engineering curriculum. The current emphasis on project-based learning is minimal, but it does exist. Many of the members of our group have been required to complete end-of-semester projects in different courses. Further, we notice that our younger group members have been required to complete more projects than our older members, indicating that the College of Engineering is already moving toward project-based learning. Thus, it seems that although current involvement in project-based learning is slight, Texas A&M is already moving in the direction of project-based learning.

Students who participate in undergraduate research are involved in the generation of new knowledge and are working with cutting edge technology in specific fields. The benefits of having every undergraduate involved in research are many, but Dr. Bennett states that “current resource limitations that constrain infrastructure pose a formidable barrier.” While other departments, such as Biochemistry, require all undergraduates to participate in research before graduation, the College of Engineering does not have the required number of professors or facilities to make this possible.

With such demanding requirements for future American engineers, it is unrealistic to expect a student to learn everything during a four year undergraduate education. Thus, Texas A&M University should not strive to teach students everything; rather, teaching students how to learn gives them the desire for knowledge and the skills required for continuous learning, allowing them to specialize in a field of their choice.

The strategic plan does not outline the logistics of this transformation in education. However, the indicators seem to show that the desire is not to build a new curriculum from the ground up. Instead, Dr. Bennett seems to suggest that each class should include a component where theory is applied to practical problems, teaching students the relationship between what they learn in lectures and how it can be used to improve the quality of life.

Texas A&M University receives a much higher component of its funding from alumni than many other universities. Continuing to develop students into effective leaders and great engineers will certainly allow A&M to maintain this high level of funding. In addition to helping to pay for the education of future Aggies, alumni must support the University in many other ways. Former students may impart their wisdom on students by returning to speak in classes or at organizational meetings. However, the most important way to influence the direction of the University is to serve on the Industry Advisory Committee, where industry leaders can influence the direction of the curriculum at Texas A&M.

Texas A&M is an institution devoted to excellence. With this dedication, students can expect A&M to continue to provide a great education at a very low cost, preparing students for the challenges that they will face in the future

References

[1] Bennett, G.K., 2009, “Strategic Plan 2011-2015,” Texas A&M Engineering Strategic Objectives.

[2] National Academy of Engineering, 2011, “Greatest Engineering Achievements of the 20th Century,” retrieved March 6, 2011 from <http://www.greatachievements.org/>.

[3] National Academy of Engineering, 2011, “Grand Challenges for Engineering,” retrieved March 6, 2011 from <http://www.engineeringchallenges.org/>.