

Enhancing STEM awareness and STEM pipeline through integrated pipelines of communication

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ABSTRACT: Students enrolling at universities as freshmen are not well prepared to pursue their chosen majors with motivation and perseverance. In addition, a lack of information is a barrier for students thinking seriously about pursuing careers in science and technology. The universities are attempting to fill the void by aggressively developing programmes to reach out to high schools and to their own student body to inform them of exciting careers in STEM fields. The Northern Illinois University (NIU), like other schools, has an active relationship with more than 300 high schools, several middle schools and Project Lead the Way Schools (PLTW). The College of Engineering and Engineering Technology (CEET) at NIU has developed an active marketing and brand building initiative that could help young students understand the nature and benefit of pursuing engineering and technology careers. The activities undertaken by the college to recruit and retain students in engineering and technology careers are outlined and discussed in this paper.

INTRODUCTION

According to the National Academies Press, the most effective way to enhance science and technology innovation and enterprise in the United States is to improve the teaching of its concepts, the skills of its teachers and to enlarge the pipeline of students with the desire and the correct preparation to pursue science, technology, engineering and mathematics (STEM) at the undergraduate level [1][2]. At the College of Engineering and Engineering Technology (CEET) at Northern Illinois University (NIU), succeeding in this regard is all about communication and extending the appropriate messages and opportunities to middle school students, high school students, current NIU-CEET students, alumni and donors and corporate sponsors alike. In this way, CEET is consistently selling STEM concepts, ideas and opportunities to all its audiences in multiple, integrated ways.

We now live in a world of niche audiences where each unique group consumes messages in multiple, segmented ways. At the same time, standard marketing approaches are still in play: messages must be clear and unified; messages must be consumed multiple times before they are remembered and budgets are tighter than ever.

The CEET has spent the last 12 months creating and now implementing a marketing plan. This plan breaks the audiences into segments according to the desired content and engagement pipelines; it integrates the messages, utilises new media and measures the mix of ideas and tactics that will extend STEM professions to audiences as young as eight years old. However, it will also continue to increase CEET enrolments and position the College as a key stakeholder in the efforts to increase economic vitality in the region. This is a national problem in the US and the colleges are struggling to sustain and enhance STEM enrolments. The high schools are not preparing students to understand and eventually pursue academic careers in STEM fields.

IDENTIFYING STAKE HOLDERS

Over the past five years, the focus of marketing has shifted from being product based to audience focused. The most important subject of any marketing piece is now the audience member consuming it. In this way, the ideas and information delivered must be central to what each audience group wants to discover not what CEET wants them to discover. CEET uses several integrated tactics for each group, and does not prioritise one over the other. Understanding this, CEET segmented the audiences into several groups, each with similar but uniquely different interests or needs.

For example, the middle school student may not be interested in the latest grant funding or vital research project, but instead may get excited watching a YouTube video of a Formula Team racing crashing one of its vehicles during a failed trial.

In the past, this would not have been marketing material, yet today it demonstrates the fast paced, hands on opportunities students experience once they come to NIU. Even more, it demonstrates to a small child how engineering is exciting and practical. Several integrated tactics for each group, and do not prioritise one over the other, were used. Some groups, such as alumni, require even more segmentation to be discussed later in this paper. The audience and the Engagement Pipeline are presented in Table 1.

Table 1: The audience and engagement pipeline.

Audience	Engagement Pipeline
Middle & high school students	Recruitment
Middle & high school educators	Partnership
NIU admitted undecided students	Recruitment
NIU admitted CEET declared/undeclared students	Retention
Registered CEET students	Retention
Alumni & donors	Partnership
Business & industry	Partnership

OUTREACH GOALS

- *Increase the awareness* of the College of Engineering and Engineering Technology with a concerted focus on CEET's practice-based education, quality of its programmes, commitment to research, obligation to student retention and ability to place students.

Over the past 10 years, CEET has grown exponentially. Even in this precarious economy, where universities and colleges alike struggle to maintain enrolments, CEET managed to increase its undergraduate enrolments by 11% in 2010. However, public relations, brand management and the overall extension of the products, services and opportunities CEET provides its region, were virtually absent. The programmes offered by the College are accredited by ABET and the partnership with approximately 200 companies provides excellent placement opportunities for the students.

The College promotes its position statement of *Bridging Theory with Practice* into most of the materials and some of the logo versions. What is more, the whole philosophy of engineering being a socially relevant field is promoted to instil the excitement of engineering especially to the younger audiences. Students and adults alike connect to the concept of *changing the world* or *creating a better, healthier, greener world*.

Engineers' role as innovators needs to be highlighted. The awareness and educational process of redefining engineering is facilitated through multiple tactics, such as You Tube videos, social media, print materials, events. Students from high schools and middle schools are also invited to visit the College and witness experiments in the laboratories to expose them to the innovative world of engineering.

- *Nurture multiple audiences:* There are two critical steps to nurturing each of the College's audiences. The first is to gather prospective students, donors or partners that might become key stakeholder for CEET. Through open houses, the Web site, and events, CEET captures interested parties who are willing and ready to hear the messages. From the first *meeting*, leads, which are defined as a person loosely interested in our products or services gather the messages and begin the process of *getting to know us* [3].

Next, the lead is nurtured through consistent and specific messaging that allows the person to gather more information about our products and services. With tight budgets, social media and e-mail marketing are key to the nurturing process. Each audience pipelines reads e-mails from the College highlighting information specific to their needs at least six times throughout the year. At the same time, social media (You Tube, Facebook, Flickr, Word press, Linked In, and Twitter) provide the opportunity to connect with leads at the very moment he or she is ready to consume the information. It is timely, fast, less formal and fun.

- *Alumni engagement:* Understanding that a lead must hear, see, or read a message about seven times before the buying process closes, CEET takes measures to distribute its messages in multiple, equally critical ways. Each audience engages with products and services in different ways. Communication must, therefore, change and suit each audience accordingly. A new company may need to visit the facilities, hear a presentation or meet for lunch multiple times before deciding to partner, whereas a prospective high school student may watch a video, attend an open house, search our Web site and decide to apply within a few weeks.

It is critical to be in all places at all times during the buying cycle to ensure the return on investment is as high as possible. In the same way, delivering CEET's message in clear, concise ways also extends STEM ideas in to the minds of people who may not otherwise have considered these disciplines [4].

- *Retention strategies:* With such focus on lead generation and nurturing, it is important to remember that it is always more cost effective to keep a customer than it is to generate one in the first place [5]. Retention is always a difficult issue for engineering schools with their rigorous attention on mathematics and physics. What is more, at NIU, the freshmen and sophomore students typically do not take many classes in the engineering building until they become upperclassmen. Therefore, it is a challenge to build rapport and create community with the younger students.

In 2011, the college hired two employees to help with retention issues. The student success specialist is now on hand to communicate, advise, engage and support all students, with specific attention to scholarship recipients, students falling behind and those involved with student organisations.

A new undergraduate advisor, available to any student in need of direction, is equipped with years of experience working with student athletes, a skill that can be applied to students with hefty workloads. The focus of this position is to identify early indicators of failure, work together with the students to solve them and promote quality life skills that will ensure a move towards graduation.

All engineering and engineering technology majors must begin their undergraduate journey with an interdisciplinary engineering and engineering technology class called UEET 101. This offers each student the opportunity to familiarise themselves with the University, meet other students with similar goals, enhance communication skills as they learn to speak in public places, practice time management techniques, discover the relevance of engineering in an innovative society and uncover the countless professions that will be available to them upon graduation.

At the same time, a new focus on cross promoting all of the credit and non-credit opportunities allows seamless pathways to graduate school or into the workforce to be created. Alumni may benefit from non-credit opportunities, and existing students can enhance their resumes by taking OSHA safety training or earning a certificate in Lean Manufacturing and Six Sigma.

- *Promote engineering professions* and the opportunities they provide. Promoting engineering professions should not be as difficult as it is. After all, eight of the top highest paying undergraduate degrees in the United States last year were engineering degrees. However, creating a larger pipeline of potential students who will continue the journey throughout their undergraduate career is all about communicating what engineering really is.

In the state of Illinois, NIU is the only university certified to offer college credit to high school students in certain classes. This Project Lead the Way programme allows NUI to work with schools all over Illinois promoting engineering and engineering technology. Students are involved in the right courses; learn valuable techniques early in the process and most shockingly, 95% of them will become engineers.

At the same time, students in middle and high school are offered the opportunity to attend summer camps, visit the facilities and experience hands on activities while learning from current academics and students. Teachers from the region also utilise summer camps, visiting NIU and learning state of the art techniques and experiments that transcend what is currently being taught.

The partnership with the NIU STEM Outreach office extends engineering and engineering technology principles to young people throughout the state. In partnership with CEET, the STEM office hosts an annual STEMfest, where students, parents and educators experience the reality of innovation. In October 2011, over 4,000 participants attended the event, where they interacted with over 400 NIU volunteers, 40 NIU departments and student groups and participated in exhibits like dissecting cow eyeballs, playing with lasers, learning from robots, and a whole lot more. The College of Engineering and Engineering Technology sent many student organisations, academic staff and students to participate, and encouraged participants to visit the engineering and engineering technology facilities and laboratories.

PROMOTIONAL OBJECTIVES

Achieving our goals requires clear objectives with a keen focus on measurement and return on investment. The following objectives each require an integrated promotional strategy to deliver the desired effect.

1. Promote the CEET identity, which utilises the NIU brand.
2. Build strong Web presence and interactive communication opportunities.
3. Develop communication pipelines for each audience using e-mail and social media where applicable.
4. Automate communication pipelines, using dynamic content, Web forms and RSS feeds.
5. Increase public relations opportunities using blogging, social media and NIU Today.
6. Cross promote undergraduate, graduate, professional development and camp opportunities throughout the College and with other university groups, such as Outreach.
7. Host ongoing open houses where people of all ages can visit and learn about CEET.
8. Provide opportunities for students and alumni to stay engaged with CEET, through the Student Advisory Community, clubs and events such as the College Bowl.

TACTICAL APPROACH

Branding and Identity

Over the past year, the College decided about specific logo use, branding and identity statements and began its efforts to filtrate these concepts into all on-line and print materials, as well as all public relations pieces. Like any branding initiative, it will take about 18 months for the initiative to conclude. The overall acceptance of this initiative is overwhelmingly successful, as the large part of the College recognises that the whole is always greater than the sum of its parts.

Public Relations

With over 200 corporate sponsors, students competing in and winning international competitions, academic staff partaking in research projects generating millions of dollars, utilising many PR fronts is crucial to creating and maintaining CEET's reputation. In order to do so, at least two articles are written and posted on the University blog each month.

At the same time, a dedicated CEET blog is currently being created so that students, academic and other staff members and others can post and generate interest in their current activities. Ambassadors and alumni of the College may also utilise this initiative to discuss their current issues.

Examples of articles:

- CEET Students Continue to Impress Employers (<http://www.niutoday.info/2011/11/10/ceet-students-continue-to-impress-employers/>);
- Higher Education, Economic Development Team Wins \$2.4 Million for Local Aerospace Industry (<http://www.niutoday.info/2011/11/10/ceet-students-continue-to-impress-employers/>).

Web site

Over the past year, CEET has contemplated, designed and created a new Web site with student and research focused content that is easy to navigate and promotes the constant two-way communication necessary to engage audiences. The new Web site was developed using current Web building strategies and relied on Web data taken from the old site. CEET hopes to launch this new site in late November and will continue to watch Web analytics and make adjustments each month to ensure each audience is finding the appropriate information. Search Engine Optimisation (SEO) is also needed to pull more search traffic from the parties who may not know CEET exists.

The new site not only acts as the foundation for all current and planned initiatives, but it also directs visitors to related social media sites, where interested parties can find more information, respond to the College as a service provider and meet other interested parties.



Figure 1: The new Web site.

Once again remembering niche audiences, specific landing pages were created for each of the audiences from the middle school student to the corporate sponsor. Each person can visit these pages and discover a portal into the exact information they need at the moment they needed. These pages will be highlighted at events like open houses or used in direct mail.

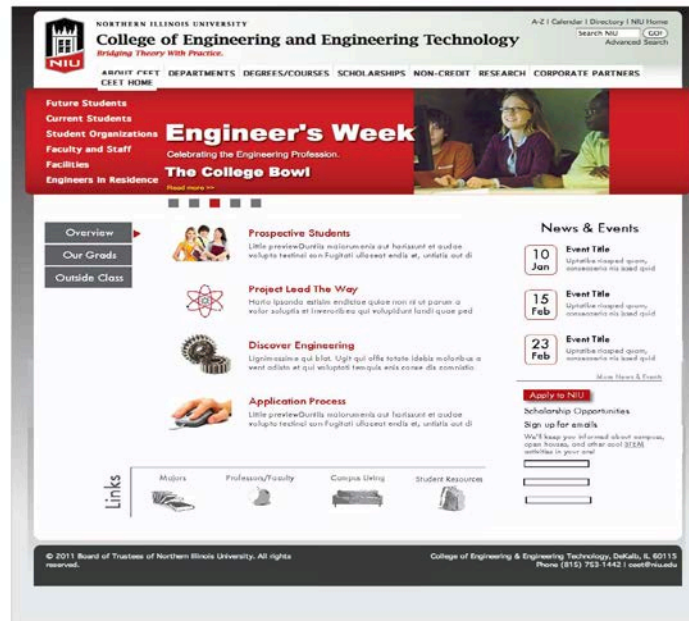


Figure 2: The new Web site.

E-MAIL MARKETING

Each audience is a member of a specific e-mail pipeline delivering information to leads who have requested communication. Information is re-packaged from the blogs and social media sites, the Web site, information on NIU's Web pages, and current events into a format specific to the audience. The College can promote events in a cost effective manner, distribute surveys, highlight current achievements and showcase research and student success stories during the year.

SOCIAL MEDIA

Originally thought to be a tactic used to communicate with existing young students, CEET now uses social media for much more. The alumni society (ETAS) promotes job opportunities through Linked In, student organisations showcase activities through photographs and on-line video to potential investors, and middle school students read blogs from the *Engineering Without Borders* students as they travel through Africa. The potential implications of so much content and quick communication strategies are endless, and most importantly - viral.

PRINT

Not all of the marketing efforts generated by CEET are on-line; in fact, the College still produces many print pieces, but uses them as techniques to drive more interested parties to the Web site. Like most universities, CEET creates brochures and flyers, posters and banners, and catalogues and booklets to enhance other pieces of information. In each case, the hope is that the potential lead visits the Web site and signs up for more information.



Figure 3: A typical flier.

MEASURING SUCCESS

No initiative or project is considered to be successful until clear outcomes are declared and measured. Accordingly, the table drawn below identifies outcomes to be measured to determine effectiveness of each initiative.

Table 2: The objectives and measurements.

Objective	Measurement
Promote identity	Gradually move all print materials over to new design and logo. Decorate building accordingly.
Build Web site	Web site goes live in April.
Develop communication pipelines	Create pipelines and track open rates, click throughs, Web site interaction. Quantify inquiries as a result of e-mail.
Automate pipelines	Highly engaged pipelines will produce additional information about our leads through forms, dynamic content and Web activity/interaction.
Cross promotion	Quantify number of partnerships, communication and reciprocal Web links.
Host activities	Quantify number of activities and attendance at events. Use surveys and conversations to track what students need and want.
Provide engagement activities	Quantify number of activities and attendance at events. Use surveys and conversations to track what students and partners need and want.

With clear, consistent messaging and a renewed commitment to making engineering and engineering technology approachable and tangible, the College of Engineering and Engineering Technology has no doubt enrolments will continue to rise and its students will become a catalyst to innovation. Communication, via e-mail, print and the Web will be continuous and focused on extending the engineering profession to young people, as well as delivering pertinent information to existing students, and finally, engaging alumni and corporate partners in multiple ways.

CONCLUSIONS

There is no doubt that by engaging young people and helping them make connections to the interesting and important world of engineering that the United States will continue its climb upwards. What is more, these interested young people will become the students of tomorrow, and later engaged and supportive alumni, who become financial partners and offer key internship and co-op opportunities.

The cycle will continue to grow and the fruits of its labour will foster innovation and change in the educational sector, the region and the world. The competition for students will be stiff and the competition for a qualified work force will be stiffer. Therefore, the need to advertise, disseminate and share will increase rapidly and every educational institution will have to employ strategies to market their programmes to build the pipeline and to attract stakeholders.

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