

# **Teamwork is Academic: The Gateway Approach to Teaching Engineering Freshmen**

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## **Abstract**

In 1993, the freshman-to-sophomore retention rate for students remaining in the College of Engineering program at Northeastern University (NU) was at 68%. Freshmen from each of the engineering disciplines at NU have been required to take a series of core courses taught by the Physics, Math, and Chemistry departments as well as a sequence of introductory courses taught by various engineering professors which were chosen from each department. It was felt that success in these introductory engineering courses, “Engineering Design”, “Problem Solving and Computation” and “Problem Solving with Software Applications” was paramount in achieving improved retention rates. However, a system was not in place to ensure consistency and improve the quality of teaching. Each term, professors from various departments were “thrown in” to cover multiple sections of these courses without much incentive, guidance, or coordination. As a result, the turnover rate was extremely high for both faculty and students. Something needed to be done in order to improve the first-year engineering experience and increase motivation of both the students and faculty to continue in the program. With the vision and support of the undergraduate Dean at NU, the College of Engineering has since adopted and developed a faculty team (Gateway) approach to teaching the core first-year engineering courses. Consequently, measurable improvements have resulted in these freshman engineering courses. The College of Engineering has steadily increased retention rates over the past decade by successful implementation of new ideas brought forth by the experiences and energies of the dedicated Gateway faculty team. The freshman-to-sophomore retention rate for students remaining in the College of Engineering now stands at 81% for a class size of 432 students as measured in 2003. This is a significant gain of thirteen percentage points over the last ten years, confirming that the team approach works. This paper will set out the details and insights for administering and teaching multiple course sections efficiently and effectively with the Gateway approach.

## **Introduction**

Webster’s dictionary defines a team as “a number of persons associated together in work or activity; functioning as a collaborative unit”. Individual team members are selected because of a unique skill set that when brought to the table will complement the other members. Engineering educators strive to promote teamwork to our students, outlining the benefits as well as possible

pitfalls. A large body of literature exists supporting the importance of teaching teamwork to our students. For example, the Foundation Coalition promotes student learning communities. These communities are used to build a sense of group identity and cohesiveness so that students may build a better understanding of the material they are learning (Clark et al., 2003; Astin, 1992). Transitioning from the importance of student teamwork to faculty teamwork in curriculum development is evident in a number of additional papers. Balamuralikrishna et al. (2003) discuss the importance of faculty collaboration or teamwork to develop student design projects that implement multiple discipline or simultaneous engineering which is principally geared towards accelerated product development; a real world experience. At Union College, faculty work together as a team to improve and teach their freshman engineering courses (Hedrick 2002). Finally, at Purdue University, the Department of Freshman Engineering is looking to take a leadership role in first-year engineering education reform by working in partnership with other schools within the university, and with industry, alumni and parents (Katehi et al., 2004). The common thread in all of the above cited work is that teamwork and collaboration is not only an effective means of educating our students but also a tool that can be used in curriculum and course development.

Not only at Northeastern, but in many schools across the country, the problem of freshman retention being lower than desired in past years has been recognized. A recent article (Loftus, 2005) summarizes a number of solutions paths that have been undertaken within the last 10 years. These include NSF funded programs to support and attract underrepresented students at Union College, half-credit courses at Tufts University to give a taste of real-life engineering, working on redesigning cars and cameras in freshman courses at Clemson University, Supplemental Instruction programs to help struggling students at University of Missouri-Kansas City, professional counselors at Syracuse University, all-engineering residence halls at Texas A & M, and summer programs for incoming engineers at Syracuse University. All of these alternative solutions have had measured success, but each requires funding. Northeastern University has dedicated engineering housing available, and components of many of the other solutions, but the team approach discussed in this paper has not required a significant dollar outlay for our college, net faculty costs have not increased for the college, rather, the allocations have changed.

The purpose of this paper is to outline the current Gateway team approach developed and employed at Northeastern University along with its features and successes as they apply to teaching engineering freshmen. This team teaching possesses three primary factors that contribute to its success. One aspect is the process of developing, using, and improving a shared curriculum by arranging for faculty to meet and exchange ideas on a regular basis. Another aspect is the core of committed and dedicated instructors that are called Gateway Faculty and whose primary job is teaching freshmen. The third aspect is the coordination with first-year advisors and other team members to monitor and help each individual student as needed. Course sections are taught by individual faculty, but the administration and coordination is overseen by team members to maintain consistency, to share resources, avoid duplication of effort, and foster motivation.

To achieve success, other elements have also contributed. One component is an assigned pair of Course Coordinators from the Gateway Faculty who are responsible for conducting biweekly meetings of all instructors and for managing any issues that arise concerning course curriculum, teaching media, physical facilities, and scheduling. In addition, there are now 5 faculty dedicated to teaching freshmen who understand and enjoy the challenges of teaching these students in transition. All of the Gateway Faculty have attended teaching workshops and have won various teaching awards. Their commitment to teaching and to working with freshman engineering students is a key element to success. Another key component is the Student Services organization in the College of Engineering who work closely with the team of instructors to advise students and identify any students who are struggling. This is accomplished by responding with progress reports on students early in the term, before the students are in irreparable trouble. These committed individuals are the first point of contact for first-year students; they track and advise students on a weekly basis, and are vital connections for students whenever they have questions or problems.

Frequently, complex problems that are solved in the workplace are the result of a combined effort of many individuals with a common goal. The same team approach has now been applied to the management of incoming freshmen. The College of Engineering has steadily increased retention rates over the past decade by successful implementation of new ideas brought forth by the experiences and energies of a dedicated group of faculty and staff. There is an appreciable gain in percentage points over the last ten years, especially for a measure that tends to possess much inertia. These numbers can be attributed largely to the team approach.

### **Some History**

Before even one Gateway instructor was hired, there was groundwork laid, and steps set in motion for changes in working with first-year engineering students at NU. At one point, all university freshmen were not considered members of any college, and so were not connected until sophomore year. These first-year students gave poor evaluations to courses and left in even larger numbers than reported here. An early insight came from the seminal work of Vincent Tinto (1993) who states that “departure mirrors the absence of social and intellectual integration into or membership in community life and of the social support such integration provides. An institutions capacity to retain students is directly related to its ability to reach out and make contact with students and integrate them into the... fabric of institutional life.” In recognizing this, the Associate Dean instituted changes that began with having first-year engineering students immediately considered part of the college, then restructuring the jobs of student services personnel to become more involved with the freshmen, and reviewing the teaching and coursework in the first year. Another step was in understanding the transition of moving in, and its myriad difficulties, so that the college could start to help first-year students make the transition, help them develop and discover motivation for learning (Chickering, 1994). In addition, the reasons students leave can be traced to many factors, but a large number of them are related to teaching, such as unapproachable faculty, unfair grading systems, and a perception of being “weeded out”, as discussed in (Seymour and Hewitt, 1997). This research by others, and a desire to solve the problems that appeared related to retention inspired the Associate Dean to impart the simple directive for all involved; when making decisions, consider the path that sets

students up for success. And so it began. As problems were solved, and conditions improved, more was discovered and researched about how other institutions were facing the same issues, and sharing some of their lessons learned.

## **Curriculum Development and Improvement**

***The Original Vision.*** Northeastern University is distinguished by the cooperative education program and its ability to offer a practice-oriented education. First-year students will not start co-op jobs for some time, but a course in design, with hands-on elements and real-world considerations can help bring their choice into practical focus. One of the first courses required for incoming freshmen is Engineering Design. The curriculum and vision for this course was conceived in a large part by Professor Gerard Voland, who also authored the textbook for this course (Voland, 2004). Voland created a large course packet which outlined the course objectives, topics, and exercises that were used by instructors as a guide to help teach the course. This guide eventually developed into the textbook that is still in use today. Since Voland taught a number of sections and was very familiar with the design process and many historical case studies, other instructors were asked to meet with him. Voland was instrumental in providing information for the course and how to teach the material with class activities, assignments and projects. He used case studies extremely effectively and made them come alive for the students, tying them into his own personal experiences with the design process. Most instructors tried to follow his model, but some found it difficult to teach the design process in the same light as Voland since they lacked his personal experiences. The Gateway team precludes this difficulty by fostering Voland's vision from the beginning and helps new instructors implement this effective approach.

***Shared Vision and Evolution of the Team Concept Through a Design Course Development.*** Projects have always been an important part of the design course. Originally as outlined in the course packet, the first building project (or minor project) was to create an airfoil design. The second project (or major project) was of the student's choice, with suggestions contained in the "text" or packet, in which there were four project cases partially researched for the students that they were encouraged to select from. Examples of major projects were to develop a solution to help with demining efforts in war-torn countries, depletion of tropospheric ozone, and non-wood pulp for paper. Over the years these projects became less exciting for the instructors and more importantly, they were even less interesting to the students. A simple need to brainstorm topics for new projects led to the exchange of many new ideas that would prove instrumental in creating a team environment. This benefited all instructors greatly and ultimately changed the way the college would approach teaching its first-year engineers.

This team approach is evident in the development of the Engineering Design course. As more instructors became involved, the course began to develop. AutoCAD was integrated into the course as a graphics communication tool, and the set of dedicated instructors (Gateway faculty) began their work on the team. The schedule and curriculum became more structured, yet still allowed for individual style. Example syllabi, detailed course schedules, homework assignments, project write-ups, and class activities were collected, compiled and provided to all of the instructors. The course material itself was taught with many more active learning techniques

learned at teaching workshops or designed by the instructors on the team. Examples of these are group work, interactive exercises, competitions, brief presentations and other strategies to make the material more hands-on. The course was no longer lecture-based, although the case studies and text material were still an integral part of the course.

With the course evolution came the motivation for new projects. A number of minor building projects were developed, and major team projects took on a new style. Some examples of the minor building projects are The Ping-Pong Ball Launcher, The Roommate Rise and Shine Device (Jaeger, Freeman & Brougham, 2004), The Mousetrap Car, Fettuccini Bridge, A Pumpkin Drop Challenge and A Submarine Design. Major projects which require an end-of-the-term presentation are still generally chosen by the students, but some team members have adopted a one project per class competition in which the selected topic is by design a socially-responsible endeavor. The team agreed to have multiple projects per term to prevent sharing of projects between sections. Projects are reviewed for their effectiveness in teaching engineering principles, creativity, and the design process. All instructors on the team have agreed to start the projects earlier in the semester than was done in past years, and build the project into homework assignments throughout the semester. Homework assignments are carefully designed for each phase of the design process so that first-year students can steadily develop the major design project with careful guidance and feedback by the instructor.

In order to foster continual improvement in all of the first-year engineering courses, each element is evaluated for effectiveness among the team members. Much of the meeting time is spent reviewing projects, quizzes, class activities, and homework to discuss what worked well, what did not, and what needs to be improved. Test structures, and test problems are discussed, also various techniques that were tried for teaching a specific subject in design or AutoCAD. Through this teamwork, new class activities were created; an example of that is the “Dream Inventions” class in which students sketch and describe their pipe dream inventions while learning about patents, inventions, and creativity. The best are awarded prizes and shown to the class. Another example is the Tower of Straws, an exercise that builds teamwork, shows design with constraints, and introduces design analysis.

Most of this discussion has emphasized the evolution of the Engineering Design course, but the same approach to teamwork is also applied to the “Engineering Problem Solving with Computation” course. In this course, first-year students learn problem-solving methods and use C++ and MATLAB as their analysis tools. New approaches to teaching programming were considered, such as Pair Programming, the technique was implemented and proved to be successful. Consequently, other instructors chose to apply the approach (Freeman, Jaeger, & Brougham, 2003). About half of the instructors chose to start the course using MATLAB while the other half begins with C++. The benefits and drawbacks of each are discussed to allow new instructors to make their own informed choice. A major change in the course that was instigated and then instituted as a team was the change from a written final exam to assigning a final integrated project that involves MATLAB and C++. This took all of the resources of a diverse team to create multiple projects from all facets of engineering. The members were then able to choose from a repository of projects to disseminate in class (Jaeger, Whalen, & Freeman, 2005).

This strategy has meant that any new instructors for a first-year engineering course have a group behind them, curriculum materials to use, and assistance from the Coordinators and other Gateway members on every aspect of the course. The team is very aware of the large amount of networking among the students and works hard to establish consistency amongst the multiple sections, but maintain freedom for the instructors to use new approaches and material. The benefit to the team of a first-time instructor is that they provide expertise from their own field and their individual teaching style which brings a fresh perspective to the team

### **The Old and the New**

As stated, the original approach to teaching first-year engineering students was to require each department to assign certain number of faculty to teach the introductory courses. Each student is required to take a series of core courses taught by the Physics, Math, and Chemistry departments as well as a sequence of introductory courses taught by various engineering professors who were chosen from the departments. It was felt that success in these initial courses was critical to retention rates. However, no system was in place to improve the quality of teaching or the courses themselves. The supplementary professors from other engineering departments were assigned to teach sections of these courses without coordination or support and there was an annual turnover rate in the auxiliary faculty pool. Something needed to be done in order to improve the first-year engineering experience and to increase retention rates of both the students and faculty. Another strategy that evolved from the biweekly meetings of faculty assigned to teach these introductory courses was selecting a faculty member to coordinate the others. As described in a previous section, the first to coordinate was Professor Gerard Voland. The successful development of the introductory courses and the team approach led to the hiring of a Gateway faculty member whose job domain was to teach the freshman engineering courses and coordinate the assigned core and additional faculty members. This provided continuity among the multiple sections and led to improved course evaluations. With the success of the single permanent faculty member assigned to teach first-year students, the College of Engineering incrementally expanded the Gateway Faculty. The present level stands at five permanent members all of which have adopted the faculty team approach that is in place today.

In the current system, all except a few sections are now taught by dedicated Gateway faculty. The five dedicated members each provide a new level of instruction since they are actively involved with freshman course development and attend teaching workshops regularly to learn about new teaching techniques. They are also involved in other first-year and pre-college activities, such as Open Houses, Orientation, and Freshman Forums. The Gateway faculty is familiar with the difficulty in teaching this population and the importance of nurturing them on their transition from high school to college. The success of the Gateway team approach is reflected in the outstanding course evaluations which are typically the highest in the college. Figure 1 shows that over a four-year period, in all cases, the average Gateway faculty ratings were higher than non-Gateway faculty. The difference was found to be significant for  $p < .05$ . The ratings are for multiple sections and multiple instructors. For example, in 1999, the Gateway course rating was for six sections that were taught by three faculty. After 2002, there is an overwhelming majority of Gateway Faculty teaching the course, and the non-Gateway faculty is

more judiciously selected. Therefore, with so many variable changes, the same comparison is not valid.

The new system has clear advantages over the old system. The Gateway team has the ability to test new ideas and activities across multiple sections and compile the relevant outcomes and data to determine the optimal way of teaching first-year engineers. It is easy for one member to fill in for another who may be attending a workshop or has a required absence since there is a familiarity with what each member is doing and their stage of progress in the course. At the biweekly meetings, team members report on their progress, pitfalls, and successes. This leads to a better understanding of what works and what doesn't. The use of other team members as a sounding board for possible exercises or course changes gives an instructor the confidence necessary to implement more radical ideas for the first time in front of the class. This is not traditionally how it was done in the past. An instructor typically had a course description, text book, and a previous syllabus that could be used to develop a course for the first time. This is neither fair to the instructor put into this situation nor to the students who are expecting the highest quality of instruction.

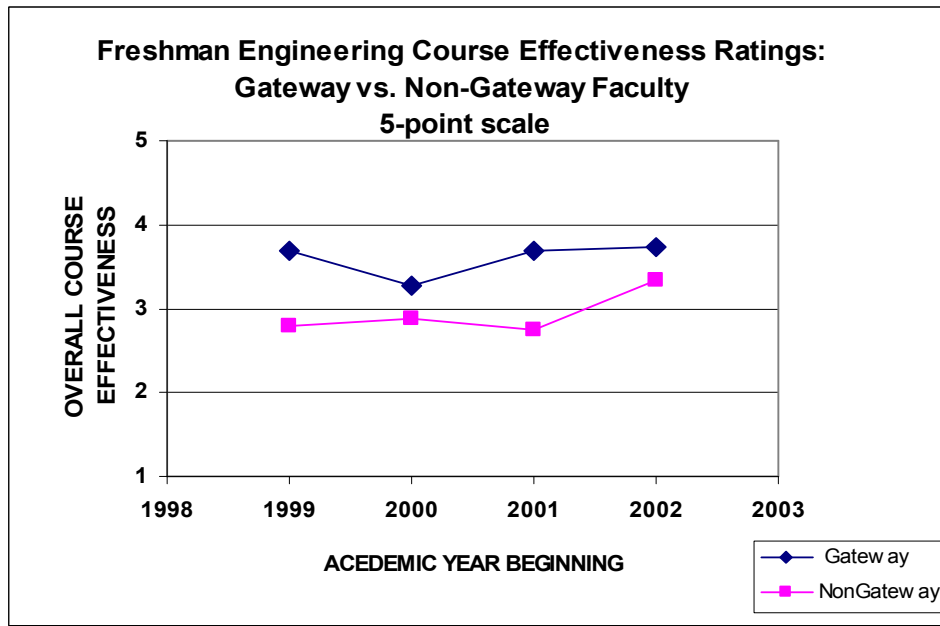
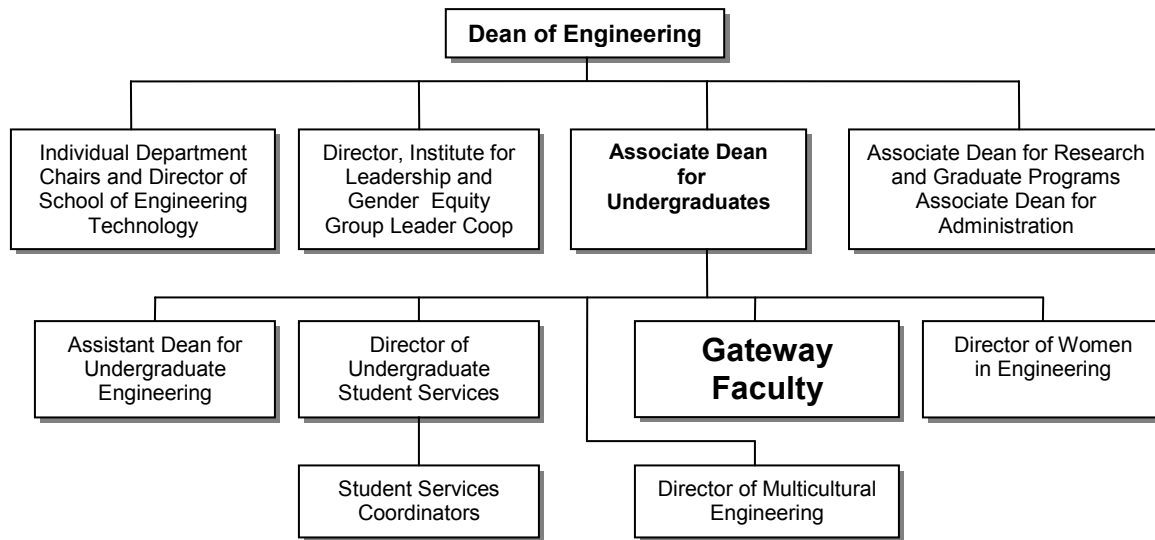


Figure 1. Comparison of Course Ratings for Gateway vs. Non-Gateway Faculty

## The Entire Team

Although the Gateway faculty cover a large percentage of the first-year student course load in terms of teaching, there is a significant support team that works with them to help first-year students succeed. An abbreviated College of Engineering Organization chart is shown in Figure 2. Under the Associate Dean falls the Assistant Dean, Gateway faculty, Director of Student Services and Student Services Coordinator, Women in Engineering and Multicultural



**Figure 2. Abbreviated organization chart for the College of Engineering.**

Engineering Directors. All of these divisions work in conjunction with one another monitoring each student’s progress and reporting deficiencies as well as progress. For instance, all engineering students are required to take a one-credit introduction course entitled “Introduction to the Study of Engineering”. These sections are taught by advisors from the College of Engineering Student Services organization. These staff members serve as the academic and administrative advisors for first-year students and have many years of experience in this role.

There is also a proactive reporting system in place that is coordinated by the Student Services advisors that involves all instructors of first-year students. It is an e-mail and web-based system in which the first-year student advisors send all instructors a web address containing a class list with student pictures. The instructors access the list and fill in information about any student who is having any kind of difficulty. The information is then sent to the advisor online, who takes appropriate action. A generic notification message is also sent to the relevant student to contact his or her advisor to set up a meeting on the basis of a submission. The Gateway faculty offices are located close enough to the Student Services Center that there is also a proximal and casual relationship that fosters helpful communication. It is a frequent occurrence for an instructor to stop in and say something like, “Who is the advisor for Student X”?, and then have a short chat discussing how the instructor might help the student be more successful, or gain a better understanding of the student’s issues. Student Services also utilizes the Gateway Faculty to contact the students. The first-year instructors distribute tutoring schedules, information on course schedules and changes, surveys, and anything else that needs to get into the students’ hands quickly and reliably.

The Gateway Faculty also works closely with the Director of Undergraduate Student Services, who is a Student Services advisor, on the course schedules each semester. This is a daunting task given 14 to 16 sections and all of the various instructor constraints for scheduling and additional course loads. The Dean of Undergraduate Engineering approves the final course assignments,



which is generally the best option possible in terms of scheduling. The Gateway team has an understanding of the issues and conflicts involved in achieving the schedule and as such, the instructors accept sub-optimal personal schedules for the good of the program. That is a general attitude of those involved, that all members sometimes have to work, adjust or cope for the success of the students and the program.

Everyone involved with the first-year experience understands the many facets involved with this responsibility. One that has already been discussed is the commitment to continually improved teaching. Another aspect is that first-year students are going through a transition period and are making many adjustments. There are challenges faced by all members, but the team continually works together discussing how to handle situations, answering questions like: “What would you do, has this happened to you, what is your experience, what is your policy when...”, etc. In combination with the professionals in Student Services, instructors feel that they are able to remain one step ahead of the next crisis. This helps the College and instructors develop a unified structure and consistent expectations for the students. From the syllabi for the first-year courses that are developed together, to the workshops set up to introduce students to their new profession, the vision of the group is setting students up for success. This vision starts with the Deans of the College and is embraced by each team member including those who join to teach for only a term. Although more time is spent working with new members to help them understand the vision, goals, students, and course material, the payoffs are inarguably evident.

### **The Expanded Role of the Course Coordinator**

There are many aspects of the course that need to be managed each semester, so two course coordinators are assigned from the Gateway Faculty for the course term. These coordinators conduct the team meetings and manage a variety of tasks. Common agenda items are:

- Scheduling – the coordinators are responsible for gathering information on scheduling commitments and constraints for instructors so that all sections and computer classroom needs can be accommodated. In addition, they schedule team meetings every two weeks at mutually agreeable times. They also may have to help find an instructor to cover a class due to illness, conferences, or other reasons an instructor might require a substitute.
- Texts and Course Materials – the coordinators recommend and order the textbooks, working with publishers and the bookstore to ensure timeliness and sufficient quantities of each textbook. Any other course materials needed such as movies and other media are also handled.
- Calendar – the coordinators distribute and discuss the academic calendar so that everyone is aware of the semester in advance. During the first semester of the freshman year, all exams in courses that freshman engineering students take are coordinated so that students do not have two major exams on the same day. This must be adhered to and any changes must come through the coordinators.

- **Software Issues** – In the fall semester, the students are using AutoCAD and Excel; in the spring semester, C++ and MATLAB. The coordinators must work with the College of Engineering and the University to maintain access to the correct version of the software, update the number of licenses the University must obtain to ensure proper operation and availability of the software, and solve any problems that may arise. This also includes establishing where there is access to the software for the students, or if it can be purchased. There are three computer classrooms where classes are held which need to be inventoried and maintained. Any problems that occur are brought to the attention of the coordinators who then notify computer support about any network and software problems.
- **Physical Facilities** – In the fall semester, the Engineering Design classes are assigned the minor design project described above. The students are required to build a prototype device to meet a specified objective. A specialized facility the “Engineering Design Project Zone” has been designated as a project staging area with tools, materials, and work benches. The Coordinators ensure that the inventory of tools and supplies are stocked, and that a technician is there for assistance when needed. Other facilities responsibilities involve planning for design classes to be held in rooms with tables which may be used in active learning exercises as opposed to rooms with attached desks. Also, any hardware problems in the computer classrooms such as non-functioning computers, projectors not working or other equipment problems are handled by the coordinators
- **Training the “New Guy(s)”** – Each semester, there are two to five additional engineering faculty that are asked to teach one or two sections of the first-year courses. The course Coordinators assist these instructors by providing them with a syllabus, detailed schedules for the course, lecture material, homework assignments, past quizzes and exams, and other materials that help bring them up to speed on the course. Most importantly, the Coordinators spend time with “new guys”, discussing the vision of the course, the challenges of the students, and the practices of the team. This doesn’t mean that the new folks have to do everything as presented, rather they are provided with the framework and are assisted in organizing and administering the course with their own style. Oftentimes, the new person brings to the table new ideas or activities from their respective field that can be further developed and woven into the course.

### **Additional Examples of Success**

There are many more examples of improvements accomplished within the Gateway team model. One example is in the approach to exams in both the Engineering Design course and in the Problem Solving and Computation Course. After years of using a traditional midterm and final exam as assessment tools, the team reviewed many comments from the students stating that these exams did not fairly evaluate their learning. The team first looked at the Design course, and redesigned multiple-choice exams, creating exams with a variety of question types that better reflected how the presented material applied. The mixed format allowed the students to better demonstrate their understanding of the concepts through problem analysis techniques, open-ended answers, and short essays.

In the Problem-Solving Course, weekly quizzes were introduced to keep the students on track and allow instructors to assess class progress. The students responded, indicating that although it became tiresome at times, weekly quizzes on programming material in reality helped them to stay on course. The final exam was also re-evaluated in the programming course; the team had long felt that a final project was a more effective means of students demonstrating their competence. The difficulty was in administering a project among 15 sections, but the team worked together to find a method, that was fair to the students, manageable for the instructors, and minimized risks of academic dishonesty (Jaeger, Whalen, & Freeman, 2005).

Another example is the revision and redesign of projects for the Design course. Research on other university practices and team brainstorming has resulted in a variety of construction projects that serve to introduce the engineering design process to the students. On the major project, which is a 6-8 week development process that does *not* require the team to develop a working prototype, the team has tried a variety of approaches. Several instructors have experimented with the entire class working on one project, and the pros and cons of this structure have been discussed. It was learned that this works well if the problem is well-structured and is broad and realistic enough for the students so they develop a variety of solutions. One advantage to the common project is that the students see how their solution is not the only one, or necessarily the best, and some positive competition results. The disadvantage is that the students feel more constrained when they are not designing a project of their choosing. A new instructor may choose whichever option they feel more comfortable with and have the confidence that the desired knowledge of the design process will ensue.

The common philosophy endorsed by the College and University of developing core competencies in first-year students such as oral and written communication skills, hands-on projects, teamwork skills, and presentation skills, are constantly being reevaluated by the team. This translates into better presentations, homework, teamwork and projects, all of which provide for a better first-year experience.

### **What Should Your School Do?**

Even without the Gateway Faculty, there are many elements of the Gateway approach that can be adapted to any first-year engineering program. One of the first steps is to understand the vision that drives the level of success seen at Northeastern. The Associate Dean's philosophy of setting up our students for success has been translated into action, and pervades the Gateway approach. Helping the students learn and become successful remains the emphasis of the team's teaching efforts and discussions. This does not mean "spoiling" the students, quite the opposite. The focus is on preparing them to be excellent college students, equipped for their sophomore year and beyond, recognizing the importance of connecting the students to the University in whatever way possible.

A key component is the commitment to meet together on a regular basis to discuss problems, challenges and success, and evaluate aspects of the curriculum. The whole team has to be open

and egoless and keep the focus on the course and the students for this to work. There should never be a problem with disseminating new and creative material amongst team members. At meetings, the team brainstorms on new approaches and solves problems together, bringing new ideas and techniques that use active learning to the table that improve any aspect of the course.

Another characteristic is a commitment to work with other faculty and advisors whenever possible to learn about the entire first-year program and its features. A program will only be as successful as its weakest link. Many of the Gateway faculty have helped with, participated in, or at least learned about the orientation process, the Introduction to Engineering course, and the curriculum in all first-year courses. In order to better advise the students, it is very helpful to know what the students are involved in, what are their concerns and pressures.

All members of the team are willing to share materials, projects, ideas and things that have or have not been effective, being willing to “put it out there”, even if it might get “bashed”. This willingness has led to the continual enhancement of the course and in individual teaching. Many times the pros and cons of different styles emerge, and each instructor chooses a path. It is not unusual to hear at a meeting, “Well I tried this, it was a flop, but I think if I change this, and add that, it might work, any thoughts?” What works for one, does not necessarily work for all, but can be adapted to individual styles for improvement. It may not be a requirement, but the Gateway Faculty really like their jobs, which is very helpful also...

## **NU at a Glance**

Northeastern University’s College of Engineering entering class has grown from 280 to 420 in the last six years. Most of these students -about 80%- live in residence halls on campus. They are placed into sections together for the first semester; they have all of their courses outside of their elective together. This sectioning is done to foster relationships and help the students connect with one another and form study groups. The first-year students are highly networked, and what is done in one section is known among the class population very quickly. That is why teamwork and a consistent approach are so important.

There are nine different colleges at Northeastern, and students that are not successful in engineering often will remain at Northeastern and transfer to another of the NU colleges. The majority of first-year engineering courses are taught by the College of Arts and Sciences. A number of the engineering faculty have been working with Arts and Sciences faculty for the past five years on assessing and improving the quality of teaching for our first-year students. There are a number of ongoing activities that a portion of this faculty works on together. The Deans and Associate Deans of both colleges also work together on issues concerning engineering students.

## **Conclusion**

The freshman-to-sophomore retention rate for students remaining in the College of Engineering now stands above an unprecedented 80% as shown in Figure 3. This has been gaining over the last ten years and this success may be attributed to the Gateway approach. Frequently, the

complex problems that are solved in the workplace are the result of a combined effort of many individuals with a common goal. The same team approach has now been applied to the management of incoming engineering freshmen at Northeastern University. The College of Engineering has steadily increased retention rates over the past decade through successful implementation of new ideas brought forth by the experiences and energies of the dedicated Gateway team.

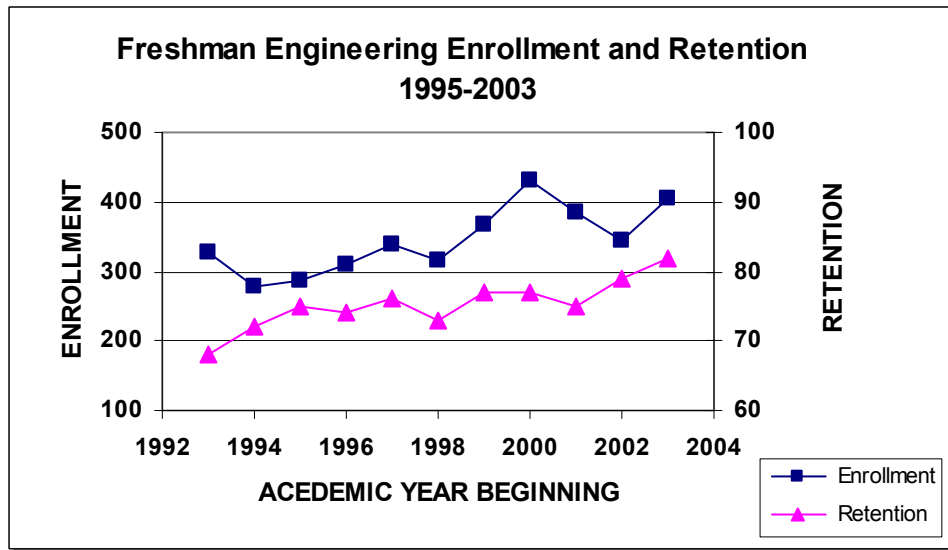


Figure 3. Freshman Enrollment and Retention Rates for the College of Engineering.

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