MISSION

vision

objectives

The University of Vermont
COLLEGE OF ENGINEERING
& MATHEMATICAL SCIENCES

STRATEGIC PLAN
JULY 2015
Mission

The Mission of the college is to foster a research and discovery-focused environment that provides students with strong theoretical foundations and practical and experiential skills, educating and inspiring them to understand our world and to confront complex societal challenges facing our state, country and the world.

Vision

The college will be a leader in providing a high quality, engaged education, and in conducting scholarly research that is equivalent, on a per faculty basis, to public colleges ranked in the top 50 in the US. The college will be nationally known for several signature areas of research and scholarly excellence and will make use of state-of-the-art facilities that will promote collaborative learning and research.
To support our mission and vision, the college has developed a Strategic Plan with four objectives:

**Objective 1:** Ensure Educational Excellence and Student Success

**Objective 2:** Achieve Research and Scholarly Excellence

**Objective 3:** Develop a National Reputation for Leadership in Outreach Engagement

**Objective 4:** Practice Responsible and Effective Stewardship of Fiscal Resources

A summary of what we have accomplished over the last two years and strategies for accomplishing each objective along with metrics for assessment are detailed on the following pages.
Background:

The landscape of higher education is evolving, and we cannot and should not ignore this reality. Indeed, we might consider ourselves fortunate that so much change is being thrust upon us at a time when we are being given the tools to successfully address the emergent challenges. As educators, we are tasked with cultivating the great problem-solving minds that will tackle the great challenges that face society. We tell students that STEM education is about teaching them how to adapt; to learn the skills necessary to face difficult tasks. We’d be well-served to listen to our own message to these bright and energetic young minds. As with all major changes there is fear of the unknown, and some individuals underestimate their own preparedness for change and capacity to handle it. Change is often beneficial, as it allows us to find ways to empower each individual to contribute toward the common good.

We, the faculty, staff and administration must commit to developing a culture that affirms and protects the dignity, discipline and intellectual excitement of academics for higher education to remain vital. The design of our future will require that we look beyond the words and numbers of our policies and to instill a trusting and flexible medium to provide for and respect the continued professional development of all members of our college. The college administration has met with various constituencies, including the staff, lecturers, faculty, students, and individual units. My goal of those meetings has been to understand various perspectives, but more importantly to demonstrate that we are all part of the same team. Each and every one of us has a role to play in the future success of CEMS.

Academia is changing in myriad ways: teaching methodologies and students’ expectations in the classroom are ever-changing; new technology constantly presents us with both real and false efficiencies; and funding uncertainties are forcing us to rethink our areas of scholarship at the same time that expectations for productivity are on the rise. Finding the optimum balance between teaching, research and service is a particular challenge.

The college leadership is committed to recognize, cultivate and reward achievement in an attempt to generate an upward spiral of productivity. The byproducts of this process will be the commodities that enable us to ascend in the rankings. This is not only critically important for attracting faculty and students, but also for establishing the foundational base of economic stability that can be reinvested in generating further achievement.

Academia must take a broad view of professional identity and development, directing faculty to recognize their strengths and to think about evolving in the dual space of the needs of the institution and the capacity of the individual. It is anachronistic to think that the apportionment of time and responsibilities should be uniform across a diverse professoriate, and that we should not incent people and have indicators to measure their productivity. It is proper to respect the diverse contributions of the faculty by giving opportunities for everyone to contribute to achieving our maximal effectiveness. When we do this, we will be solving our greatest problem and learning from our own curriculum.
Accomplishments over the last two years:

Over the last two years CEMS has evolved along these lines and we have made great strides. We have had some successful recruitments that have both strengthened our academic core and expanded our breadth of expertise. We have hired six tenure track faculty members: two in Math (Samuel Scarpino in Complex Systems [IGERT] and Christelle Vincent in number theory and algebraic geometry); and four in the School of Engineering – two Environmental Engineers (Raju Badireddy and Huijie Lu), a Mechanical Engineer (Patrick Lee) and an Electrical Engineer (Mads Almassalkhi). In collaboration with the Rubenstein School of Environment & Natural Resources, we jointly hired Jennie Stephens as the Blittersdorf Professor. We will be conducting five tenure track searches this fall for a faculty member in Math, one in Statistics, one in Computer Science and two in the School of Engineering (one in Mechanical Engineering and one in Electrical Engineering).

We have also hired six lecturers (two in Math - both with PhD’s), one in Statistics (MS), one in Computer Science (PhD), one in Mechanical Engineering (PhD), and a CAD lecturer (MBA). We hired a senior lecturer as a Professor of the Practice for Civil and Environmental Engineering and will have his PhD by his start date. We are conducting a search for a lecturer in Electrical Engineering and will be conducting a search for a senior lecturer as a Professor of the Practice for Mechanical/Electrical Engineering.

To strengthen our ability to provide support for our faculty and students, we have hired an additional academic advisor in CEMS Student Services (Matt Manz), a lab manager for the School of Engineering (Max Graves), an internship coordinator for the college (Alicia Ellis), a pre-award and financial support professional (Sylvie Butel), and a communications professional as our communications director (Jenn Karson).

During this period we have appointed a number of new members of the leadership of the college. Jeff Buzas was appointed Chair of Mathematics & Statistics, Greg Warrington was appointed Associate Chair of Mathematics & Statistics, Yves Dubief was appointed Program Head of Mechanical Engineering and Jeff Frolik was appointed Program Head of Electrical Engineering.

We have continuously worked to improve the facilities and infrastructure of the college. To this end we participated in the planning process for the new STEM Complex which broke ground in mid-May. This is the largest capital project in University of Vermont history ($104M). We have renovated all corridors in Votey Hall, along with several labs and offices. We continue to remodel other areas of Votey this summer. Many more renovations will come over the next three years as part of the STEM Complex project. We have begun an ambitious campaign to upgrade the equipment in the Votey teaching labs and prototype shop, and we are hopeful this will further enhance the student learning experience.
With the goal of making the CEMS Board of Advisors more active and engaged, we have appointed 10 new board members (currently 15 total) over the last two years and have updated the bylaws. We have also expanded the membership and substantially modified the operation of the Board of Advisors of the School of Engineering by expanding the membership from about 10 to over 30 members.

We have made substantial improvements in the areas of marketing, communications and social media. We have created a hardcopy biannual college newsletter called SUMMIT (http://www.uvm.edu/~cems/?Page=summit.php&SM=_newsmenu.html), and have made significant upgrades to the college website and student recruitment materials. CEMS maintains an active social media presence on Facebook, Twitter and other popular outlets.

We completed the ABET self-study reports for the four ABET accredited engineering programs. The reports were submitted at the end of June in preparation for an accreditation visit that will take place in early October.

To recognize some of our most outstanding faculty members we have appointed four endowed professors during the past two years: Donna Rizzo - Dorothean Professor; Chris Danforth - Flint Professor; Josh Bongard – Veinott Green and Gold Professor; and Paul Hines – Fisher Professor. We also implemented a number of annual awards in the college. They are: 1) Outstanding Faculty Performance; 2) Award for Excellence in Teaching; 3) Award for Excellence in Service; and 4) Award for Excellence in Research.

In order to allow for each faculty member to maximize his or her contribution to the college we initiated a variable workload. The focus is on the collective benefit of enabling each individual to contribute according to his/her strengths. Faculty members who have a demonstrated record of productive research should be afforded more time to build upon their success. Talented teachers should be provided the opportunity to focus on that strength.

In order to rise in the rankings we need to increase the size and quality of student body. Our undergraduate application pool has increased by over 22% while we have only increased our number of undergraduate admits by 10%. At the same time our incoming freshman class has grown by about 13.5% while the quality of our students has improved by a number of measures: 3% increase in average SAT scores, 4% increase in the average high school rank and 10% increase in ACE scores. We have improved our selectivity from 79% to 70%.
We have implemented a number of innovations and changes to our curricula. We created a certificate in Actuarial Science and are working on creating several other certificates. With support from various constituencies throughout the University, we submitted to Faculty Senate a proposal for a new BS degree in BioMedical Engineering. We are in the process of developing a proposal for a new BS in Data Science. UVM’s Board of Trustees approved a new MS degree in Complex Systems and Data Science that will start this fall.

We are working with the Graduate College on a pre-masters Global Gateway Program which should result in an increase in self-funded international graduate students in CEMS. Our graduate student enrollment has increased from 161 to 187 in the past two years (16%).

We have developed and are now implementing new plans for advising, evaluation of teaching performance and measuring scholarly productivity. In addition the University has transitioned to a new RCM budget model: Incentive Based Budgeting (IBB). We have been actively involved in developing models to understand the implications of IBB to our college. We aspire to achieve the highest level of transparency and to share information with all our faculty and staff.

Our development efforts have been highly successful. We have obtained over $3.8M in new commitments over the last two years for facilities, scholarship, professorships and programmatic support. In addition, this spring UVM received the Richard L. Fisher estate gift at a value of $6.8M which is $1.8M more than the original commitment of $5M.

The above outlined changes in the college over the past two years align with and support the objectives delineated below. The objectives, goals and the metrics are intended to ensure that we continue to advance towards accomplishing the vision of the college.
Key Objectives: The College of Engineering and Mathematical Sciences will focus its energy and resources on driving progress on four key strategic objectives:

Objective 1: Ensure Educational Excellence and Student Success:

GOALS:

1. Recruit, develop, support and retain a diverse world-class faculty and instructional staff dedicated to teaching, research, technology development, and entrepreneurship

   - Develop a faculty mentoring program.
   - Develop methods to encourage and support innovative educational practices (such as online learning, remote video, etc.) that are more flexible and meet the needs of our students.
   - Refine the flexible workload policy in order to better recognize and reward the variety of ways in which faculty can contribute to the vision of the college - teaching, research, undergraduate advising, high level professional service, etc.

2. Recruit, support and retain the best undergraduate and graduate students, including underrepresented populations (women and ALANA students)

   - Invest in comprehensive monitoring of student satisfaction and progress as the college strives to achieve University retention, graduation and learning-outcome goals.
   - Implement plans to enhance the learning experience with peer mentoring, support for student organizations, innovative electives and other opportunities for students to collaborate early in their academic careers.
   - Hire a graduate student coordinator to help with the recruitment and ongoing support of graduate students. Responsibilities will include developing recruitment materials, processing applications, organizing Graduate Student Visit Days and serving as a resource for graduate students with questions about their degree programs (graduation requirements, graduate school forms, etc.).
   - Implement the pre-masters Global Gateway Program to recruit more self-funded graduate students. Develop additional MS degree programs that are attractive for self-funded students such as MS degrees in Engineering Management, Biomedical Engineering, and our newly approved MS in Complex Systems and Data Science.
3. Continually **improve and innovate** curricula

- Support UVM’s newly adopted general education requirements in sustainability, writing and diversity. Develop curricular options in emerging areas of interest such as renewable energy, complex systems, data science, and entrepreneurship.
- Maintain ABET accreditation for all SoE programs and build continual assessment processes.
- Identify and develop new programs synergistic with the strengths of the University.
- Incorporate more project-based learning with an emphasis on transferable skills.
- Increase support for student organizations, co-curricular activities and leadership opportunities.
- Develop effective Internet-based learning approaches for both on-campus and off-campus students.
- Develop a technical communication component of the curriculum.
- Develop technology/entrepreneurship opportunities for our students, focused on collaborative and innovative thinking.

**THREE-YEAR METRICS:**

- Increase selectivity of our undergraduate students from 70% to 65%.
- Increase the percent of female students from 19% to 25%, thus exceeding the national average.
- Increase our four-year graduation rate from 62% to 68%.
- Increase the number of students that pursue internships from the current estimate of 60% to 75%.
- Establish a Co-op program for our students and enroll at least 10 students.
- Maintain the average class size at less than 35.
- Increase the number of distance courses by 5 per year.
- Implement the recently adopted “Evaluation of Teaching Performance Guidelines.”
Objective 2: Achieve Research and Scholarly Excellence

GOALS:

1. Develop or enhance strong research programs

   - Identify and scale up existing areas of strength in the college to leverage upon our current success and advance the college identity on the national stage. Strategically cultivating signature areas, to be designated as Programs of Research and Scholarly Excellence (PRSE), will be critical to differentiating the college and will facilitate in attracting students, faculty and external funding sources. A process will be developed to identify these programs (for a period of 3-5 years) and for re-evaluation and re-designation or identification of other emerging areas.

   - Create seed funding opportunities to support novel research ideas.

   - Consider development of new research programs in areas such as: nanotechnology, information technology, sustainable engineering, biomedical engineering, water, and healthcare/disease. These are at the intersection of societal needs and UVM core values and capabilities.

   - Evaluate strategic opportunities for Research Faculty (Affiliate, Assistant and Associate) that can support the research mission of the college.

2. Encourage development of interdisciplinary research, which addresses strategic needs of industry, government, and society

   - Continue to explore partnerships across campus and with other universities.

   - Reach out to industry to build strategic partnerships with industry and government agencies. Appoint an Associate Dean for Research and Graduate Education that will be responsible for the implementation of these efforts.

   - Sustain the productive operations of existing programs such as the NASA SGC/EPSCoR platform.

   - Create incentives for developing new inter-disciplinary research efforts. Cultivate support for successful existing cross-disciplinary efforts.

   - Expand research into educational opportunities in Mathematics, Statistics, Engineering and Computer Science.
3. Enhance **administrative support**

- Add additional administrative support for research in the college such as an Associate Dean for Research and Graduate Education. This individual would be expected to work with faculty to strengthen our graduate programs (graduate core, course credit requirements, qualifying exams, publication requirements), research needs of faculty, and industry and government research partnerships.

**THREE-YEAR METRICS:**

- Increase our self-funded graduate student population from 45 to 100 and GRA’s from 75 to 100.
- Increase the number of high quality (top tier journal publications) by 20%.
- Increase the number of proposals submitted by 10%.
- Increase PhD graduates by 15%.
Objective 3:
Develop a National Reputation for Leadership in Outreach Engagement

GOALS:

1. **Educational partnerships** with K-12
   - Enhance and expand existing service learning platforms.
   - Sustain and support the Vermont Mathematics Initiative and the nascent Vermont Engineering Initiative.
   - Demonstrate a commitment to leadership in the incorporation of the NGSS standards in the K-12 classrooms of Vermont.
   - Collaborate with GENERATOR and other outlets for the Maker movement.
   - Collaborate with the Teens Reaching Youth (TRY) program.

2. **Portfolio** of programs
   - Develop summer programs that attract and energize pre-college students to pursue higher education in STEM disciplines.
   - Maintain and advance the vast portfolio of outreach ventures including CS Fair, MATHCOUNTS, the Vermont High School Math Contest, FIRST, The Governor’s Institutes in Engineering and Mathematics, Engineering Week, and other efforts.

THREE-YEAR METRICS:

- Expand the coalition of external parties with whom the college interacts by 20%.
- Expand the number of students engaged in our programs by 50%.
- Increase the Outreach gift fund by 50% over the next three years.
Objective 4: Practice Responsible and Effective Stewardship of Fiscal Resources

GOALS:

1. **Generate resources to attract, support, and retain** world-class faculty and students. Long-term goals include:
   - Offer market-level startup packages.
   - Double the number of endowed chairs and professorships to ten.
   - Maintain a minimum growth rate of 4% per year of undergraduate student credit hours while meeting the goals for increase in student quality.
   - Encourage and support continued professional development with a focus on encouraging Associate Professors to strive for promotion.

2. **Provide the necessary facilities** for innovative research and instruction
   - Support the fulfillment of the STEM building complex: work with UVM Facilities, Design and Construction and the architects in the implementation phase of the project.
   - Continue to upgrade equipment in the laboratories, with development of a long term, master plan for facilities and equipment, along with an increase of the existing portfolio of endowed funds that support the infrastructure of the college.
   - Continue to evolve the safety protocols for the college.
   - Continue to refine the space utilization policy so that it rewards and motivates productivity.
   - Find efficiencies in space utilization such that costs are justified and manageable.
   - Create additional study and work space for students.
   - Provide a data infrastructure to both automate administrative tasks and to support decision making by the faculty and administration.
3. Develop a **stable financial position** for the college

- Maintain a positive annual balance that addresses emergent needs but also considers long term consequences.
- Cultivate the Fund 108 “reserve” with the goal of building it to 15% of our annual budget both to act as insulation against a downturn in enrollment (or other causes of a budget shortfall) and to provide a source for investment funds for emergent opportunities.
- Identify and develop strategic opportunities to propagate IBB principles down to the units and individuals to continue to reward productivity and share in the rewards/risks.
- Annually provide the college with a three-year projection of the budget along with relevant analysis regarding deviations from previous year and tactical decisions motivated by the budget and the actuals.

4. **Encourage and support professional development** for staff

- Supplement the practice of completing thorough annual performance appraisals for all staff with a commitment to identifying and supporting opportunities for personal development.
- Continue to examine the organization of the staff so that efficiencies are captured and backups are cultivated.

**THREE-YEAR METRICS:**

- Raise $10M in commitments for support for Professorships/Chairs, Scholarships, Programmatic Support and Infrastructure.
- Build Fund 108 “reserve” to 3% of our annual budget.
- Generate $500K of net new revenue to invest in strategic initiatives and growth.
- Continue to hold an annual budget forum in order to provide clarity about actions and plans as well as to engage faculty and staff about the challenges and opportunities ahead.
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