Executive Summary

The College of Science, Engineering and Technology provides quality programs that focus on the student experience while providing expertise in some of the most needed fields of study for regional industry. We take pride in providing these programs as well as the large amount of service and support we provide students in programs throughout campus.

This year the college has made great progress on attaining its strategic goals through global actions recommended by an implementation task force (see attached). The four goal areas can be stated succinctly as (1) providing solutions for the region, (2) engaging in transformative teaching methods, (3) exploring new programs and initiatives, and (4) providing mentorship throughout the college. We have made excellent strides in all areas and look forward to expanding our efforts in the coming year. Additionally, the college participated in the university effort to complete the Academic Master Planning process and create viable new directions while maintaining our current strengths in alignment with our mission and goals.

The college takes great pride in sharing the successes and scholarship of our faculty and students, which are too numerous to mention in the present document. We include a brief description of a representative sampling in the report that follows. Details of many of the accomplishments in the report can be found at the CSET News & Events website (http://cset.mnsu.edu/news.html).

Select accomplishments in:

1. Student Success

   • The College of Science, Engineering and Technology is extremely proud of the number of majors participating in research activities whether it is mentored, student/faculty research or independent research such as the Frey Fellowship. On campus, CSET students dominate the Undergraduate Research Symposium with significant numbers in poster sessions and presentations. Over 20 CSET majors attended the National Conference on Undergraduate Research held this year in Spokane, Washington.

   • The college is fortunate to have student chapters of many professional associations affiliated with our campus. Not only does this provide leadership opportunities for students, but in addition, they are able to participate in inter-collegiate design competitions, and regional and national meetings. The value to these students is hard to quantify, but often the networking opportunities lead to offers of employment or entrance into graduate programs.
The relatively young Twin Cities Engineering programs, located on the campus of Normandale Community College, had their first five graduates this year. Graduates of this program are intending to continue into master's programs in engineering. Behind the recent graduates are 20 additional students enrolled in the program which features a project-based curriculum.

CSET students are successful in securing paid internships, particularly in Computer and Information Science where students are also reporting near 100% placement in full-time employment. Overall, internships have proven to be an essential way for students to gain paid experience and, even though not required by many majors, students perceive internships as an important part of their academic preparation.

2. Diversity

A. Employees (hiring, promotion)

Women faculty continue to gain representation in non-traditional areas such as engineering, construction management, and physics with new probationary hires, tenure and promotion. Several of the female faculty, new to the college during 2014-2015, are also ethnically diverse.

Ethnic diversity within the college continues to rise. During the 2014-2015 academic year approximately 35% of tenure track, probationary, and fixed term faculty were of diverse ethnicity or non-Caucasian.

B. Students

Several new diversity initiatives were implemented during the 2014-2015 academic year. Students from the Brazilian Scientific Mobility program have received extra advising support from the CSET Advising Center where a graduate student was hired specifically to aid those students and the students within the college from Saudi Arabia. In addition to advising support, several Brazilian students received internships within the Department of Biological Science where they spend a number of weeks during the summer working on Food Science and Microbiology research projects under the tutelage of Drs. Wrigley and Secott.

The inaugural Women in STEM luncheon was hosted by the college and advising center for majors. A woman professional engineer originally from Mexico was the featured speaker sharing her experiences getting a start in a non-traditional role. Approximately 150 students, faculty, and staff attended.

CSET has a long and rich history supporting initiatives in K-12 outreach, specifically focused on science and engineering at the underserved middle and high school populations for both male and female students. Again this year we hosted several diversity outreach activities with Latino Engineering Academic Day (LEAD), the first African American Day (A2LEAD), and the first ever Girls Explore STEM Academic Day and summer camp.
3. Quality of Graduates

- The College of Science, Engineering and Technology is proud to share the success of our graduates in several categories. Performance on professional exams is an area where our grads have exceeded the national average for many years running. An example of this is the engineering students sitting for the Fundamentals of Engineering test (precursor to the PE licensure exam,) where our students achieved a pass rate of 100%. In Mathematics, over 80% of Math Ed graduates passed the Mathematics MN Teachers Licensing Exam.

- Job placement statistics for majors within CSET remain strong for those students looking for employment after graduation. The Department of Construction Management reported 100% placement of their graduates with a total of 42 companies recruiting on campus. Similar demand for graduates is reported by our engineering departments as well as physics graduates.

- Acceptance into graduate schools and other post-baccalaureate professional schools is impressive. For example of the 16 graduate degrees awarded in the Department of Mathematics and Statistics, 6 graduates were accepted into Ph.D. programs at highly ranked graduate schools with the remaining students finding gainful employment in their chosen fields. Graduates in the Departments of Biology and Chemistry are seeking and gaining admittance into Medical, Veterinary, and Dental schools as well as other professional schools.

- Several new programs have been proposed such as the master’s degree in Electrical Engineering (MSEE,) a new certificate program in Renewable Energy, and the first offering of STAT 154 on-line. In addition two new PSM programs will begin in the fall, one in Information Security and Risk Management and one in Engineering Management. Both of these new programs were developed in collaboration with the College of Business. The recognized importance of writing skills in the curriculum of science and engineering programs motived the Department of Physics and Astronomy to change their Advanced Laboratory course to a writing intensive designation to help improve the writing ability of physics majors. There are 7 additional new classes with the writing intensive designation within science and engineering majors in AET, MET, Math, and the CS minor. In the Department of Mechanical and Civil Engineering faculty are receiving pedagogical training through the ExCEED program.

4. Partnerships & Collaborations

A. Within the university

- The College of Science, Engineering and Technology has seen an increase in cross-disciplinary collaboration within the college over the past year. The MAX Scholar program added a faculty member from the technical communications area to the core group coordinating the activities of the group. This has enriched the breadth of the program and has supported the thrust of increased writing experiences for our majors. The Brazilian student cohort has been a collaborative teaching effort within both the
science and engineering majors. The Department of Electrical and Computer Engineering and Technology partnered with other CSET departments to develop a graduate course, international engineering minor program and new certificate program in renewable energy.

- Both Bureau 507 and the User Experience Center are examples of collaborations within different areas of the university. The Bureau worked with College of Allied Health and Nursing and with the College of Education on projects run by students mostly from the computer information science disciplines. The User Experience Center was originally started with Strategic Priority funding to the Department of Computer and Information Science and Technical Communications and English.

- Faculty members from both the departments of Electrical and Computer Engineering and Technology and Mathematics and Statistics taught the ModSim graduate classes and Dr. Namyong Lee serving as Research Director for Minnesota Modeling and Simulation Center.

- The Minnesota Center for Engineering and Manufacturing Excellence, in collaboration with the Women’s Center offered the first Girls Explore STEM week-long camp targeted at girls in middle school. They have also partnered with Institutional Diversity on several new and continuing initiatives.

B. With other institutions

- Collaborations with other institutions in the past year include the Twin Cities Engineering program, located on the Normandale campus and laboratory space on the campus of Hennepin Technical College. Iron Range Engineering works with the Mesabi Range to support lower division curriculum along with the University of Minnesota-Duluth and Itasca Community College. Riverland Community College and CSET have been working on a 2 + 2 for Food Science Technology and Biotechnology and are exploring the possibility a new Agricultural Engineering 2 + 2 program.

- The Department of Computer and Information Science and the Department of Automotive and Manufacturing Engineering continue their student exchanges with Han University and the counterpart to MSU’s Bureau 507, called Buro302 at Han University in the Netherlands. A faculty member from the Department of Physics and Astronomy is working with NASA-JSC, the Universities of Hawaii, Minnesota, Washington, and California at Berkeley on interplanetary dust particles. The Department of Construction Management partnered with 8 other regional CM programs to form a consortium dedicated to advancing the construction management profession.

C. With the greater public/community

- Industry partnerships are critical for the Twin Cities and Iron Range Engineering Programs and their project based curriculum. To date 31 formal partnerships are in place to support these two programs and coop opportunities for students. The Le Sueur Foundry and Polaris are new partnership for the Department of Automotive and Manufacturing Engineering. Additive Manufacturing has been added to the long list of
experience in the department of AMET and partnerships with MnCEME and others are being forged to offer training for regional manufacturing companies utilizing the recent donation of Siemen’s software.

- Faculty members continue to be active on local, regional, and state-wide boards such as representation on the Board for Mankato Habitat for Humanity, the Water Quality professional development group of the International Association for Food Protection, the State of Minnesota Multi-Agency Silica Sand Rulemaking Advisory Board, Minnesota Construction Association Leadership, and the Minnesota Office of Higher Education. In addition, an example of national activity includes a faculty member from the engineering disciplines participating in an Engineering Education Policy workshop at the National Academy of Engineering and a faculty member’s Technical Report Column for ACM SIGACT newsletter.

- The college’s commitment to K-12 outreach activities continues with the regional Science Fair, Math Competition, Math Counts, Project Lead the Way, Scrubs Camp, Girls Explore STEM Camp, ZAP camps with different STEM emphases, and other engineering-related high school competitions during Engineering Week. To recognize the college for our strong commitment to supporting elementary teachers was the Improving Teacher Quality grant received from the Minnesota Office of Higher Education to provide elementary teachers with professional development in Mathematics.

- Over 1,100 community members and students attended public viewings at the Standeford and Andreas Observatories during the academic year. This number is an increase over past year’s participation. A new initiative with East High School and the Civil Engineering program supplies tutors who work with students on their campus. New concurrent enrollment partnerships are in place with St. James High School and St. Peter High School.

- A Nobel Laureate was the invited speaker for the annual Ford Lectureship in the fall. A TCE faculty member was featured on a FOX 9 television program giving additional exposure to the project-based program. The Physics and Astronomy department hosted 13 research seminars during the year, featuring both faculty members, alumni and hosted speakers.

5. Development of New Resources

A. Grants

- The college was awarded approximately $3.5 million in funding from various federal, state and private contracts and grants representing about 40% of the university total.

- The College of Science, Engineering and Technology submitted 14 proposals to the National Science Foundation to the following programs: S-STEM, Improving Undergraduate STEM Education, Engaged Student Learning: Exploration, EDU Trace of Secure and Trustworthy Cyberspace, EAGER: Phase 2, Manufacturing Machines and Equipment, Major Research Instrumentation, Scientist Development Grant, and Geobiology and low-temp Geochemistry.
• In addition, proposals were submitted to the Minnesota Departments of Transportation, Natural Resources, Agriculture and the Minnesota Pollution Control Agency. At the national level proposals were submitted to the American Chemical Association, American Thyroid Association, American Heart Association and the US Department of Labor. Collaborative proposals were submitted to Advance IT MN at Metro State University, Northwestern University, University of Minnesota, Macalester College, and Carlton College. The Bush Foundation and several smaller collaborators complete the list of proposals submitted during the 2014-2015 academic year. All three centers within the college, the Water Resource Center, the Center for Transportation Research, the Minnesota Center for Engineering and Manufacturing Excellence and 7 out of 10 departments were represented with proposals this year.

B. Giving

• The college had a very successful year with a giving total of $1,943,793. The majority of the total came from two gifts-in-kind 1) ETAP Power Generation Software valued at $856,788 and, 2) a Linear Accelerator donated by Triangle University Nuclear Lab valued at $650,000. These two gifts were donated to the Departments of ECET and Physics/Astronomy respectively. Another cash/gift-in-kind combination went to the Department of ME/CIV and was donated by Wells Concrete and the PCI Foundation valued at a total of $80,000 to develop a precast concrete education program. The remaining balance consisted of cash and cash pledged totaling $335,605.

C. Opportunities

• In a year when each college was asked to return non-salary and equipment funding when possible to help defray the university budget deficit, the college sacrificed several significant projects such as the replacement of seating in Trafton C121 with Institutional Equipment/Furnishings funding of approximately $140,000 along with other long-standing requests. However, based upon the success of prior fundraising efforts and generous donations of gifts-in-kind, the college was able to benefit from the MnSCU Leveraged Equipment Matching Program for a total exceeding $450,000. These funds were used to purchase additional equipment for the Departments of Integrated Engineering, Automotive and Manufacturing Engineering, Construction Management, Electrical and Computer Engineering and Technology, Biology, and Mechanical and Civil Engineering.

D. Students funded

• Funding for student travel is provided by the college for both undergraduate and graduate students to present at national conferences and professional meetings. The college provided funding for over 20 CSET students to travel to the National Conference on Undergraduate Research, this year held in Spokane, Washington. Our majors are successful recipients of Undergraduate Research Symposium grants and also participate in Posters on the Hill at the Capitol in St. Paul.
• Student groups also receive some financial assistance with regional competitions as part of their fundraising efforts. An example of regional competitions include for Civil engineering students the steel bridge competition, concrete canoe, big beam, and Robots for Relief.

• Many students are employed within departments as either work-study or student help. Other students are employed through other initiatives/opportunities such as the 20 CIS students funded through Project Maverick, the 10 funded through the FPX project, and 20 funded through Bureau 507. These students are paid hourly for their work, meantime gaining invaluable experience while solving ‘real world’ problems.

6. Challenges

• One of the major challenges the college faces with graduate education in the sciences and engineering is the relatively low graduate assistantship stipend. Departments feel that the low stipend limits pool of quality students. In addition, there are a number of graduate assistants coming into master’s programs that must have deficiencies removed, putting additional strain on undergraduate capacity. As a college, we have lobbied for an increase in the stipend over the past 10 years that the amount has been stagnant.

• Departments supporting service courses, particularly Biology, Chemistry and Geology, Mathematics and Statistics, and Physics and Astronomy are struggling to accommodate enrollment increases. In many areas our faculty to student ratio is the highest on campus and is causing tension within a ‘no new positions’ environment. Maintaining course quality and a positive student experience is a major challenge. This is one area where the graduate assistants can be a tremendous help, but as those numbers are falling in some critical areas, so is the support they provide to large sections with multiple laboratories/recitation sections.

• Space continues to be challenging across all departments. The demand for student/faculty research space and student project space persists. New faculty, those coming in to fill behind retirements, are asking for space and start-up funding during the interview and hiring process. We try to accommodate as much as we can, but with such limited potential, we have an almost impossible backlog of requests to fill. With the situation as it is, the college is hard pressed to give up space to other colleges. This is a university problem which hits our college hard because of the prevalence of research by our faculty.

7. Other

• The college has a long history of program accreditation within the engineering disciplines with the Accreditation Board for Engineering and Technology. The Mechanical and Civil Engineering programs received accreditation to 2018. A self-study was completed by the Twin Cities Engineering program and the initial site visit is planned for mid-fall. This year the Biochemistry BS program was awarded accreditation through ASBMB. Mathematics and Statistics programs and Biological Science programs
completed program review. The Chemistry BS program received the 2014-15 Pathways to Student Learning Award for their work in assessment and continuous improvement.

8. Research, Scholarship and Creative Achievement

- Six CSET faculty members received Faculty Research Grants, totaling nearly $30,000 towards projects involving students, industry and seeding grant applications. Four CSET faculty members received a total of $9,000 in Faculty Improvement Grants to travel to workshops, work with collaborators and develop new skills towards their teaching and scholarship. Impressively, a faculty member of the Department of Automotive and Manufacturing Engineering Technology was one of only four 2015-16 Presidential Teacher Scholar Fellowship awardees.

- The Department of Automotive and Manufacturing Engineering Technology’s Strategic Priority Funding Proposal “Develop a Certificate in Additive Manufacturing” was one of two such proposals to be approved for funding.

- Using a Request for Proposal (RFP) process, the college awarded 10 faculty members reassigned time for the upcoming AY15-16, while fourteen faculty members completed their projects awarded for AY14-15. These reassignments are for grant writing and research endeavors and require the awardee to produce measurable outcomes to be disseminated to the college and greater academic community. The funding for this project comes from the college portion of summer surplus supplemented with some additional funding coming from individual departments.

- Dr. Rebecca Bates of the Department of Integrated Engineering was selected as one of three 2015 Minnesota State University Mankato Distinguish Faculty Scholars.
APPENDIX FOR 2014-15 ANNUAL REPORT

MASTER LIST OF RESEARCH, SCHOLARSHIP, AND CREATIVE ACHIEVEMENT

(Faculty members listed in bold, students with *)

PUBLISHED ARTICLES

**Automotive and Manufacturing Engineering Technology**


**Biological Sciences**


Submitted Articles


Ruhland, CT and *Eatwell M.  The effects of ultraviolet radiation on the brown midrib mutants of Zea mays and Sorghum bicolor.  Submitted to Agricultural and Forest Meteorology.

Chemistry and Geology


Mo en, RJ, Klein, JC, Thomas, DD. (2013). Electron paramagnetic resonance resolves effects of oxidative stress on muscle proteins, Exercise Sport Science Review.


Computer Information Science


Electrical and Computer Engineering and Technology


Integrated Engineering


**Other Journal Activity**


**Swanson, J. et al.** (2014).Measurement of solid particle concentration is aided by catalytic stripper technology. *Association for Aerosol Research, Gesellschaft für Aerosolforschung (GAeF) conference held in Karlsruhe, Germany, June 18-20, 2014.*

Ultrafine Particles – Air Quality and Climate Conference held in Brussels, Belgium, May 4th and 5th, 2015.

Mathematics and Statistics


Tung, C-C. “On Wirtinger derivations of currents and conditions for weak holomorphy ”, 21pp (submitted).


**Mechanical and Civil Engineering**


**Physics and Astronomy**


PUBLISHED BOOKS

Biological Sciences

Mercurio, Steven, Textbook: Biological Toxicology, Jones & Bartlett publishers. Accepted and due for release in late July.


Electrical and Computer Engineering and Technology


Mathematics and Statistics

CHAPITERS IN BOOKS


PRESENTATIONS

Automotive and Manufacturing Engineering Technology


Biological Sciences


Chemistry and Geology


Computer Information Science


**Veltsos, C.** (Jan 28, 2015). Supply chain risks in the global marketplace. Logistics and Transportation Course (MET426/526). Minnesota State University, Mankato, MN.


Construction Management


Integrated Engineering


**Bates, R.** (February 2015) Enabling student academic engagement in higher ed: The role of belonging and community. MSU Center for Excellence in Teaching and Learning Scholars at Work Session, Mankato, MN.


J. Swanson et al., (May 2015) Characterization of airflow patterns downstream of plated filters using the PIV system. 47th Center for Filtration Research Review Meeting, Minneapolis, MN.


Mathematics and Statistics

Ford, J. and Sturm, F. (June 21, 2014) IBL teaching methods in an advanced class on Vietoris homology, Legacy of R.L. Moore Conference, Denver, CO.

Kim, I-J. (April 25, 2014) Eventual positive and data analysis. North Central Section of the MAA Spring Meeting.


Zhao, R. (June/July 2015). is being invited to give a presentation in a mini-symposium at the annual meeting of Society of Mathematical Biology, Atlanta, GA.

Zhao, R. is being invited to give a presentation in the International Symposium on Application of Nonlinear Partial Differential Equations in Life Science, Tianjin, China, August 4-7, 2015.

**Mechanical and Civil Engineering**


**Physics and Astronomy**

**Dall’Asen, A.** (April 2015) Structural and compositional characterization of carbonaceous meteorites for clues to planet formation. APS Meeting.

Palma, R. (November 2014). Relics of the early solar system: Comets and interplanetary dust. Department of Physics Colloquium, Gustavus Adolphus College, St. Peter, MN.

Palma, R. (March 2015) NASA’s stardust mission and the connection to interplanetary dust particles. Texas State University, San Marcos, TX.


Four faculty in the department gave research seminars as part of our speaker exchange program (R. Palma, T. Brown, A. Roberts, A. Dall'Asén) to four different colleges in the surrounding area.

EXHIBITIONS

Automotive and Manufacturing Engineering Technology


OUTREACH or PRODUCTIONS STAGED or COVERAGE IN THE MEDIA

Automotive and Manufacturing Engineering Technology

Dr. Harry Petersen arranged and coordinated the SME and APICS-sponsored presentation “Innovation- a survival issue” by Geoffrey Nicholson, former Vice President of 3M, presented in Ostrander Auditorium Tuesday, April 14.

Integrated Engineering

Dr. Jacob Swanson was featured in “Why rush hour air can hurt your health.” FOX 9 TV broadcast, 29 January 2015. http://www.myfoxtwincities.com/story/27977926/investigators-why-rush-hour-air-can-hurt-your-health

Mechanical and Civil Engineering


PCI Journal Fall 2014: “Minnesota State University adds precast concrete educational projects”.


KEYC-TV September 30, 2014. Minnesota State University at Mankato receives PCI Foundation Grant.

Physics and Astronomy

S. Kipp and P. Eskridge run the Institutional Diversity 2014 Summer Camp in STEM. About 40 middle school students were in the observatories on the evening of July 30.

T. Brown gave a 3-hour workshop to Blue Skunk’s Club for children in the age group of 8-13. They did several small projects in the workshop.

The department gave its Special Physics Award to the best physics project in the regional junior and senior high school Science Fair.

The department held 13 physics research seminars this year. 9 of the 13 talks were given by invited speakers from other universities or industry. One was given by the staff from the Memorial Library, and 3 were given by the faculty in the department.
Strategic Goals and Implementation Recommendations
MISSION

As educational leaders in science, technology, engineering, and mathematics (STEM), our accessible faculty advances student scholarship through innovative teaching, research expertise, and the exploration of new technologies and ideas. We prepare our students for professional careers and advanced study while connecting with local, regional and global communities.

VISION

We strive to provide a mentored educational experience to every student in our college; develop the most qualified engineers, scientists and STEM teachers; and establish our college as the preferred Master's degree provider in Minnesota.
2012-2017 STRATEGIC GOALS

SOLUTIONS

Promote quantitative, technological and analytical solutions that focus on regional issues with global connections.

TEACHING

Transform Teaching and Learning by encouraging advanced, engaging teaching methods, classrooms and laboratories guided by effective assessment of student learning.

EXPLORATION

Explore and Enrich new and existing programs and scholarly initiatives.

MENTORSHIP

Provide a mentored educational experience to every student in the college.
IMPLEMENTATION PLAN: GLOBAL ACTIONS

1. Faculty Reassigned Time
2. Prioritization for Resource Allocation
3. Reporting/Assessment
4. Publicity/Marketing/Recruitment
5. Advising/Mentoring/Professional Development
6. IFO Committees/University Policy
7. Outreach
8. Interdepartmental/Unit Communication

* Note: Specific actions were determined from the Strategic Goals (Solutions, Teaching, Exploration, Mentorship) and subsequently consolidated to form the global actions. See Implementation Plan for the mapping of each action to its strategic goal and global action.