WT 125 Generational Plan
Colleges and Responsibility Areas

Date
March 26, 2018

Area of Responsibility Name
School of Engineering, Computer Science, and Mathematics

Introduction
The School of Engineering, Computer Science, and Mathematics at West Texas A&M University is committed to the intellectual, professional, and social growth of students by providing an education grounded in unique problem solving, critical and creative thinking, multidisciplinary teamwork, and effective communication skills. The School prepares students to be professionally employed, serving the rapidly changing technological needs regionally and throughout the state, nation, and world while appreciating the social, economic and ethical issues encountered in a modern global society.

The School of ECSM is planning innovative strategies in the following theme groups: Community Colleges, Undergraduate Academics, Graduate Academics, and Intellectual Resources.

1. By 2035, the School of ECSM will have a four year program for high school students which results in them graduating with a MS in Engineering. They will complete their undergraduate engineering degree within the first two years of graduation from high school and then complete the MS degree within the last two years of the programs. This will allow students to take full advantage of the dual credit courses offered by CCs through their high school while also allowing for them to mature and develop for four years before entering the workforce.

2. By 2035, 100% of the students within the School of ECSM will be required to participate in an internship, study abroad, project-based international travel experience, or other human-based experiential learning.

3. The School of ECSM will strengthen the pipeline of students, including underrepresented minorities, into mathematics and engineering graduate programs. We are proposing a three-pronged approach for boosting graduate enrollment and degree advancement including the enhancement of the existing pipeline with Texas A&M University which allows students to progress through the Ph.D.

4. The School of ECSM will be a fundamental part of the information technology development at WTAMU through interdisciplinary projects, student research and design, faculty research, and K-12 education connections, specifically with respect to the Internet of Things (IoT) and Artificial Intelligence (AI).

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Theme Group Name
The Panhandle and Its Heart-The I-27 Corridor

Key Idea (1)
As a regional research university, we focus first on the research needs of the Panhandle region where solutions to our everyday problems are transferred to meet the needs of similar regions across the nation and world. This allows for the multiplication of the benefits from our research and resolution of the challenges and opportunities that characterize the region.

Key Idea (1)
The School of Engineering, Computer Science, and Mathematics serves as the research center and technology development leader for the panhandle region by creating solutions to local challenges that can be transferred nationally and internationally to similar regions.

Goal 1:
The School of ECSM will create new research in renewable energy, power, and water to specifically address local needs.

Action(s) 1.1:
We will invest in faculty research and development specific to these areas and hire with special attention to these foci.

Measurable Outcome(s) 1.1.1:
Faculty research will produce solutions to local needs through completed projects, published articles, and other quantitative deliverables.

Theme Group Name
Our Relationship to Community Colleges

Key Idea (1)
The School of ECSM values the relationships that we have worked to build and foster with community colleges (CCs) over the last decade. Our administration and faculty have worked closely with those at CCs to develop curriculum, advising pathways, continuation scholarship programs, and articulation agreements in efforts to help transition students from a 2- to 4-year institution. These efforts have resulted in a 30% transfer student population in the School of ECSM. The School will continue to foster these relationships and work to establish

additional relationships with CCs as outlined below. Please note that community college students will be defined as those transferring from a 2-year institution and/or those coming directly from high school with an associate degree or more than 30 hours of coursework completed.

The practice of high school students taking dual credit courses, which earns them both high school and college credit, is an established and growing practice in Texas. It is important for the university community to understand the concept, practice, value, importance, and economic advantage of dual credit courses for today's students and their parents, and to know how to best advise them on their academic choices. It is estimated that Dallas Independent School District will produce 2000 high school graduates with associate's degrees by 2019. By 2035, the School of ECSM will have a four year program for these high school students which results in them graduating with a MS in Engineering. They will complete their undergraduate engineering degree within the first two years of graduation from high school and then complete the MS degree within the last two years of the programs. This will allow students to take full advantage of the dual credit courses offered by CCs through their high school while also allowing for them to mature and develop for four years before entering the workforce.

Key Idea (1)
Community college relationships are critical to the future growth of The School of ECSM.

Goal 1:
Grow community college enrollment from 2-year institutions to be 50% of the undergraduate student population in ECSM by 2035.

Action(s) 1.1:
Continue to maintain healthy relationships with current partners at Amarillo College and South Plains College and incrementally grow this student population to 40%. This includes faculty visits, scholarship opportunities, active recruitment, and positive word-of-mouth advertising by experience of transfer students.

Measurable Outcome(s) 1.1.1:
Keep articulations agreements current, visit campuses at least once per semester, reach out to know transfer students in our programs.

Measurable Outcome(s) 1.1.2:
The School of ECSM is currently at 30% of the student population being transfers from AC and SPC with goals of 32% in 2020, 35% in 2025, 38% in 2030 and 40% in 2035.

Action(s) 2.1:
Develop relationships and articulations agreements with two additional community colleges.

Measurable Outcome(s) 2.2.1:
Increase enrollment of transfer students in undergraduate ECSM programs by 10% from new articulation agreements by 2035.

Goal 2:
Develop a novel degree program for students who graduate from high school with an associate degree from a CC. The program will consist of two years of undergraduate engineering or mathematics curriculum and two years of graduate-level work resulting in a MS in engineering or mathematics.

Action(s) 1.1:
Draft degree programs using existing articulation agreements with CCs. Work with ABET to ensure that these programs meet accreditation requirements.

Measurable Outcome(s) 1.1.1:
Degree programs in the catalog using this new model for 4 year engineering education.

Measurable Outcome(s) 1.1.2:
Degree programs in the catalog using this new model for 4 year mathematics education.

Theme Group Name
Undergraduate Academics

Key Idea (1)
The School of ECSM was heavily involved in the Undergraduate Academics theme group and as such, much of what we envision for undergraduate academics in ECSM in 2035 aligns with that report. Problem solving is the foundation of engineering, computer science, and mathematics. As such, The School of ECSM will support and involve students in as many experiential learning opportunities as possible. Along with innovative face-to-face experiential learning curriculum, the School must develop and utilize innovative experiential learning

pedagogies in distance education courses. The School of ECSM environment will support small group discussion, communication emphasizing courses that utilize innovative instructional strategies, course-embedded travel experiences both within the U.S. and abroad, and service learning and research experiences across the curriculum. By 2035, 100% of the students within the School of ECSM will be required to participate in an internship, study abroad, project-based international travel experience, or other human-based experiential learning.

Key Idea (1)
Engineering, computer science, and mathematics education must develop and utilize innovative experiential learning pedagogies in face-to-face and distance education courses.

Goal 1:
Expand unique educational travel experiences across the university curriculum to a level of each discipline or major offering a travel embedded course either within the U.S. or abroad once every two years, allowing all students the opportunity to participate.

Action(s) 1.1:
Increase the level of funding available for course travel experiences and develop these experiences within core and major specific courses. Example: A collaboration between Environmental and Civil Engineering and Wildlife Biology and History where students experience Glacier and Yellowstone National Parks, our newest and oldest National Parks, and see first-hand the on-going change in our national environmental policy.

Measurable Outcome(s) 1.1.1:
Number of embedded travel experiences within 3000 and 4000 level courses by discipline.
Number of embedded travel experiences within core level classes.
Student measures of critical thinking at the conclusion of the core and upon graduation.

Goal 2:
Expand the number of real-life experiential learning experiences within a more traditional theoretical classroom

Action(s) 1.1:
Increase the number of embedded experiential learning opportunities within 2000 through 4000 level courses. Example: In engineering, 3000 level discipline courses are

design courses where students put their theory into practice throughout the course. In Music, these opportunities are throughout the degree program.

Measurable Outcome(s) 1.1.1:
Number of embedded experiential learning opportunities within 3000 and 4000 level courses by discipline.
Number of embedded experiential learning opportunities within the core.
Student measures of critical thinking at the conclusion of the core and upon graduation.

Goal 3:
Increase opportunities for distance education in engineering, computer science, and mathematics while maintaining the problem-based learning fundamental to the programs.

Action(s) 1.1:
Develop and utilize innovative experiential learning pedagogies in distance education courses, specifically with regard to engineering laboratory experiences.

Measurable Outcome(s) 1.1.1:
Online laboratory-based course offerings beginning in 2025. Entire curriculum offered through distance education including laboratories by 2035.

Theme Group Name
Graduate Academics

Key Idea (1)
In 2017, RAND Education, a unit of the RAND Corporation, evaluated the policies and strategic plans implemented by the state related to graduate education in Texas, such as the 60x30TX strategic plan. The results of this study signal to institutions the need to expand graduate education, specifically with regard to STEM fields. The study also highlights the underrepresentation of Hispanics in Texas graduate degree awards, and indicates the need for efforts to attract more domestic students and plans to increase the number of underrepresented students entering these graduate programs.

The School of ECSM will strengthen the pipeline of students, including underrepresented minorities, into mathematics and engineering graduate programs. We are proposing a three-pronged approach for boosting

graduate enrollment and degree advancement including the enhancement of the existing pipeline with Texas A&M University which allows students to progress through the Ph.D. More broadly, we will build the pipeline starting at earlier stages of education by increasing the numbers of Panhandle mathematics teachers enrolled in our graduate programs. By educating these teachers, we will have a direct impact on students due to increased mathematics offerings at the high school level, and an indirect impact on their current exposure to engineering and computer science fields as well as future opportunities for education.

Key Idea (1)
Graduate engineering and mathematics education creates a more skilled workforce and spurs innovation for the Texas panhandle and beyond.

Goal 1:
The School of ECSM at WTAMU will increase graduate enrollment in the MS in Engineering to be 20% of the undergraduate enrollment by 2035.

Action(s) 1.1:
Develop a degree plan for students interested in graduate study where upper-level engineering electives can be stacked graduate classes thus creating an internal articulation agreement from the undergraduate to the graduate degree.

Measurable Outcome(s) 1.1.1:
Enrollment (as a percentage of undergraduate engineering programs) will be at 5% by 2020, 10% by 2025, 15% by 2030, and 20% by 2035.

Action(s) 1.2:
Create a scholarship program for underrepresented groups transitioning from the undergraduate to the graduate program.

Measurable Outcome(s) 1.2.1:
Female and Hispanic enrollment in graduate program is comparable to undergraduate program.

Goal 2:
The School of ECSM at WTAMU will increase graduate enrollment in the MS in Mathematics by educating mathematics teachers representing 50% of the Texas Panhandle public schools.

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Action(s) 1.1:
Targeted recruiting of high school mathematics teachers.

Measurable Outcome(s) 1.1.1:
Dean/Associate Dean contact with potential MS students in mathematics targeting junior highs and high schools with high numbers of underrepresented populations.

Action(s) 1.2:
Create and seek funding for secondary mathematics teacher scholarships for graduate school.

Measurable Outcome(s) 1.2.1:
Write proposals to NSF and other agencies to seek federal funding for a research-based scholarship program for mathematics teachers.

Goal 3:
The School of ECSM at WTAMU will increase double the number of students guaranteed acceptance and funding for Ph.D. studies in engineering at TAMU by 2035 with 30% of the students being domestic Hispanic.

Action(s) 1.1:
Students who enter the pipeline now produce research results and graduate with their degree within four years.

Measurable Outcome(s) 1.1.1:
Enrollment of students in TAMU Engineering Ph.D. programs from WTAMU.

Theme Group Name
Residential Education Experience

Key Idea (1)
Living Learning Communities
A best practice in the programming area of residential living is a concept called living/learning communities. Models for the program typically involve linking students through a major code, and having students in that

program share a living space. They all live in the same wing of a particular residence hall, with an upper-class peer leader also living and serving as a peer mentor for the group of students. This can be particularly useful for freshman students in their first 30 hours of an engineering, computer science, and mathematics program.

Key Idea (1)
Engineering, computer science, and mathematics students will be retained at higher rates from first to second semester of study by living in a learning community based on major code in a residence hall.

Goal 1:
Freshmen ECSM majors have the option to live in a specified residence hall based on their major code.

Action(s) 1.1:
ECSM will work with the residence hall director to create living/learning communities for students in their first 30 hours of our degree programs.

Measurable Outcome(s) 1.1.1:
How many students are self-selecting living in an ECSM learning community?

Measurable Outcome(s) 1.1.2:
How is freshman retention impacted from first to second semester?

Theme Group Name
Financial Resources

Key Idea (1)
Extramural research funding is critical for the funding of research and technology development.

Key Idea (1)
The School of ECSM must obtain external research funding to promote science and technology development in the panhandle region.

Goal 1:
Faculty members in the School of ECSM will obtain 25% of their 9 month salary through external research funding.

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Action(s) 1.1:
Faculty in ECSM must be submitting 2 major proposals per year which are vetted first through a proposal development team.

Measurable Outcome(s) 1.1.1:
How many proposals are submitted each year? Funded each year?

Theme Group Name
Intellectual Resources

Key Idea (1)
The current and next generation of students have always been connected to the world around them. Engineering, computer science, and mathematics are critical program areas for the development of future intellectual resources in information technology at WTAMU.

The industrial revolution sparked a wave of innovation that transformed our world. From the steam engine and automobile to radio communications, we are living in times of exponential change fueled by rapid advancements in technology and the internet, which just keeps getting faster and more ubiquitous. Industry 4.0 brought about disruptive innovation, cloud, the internet of things (IoT), and artificial intelligence, which will demand a new way of thinking. West Texas A&M University will need to develop an understanding of these concepts and begin to incorporate these technologies into classrooms, online learning platforms, mobile apps, the library, the business office, financial aid, and all across the campus where student services could be augmented with automation, artificial intelligence, virtual reality, and a deep level of personalization (WT125 Information Technology white paper, https://www.wtamu.edu/webres/File/About/White%20Papers/12_wt125_white_paper_information_technology.pdf)

The School of ECSM will be a fundamental part of the information technology development at WTAMU through interdisciplinary projects, student research and design, faculty research, and K-12 education connections, specifically with respect to the Internet of Things (IoT) and Artificial Intelligence (AI).

Key Idea (1)
The School of Computer Science and Engineering has been building IoT air quality sensors using open source technology for Texas A&M Agrilife Research in Amarillo to measure background concentrations

of gases, particles, and bioaerosols at feed yards. There is an opportunity to introduce technology into many applications in agricultural research.

Goal 1:
Faculty members in the School of ECSM will develop a working relationship with Agrilife for research and development of new IoT technologies that impact the panhandle region.

Action(s) 1.1:
Graduate students in ECSM conduct IoT and AI research with Agrilife.

Measurable Outcome(s) 1.1.1:
How many graduate students are studying engineering and conducting research in IoT and AI?

Theme Group Name
Human Capital

Key Idea (1)

Key Idea (1)
The School of ECSM will place an emphasis on diversity of faculty to include ethnicity, education, gender and ideas. We will create a positive culture for encouraging faculty and staff to pursue training, identify pathways for advancement, and develop family support.

Goal 1:
Build a diverse faculty in all programs in ECSM.

Action(s) 1.1:
Use diversity as a critical factor in the hiring process—focus specifically on female and Hispanic candidates as both are historically underrepresented in ECSM.

Measurable Outcome(s) 1.1.1:
Is our faculty diverse in ethnicity, education, gender, and ideas?

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Theme Group Name
Research and Infrastructure

Key Idea (1)
Research and innovation are fundamental and imperative processes in creating transformative technologies to meet the needs of the Panhandle, State, Nation, and world. The School of ECSM can be the hub for technology development in this region.

Key Idea (1)
The School of ECSM can be the hub for technology development in this region.

Goal 1:
Engineering, computer science, and mathematics faculty will conduct relevant research.

Action(s) 1.1:
Faculty will receive 2:2 loads to submit proposals and conduct research. They will teach one undergraduate and one graduate class per semester.

Measurable Outcome(s) 1.1.1:
Faculty will maintain this load based on productivity. How many proposals were submitted in this academic year? How many were funded? How many graduate students are actively funded by their external research dollars?

Theme Group Name
Leadership Governance and Organization

Key Idea (1)
Promote a common School culture that unifies all internal and external stakeholders through human-centered problem solving.

Key Idea (1)
The School of ECSM will foster a common School culture that unifies all internal and external stakeholders using the central theme of human-centered problem solving.

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Goal 1:
Utilize all senior-level capstone classes in ECSM program to develop a central theme of solving problems, creating designs, writing software, and building prototypes that are centered around human-based needs.

Action(s) 1.1:
Administrators and faculty must begin introducing this idea early in the curriculum and weaving it throughout degree plans.

Measurable Outcome(s) 1.1.1:
The measureable outcome is the number of human-centered design projects in ECSM capstone classes.

Appendices and Additional Facts and Analysis

No Information Submitted

References

http://www.thecb.state.tx.us/reports/PDF/9279.PDF?CFID=73506402&CFTOKEN=71045401