Campus or Unit:  Missouri University of Science and Technology
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Lever Summary:

The Office of Undergraduate Studies and the registrar are notified upon completion of the experiential learning opportunity. The completed learning will appear on the student’s academic record and the Missouri S&T degree audit. In fall 2016, seven students completed their significant experiential learning opportunity.

Experiential learning remains a top priority for the campus and the students. Two of the approved experiential activities are cooperative learning (co-ops) and internships. Undergraduate students gain valuable work experience on co-ops and earn on average $3,338 per month; graduate students earn $3,934 per month. In 2015-2016, 436 students participated in a co-op with 177 different employers. An additional 500 students participated in an internship with 270 employers in 37 states. These employer-focused experiential learning opportunities help develop students beyond the traditional classroom with hands-on skills, leadership enhancements, and improved communication. With 50 percent of our graduates remaining in Missouri, Missouri S&T provides a talented population ready to hit the ground running in the workforce.
Action 1.1.2: Incorporate experiential/service learning into the core curriculum in all degree programs at any level beginning in the freshman year

- The degree requirements for experiential learning applied to all students entering under the auspices of catalog year fall 2015. This standard also applies to students who change their program of study as listed under this current catalog.

- The approved definition of experiential learning is as follows: “Experiential learning at Missouri S&T refers to learning stimulated by a variety of structured activities that differ significantly from the traditional lecture format. Experiential learning activities are designed to require students to go beyond mastering basic skills and knowledge in the application of that material to problem solving challenges. These activities involve collaboration and reflective learning and allow students to learn in environments that align with their aptitudes.”

- The approved core principles of experiential learning are: 1) student centered rather than teacher centered; 2) active learning rather than passive learning; 3) application of learned principles to form realistic solutions to problems, issues, and challenges; and 4) reflection upon the learning experience.

- Missouri S&T has established experiential learning implementation guidelines: 1) activity must be university-sponsored or affiliated and the student must receive written approval of the activity from a faculty member or academic advisor; 2) the faculty member or advisor will ensure the activity is of significant duration, intensity, and rigor to demonstrate successful application of learned principles; 3) the focus must be on ‘learning by doing’ in a creative and innovative activity that falls outside of the realm of traditional lecture; and 4) a significant experiential learning activity will include a written summary reflection piece that documents the experience from the student perspective. This piece should be of a quality suitable for inclusion as an attachment to a co-curricular transcript or in an e-portfolio.

Action 1.1.3: Assign responsibilities associated with monitoring experiential learning activities and maintaining the reporting of those activities to the vice provost for undergraduate studies, who will regularly inform the executive director of strategy, planning and assessment on progress

- Monitoring experiential learning activities is an important aspect for demonstrating the campus commitment to its quality initiative under the Higher Learning Commission.

- The vice provost for undergraduate studies worked with student affairs and the registrar’s office to ensure a proper monitoring system was in place. The vice provost and the executive director of strategy, planning and assessment are in regular communication to ensure activities are properly documented.

- Undergraduate studies, student affairs, and enrollment management developed a catalog and evaluated all potential experiential learning opportunities in those divisions. This comprehensive cataloging is designed to promote experiential learning, in general, and can be utilized by faculty, staff, and students.

- Undergraduate studies prompts all academic departments each semester to submit a list of students in their major who have completed the experiential learning activity for graduation.
Action 1.1.5: Career Opportunities and Employer Relations (COER) will continue to explore internship and externship opportunities in the summer and inter-sessions as well as during semesters

- Career Opportunities and Employer Relations (COER) fall 2016 career fair results: 307 employers attended, including 32 first-time employers; 38 employers were hiring international students; 16 employers were hiring all majors; and 163 employers were from Missouri. Employers represented 32 states and 63 Fortune 500 employers attended (an increase of 34 percent over fall 2015). A total of 3,715 students attended the fair.
- There were 2,618 on-campus interviews during the fall career fair. 1,717 active jobs were posted, and 232 rooms were reserved the day following the career fair for additional interviews.
- The entire campus supported the career fair and this fall set a record with 170 volunteers.
- 32 new employers have been engaged to discuss experiential learning opportunities and eight potential employers were engaged for new internship and co-op opportunities.
- The spring career fair has 92 employers registered.
- 227 internship and 129 co-op positions were posted in Miner Jobs.
- 25 employers have been contacted to participate in the spring externship program over spring break.
- COER hosted trips for 35 students to visit MasterCard and Control Devices in St. Louis.
- In fall 2016, COER provided six “Need Experience” presentations on experiential learning opportunities that included “What Employers Want,” with 204 participants.
- Leadership and Cultural Programs (LCP): provided 13 “What Employers Want” and how to engage outside of the classroom presentations with 1,708 participants; and offered seven educational workshops on negotiation skills and marketing your leadership skills, 111 student participants.
- The Princeton Review ranked Missouri S&T career opportunities and employer relations 15th in the nation for career services.
- The dean of students created a new spring internship for an undergraduate psychology student.
- COER: hosted Boeing Tent Day engaging 70 Boeing employees in 21 campus events; hosted a suit drive, an alumni breakfast, and two simulator events on-site, with 2,070 students participating; hosted Garmin Tent Event with six Garmin employees in three campus events, 200 students; and hosted Union Pacific Tent Event engaging eight Union Pacific employees in four campus events with 1,200 students.

Action 1.1.6: Establish experiential opportunities through peer advising and mentoring

- COER: utilized two student mentors to facilitate 50 resume reviews for freshmen and sophomores; and selected three students for the St. Louis Regional Business Council mentoring program which connected students with St. Louis area executive mentors.
- LCP: utilized ten peer mentors to train on the emerging leaders program; created and trained five new Organizational Leaders’ peer mentors; hosted 17 students for peer mentoring; facilitated the senior Chancellor’s Leadership Academy (CLA) coordinators to organize the career fair coat and backpack check for 262 participants; assisted six CLA coordinators who organized six service projects; and assisted CLA members who organized the Trunk or Treat event which set a record with 600 trick or treaters, representing a 33 percent increase over the prior year.
- Leach Theatre leadership mentored 25 student workers and integrated a leadership transition process.
• Counseling, disability support, and student wellness: hired four new Peer Wellness Educators, three received training to become STEP UP! facilitators; and recruited 12 new Joe’s PEERS for a total of 21 student peers.
• Student life implemented Second Saturday of Service programs: facilitated projects at Kaleidoscope with 12 students; 24 students at Ozark Rivers Audubon Society; and 12 students at Presbyterian Manor.

**Action 1.1.7: Identify prospective donors to expand activities at the Kummer Student Design and Experiential Learning Center through increased giving and major gifts**

• The Kummer Student Design and Experiential Learning Center serves as the business incubator and support center for 14+ multi-disciplinary design teams which include: Advanced Aero Vehicle Group, Baja SAE, Chem E Car, Concrete Canoe, Drillbotics, Engineers Without Borders, Formula Electric, Formula SAE, HPER Rocket Team, Human Powered Vehicle, IGEM, Mars Rover, Multirotor Robot, Nuclear Science, Robotics, Solar Car, Solar House, and Steel Bridge.
• The center provides leadership, networking, and technical learning for over 600 students. The design center also provides strong levels of engagement with faculty, staff, businesses, and the community.
• Advancement has identified donors and prospects who will be approached for gifts in support of the center’s expansion.

**Action 1.1.8: Develop promotional materials to promote experiential learning to the community and to promote options for students**

• Experiential learning has been incorporated into the entire communication plan for recruiting undergraduate students. Experiential learning has been infused into the recruiting process: it is 1) in the promotional items mailed to over 100,000 prospective students early in the recruiting process; 2) utilized in the premier recruiting piece, Viewbook, which is mailed to 20,000 prospective students who have demonstrated interest; 3) featured in several emails which are a part of the recruiting plan; 4) featured in presentations which are given to Missouri high school counselors; 5) presented to out-of-state counselors during Counselor Visit Days at Missouri S&T; and 6) highlighted to prospective students and their families at all campus visits.
• The vice provost for undergraduate studies and the vice provost and dean for enrollment management performed on-campus forums to promote the understanding of the experiential learning requirement to currently enrolled students.
• The marketing and communications department has written stories, developed news releases, posted articles on the main website, and produced video.

**Action 1.1.9: Enhance the student employee training initiative through cross-campus collaboration supporting experiential learning**

• A committee was created to develop a training initiative for student employees. Formalized training began in fall 2016.
• In fall 2016, LCP: developed Catalyst Leadership Training, a nationally recognized full-day training from Leadershape, 23 peer mentors attended; and integrated the Five Exemplary Practices of Leadership into residence hall trainings, collaborating with the Corporate Development Council and student life.
Student affairs engaged 81 students in three different areas (communication, professionalism, and professional development) during three different sessions. Each session was delivered by faculty, staff, and peer mentors. A survey was conducted following the sessions and 87 percent agreed the program helped prepare them for working in a campus office.

**Action 1.1.10: Ensure diversity and inclusion themes are incorporated into experiential learning opportunities**

- LCP established methods to ensure diversity and inclusion themes are incorporated into leadership programs.
- The dean of students met with the Corporate Development Council (CDC) to discuss cultural awareness and sensitivity in the workplace. Feedback was requested from corporate partners for best practices.
- All 86 Miner Challenge participants participated in social justice training.
- A diversity learning session was provided to 10 student affairs staff.

**Action 1.1.11: Identify funding sources to expand study abroad programs and maintain services related to these programs**

- The College of Arts, Sciences, and Business collaborated with international and cultural affairs to develop a Global Scholar Initiative Program to support the development of faculty-led programs abroad. The college contributed $12,500 to support four new study abroad programs (literature, economics, Spanish, and folklore) anchored by faculty; three of the new programs will launch in summer 2017.
### Lever Summary:

The Entrepreneurial Internship and Cooperative Education Program (EICP) is an innovative experiential learning program operated by Missouri S&T’s Office of Technology Transfer and Economic Development (TTED). The EICP is designed to encourage students to explore and consider entrepreneurship as a career option. Students learn key entrepreneurship skills including: problem solving in a business context, searching for a scalable business model, innovation, creativity, project management, and leadership skills.

The program is structured either as a summer internship or a fall semester co-op experience with milestone-based award payments. The milestones align with an entrepreneurial methodology which integrates the customer discovery phase as part of the customer developmental phase (lean start-up process). This methodology was articulated by Steven G. Blank with the jobs-to-be-done (JTBD) framework popularized by Harvard University’s Clayton Christenson and the outcome-driven innovation (OID) approach championed by Anthony Ulwick of Strategyn, LLC. TTED provides funding to students which are competitive with salaries they could earn at internships or co-ops with traditional employers. This funding allows EICP participants to pursue an entrepreneurial endeavor on a full-time basis for up to four months under the guidance of TTED staff and professional mentors.

EICP is a form of experiential learning because it prepares students “for” entrepreneurship as opposed to just teaching students “about” entrepreneurship. The experience also provides participants with practical, real-world opportunities to enhance their innovation, project management, and leadership skills in a way that is demonstrable to potential employers and investors. It also mitigates the opportunity costs that prevent many students from seriously exploring entrepreneurship while in college. Since it was first launched in 2014, EICP has provided almost $180,000 in cumulative funding to allow 12 students the chance to develop innovative new products and services, and pursue the launch of new business venture.
Action 1.2.1: Create and promote an innovation team that solicits and considers creative suggestions from Missouri S&T family; empower owners for implementation. Create a small fund to implement several each year

- In order to solicit suggestions from the entire campus, an innovation proposal form has been developed and launched on the innovation website, innovate.mst.edu. This proposal form remains on the website to allow for ongoing suggestions from the Missouri S&T family. Proposals focus on a description of the innovative idea, the owners for implementation, expected outcomes, estimated budget, and the proposal's connection to the Missouri S&T strategic plan.
- A communication plan was implemented for the Innovation Team. This plan included development of social media outreach via Facebook and Twitter. Information posters were placed in each building on campus for increased awareness.
- All recipients of innovation funding submitted outcomes/results and an Innovation Outcomes flyer was developed. The flyer demonstrated the impact to the campus and ultimately stimulated future innovation. This flyer was presented to the Board of Curators, Board of Trustees, alumni, prospective donors, and other campus constituencies. In fall 2016, an outcomes booklet was created to further highlight proposal outcomes.
- The Miner Tank was developed and implemented in fall 2015. The Miner Tank followed the format of the “shark tank” television program. Faculty, staff, and students submitted proposals, presented their ideas to the Miner Tank, and answered questions from the Innovation Team. The tank was an open forum and the campus community was invited to attend.
- In fall 2016, 16 innovation proposals were submitted and four were awarded. The submitted proposals were: Science Diplomacy Case-Study Database, Bisphosphonates and Bioactive Glass Research, Smart Drug Delivery Carrier for Cancer Chemotherapy, Miniature Greenhouse Platform, Innovative Learning Center, Online Learning System, Biodegradable RFID Chips, Global Village Course, Radioactive Nanomaterials for Cancer Treatment, Polymer-based Asymmetric Hollow Fiber Catalytic Membranes, Lab-grade DC Power Supply, Video Arcade System, Clean Energy Gym Generator, DIVO Joint, and Personal Mini-labs.
- Awarded fall 2016 innovation proposals were:
  - Gas separation with 3D printing - the aim of this project is to fabricate effective and robust adsorbent monoliths for use in gas separation processes by using 3D-printing technique. With numerous advantages offered by 3D printing, this technique could be utilized to fabricate novel monolithic adsorbents with controllable channel size, wall thickness, and cross-sectional shapes. Most importantly, the mechanical strength of the 3D-printed adsorbents is expected to be higher than that of conventional beads or pellets. The researchers recently fabricated zeolite monoliths and tested their adsorptive performance for removing carbon dioxide from indoor environments. The results were very encouraging, thus confirming the innovative approach taken for addressing the scalability issue of adsorbents. This work could provide the foundation for 3D printing of other efficient solid adsorbents like MOFs, graphene, etc.
  - Radioactive nanomaterials for cancer treatment - this proposal integrates facilities and creates protocols for in-vivo mice studies of radioactive nanomaterials for cancer treatment. The facilities needed to be integrated with a newly created mouse colony (biology department), radioactive nanoparticle production (nuclear research reactor), and detection and visualization of radioactive chemicals in mice (nuclear engineering). The new integrated
facilities will provide the capability to test radionuclides (and combination radionuclides) made in-house for cancer treatment. The new facility provides a strategic advantage that will be used to submit future proposals for exploratory new treatments to the National Institutes of Health (NIH) in collaboration with Washington University. The treatments may include radioactive multicomponent nanoparticles (acute and chronic exposure), capture therapy with boron nanoparticles, or biological pathways of functionalized nanostructures.

- DIVO joint - robotics are becoming more and more prevalent in today's world. In order for institutions to keep up and contribute to this vast field of robotics, it is crucial that robotics as a field becomes more accessible to the average person. Most robotic systems require more than one degree of freedom, often the ones implementing these systems fail to develop a cost effective solution to the system they are trying create. Currently, there is no such device as a “two axis servo.” The DIVO (Differential Servo) joint is a simple two axis servo that radically reduces the complexity required to make any type of robotic system. DIVO simply makes it easy to create complex mechanical motion systems (robotic arms, robotic snakes, multi jointed systems, and general robotics applications).

- Video Arcade System - this charity arcade system is based off the one utilized at Stockholm Arlanda Airport and Göteborg Landvetter Airport. Like its predecessors, the system will host a number of games that individuals can pick from and spend their pocket change. The money will then be donated to a local charity. This design is superior to both its predecessors because it will be of the cocktail variety and allow for more than one person (four in the design) to play, therefore allowing more money to be donated. This proposal's best ability is to strengthen ties with our community while allowing students to relax by playing video games.

Fiscal Year 2016- Awarded Innovation Proposal Outcomes:
(The proposal outcomes were collected in December of 2016)

Portable Sampling Kit for Trace Metals Associated with Breast Cancer
Innovation funding assisted in development of the “P-scan,” a fast, point-of-care method for checking urine samples for biomarkers of the protein pteridine. Dr. Yinfa Ma’s research shows that higher levels of certain pteridine metabolites occur in urine samples from women who have been diagnosed with breast cancer. Ma hopes his invention will soon replace – or at least supplement – the mammogram for early detection of breast cancer.

The P-scan works by passing the urine through a small tube and detecting the fluorescence given off by the pteridine biomarkers. The advantage of this technique is that it delivers excellent sensitivity without the need for costly instrumentation. The P-Scan can detect over 70 unique compounds in urine, many of which Ma believes may also be indicators of specific cancers, which he hopes to study in future clinical trials. Ma’s research suggests that two of these pteridine metabolites – isoxanthopterin and xanthopterin – are present in elevated levels in the urine of women with newly diagnosed breast cancer.

New clinical trials are under way at Missouri S&T to verify these findings and to test whether pteridine biomarkers can be used to detect other types of cancers. In February 2016, Missouri S&T entered into an agreement with Cancer.im, Inc. to commercialize the P-scan.
Solar Village Living Lab
This interdisciplinary endeavor entails close collaboration among faculty members from the departments of English and technical communication and electrical and computer engineering. The research combines technology diffusion theory, ethnographic research methods, and power management technology into a more comprehensive view of how people use power and how their attitudes and beliefs about power management affect their willingness to accept new technologies. This data can be better used to track human power consumption behavior. This study will be a start in determining what those behavioral patterns and tolerances are and help establish Missouri S&T as a leader in human factors smart grid research. Sensor equipment has been installed in the 2013 solar house which began the team’s research initiative.

KMST Student News Group
KMST implemented processes and standards for training students on interview skills, radio feature recording, and production. Features have been produced and aired on KMST on topics including Project Lead the Way, cutting edge power systems, and graduate research. KMST is working with the technical writing faculty in English and technical communication’s to begin a process of transcribing the recordings and editing the spoken content for the web and social media.

University Innovation Fellows - Stanford Meet-Up
As a result of funding from the Innovation Team, five students attended the University Innovation Fellows (UIF) training at Stanford and applied lessons learned as members of the 2015-16 class of University Innovation Fellows at Missouri S&T. UIF is a program run by Stanford and the National Science Foundation that trains student leaders in innovation and entrepreneurship (I&E) who, with their training, create new clubs, programs, academic opportunities and entrepreneurial spinouts on their campuses to help grow their I&E ecosystem. This meet-up offered students the opportunity to meet with Fellows from over a hundred other colleges across the country to discuss their ideas and collaborate on improving our respective campuses.

Multifunctional Magnetic Nanomaterials for Early Detection and Treatment of Cancer
The minimum volume of cancer cells that can be accurately analyzed for tumor type and measured to determine tumor stage is inversely related to magnetic resonance sensitivity. With the innovation funds, an acupuncture-MRI probe was invented and developed which increases the sensitivity of MRI/MRS signals by three orders of magnitude, and thereby reduces the volume of the cancer cells that can be accurately diagnosed from approximately one cubic centimeter to one cubic millimeter.

Opening Week Workshop: Igniting Innovation
Twenty-one students participated in the opening week workshop and learned about topics such as the Business Model Canvas and Design Thinking Process. The workshop’s main project challenged students to identify a problem with the Missouri S&T campus or any college campuses in general, find a solution for that problem, and pitch a created product or service to a panel of judges at the end of the week. Judges for Igniting Innovation included: Dr. Dennis Goodman (medical director), Malcolm Townes (associate director of tech transfer and economic development), Keith Strassner (director of tech transfer and economic development), and Michael Davis (associate professor of economics).
Safe Drug Delivery System
The S. Barua research team at Missouri S&T developed a new drug delivery system by depositing a thin layer of bioresponsive polymer coating on drug nanoparticles for the treatment of breast cancer. The nanoparticles are made of an anti-cancer drug camptothecin (CPT) with a pH sensitive protective layer of poly (ε-caprolactone) (PCL) polymer. The polymer layer degrades at lower pH of 6 as it is seen in the breast cancer microenvironment than that (pH 7.4) of blood. Breast cancer cells are targeted by conjugating trastuzumab (TTZ) antibody with the surface of PCL-coated CPT nanoparticles that are taken up inside the cells by active endocytic mechanisms. Finally, CPT-PCL-TTZ nanoparticles have been shown to inhibit breast cancer cell growth by 60 percent in BT-474 and MDA-MB-231 breast cancer cells. Research has been published.

Smart Tools for Cognitive Health Assessment and Care
The Smart Chair is in use at Phelps County Regional Medical Center (PCRMC) for pilot studies with real patients of cognitive health. The research team is working with Missouri S&T and PCRMC for patent filing based on the outcomes from the Smart Chair project. The wearable casing is 3D printed in the Missouri S&T library printing facility and the latest version of the wearable device is smaller than initial design. The team presented research to the US Army from Fort Leonard Wood at its facility in June 2016. The military is currently working with Missouri S&T to utilize the wearable device for analyzing heart rates to enhance shooter accuracy.

Heartland Synthetic Biology Consortium
Innovation funds brought together multiple constituencies to learn about and discuss synthetic biology. The forum consisted of several events for a 3-day BioBuilder Workshop to learn how to teach high school students about synthetic biology. The event brought together 40 people (students, staff, faculty, and community members) to work through a case study and discuss the ethics of using synthetic biology to fight mosquito borne illnesses. iGEM members from around the region held a meet-up event during the forum which included presentations by each team, social activities, team building, and a public event for children in the community to participate in hands-on science activities.

IDE Maker Spaces
The Maker Space provides a place for students and other members of the university community to design and build personal projects. Equipment in the space includes a stereolithographic 3D printer, a CNC router, an electronics lab, and general shop space. The space is located in the basement of the IDE building and incorporates several existing shop spaces into one inclusive manufacturing environment. Innovation seed funding for developing the maker space enabled Missouri S&T to expand opportunities for self-directed projects, while also strengthening the university’s NSF I-Corps site program to apply university research for social and economic impact. Currently, Missouri S&T has trained 15 I-Corps teams and uses the newly formed maker space for product prototypes. The university is further developing collision spaces, maker spaces in residential colleges, and ideation spaces. Missouri S&T secured funds from the Missouri Technology Corporation to expand the I-Corps program to train teams throughout the state. The university trained instructors from the University of Missouri-Columbia, the University of Missouri-Kansas City, and Truman State. This foundation has positioned Missouri S&T as a leader in seeking status as an I-Corps Node, which is designed to support regional needs for innovation education, infrastructure and research in collaborate with other universities within the UM System and the region. Missouri S&T participates in a national innovation ecosystem that further enhances the development of technologies, products and processes that benefit society. The primary focus of the program is to: 1) identify, develop and support promising ideas that can
generate value; 2) create and implement tools and resources that enhance our nation’s innovation capacity; 3) gather, analyze, evaluate and utilize the data and insight resulting from the experiences of the I-Corps teams; and 4) share and leverage effective innovation.

Innovation in Education Grants
Four Innovation in Education grants have been awarded to Missouri S&T faculty for 2016-2017 as part of a new grant program funded by the Innovation Team and administered through CERTI. The program seeks to infuse one or more of the following skill sets into undergraduate student curriculum: creativity, entrepreneurship, leadership, innovation, or design thinking.

The funded grants were:
• “Bringing Entrepreneurial Thinking and Innovation to a Senior Design Course,” Mihail Cutitaru, assistant teaching professor, electrical and computer engineering, $4,250.
• “Redesigning the Global Village as a Three-Credit Faculty-Led Study Abroad Program,” Audra Merfeld-Langston, department chair and associate professor, arts, languages and philosophy, $5,000.
• “Improvement of Teaching Effectiveness by Active and Cooperative Learning,” Mingzhen Wei, assistant professor, geosciences and geological and petroleum engineering, $4,810.
• “Introducing Design Thinking Into a Biological Design and Innovation Course,” David Westenberg, associate professor, biological sciences, $5,000.

Borate Bioglass and Mesenchymal Stem Cells
The goal of this proposal is to take a pre-existing Missouri S&T product (borate bioglass) and increase its clinical market by combining it with adipose stem cells. This project has brought faculty and student researchers from both colleges at Missouri S&T together with local clinicians. One of the exciting aspects of this project is the ability to acquire adipose stem cells from the local diabetic population. Research is ongoing.

Designing Fuel Cell Flow Fields Using Bio-Inspired Designs
Prior to beginning this project and presenting to the Innovation Team, the research team had a set of bio-inspired fuel cell flow field designs that were computationally and experimentally shown to improve the performance of fuel cells when compared with industry-standard designs. The main outcome of this six-month project was the development of commercial-scale flow field designs. Previous designs were at the laboratory scale, about 25 sq. cm. The team developed fuel cell flow field designs for an active area around 600 sq. cm, representing a big step towards commercialization. These designs still embody the core features of the laboratory-scale designs. In addition, the parasitic losses have been greatly reduced and the design complexity has also been reduced meaning these designs would be easier to manufacture. The team is continuing to take steps towards commercialization, which includes further studies, publications, seeking additional funding and industry partners, and managing intellectual property issues.

Mars Rover Design Team: Miniature Rover Platform
The miniature rover platform was used in the 2016 spring and fall semesters as a project for new design team members. Students successfully created and drove an operating miniature rover by the end of the spring semester. The miniature platform allows students rover experience on a scaled down model before contributing on the full-scale rover.
Mars Rover Design Team: Sample Bay
The team created an all-new sample bay containing options for collecting six sample tubes, repaired the Raman-Fluorescence spectrometer, and used a new and innovative technique of embedding the pH and soil sensors into the drill sheath. All of these aspects allowed for more accurate data readings and resulted in the Mars Rover team taking 1st place in the Phobos Division of the University Rover Challenge. In addition, the group received the John Berenka Science Award, given to the team with the most complete and thorough approach to the sample return task.

Miner Multi Media (MMM): Marketing Video
Innovation funding enabled MMM to acquire video equipment and create a variety of projects to benefit the campus community. Members filmed campus events such as Greek Sing 2016 and designed a promotional video for student affairs. Additional projects are ongoing.

Electric Tractive System for Multi-motor Applications
Funding is being used on two projects: 1) the electric tractive system, electrical design has been completed and is under review; and 2) the motor dynamometer in E3 Commons, which was completed thanks to a partnership with the mechanical and aerospace engineering department and the Formula Electric design team. It will be available for use in the spring 2017 semester when software integration is complete.

Acupuncture Magnetic Resonance Imaging for Skin Cancer Detection
The acupuncture MRI probe will afford enhanced sensitivity to detect early-stage disease and provide a high-resolution radial profile of the diseased skin tissue. While the innovative MRI probe is mildly invasive, it offers the advantages of very high sensitivity and specificity, as well as quiet operation. Research and development is ongoing.

Action 1.2.2: Implement a Learning Commons with state-of-the-art collaborative technology, practice presentation rooms, experimental technology lab with video editing and 3D printing capability for teaching, learning and research

- During the fall 2016 semester, the transformation of the library into a collaborative learning and community space continued.
- Architectural plans to re-configure spaces were completed. A kick-off construction phase commenced in December 2016 to rebuild four study rooms on the third floor.
- An Art in the Library program commenced, with a highly successful juried student art exhibit during the fall semester.
During July – November, 2016, there were 231,089 entrances to the library, a record (and a 6 percent increase over the same time the previous year).

Increased interactions with the Missouri S&T community over the same period in FY16:

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<th>Service Desk checks-outs (books, media, laptops, reserves, keys, tools)</th>
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The Learning Commons has undergone physical transformations in the multi-media center with four high performance CAD 3D graphic work stations, a 3D scanner, a Nonavitra visualization wall, additional quick print stations, co-lab spaces, enhanced presentation rooms, and a dining option.

**Action 1.2.3: Devise a plan for TedX-like series for students, faculty and staff (e.g., experiential learning activities, professional development)**

- Many departments on campus utilize TedX video series installations for professional development.
- Human resources has developed a TedX professional series to be launched in spring 2017.

**Action 1.2.3 a: Council of Graduate Students will host Ted Talk-style inspirational lectures to showcase ideas and “ignite” the campus and Rolla community**

- The Council of Graduate Students hosted its annual seminar series displaying 6-12 minute talks from faculty, staff, students, and community members designed to inspire and ignite the community. In fall 2016, a total of nine presentations were delivered with 90 attendees.

**Action 1.2.4: Encourage entrepreneurship in the campus community through entrepreneurship courses to feed the campus business “incubator” including interdisciplinary coursework that attracts creative students who want to make a difference**

- The Technology Development Center (TDC), located at Innovation Park, houses 27 tenants including companies such as Boeing and Garmin, includes local companies, as well as Missouri S&T faculty and student start-ups. Smart Health Beacons, LLC, a university start-up is also housed in the park and is focused on commercializing technology related to smart health chairs and health monitoring sensors for patients suffering from dementia. The student incubator program currently has 11 teams and companies working to launch a wide variety of businesses. Student participants receive rent-free space as well as in-depth counseling and support from TDC staff.
- I-Corps entrepreneurial education program is based on the I-Corps curriculum with experiential, collaborative learning and uses Canvas with the Lean LaunchPad methodology. I-Corps objectives are to: enhance entrepreneurial activities and training experiences for undergraduate and graduate students; expand training opportunities available to post-doctoral researchers, students, faculty, and underrepresented groups; increase the number of teams entering the NSF I-Corps program and other programs; and transition more activities to commercialization. Teams are recruited from existing and new entrepreneurial student and faculty activities, course projects, research, and participants in local and regional venture competitions and entrepreneurship events.
Action 1.2.5: Identify a series of co-curricular opportunities (e.g. intersession or alternative spring break events) for interdisciplinary groups of students, faculty and/or staff focused on providing solutions for problem-solving, innovation or leadership and link to career readiness

- Miner Challenge will host its first summer break to Alaska through collaboration with university advancement and Missouri S&T alumni.
- 80 participants registered for six Miner Challenge trips over winter break. Spring break trips to Illinois, Texas and Mississippi are scheduled.
- The Miner Challenge cookie dough fundraiser increased sales by 140 percent with 964 containers sold, representing $6,700 in funds.
- Ten students participated in the first Alternative Weekend Break through a partnership with GateWay 180 in St. Louis, CDC Company, and MYNAH Technologies. An alumni also participated in the event.
- Student affairs developed plans to expand the Global Leaders Institute to a weekly, semester-long program.
- Student affairs collaborated with the National Society of Leadership and Success to extend invitations to 1,860 sophomores and juniors to engage in an ongoing leadership development program.
- Leadership and cultural programs provided 397 students with cultural competency programming as part of a co-curricular event.
- Five new students took part in the Graduate Leadership Development Program (GLDP). Funding of $10,000 per campus, per year, for three years is provided from the UM System.

Action 1.2.6: Continue developing minor and certificate programs (e.g. leadership, entrepreneurship, humanitarian engineering, and science and creativity)

- Foundations of Leadership has been submitted to Faculty Senate for approval. The director of leadership and cultural programs has been approved to teach the course.
- The new entrepreneurship minor began enrollment in fall 2014.
- The humanitarian engineering and science minor was completed in fall 2014.
- The new technical innovation and entrepreneurship minor was completed.
- The creativity minor is still under development.
- The Applied Innovation Minor (AIM), is under review in Faculty Senate.

Action 1.2.7: Encourage participation in cross-disciplinary or global experiences (e.g., arts and humanities experiences for engineering, science and business students, study abroad)

- In fall 2016, the College of Arts, Sciences, and Business partnered with student affairs to help develop new theme-based living and learning communities on campus, one is based on entrepreneurship and one is based on global culture.
Action 1.2.8: Identify ways in which graduate students’ research can be transformed into entrepreneurial application

- Graduate studies hosts the Three Minute Theses (3MT) competition to enhance recognition of graduate research.
- The Office of Technology Transfer and Economic Development continues to provide training and counseling to graduate students interested in launching their own venture. The services provided are: business plan development utilizing tools such as Lean Start-up and the Business Model Canvas, venture financing, and technology commercialization.
- Missouri S&T I-Corps program creates a replicable process to develop mindset and skills in students, post-doctoral students, and faculty that will build the capacity and resources needed to take an increased numbers of ideas, projects, and research concepts to commercialization.
- A makerspace for students to create prototypes of their entrepreneurial ideas and products has been created.
- The Entrepreneurs Workshop offered guidance to faculty, post-doctoral researchers, and graduate students on how to turn their ideas into successful businesses. The Entrepreneurs Workshop, an eight-session workshop, maximizes student research and increases the success rate of startup ventures.

Action 1.2.9: Encourage an environment that promotes student-staff interaction through research and/or entrepreneurship

- Student life staff participated in the Undergraduate Innovation Fellows forum.
- The dean of students engaged the College of Arts, Sciences, and Business to aid in development of a student affairs internship curriculum for the division.

Action 1.2.12: Develop student, faculty and staff affinity groups

- Student life has been working to identify existing Registered Student Organizations (RSOs) which may become natural affinity groups for all campus constituents.
- An African and African American women’s affinity group has been established.

Action 1.2.13: Infuse curriculum to enhance campus diversity and inclusion competencies

- Academic departments are collaborating with the diversity committee to analyze current courses with enhance competencies.
Lever Summary:

Promoting a multi-dimensional model of wellness encompasses the health and wellness of the campus community which remains of utmost importance at Missouri S&T. Our Student Health Services department provides excellent walk-in outpatient care services for students and responds as a campus community to emerging worldwide concerns. Most recently they responded to the emerging threat of the Zika virus by implementing a screening process for students who travel abroad and prepared for a potential Mumps outbreak through UM System collaboration to conduct staff training and issue notification to MMR waivered students. Remaining abreast of this and other disease updates are essential for an effective response.

A major achievement in regards to campus health and safety is the approval of a tobacco-free campus policy implemented in August. The health director was instrumental in bringing this policy to fruition following survey data that clearly indicated this was the desire of 80 percent of Missouri S&T students. Tobacco screening was obtained at each clinic visit, and cessation services were offered to tobacco users.

The acute care clinic continues to be heavily utilized with service delivery numbers exceeding national standards for same-size universities with approximately 6,065 appointments and 3,849 patients this fall (an increase of five percent over last fall). Specialty services most heavily utilized were the laboratory, immunization, allergy immunotherapy, tuberculosis surveillance, sexual transmitted disease clinics, and well-woman appointments. The fully-implemented electronic records system and patient portal have streamlined the documentation and care process.

The sports medicine clinic is available to all students and continues to be in high demand with approximately 16 percent of clinic visits being orthopedic or injury related, with 995 appointments. The athletic training team provided 5,866 treatments this fall. The sports medicine team continues to create innovative, data-driven programs that are leaders in the field of college health. The concussion program is one such program, receiving American College Health Association (ACHA) Best Practices award. In addition to health care, they provide health career mentoring, rotation, and volunteer opportunities for students to engage in experiential learning.
Student health services recently joined Global TravEpiNet, a national consortium of U.S. travel clinics to deliver enhanced medicine services. They recently appointed a Student Health Governing Body and are in the process of obtaining ambulatory care accreditation to ensure delivery of health services for students is state-of-the-art. Student health services continues to partner with college-specific healthcare organizations at local and national levels.

**Action 1.4.1: Identify, develop and implement professional development plans to enhance leadership, creativity, and innovation for the staff in each department or unit**

- The myPerformance tool remains a priority for the campus.
- Student affairs initiated a safety incentive program with service staff.
- Student affairs had two staff serve on the International Education Week panel focusing on the support and safety of international students with 34 student participants from 12 countries and five faculty participants.
- Counseling began UM system-wide planning for student focus groups for greater consistency and efficiencies across the system.
- The College of Arts, Sciences, and Business created opportunities for administrative assistants to identify professional strengths and develop strategies to maximize individual skills.
- Professional development for staff in the office of sponsored programs occurred with staff participating in the following trainings: Building a Foundation-Discrimination Prevention and Title IX; Conflict of Interest; Fiscal Officer Development Meeting; Freshman Faculty Forum-University of Missouri Research Board; Freshman Faculty Forum-Proposal Budgeting and Cost Sharing; Freshman Faculty Forum-Grant Award Management; ITAR-Best Practices - U.S. Department of Commerce; Make It Safe Training; Managing Interpersonal Conflict; NCURA-Financial Research Administration; NSF Proposal and Award Policies; Society for Technical Communications: Getting to Compliant - Responding RFPs for the Technical Writer; Society for Technical Communications: How is Writing Collaboratively Used to Our Advantage; Society for Technical Communications: What Technical Communicators Need to Know; Team Building; and Women in Leadership Conference.

**Action 1.4.2: Streamline and integrate professional development and leadership plans for students to enhance creativity and innovation**

- Implementation of the Residential Curriculum model has redefined how program education is conducted in the living communities. This included RAs shifting from a managing only program to hosting intentional conversations “Check-in-Chats” that resulted in RAs connecting more directly with their residents and being able to identify concerns at an earlier stage. The RAs conducted over 5,000 check-in-chats this fall that included topics on transitions, goal setting, roommate relations, career planning, privilege and identity, and the sophomore slump. All passive programming was aligned with the curriculum model and a rubric was designed for assessment of learning outcomes. The curriculum focuses on enhancing self-awareness, communicating across differences, and engagement in the living community.
- In fall 2016, COER implemented new Graduate Professional Development plans, provided to 529 graduate students; and distributed 4,669 Professional Development Plans to undergraduate students.
• COER engaged bi-weekly with graduate studies to create an ongoing collaborative program to introduce graduate students to a specialized career plan; and hosted a graduate student focus group to learn more about the needs of graduate students.
• COER: hosted a mini career fair during opening week; five student affairs units engaged 1,500 freshmen; presented and reviewed resumes for students in Hit the Ground Running; presented professional development seminars to 1,691 students; and facilitated an etiquette dinner to 90 participants.
• Leadership and cultural programs: provided 58 educational programming events for 762 students; engaged 68 students in nine educational hours on developing leadership skills and professionalism; redesigned the student program assistant position to ensure a higher-quality learning experience with professional development; provided a three-hour leadership workshop to 28 students; facilitated a two-hour workshop to 12 students from Oman; and utilized student feedback to redefine the emerging leaders certificate qualifications requiring students to develop personal participation goals and create a leadership development plan.
• Student life: hosted the Miner Challenge student leader day-long leadership retreat; and implemented a social justice training curriculum for trip leaders and participants.
• Chancellor’s Leadership Academy engaged 11 alumni and 68 students who participated in conflict resolution training.
• An AT&T representative provided a workshop on interviewing tips to 63 students.
• The College of Arts, Sciences, and Business dedicated $4,948 in funds for student to travel to conferences. The college continued professional development by launching several initiatives for staff which will continue throughout 2017. College faculty received $20,692 in funds for attending conferences and other professional activities. Several faculty were nominated to the University of Missouri Leadership Development Program.
• The College of Arts, Sciences, and Business created Undergraduate and Graduate Student Leadership Councils. These councils provide opportunities for members to assume leadership roles within the student body.

**Action 1.4.3: Integrate meaningful developmental experience designed to enhance students’ interpersonal, communication and leadership skills**

• COER engaged eight students in a St. Louis regional networking event, and facilitated Skype practice interviews.
• Leadership and cultural programs distributed 1,708 leadership plans and performed eight Foundations of Leadership workshops to 21 students.
• Student life hosted Greek Presidents Kick-off engaging leaders from 28 Greek chapters with 18 staff.

**Action 1.4.4: Promote a multi-dimensional model of wellness that incorporates a whole-person concept and encourages lifelong health**

• Student wellness promotes a multi-dimensional model of wellness through various strategies which are guided by research, theory, and best practices. Prevention is guided by five primary levels: 1) strengthen individual knowledge and skills (e.g. Safer Sex EDU, Alcohol screenings); 2) promote community education (e.g. social marketing, safe party planning); 3) educate providers (e.g. Joe’s
PEERs, STEP UP!); 4) foster coalitions and networks (e.g. UCARE, Partners in Prevention); and 5) change organizational practices (e.g. Tailgating Policy, Residential Life Alcohol Policy).

- Missouri S&T students are very active with 4,362 entries in intramural activities, engaging 1,689 students representing 549 teams.

- Counseling, disability support, and student wellness: revised collaborative service provisions with student health to enhance service delivery and to meet student needs; engaged the Missouri S&T police on collaborative response and after-hour services which resulted in new on-call protocols for professional staff; facilitated MBTI for 158 students; facilitated 289 student alcohol screenings; performed 325 consultations with students, staff, faculty, and parents; had 109 StressLess room visits of which 40 were new students; performed 1,133 counseling sessions with 367 clients; collaborated with student health on Project Hope which provides housing for homeless youth in Rolla; engaged PCRMC for psychiatric services to enhance the referral process following hospitalization; established a student emergency fund and application process to assist students with unexpected expenses of which $570 has been raised; presented what services are provided for students on campus to 156 faculty; 100 students engaged with World Suicide Prevention Day; engaged a masters class of 90 students on the types of counseling services offered; presented a test anxiety workshop to 75 students enrolled in calculus; provided six Tobacco Cessation sessions for students; facilitated 51 stress management trainings; hosted Mocktails Vegas Night engaging 200 students; and facilitated six Miner Well events.

- Residential life collaborated with the dean of students and counseling in revised protocols for responding to students of concern in residence halls.

- Employee assistance program provided services for 15 employees and engaged 141 employees on tobacco cessation at the Missouri S&T Wellness Fair.

- Disability support services: provided 2,412 accommodation letters for 343 students; facilitated the provision of 126 books in alternate format; facilitated 18 housing accommodations; facilitated one equity based university dining accommodation; completed 46 priority registrations; and provided consultations to 1,897 students, 634 staff, 175 faculty, 101 parents, and 132 constituents.

- Student health: completed appointments with 3,949 unique patients which represented a 5 percent increase over the previous fall semester; facilitated 5,866 athletic treatments, a two percent increase; provided 176 pre-participation physicals for athletes; facilitated 38 general physicals; provided 34 travel consultations; administered 563 flu shots; performed 73 well-woman appointments; completed 323 TB visits; and provided 137 hours of counseling, representing a 22 percent increase over the prior year.

- Student wellness engaged 1,470 students during the International Student Picnic.

**Action 1.4.5: Increase the percentage of on-campus graduate students who participate in one or more professional development activities**

- Technical editing for graduate students performed by graduate studies increased by 27 percent over the previous year.

- COER hosted an etiquette dinner for graduate students.

- Graduate studies began utilizing Starfish/S&T Connect in fall 2016. This software tracks student engagement with the office, advisors, and events related to professional development (examples of engagement are explained in Lever 4.5).

**Action 1.4.6: Create an interdisciplinary student leader certificate program**

- Eight students enrolled in the Foundations of Leadership course.
• Emerging Leaders Institute certificate program provided 23 workshops for 190 students; and the Emerging Leaders Institute certificate ceremony had 20 participants who earned certificates.
Lever Summary:

Below is a summary of the completed hires and searches in progress for the four signature areas.

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<th>Campus or Unit:</th>
<th>Missouri University of Science and Technology</th>
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</thead>
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<tr>
<td>Lever Number:</td>
<td>2.1</td>
</tr>
<tr>
<td>Lever Description:</td>
<td>Employ transformative and focused faculty hiring and retention, including cluster hires in select areas of expertise to support best-in-class (BIC) achievements</td>
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<td>Lever Metric:</td>
<td>Hire 12 faculty to support best-in-class signature areas Identify BIC signature areas</td>
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### Advanced Manufacturing
- T/TT Mechanical Engineering
- T/TT Electrical Engineering
- T/TT Search in progress

### Advanced Materials for Sustainable Infrastructure
- T/TT Materials Science and Engineering
- T/TT Civil Engineering
- T/TT Search in progress

### Enabling Materials for Extreme Environments
- T/TT Chemistry
- T/TT Physics
- T/TT Nuclear Engineering
- T/TT Search in progress

### Smart Living
- T/TT Psychological Science
- T/TT Psychological Science
- T/TT Search in progress

### Enabling Materials for Extreme Environments
- T/TT Search in progress

- Advanced Manufacturing has 98 applicants for three positions. The search committee will meet in February to conduct phone interviews.
- Enabling Materials for Sustainable Infrastructure has 43 applicants for two positions. Phone interviews will occur in February with on-campus interviews expected in March.
- Advanced Materials for Sustainable Infrastructure has 104 applicants. Cluster hires are expected in advanced construction polymer materials and chemicals; automation in
construction; and composite design for infrastructure. Phone interviews are scheduled in February with on-campus interviews expected in March.

- Smart Living is still collecting applications with a plan to review those in February.

**SIGNATURE AREA PILOT PROGRAM**

A two-year pilot program with the College of Arts, Sciences, and Business was implemented. This program was designed to engage faculty in a variety of disciplines with the signature areas. The program was an open call for proposals with $80,000 in non-recurring funding each year. A total of $120,000 has been awarded over the past two years. The projects engaged 46 undergraduate students and nine graduate students. Below are the current results of the pilot program.

**FUNDED PROJECTS:**

- **Objective Detection of Sleepiness Using Physiologic Measures**  
  *Signature Area: Smart Living*; PIs: Matthew Thimgan, biological sciences; Jennifer Leopold, computer science; Susan Murray, engineering management; and Amber Henslee, psychological science.

- **Synthesis of Robust Nanostructured Borides and Carbides for Smart Applications Under Extreme Environments**  
  *Signature Area: Enabling Materials for Extreme Environments*; PIs: Manashi Nath, Amitava Choudhury, and Pericles Stavropoulos, chemistry.

- **Statistical Tools for Developing and Testing Advanced Materials for Infrastructure and Extreme Environments**  
  *Signature Area: Advanced Materials for Sustainable Infrastructure*; PI: V. A. Samaranayake, mathematics and statistics.

- **3D Printing of Bone Using Bioactive Glass and Mesenchymal Stem Cells**  
  *Signature Area: Advanced Manufacturing*; PIs: Julie Semon, biological sciences; Ming Leu, mechanical engineering; and Delbert Day, ceramic engineering.

- **Synthesis and Applications of Nanostructured Ceramics under Extreme Environments**  
  *Signature Area: Enabling Materials for Extreme Environments*; PIs: Manashi Nath, Amitava Choudhury, and Pericles Stavropoulos, chemistry.

- **Economic Analysis of the MST Solar Village and Some Policy Recommendations**  
  *Signature Area: Smart Living*; PIs: Mahelet Fikru, Gregory Gelles and Ana M. Ichim, Economics; Jonathan Kimball and Maciej Zawodniok, electrical and computer engineering; and Joseph Smith, chemical and biochemical engineering.

- **Going with the Flow? Adapting to New Cultures and Technologies in Guatemala**  
  *Signature Area: Smart Living*; PIs: Audra Merfeld-Langston, arts, languages, and philosophy; Curt Elmore and Joe Guggenberger, geological engineering.
OUTCOMES:

- **External funding received: $183,229**
  U.S. Department of Education International Studies and Foreign Language program; grant to develop new minor in Latin American Studies for Technical Applications, funded for $93,229 in year one and $90,000 in year two; PI: Audra Merfeld-Langston; Co-PIs: Joe Guggenberger, Curt Elmore, Kathleen Sheppard, and Jorge Porcel.

- **Proposals currently under review with external agencies: $3.35M**
  - National Science Foundation $246,964 grant: Cultural Considerations Towards Renewable Energy Development in Rural Bolivia, under consideration; PI: Joe Guggenberger.
  - National Endowment for the Humanities $90,000 grant: Cultural Bridges: The Humanities and Engineering in Latin America; PI: Shannon Fogg; Co-PIs: Audra Merfeld-Langston, Kristine Swenson, Kathryn Northcut, Jorge Porcel, and Kathleen Sheppard.
  - NSF Biomedical Engineering Program $594,642 grant: Solvent Based Extrusion Fabrication Using Borate Glass and ASCs; PI: Ming Leu; and Co-PI: Julie Semon.
  - National Science Foundation Chemical Catalysis $504,634 grant: Understanding the Electrochemical Activity of Transition Metal Selenides for Water Oxidation; PI: Manashi Nath.
  - Department of Energy $857,887 grant: Enhanced Microgrid Resiliency through Improved Energy Management and Economic Optimization; PI: Joseph Smith; Co-PIs: Greg Gelles, Bruce McMillin, and Mahalet Fikru.
  - National Science Foundation Directorate of Computer and Information Science $617,234 grant: Smart-Village Testbed For Experiential Learning And Smart-Cities Research; PI: Maciej Zawodniok; Co-PIs: Sanjay Madria, Jonathan Kimball, and Mahalet Fikru.

ADDITIONAL PILOT PROGRAM OUTCOMES:

- Audra Merfeld-Langston completed 60 hours of intensive Spanish instruction, leading to improved communication with partner institutions in Nicaragua and Bolivia.
- Audra Merfeld-Langston and Co-PI Joe Guggenberger were awarded a Study Abroad Development Grant to develop a new faculty-led study abroad program in Nicaragua.
- Mahelet Fikru and team: built a system dynamics model to predict the energy generation by the solar village; developed a theoretical model to understand the determinants of reliance on cleaner energy; created a Microsoft Excel simulation tool to conduct economic analysis under different assumptions; and designed pedagogical exercises/handouts based on the methodology and data used in the project.
• Manashi Nath and team were the first to identify Ni3B as a catalyst for water oxidation (i.e. O2 evolution reaction).
• V.A. Samaranayake’s research provided valid experimental designs and analysis for an eco-efficient binder for infrastructure construction, an ultra-high performance concrete, and high-strength self-consolidating concrete.

Action 2.1.2: Develop and implement a process to transparently allocate all faculty positions to impact strategic plan and progress on unit performance measures

• The hiring table and hiring criteria have been updated to reflect alignment with the strategic plan.
• All positions were evaluated in conjunction with unit performance measures to strategically allocate faculty lines. The vacant lines and strategic allocations responsibility transferred from the provost to the vice provost and deans in fall 2016.
• A base plus benchmarking model was utilized for transparently allocating positions.

Action 2.1.3: Develop and implement a process to allocate faculty raises aligned with the strategic plan to address retention and reward high productivity

• In FY14, a new process for increasing bumps in pay from assistant to associate professor and associate to full professor was implemented. The increases for promotion to full professor were phased-in over three fiscal years, beginning at $4,000 in FY14 and ending at $10,000 in FY17. The increase for promotion to associate professor and the granting of tenure was phased-in over two fiscal years, beginning at $3,000 in FY14 and ending at $5,000 in FY16.
• The faculty hiring process has been redesigned to incorporate a new process to ensure the following: 1) all open positions are analyzed strategically and allocated appropriately; 2) the active recruiting process follows new guidelines for advertising and responsibilities for the hiring authority; 3) the selection process for both the candidate and the committee have been changed; and 4) the on-boarding process has changed the roles and responsibilities for both human resources and the hiring authority.

Action 2.1.4: Identify and pursue companies, foundations and individual donors for charitable gifts to hire two national academy stature faculty in endowed chair positions in strategic areas #1 and #2

• Companies and prospective donors have been identified and prioritized for solicitation. However, in 2016 the signature area faculty proposed hiring one senior and one junior faculty member for each faculty area in lieu of national academy stature faculty and the provost and chancellor approved and funded this request.

Action 2.1.5: Hire four faculty to complement each endowed chair hired under Action 2.1.4

• This action depends upon completion of Action 2.1.4.

Action 2.1.6: Identify and pursue companies, foundations and individual donors to fund start-up packages

• Companies and prospective donors have been identified and prioritized for solicitation.
• A new process was outlined by the provost and the vice chancellor for finance and administration on funding start-up packages.

**Action 2.1.8: Identify and pursue companies, foundations, and individual donors for charitable gifts to hire two national academy stature faculty in endowed chair positions in strategic areas #3 and #4**

• Companies and prospective donors have been identified and prioritized for solicitation. However, in 2016 the signature area faculty proposed hiring one senior and one junior faculty member for each faculty area in lieu of national academy stature faculty and the provost and chancellor approved and funded this request.

**Action 2.1.9: Hire four faculty to complement each endowed chair hired under action 2.1.8**

• This action depends upon completion of Action 2.1.8.
Lever Summary:

The foundation for establishing Missouri S&T as the technological research university for the state of Missouri lies in faculty research. The information below is not all of the research occurring on-campus, merely highlights of certain areas to demonstrate the vast array of research on campus.

Faculty Research Highlights:

- Missouri S&T researchers are working to extend the life of lithium-ion batteries like the ones that power many gadgets. Published in the journal Scientific Reports, Dr. Xinhua Liang, assistant professor of chemical and biochemical engineering at Missouri S&T, discusses his research on how to make those batteries more reliable and longer-lasting using a thin-film coating technique called atomic layer deposition (ALD). “Unlike current research practice that either covers the particles’ surface with insulating film or dopes the particles to improve the performance of the battery,” Liang says, “this ALD process combines the coating and doping processes into one, and applying this technique makes rechargeable lithium-ion batteries last longer.”

- Seeking cures for cancer and neurodegenerative diseases like ALS or Parkinson’s can be painstaking, time-consuming, and expensive. One Missouri S&T researcher hopes to take a data-driven approach to predict which potential drug therapies could one day lead to cures. “We use math and computational modeling as a tool to understand the mechanisms in cells, and we develop computational and mathematical models that make predictions about what will happen with different therapies,” says Dr. Dipak Barua, assistant professor of chemical and biochemical engineering. His work is funded by the U.S. Department of Energy.

- Electronic surveys are a popular tool for marketers to gather information from consumers — but they aren’t that effective, says Dr. Keng Siau. The professor and chair of business and information technology sees the wide array of tools developed to study the brain as instruments that could be employed by marketers. In research published in the Journal of Database Management, Siau reviewed several of these tools. He continues to conduct research on market research by employing one relatively low-cost method, the electroencephalogram, or EEG, in Missouri S&T’s Laboratory for Information Technology and Evaluation.
• Drs. Susan Murray and Matthew Thimgan wrote the book on how to prevent the next major human-related disaster. In *Human Fatigue Risk Management*, the co-authors discuss how a “fatigue risk management” system could prevent future loss of property and life. Murray, a professor of engineering management and interim chair of psychological science, is an expert on human factors. Thimgan, an assistant professor of biological sciences, conducts research in sleep biology, including studies of fruit flies that could lead to clues for treatment of Alzheimer’s patients.

• By laser-cooling atoms in his custom-built vacuum chamber and studying their movements, Dr. Daniel Fischer hopes to better understand how atoms and their components are affected and directed by environmental factors. The work has “both fundamental and technological relevance for the future,” says Fischer, an assistant professor of physics and National Science Foundation Early Career Development (CAREER) Award recipient. “For example, if you destroy a cancerous cell in a body, the destruction of the genetic material is not only driven by their direct absorption of radiation but also by the interaction with nearby molecules and surrounding liquids. By understanding how the atoms of these cells share the absorbed energy, we could better control localized treatments.”

• Emojis of the future could become three-dimensional images on your smartphone instead of the flat smiley faces. In research published in the journal ACS Nano, Drs. Xiaodong Yang and Jie Gao, both assistant professors of mechanical engineering, described their use of nanometer-scale metallic film to demonstrate “clean and vivid full-color holographic images with high resolution and low noise.” This work could result in 3D floating displays on our smartphones as well as 3D security marking onto credit cards.

• Electrical engineering researchers have developed a portable microwave 3D video camera that can be used for industrial inspection applications and security screening that might one day be used by first responders checking for the presence of explosives or other materials. “It’s like an airport scanner but much smaller,” says one of the researchers, Dr. Mohammad Tayeb Ghasr, assistant research professor. “It’s portable, so it can be used on-site wherever it is needed.”

• By studying how water flows through soil and rocks, Dr. Xiaoming He, an assistant professor of mathematics and statistics, is bringing new insight into how waterborne pollutants behave. “Liquids always find the easiest passage out of a pressurized field,” he says. “My work helps to predict its direction through a field of soil, rocks and fractures.” His simulations could apply in almost any field where understanding porous medium flow and free flow has an impact, such as gas and oil extraction and industrial filtration systems.

• A book by historian of the American west, Dr. Diana Ahmad, offers insight into the relationship between pioneers and animals, both wild and domestic, during the U.S. westward expansion of the mid-1800s. “Animals were a reminder of home for travelers,” says Ahmad, Curators’ Distinguished Teaching Professor of history and political science. “The chances of ever going back to where you came from were low, so if your domestic working animals – like horses or oxen – died, it was like losing a part of your immediate family and ‘former life.’” Her book, *Success Depends on the Animals*, was published.

• The metaphorical big dogs may seem to have all the advantages in life — but when it comes to life span, bigger may not always be better. That’s the finding of Dr. Chen Hou, who has developed a theoretical model to measure aging on the basis of energy expenditure. Hou’s research finds that growth carries a trade off with health maintenance, and concludes that previous research in the area is not as straightforward as once thought. “Past studies of metabolic rates have yielded conflicting results when comparing different species and introducing diet restrictions,” says Hou, an assistant professor of biological sciences. “My model shows that energy used during growth is the key to understanding longevity.”
Funding for a new University Transportation Center (UTC) at Missouri S&T could mean the end of traffic delays due to bridge or road repairs. “We plan to develop a robotic arm for both flying and climbing unmanned vehicles to inspect and maintain bridges and other transportation infrastructure,” says Dr. Genda Chen, the Robert W. Abbett Distinguished Chair in Civil Engineering and director of the new UTC, which is called Inspecting and Preserving Infrastructure through Robotic Exploration, or INSPIRE. “Once this technology is developed and in use, we will never need to close traffic for bridge or highway inspection and preservation.”

Water splitting — the process of separating water into its elements of oxygen and hydrogen — holds promise as a way to produce clean hydrogen fuel. But most approaches are too costly (because it requires precious metals like platinum) and inefficient. Dr. Manashi Nath, associate professor of chemistry, and her colleagues have discovered a better way to split water, and it involves the abundant and relatively inexpensive metal nickel. Publishing in the journal ChemSusChem, Nath and her co-researchers present how their approach could make hydrogen fuel a more viable energy source in the future while addressing the technological challenge of developing clean energy.

Action 2.2.1: Increase Missouri S&T’s undergraduate enrollment by 500 by 2020

- Fall 2016, overall enrollment dropped from 8,889 to 8,838, a decline of 0.6 percent.
- Fall 2016, undergraduate enrollment grew from 6,841 to 6,909, an increase of 1 percent.
- Undergraduate female enrollment grew from 1,599 to 1,613, a 0.9 percent increase or 14 students.
- Graduate female enrollment declined from 444 to 396, a 10.8 percent decline. One primary reason for this decline is due to the discontinuation of the Sri Lanka psychology program which represented 53 female students.
- Minority student enrollment grew from 1,061 to 1,112, a 4.8 percent increase.
- Underrepresented minority enrollment grew from 724 to 740, a 2.2 percent increase.
- The freshmen class continues to have the same excellent ACT average as the prior year at 28.1.

Year over year student headcount:

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<th>Fall 2016</th>
<th>Difference</th>
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<th>Difference</th>
<th>Percentage</th>
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Action 2.2.2: Increase Missouri S&T’s Ph.D. enrollment by 200-400 by 2020

- Ph.D. enrollment increased from 593 to 624 this year, a five percent increase over the prior year and a 21 percent increase over baseline.
- The campus is on target to meet its goal of an additional 200-400 Ph.D. students by 2020.
Action 2.2.3: Increase the number of T/TT (and NTT) faculty members by 67 (33) (12 T/TT in conjunction with Lever 2.1 focused areas phase 1 hiring)

- Chair searches in progress: geology, geoscience and petroleum engineering, biological science, chemistry, computer science, psychological science and engineering management and systems engineering.
- Fall 2016, tenured tenure-track faculty numbers were 306, up from 277 in 2012 (an 11 percent increase). This number does not include those who started in the spring 2017 semester.
- Fall 2016, ranked non-tenure track faculty were 58, up from 32 in 2012 (an 81 percent increase).
- There have been 42 additional faculty hires since 2012 and 18 current searches. These hires do not include any vacancy filled positions but are new additional lines toward the goal of 100 additional faculty hires.
- From fall 2014 to fall 2016 the university allocated $7,020,793 in startup and has committed to an additional $2,140,795 in startup for FY18.

Action 2.2.4: Transparently allocate as defined in Action 2.1.2 all open and new faculty positions to impact strategic plan and progress on unit performance measures

- The new hiring process includes transparently allocating all new and vacant faculty positions based on their impact to the strategic plan and department-determined performance metrics.

Action 2.2.5: Increase the number of technical/specialized staff members to support strategic program activities

- Sponsored programs is interviewing for two lead proposal developers and a compliance manager.

Action 2.2.6: Missouri S&T will develop specific agreements with UM campuses and possibly other academic institutions to collaborate in delivering courses and degrees that enhance current portfolios

- An agreement with UMKC Business School has been developed for a certificate in entrepreneurship.
- Several course-sharing initiatives with System including: 1) University of Missouri-Columbia for introduction to construction management and environmental engineering, mathematics; 2) University of Missouri-St. Louis for classical optics, philosophy, ethics, sociology, nanotechnology, technical communication, English, technical writing, usability studies, proposal writing, technical editing, web-based communication, and history of technology; and 3) University of Missouri-Kansas City for electrical engineering in signal integrity, and interference control in electronic systems.
**Lever Summary:**

**OUTCOMES**

- The total dollars under review is $69 million which represents a four percent increase, and grant submissions are on track to increase by another 20 percent this year.
- To date, the number of active awards is up by three percent.
- To date, total expenditures are $18 million, representing a five percent increase.
- To date, net grant and contract expenditures are $14 million, representing a six percent increase.
- To date, royalty income was $239,000 and is on track to setting a record high for the university.
- In the past six months, the Technology Transfer office managed 155 active cases, filed 19 patent applications, issued 13 new patents, and five new license agreements, including two new faculty startup companies.
- To date, the College of Arts, Sciences, and Business had two new patents: “Conversion of Glycerol to 1,3-Propanediol under Halo-alkaline Conditions,” (Mormile and Sutton) and “Multifunctional Porous Aramids (Aerogels) and Fabrication Thereof,” (Leventis Sotiriou Leventis and Saeed).

Missouri S&T’s Small Business Technology Development Center exceeded all small business administration goals. The center provided business counseling to 111 clients in eight counties surrounding Rolla. The clients generated increased sales of $6.8 million and created 97 new jobs. New start-ups or business expansions often experience challenges finding capital and the center worked with local bankers and businesses to assist in raising $7.1 million in capital. Center staff provided 35 training courses for 369 individuals in the areas of business startup, financial management, social media marketing, and intellectual property.

The center is very active in the “Boots to Business” program at Fort Leonard Wood, providing business training and counseling to service men and women as they transition from military life to the civilian sector.
The Opportunities for Undergraduate Research Experiences (OURE) program accepted 184 students for the 2016-2017 academic year, an increase of 32 percent over prior year and 61 percent over baseline. In fall 2016, 171 completed the program a 55 percent increase over baseline.
The number of citations is one of Lever 2.3 metrics. Demonstrated in the chart below are the number of citations by department since the baseline in 2012 as noted in Academic Analytics.

<table>
<thead>
<tr>
<th>Department</th>
<th>2012 Citations</th>
<th>2013 Citations</th>
<th>2014 Citations</th>
<th>2015 Citations</th>
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<tbody>
<tr>
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<tr>
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<td>0.3</td>
<td>0.4</td>
<td>0.3</td>
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<tr>
<td>Mathematics and Statistics</td>
<td>17.6</td>
<td>22.9</td>
<td>26.2</td>
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<tr>
<td>Physics</td>
<td>384.8</td>
<td>405.4</td>
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<td>40.0</td>
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</tbody>
</table>

**Action 2.3.1: Develop and implement performance-based resource allocation models commensurate with degree offerings, including productivity in research, scholarship and creative works**

- Each department has completed performance and productivity measures. These measures are in place and are being tracked.
- The Delaware Study is being used for data analysis and provides a framework for base budget benchmarking.

**Action 2.3.2: Identify and take actions to improve the metrics that contribute to increasing the national ranking of five graduate programs**

- Graduate studies engaged department chairs and the vice provost and deans of the two colleges to select five programs for metric improvement. During the fall 2016 Strategic Plan Mid-Cycle Review, discussions around what approach for determining those programs occurred. Further discussions will take place in the spring 2017 semester.
- A data analyst will focus on creating a graduate dashboard, analyzing metrics for national rankings, and assessing graduate learning outcomes.
- A Miner Analytics dashboard developed in institutional research and assessment will assist in data collection and tracking.
**Action 2.3.3: Be selected to lead a National Science Foundation Engineering Research Center-type center**

- Missouri S&T has approached the other three system campuses to initiate discussions regarding a UM system-wide research center focused on living with technology. Smart Living is the integration of ubiquitous sensing and data management to provide autonomous decision making. This center would bring expertise from a number of areas including smart building, smart cities, smart health and home care, smart grid (energy), and smart policies. Engineering Research Centers have a heavy focus on STEM-related programs which aligns with the state’s job growth needs. With Missouri S&T as the state lead for Project Lead the Way, the university is poised to develop innovative ways to develop the state’s STEM pipeline.

**Action 2.3.4: Establish new sustainable industry-funded research consortia**

- In fall 2016, a task force was formed to assemble a report on research consortia best practices that will foster the development of additional industry-based consortia. The task force report will be completed in March 2017.
- The Microgrid Industrial Consortium was established.
- The Particle Gel Conformance Control Industrial Consortium was established.
- The Kent D. Peaslee Steel Manufacturing Research Center is a consortium of steel companies, foundries, suppliers, and university researchers working together to address fundamental steel casting issues.
- The Small Modular Reactor Research and Education Consortium (SmrREC) led by Missouri S&T provides its members with research results to advance the design, construction, and operation of small modular reactors by collaborating in the development of precompetitive technologies.

**Action 2.3.5: Establish programs and facilities to host visiting world-class faculty**

- With the development of the two colleges, processes are now in place to host world-class faculty.

**Action 2.3.8: Expand research and entrepreneurial opportunities for undergraduate students, including the Opportunities for Undergraduate Research Experiences program**

- The UM System Entrepreneurial Scholars and Interns program was introduced to develop entrepreneurial principles and practices for undergraduates. Students took approved entrepreneurial-related courses followed by a 10-week paid summer internship.
- The university developed a maker space in the Interdisciplinary Engineering building. Currently under development are a hacker space and a collision space. These spaces are designed for student innovation and expansion of entrepreneurial opportunities.

**Action 2.3.9: Balance teaching and research relative to comparator institutions by enforcing workload policy**

- The College of Engineering and Computing developed a faculty task force working in collaboration with department chairs to develop a framework for departments to identify their own workload models.
- Intercampus Faculty Council (IFC) endorsed a flexible workload policy that the campuses are encouraged to implement.
• The College of Arts, Sciences, and Business developed a workload policy in accordance with campus policies and tailored the policy to specific departmental needs.

**Action 2.3.10: Develop and implement a new program to instill a culture of excellence in research, scholarship and creative works in early career faculty**

• The College of Arts, Sciences, and Business provides financial support for teaching faculty to attend and participate in national conferences on pedagogy. An additional incentive for faculty who design new online summer course offerings is also provided; these courses accommodate some student’s educational needs, as well as allow faculty to remain productive in the summer months.

• The College of Engineering and Computing developed the Dean’s Scholar Program, which focuses on the retention of junior and mid-career faculty. Nominations originated from the departments, a two-year titled position was created, and $5,000 was awarded to support the faculty.

• A dual-career hires program is in effect to build a culture of excellence and retention of early-career faculty. This program was utilized in fall 2016.

• New faculty orientation and the freshmen faculty forum have been enhanced to instill excellence. These programs have established more contact hours with mentors designed to increase creative works.

• All new faculty are involved in two one-day orientation sessions. These sessions include: 1) library resources for teaching and research; 2) teaching expectations and assessment; 3) developing approaches and viewpoints to achieve career success; 4) preparing for your first class at Missouri S&T; 5) diversity of scholarship; 6) sponsored research; 7) data management; 8) scholarly tools; and 9) tenure and promotion process.

• The freshmen faculty forum meets twice monthly and covers: proposal writing, technology transfer, ethics, social media, proposal budgeting, course design, and learning styles.

**Action 2.3.11: Develop and implement a new program to instill a culture of excellence in research, scholarship and creative works in doctoral students**

• Graduate studies expanded the graduate research poster event.

**Action 2.3.12: Develop and implement a cost share program which supports students who attend national conferences to present their research results**

• The College of Arts, Sciences, and Business maintains a program to support undergraduate and graduate student travel so they can present their research at professional conferences.

• An additional program is under development in graduate studies.
Raising the visibility of the campus remains a strategic priority. The university has implemented a refreshed brand identity to further unify the university’s messaging and visual identity. This lever identifies actions that are designed to enhance the campus reputation and the following activities have been identified:

- Continued rollout of “Miners Dig Deeper” visual identity, including these high-impact, high-visibility areas:
  - Expanded templates for use by campus on the brand.mst.edu website.
  - Incorporated visual identity in high-visibility environmental signage related to three major milestone anniversaries at Missouri S&T: 1) the mechanical and aerospace engineering centennial; 2) the 50th anniversary of engineering management and systems engineering; and 3) the 25th anniversary of Leach Theatre.
  - Expanded campus banner program to include Gale Bullman Building and surrounding area.

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  - Expanded campus banner program to include Gale Bullman Building and surrounding area.

### Lever Summary:

**Fall 2016 MEDIA COVERAGE**

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>July</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
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<td>37</td>
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<td>47</td>
<td>39</td>
<td>33</td>
<td>17</td>
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<td><strong>TOTAL</strong></td>
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<td><strong>442</strong></td>
<td><strong>667</strong></td>
<td><strong>652</strong></td>
<td><strong>437</strong></td>
<td><strong>355</strong></td>
<td><strong>2,968</strong></td>
</tr>
</tbody>
</table>

### Lever Number: 2.4

**Lever Description:**

Create and implement a communication and marketing plan to raise the visibility of the campus and convey our return on investment

**Lever Metric:**

Percentage of General Operating Revenue dedicated to institutional marketing and visibility efforts comparable to best-in-class universities (2020 target, 1 percent)
Developed "Miner Pride" wall in Gale Bullman Building (across from Hall of Fame Room).
Incorporated new banners inside Student Recreation Center.
Incorporated visual identity and brand voice in several academic newsletters, including:
  - Computer science
  - Materials science and engineering
  - Mining engineering
  - Psychological science

- Held first-ever Brand Symposium for campus, with over 120 participants (staff, faculty, and students) and over 100 participating for one or more of the sessions offered.
- Further refined mst.edu website to better articulate brand identity in online format.
- Updated College of Arts, Sciences, and Business and College of Engineering and Computing websites to further integrate those sites into the university’s visual identity and to develop them as resources for visitors interested in research, partnerships, etc.
- Created social media outreach for both the College of Arts, Sciences, and Business (Facebook, Instagram and Twitter) and College of Engineering and Computing (Facebook and Instagram).
- Developed e-newsletter for College of Engineering and Computing to reach potential influencers (those college and university presidents, chancellors, provosts, deans, etc.) who vote on U.S. News & World Report rankings.
- Completed and distributed 16 research-focused news releases during the first six months of FY17 – on track to achieve goal of 30 news releases in FY17 to promote Missouri S&T research to media.
- Redesigned re:Search annual research magazine to align with new brand identity standards.
- Obtained nearly 3,000 media mentions about Missouri S&T during the first six months of FY17.
- Recognized by the Council for the Advancement and Support of Education (CASE) District VI with 12 awards for marketing and communications efforts, including two specific to our branding effort: One for “institution-wide branding programs” and one for “visual identity systems.”
- Promoted experiential learning to audience of nearly 60,000 alumni by featuring Missouri S&T’s experiential learning in the summer 2016 issue of Missouri S&T Magazine.
- New positions to coordinate college-level marketing, communication and visibility were deployed. Two senior strategic communication consultants serve as liaisons to the colleges and two user interface/user experience designers serve as website liaisons to the colleges.

**Action 2.4.8: Require all communications and marketing materials (print, web, video, etc.) to be reviewed by a central marketing team to ensure consistency of messaging appearance and tone**

- Marketing and communications deployed the brand.mst.edu website to provide templates to staff responsible for developing marketing materials to ensure consistency of visual identity.
- Marketing and communications developed marketing materials for the colleges with a unified look to create consistent messaging.
- Marketing and communications initiated an environmental signage program on campus to raise visibility of the brand identity, voice, messaging, and visuals.
Action 2.4.11: Centralize all communications and marketing operations

- The university established a new branding strategy which included: a refreshed web design, an email signature generator, poster templates, and multiple business card designs as part of the centralized approach.
- Materials available on brand.mst.edu include templates for the following: PowerPoint, flyers, postcards, research posters, business cards, and letterhead.

Action 2.4.13: Explore development of Scholars’ Mine designed for increasing internal and external communication and globally promoting the intellectual work of the campus

Global snapshot of activity within Scholar’s Mine:

- Scholars’ Mine currently contains 29,347 works created by our faculty, students and staff.
- Global readership has increased 6.5 percent over the same period of time the previous year.
- Global downloads of full text content has increased by 5 percent.
**SCHOLARS’ MINE - STATISTICS REPORT**

Global Access = Global Impact

**Readership Density**

**Top 20 Countries by Downloads**
Total Downloads = 302,726
5% Increase

**Top Downloads**


SCHOLARS’ MINE - STATISTICS REPORT

Total Users: 44,246 (6.5% Increase)

Total Sessions: 53,783 (12.6% Increase)

Total Pageviews: 149,299 (20.9% Increase)

Total Works Added: 1,752 (162.3% Increase)

Summary

- Global readership has increased 6.5%
- Global Downloads of full text content has increased by 5%
- The total number of pages viewed by readers has increased by 20.9%
- Scholars’ Mine currently contains 29,347 works created by our faculty, students and staff
- In the current calendar year 670,250 downloads of full text documents have occurred
- Since November of 2014 927,261 downloads of full text documents have occurred
- We will reach 1 million downloads in the first quarter of 2017

Visit About Scholars’ Mine at: http://libguides.mst.edu/scholarsmine for more detailed statistics.
Action 2.4.14: Execute an integrated visual identity and consistent outreach for Student Affairs to convey return on investment

- Communication and marketing:
  - Assisted student affairs in the recruitment and hiring of a new staff member to provide greater consistency of visual identity and messaging.
  - Provided visual templates to assist student affairs and offered graphic design and web assistance.
  - Upgraded visuals for student eConnection (managed by student life) to make it consistent with the university’s brand and visual identity.
  - Encouraged the student affairs marketing coordinator to attend weekly meeting with marketing and communications creative services team.

- COER: created a communication plan that aligns with the campus brand; and updated the Mentor a Miner program visual presence in collaboration with communications and marketing.

- Eddie Grover-Bisker, director of COER, was honored by the National Society of Leadership and Success for Excellence in Service.

- Counseling updated departmental brochures and business cards to align with the marketing strategy.

- Dean of students: inventoried all student affairs communication pieces and developed a divisional communication plan; printed 2,500 fall programs calendars and 4,500 mini-planners for students; the 2017 calendar aligns with the brand and includes all recognized student organizations; and 40 staff were recognized for outstanding efforts during monthly student affairs meetings.

- Leadership and cultural programs: hosted the Winter Student Leadership Awards; collaborated with communications and marketing and revised the SILC brochure and leadership guides; and the Leadership Educator’s Institute selected Jerri Arnold-Cook to facilitate a roundtable discussion on the development, implementation, and evaluation of a co-curricular leadership certificate program.

- Student affairs had 12 staff attend the brand symposium.

- Student health developed an at-a-glance resource guide and promotional materials which aligns with the campus strategy.

- Counseling integrated MinerBytes within the department.

- Leach Theatre hired two students to promote events, which resulted in an increased number of students utilizing free or discounted tickets.

- Joe’s PEERS was awarded the Outstanding Peer Education Group from the BACCHUS initiatives of NASPA (student affairs in higher education).

- Athletics: hosted the 2016 Greater Lakes Valley Conference (GLVC) Cross Country Championships with 450 coaches and student-athletes in attendance; Missouri S&T was named as one of the 24 finalists for 2017 NCAA Award of Excellence for Joey’s Day Make-A-Wish reveal; inducted five student-athletes and the 2004 softball team into the Hall of Fame; men’s soccer remained undefeated in the GLVC; Anna Fink, women’s soccer, named to first team CoSIDA Academic All-American; Bret Curtis, football, named second team CoSIDA Academic All-American, with these two being the 89th and 90th earning this honor placing Missouri S&T as fifth all-time among NCAA DII; and Braxton Graham, football, named GLVC Special Teams Player of the Year.

- Redesigning the division of student affairs website to launch early 2017.
Action 2.4.15: Develop a communication plan to increase awareness of campus internationalization efforts and international collaboration activities identified during the ACE Internationalization Lab

- International affairs and cultural programs performed an evaluation of a comprehensive internationalization model. Part of this evaluation included a strengths, weaknesses, opportunities and threats evaluation of the campus activities and overall visibility.
- Joined the ACE Internationalization Laboratory advisory group for support and guidance. The ACE advisor visited the campus in November 2016.
- International enrollment increased from the 954 baseline in 2012 to 1,126 in fall 2016.
- International affairs is investigating best practices to increase enrollment and ensure document processing meets benchmark standards.
- A contract with a recruiter in India was signed to focus on international enrollment. Research is underway in 2017 to confirm 20 additional contract recruiters.
Summary:

Amy Skyles, a Missouri S&T instructional designer and adjunct instructor for biological sciences was published in the *International Journal for Innovations in Online Education*, September 2016, for her work on integrating technology and innovation into laboratory redesign.

Skyles concluded that laboratory redesign does not require use of existing laboratory facilities. Laboratory activities that do not require specialized equipment are, in fact, often better able to accomplish course goals when conducted outside of the traditional lab classroom. Costs of laboratory delivery can be significantly reduced through the use of innovation such as the replacement of instrumentation with inexpensive alternatives from hardware stores to methods that utilize smartphones and tablets. Such methods make use of technology that is readily available to most students and little assistance is needed for students to master the learning requirements when smartphone devices are used for learning. Laboratory kits work well and can be used at home to augment online instruction, thus truly making laboratory activities available to an expanded audience of learners. Continued experimentation is needed for the laboratory redesign. Each redesign project must be evaluated annually to determine if new methods and technologies can replace former lab components.

Using best pedagogical practices, Missouri S&T is evaluating courses and discovering new pathways for accomplishing the course goals in all redesigned courses, not just the lectures. The processes used to create DELTA (Delivering Experiential Labs to All) labs have been documented in order to create a collection of redesign guide sheets. This collection is being piloted at Missouri S&T and will eventually serve as a course redesign handbook for use by any instructor or instructional designer interested in laboratory course redesign.

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**Campus or Unit:** Missouri University of Science and Technology

**Lever Number:** 2.5

**Lever Description:** Modify our conventional methods of teaching to accommodate current, new and advanced technology that will enhance student learning and increase faculty productivity

**Lever Metric:** Calculus success increased by 7 percent

**Lever Summary:**

Amy Skyles, a Missouri S&T instructional designer and adjunct instructor for biological sciences was published in the *International Journal for Innovations in Online Education*, September 2016, for her work on integrating technology and innovation into laboratory redesign.

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Action 2.5.2: Enhance resources for distance and blended learning, particularly with respect to the management and distribution of multimedia objects (aid professors’ use in the classroom instead of taking a field trip)

- Learning Technology Portfolio – Kaltura/Mediaspace – is used on campus and by Video Communications Center for distance students.
- Faculty Learning Communities in partnership with CERTI redesign courses.
- Education Technology presented at Freshmen Faculty Forum.
- Education Technology completed two sessions of eLearning Community of Practice with 34 attendees and 24 unique customers.
- EdTech U (also known as CanvasU) – fall 2016 had 336 total visitors: 252 were unique; 112 were unique faculty; seven unique staff; and 134 unique students.
- eStudio – fall 2016 had 63 sessions with 103.5 hours of recording.
- DELTA (Instructional Laboratory Pilot) – had one eFellow participant.
- Expanded online presence and resources through the edtech.mst.edu/teach website.
- Instructional design consultations – fall 2016 had 709 consultations for 1028.5 hours.
- Lecture Capture (instructor use, viewers, and total views) – fall 2016 had 31 unique instructors, 3,672 viewers, and 18,205 total views.
- Clicker Loaner Services – fall 2016 had systems loaned out 47 times.
- Student Response Systems (clickers) – fall 2016 had 32 instructors; and 3134 total students with 42 percent freshmen, 25 percent sophomores, 14 percent juniors, 18 percent seniors, and 1 percent were graduate students.
- Learning Stack – Learning Technology Portfolio – fall 2016 Canvas stats - 550 courses; 496 instructors; 7,352 students; 7,874 assignments; 21,212 files uploaded – projects are planned for Lecture Capture and Proctoring.
- Education Technology assisted with end of semester evaluations (improving response rates) – worked in collaboration with CERTI – completed website FAQs and encouraged students to complete the end of semester evaluations at several student events throughout the semester.
- Mid-Semester Evaluations – fall 2016 with 10 instructors participating representing 26 unique classes.
- Education Technology is currently planning the spring 2017 Teaching and Learning Technology Conference. This is the tenth conference to be offered.

Action 2.5.6: Create and implement a stipend program to reward faculty who incorporate Blended Learning techniques into their courses

- The Provost eFellow Program is currently in place to reward faculty. This program provides a three-tiered reward approach. Tier One, based on a complete full course redesign, provides a stipend of $5,000. Tier Two, smaller in scope with just one or more aspects of the course being redesigned, provides a stipend of $2,000. Tier Three, which involves minor changes and not a complete redesign, provides a stipend of $1,000.
- Provost’s eFellow Program – 6 grants awarded
  - Stuart Baur – ArchE 3805: Building Lighting Systems
  - Daniel Forciniti – ChE 5241: Chemical and Biochemical Process Safety
  - Zeshan Hyder – MinEng 4113: Mine Atmosphere Control (DELTA participant)
  - Nick Libre – CE 2211: Mechanics of Materials
Action 2.5.8: Redesign high-volume courses through integration of new technology and modified teaching methods to enhance student learning

- Freshmen Engineering (FE1100) is under redesign and part of the Provost’s eFellows Program.
- Education Technology worked closely with GTAs in chemistry on their processes.
- A series of high-volume courses under complete redesign are Calculus I, II and III.
- In fall 2014, Calculus I piloted an interactive lab. The new interactive lab met one day per week for 75 minutes. The lab was open to any student enrolled in a Calculus I lecture was standardized and interactive, and had limited class size of 30 students. Two faculty taught the pilot labs and worked closely together to develop interactive activities.
- In fall 2015, four sections of the new Success for Calculus were taught to 140 students, three sections were taught in spring 2016.
- In fall 2015, new Calculus II labs were piloted.
- Calculus III labs were piloted in spring 2016.
- As with any pilot, lessons were learned so future improvements could be made. The pilot demonstrated a need for more than one day per week of face-to-face contact; this change was implemented in fall 2016.
- Restructuring the Success for Calculus course around calculus topics and not algebra and trigonometry topics was implemented in fall 2016.
- Student success activities for calculus students were also created and implemented. The following activities occurred: 1) diet and exercise training; 2) goal-setting presented by the Student Success Center; and 3) guidance for test anxiety was conducted by the office of Counseling, Disability Support, and Student Wellness. Student feedback from the test anxiety workshop was extremely positive with students stated: “I learned to face my anxiety and address the problem,” and “I learned three things that contribute to my test anxiety: expectations, negativity and lack of preparation.”
The campus has implemented structural changes needed to facilitate the campus strategy and raise national visibility. The campus is currently exploring the organizational structure to capture efficiencies and process optimization.
**Action 2.7.1: Implement the organizational structure appropriate to strategic plan**

- The offices of graduate studies and research and sponsored programs were visited by consultants. Auditors assessed the appropriate structure, reviewed processes, and developed a plan for efficiencies. Discussions on these plans will occur in spring 2017.
- The campus structure is currently being analyzed for any possible streamlining of processes in units or across divisions in order to gain optimum efficiencies with completion expected in July 2017.
**Lever Summary:**

All academic affairs departments have established productivity measures divided into two primary areas; external measures designed for benchmarking comparisons to other institutions and internal measures designed for departmental comparisons at Missouri S&T. The departmental measures are demonstrated in Action 3.1.1. Academic Analytics released the 2015-2016 results in December 2016.

Missouri S&T continues to develop programs that will positively impact the state and the nation. One of the programs under development is a Ph.D. in Integrative Biosciences and Biotechnology. Biotechnology is the fusion of technology and biology to help solve societal issues. Biotechnology is found virtually everywhere; for example, 70 percent of all processed food items owe their existence to biotechnology. This degree will train graduates to be on the forefront of an ever-changing environment.

The Applied Innovation Minor (AIM), is part of a comprehensive set of programs to develop people, processes, and tools to accelerate the application of technical innovations for social and economic benefit. This effort directly addresses the application aspect of our University’s mission: “Missouri S&T integrates education, research and application to create and convey knowledge that serves our state and helps solve the world’s great challenges.” To fully address this mission requires multiple elements, each with its own focus, but overall contributing to the complete capability. In a technical context this minor is focused on highly experiential methods to develop the capability in our students to bridge the deep gulf between researchers, engineers and scientists, creating new technical capabilities and users with the context and understanding of application and use (connecting what’s possible with what’s needed).
**Action 3.1.1: Continue performing comparisons of academic department productivity to peer institutions**

**Department Productivity Measures**

**Materials Science and Engineering**

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<td>65,374</td>
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Action 3.1.2: Identify and take actions to improve the metrics that contribute to increasing the national ranking of all graduate programs

- Graduate studies personnel attended the Oak Ridge National Laboratory’s Graduate Fair. Graduate studies staffed a booth at the event to increase name recognition and recruit doctoral students.
- The development of departmental productivity measures which align with strategic plan strategy metrics aid in the development of internal processes that improve efficiencies and increase outcomes for graduate programs. Graduate studies is focusing on further developing those metrics in 2017 with the assistance of the executive director for strategy, planning and assessment.

Action 3.1.3: Evaluate the need for new or elimination of existing degree programs

- This action is currently in progress and remains ongoing.
- A new Ph.D. in Integrative Biosciences and Biotechnology is under development.
- A masters in science management is under development.
Campus or Unit: Missouri University of Science and Technology

Lever Number: 3.2

Lever Description: Centralize corporate relations to improve service to existing partners and to identify and establish new partnerships for the purpose of increasing/enhancing research, economic development, credit and non-credit education, philanthropy and the hiring of our graduates

Lever Metric: Number of corporate partnerships

Lever Summary:

Corporate relations is responsible for growing and enhancing corporate partnerships, developing a web portal for corporate and industry partners, and creating a corporate relations stewardship program.

Corporate relations manages the contact with each strategic partner and organizes those relationships through a tiered matrix. The matrix is based on the depth and breadth of the relationship with Missouri S&T. Tier five is a single point of contact, or limited capacity. Tier four is a managed relationship which has a few points of contact that requires a level of coordination. Tier three is a tailored partnership, corporate relations works closely to identify value-added for enhanced relationship. Tier two has a broad-based engagement with the contact engaging in multiple relationships. Tier one is a strategic partner, a long-term, significant ongoing contributor. A tier one could be engaged with sponsored research, provide charitable gifts, a trustee, signed master agreement, and/or work with student groups.

A sample view of the tiered matrix is provided below.

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<td>single point of engagement</td>
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**Action 3.2.6: Broadly identify needs of external constituents that could be met by Missouri S&T**

- The executive director of corporate relations implemented a plan to identify the needs of external constituents.
- The office developed a rubric and evaluated the existing relationships with external partners. Understanding the needs of the external partners first began with understanding “why” they have a relationship with Missouri S&T and then understanding “what” the relationship focus has been. Relationships can focus on research, co-ops, internships, post-graduation hires, charitable contributions, or other factors.
- A sample of the rubric is demonstrated below.

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- Based on assessing the needs of partners, an engagement model was created as demonstrated in Action 3.2.7.

**Action 3.2.7: Determine mechanisms to develop reciprocal partnerships**

![Corporate Engagement Model](image-url)
Action 3.2.8: Develop a method for evaluating the relative strength and breadth of the partnerships with external constituents (research, student hiring, giving, distance courses, board memberships, etc.)

- 2,600 companies were identified as having contact with Missouri S&T, 72 have multiple touchpoints and 50 are strategic relationships.
- A Corporate Advisory Board was developed and the first meeting was in April 2016.
- A new relationship with MasterCard was developed and a distance training contract was signed in fall 2016.

Action 3.2.9: Develop a matrix that reflects the multiple results of Action 3.2.1 above and provides an overall indication of the strength of the relationship and helps identify paths to maintain, strengthen or expand the partnership

- The executive director has developed a matrix and rated relationships.

Action 3.2.10: Create a concierge approach to corporate relations including a web presence that supports the mission of the office

- The executive director established a website.
- The executive director disseminated the one-stop approach throughout the campus and provided a concierge contact approach allowing external companies, organizations, and agencies to make efficient contacts with Missouri S&T.

Action 3.2.11: Develop a marketing plan to communicate the benefits of the office to key customers

- Marketing and communications developed the corporate relations website as well as marketing materials for the new office; provided design, email, and editorial services for the corporate relations e-newsletter; and promoted and provided visual identity, web support, and email support for the Industry Day event held in fall 2016.

Action 3.2.12: Work with Information Technology to create a “customer relations” management database that provides easy access to usable and actionable information

- The customer relations management database is under development. A partnership with IT assists in developing the customer relations management database providing easy access to usable and actionable information. This process should be fully completed in February 2017.

Action 3.2.13: Create a metric that can be used to record corporate relations success in enhancing “customer relations” or industrial donations, funded research, distance learning, non-credit courses, or other partnerships

- The matrix developed was designed to establish benchmarking and metrics.
The Campus Master Plan is currently being updated.

The Kennedy Experimental Mine building was completed.

Strategically purchased properties: TKE Fraternity on State Street, 605 11th Street, and several residencies on 13th street. Additional properties in the Rolla community are being explored.

Executed a long-term lease with Phelps County Regional Medical Center to occupy half of the former Mercy Clinic building. This lease will free up space in the central part of campus allowing for additional academic uses.

A lease for the basement of the Hasselmann Alumni House was completed. This lease allows for space to open up in Castleman Hall to bring all of Arts, Languages, and Philosophy together.

Schrenk Hall phase two renovations are underway, which will renovate laboratory space over 2.5 floors.

First phase of the Learning Commons has been completed.

Began the planning phase for expanding the wellness and fitness center.
Action 3.3.1: Leverage strategic funds for instructional laboratories with matching funding from non-appropriated sources

- The university dedicated $500,000 in general revenue to the colleges to be allocated for lab upgrades. A funding proposal process will be determined, but a key component will involve a matching process from outside sources.

Action 3.3.2: Continue exploring plans and processes for acquiring matching funding for research equipment in areas that have high return on investment to be matched with non-appropriated funds

- As the campus identifies potential donors for future equipment needs, strategies for leveraging those potential investments through a matching program is being explored.
- Departments are working closely with their respective Academies.

Action 3.3.4: Continue evaluating all campus facilities for their readiness for sustainable growth and return on investment

- The Campus Master Plan was completed and approved by the Board of Curators. The plan evaluated all campus facilities for effective space utilization and sustainable growth. The third year update is in process.
- The university received state funds for the experimental mine building and renovations for Schrenk Hall.
- A 50/50 request was submitted to the state for an advanced construction materials lab in Butler-Carlton Hall and the third and final phase for Schrenk Hall renovations.

Action 3.3.6: Investigate the feasibility of establishing a $20 million endowment for the maintenance of (teaching, research, and co-curricular) equipment

- This action has been assessed as not a feasible option. However, $500,000 in recurring funds is being allocated beginning FY17 to the colleges to establish a permanent matching fund program for instructional and research laboratory equipment and innovation.

Action 3.3.10: Implement Learning Space Design Guidelines based on standard practices to guide the design of all learning spaces on campus

- Education Technology made contributions to the advancements and improvements in the Library Commons area.
- Disability support services worked with Education Technology to accommodate student needs.
- Technology refresh – lifecycle maintenance of classrooms and CLCs– discussions have been ongoing to add 4 new CLCs to campus.
- Hybrid distance classrooms – a pilot program has started to develop a hybrid design for technology in classrooms to increase distance education functionality and availability.
- Learning space guidelines were created and provided a framework for classroom spaces containing presentation technology. The guidelines highlighted the most common points of convergence at which architecture and audio-visual technology intersect, an integral part of the learning environment. This document was given to the registrar and physical facilities.
- Space utilization guidelines were approved by the Space Committee.
Action 3.3.11: Assess effectiveness of collaborative learning spaces (e.g. learning commons) that can be used for experiential learning opportunities and undergraduate research

- Results of the Education Technology DELTA (redesigned instructional laboratory courses) program indicate students are using collaborative commons areas to perform laboratory experiments, freeing up traditional laboratory space/time to address increased enrollment.
- The library director partnered with the vice provost for undergraduate studies to develop a plan for a collaborative learning space.

Action 3.3.12: Provide innovative student support facilities to meet customer needs

- Established Rolla Suites office to serve the downtown housing locations; opened Rolla Suites residence hall with 44 students.
- Expanded dining services with two new food services locations: a south campus facility, Au Bon Pain, and a Residential Commons self-service vending market, Avenue C.
- Opened University Commons for 450 students.
- Opened the renovated Residential Commons computer lab with areas for work groups, white boards, and a media-scape unit.
- Completed construction of new upper bleachers for the Bullman Building gymnasium.
- Renovated the west hallway of the Bullman Building with Miner Pride – Miner Tough murals to promote institutional pride.
- Developed plans and identified funding to add new indoor batting cages for the softball and baseball teams and new indoor hitting cages for women’s and men’s golf teams.
- Completed phase one of a three-phase sound system improvement project; the first phase has shown marked improvements in the quality of sound production; phase two completion expected by fall 2017.
- Completed Testing Center renovation centralizing testing services in one location that included expanded seating capacity to address demand and doubling the number of reduced distraction rooms for students with documented ADA/504 accommodations. The Testing Center administered 3,195 tests to 1,890 candidates.

Action 3.3.13: Develop a plan to increase gender neutral/family restrooms

- All new facilities incorporate gender neutral and family restrooms.

Action 3.3.14: Develop a plan to increase lactation rooms

- A plan is under development with the vice chancellor for finance and administration, physical facilities, and institutional equity, diversity and inclusion.
**Lever Summary:**

Human resources, equity, and inclusion created a series of trainings to develop new managers, academic administrators, staffs and students.

- **Supervisory Series**
  - Each session has a facilitator that leads the conversation and lends expertise in the topic to be discussed. A large benefit of this program comes from the conversations between participants. This group lends itself to both those who want to advance their professional knowledge as well as those who need to bounce ideas and scenarios off of like-minded colleagues. There are 22 participants for the 2016-2017 series.

  Training Dates and topics:
  - Oct. 11: Kick-off Lunch
  - Oct. 25: Understanding a Manager’s Role/Expectations
  - Nov. 2: Cross-Cultural Managing
  - Dec. 6: Benefits/Payroll/Compensation/University Policies
  - Jan. 10: myPerformance and Performance Management
  - Jan. 31: Recruitment and Onboarding
  - Feb. 14: Progressive Discipline
  - Feb. 28: Multipliers
  - March 14: Healthy Workplaces
  - March 28: Employee Motivation
  - April 11: Final Lunch/Peer Coaching.

- **Academic Administrators Professional Development**
  - Invitation-only series. All seminars examine current trends; challenges and best practices; and helping to advance teaching, scholarship, and service of academic administrators on our campus. Topics include faculty recruitment, procedures, leadership skills, strategic planning, and how to handle legal and personnel issues.
Training dates and topics:
Aug. 26: Policies and Procedures
Sept. 30: Leveraging University Advancement
Oct. 21: Civil Rights and Equity
Nov. 18: Leading by Influence
Jan. 27: Faculty Recruitment
Feb. 24: Student Success Strategies

Human resources, equity, and inclusion has applied for three federal grants to assist the campus.

- **TRIO**
  - The Federal TRIO Programs (TRIO) are Federal outreach and student services programs designed to identify and provide services for individuals from disadvantaged backgrounds. TRIO includes eight programs targeted to serve and assist low-income individuals, first-generation college students, and individuals with disabilities to progress through the academic pipeline from middle school to post baccalaureate programs.

- **Upward Bound – Math and Science**
  - Upward Bound serves: high school students from low-income families and high school students from families in which neither parent holds a bachelor’s degree. The goal of Upward Bound is to increase the rate at which participants complete secondary education and enroll in and graduate from institutions of postsecondary education. All Upward Bound projects must provide instruction in math, laboratory science, composition, literature, and foreign language.
  - The university is analyzing schools in the boot heel and St Louis to target for this program.

- **Veteran’s Upward Bound**
  - Veterans Upward Bound is designed to motivate and assist veterans in the development of academic and other requisite skills necessary for acceptance and success in a program of postsecondary education. The program provides assessment and enhancement of basic skills through counseling, mentoring, tutoring, and academic instruction in the core subject areas. The primary goal of the program is to increase the rate at which participants enroll in and complete postsecondary education programs.
  - The university is exploring community support opportunities.
  - January 18th Technical Assistance Webinar for Veterans Upward Bound occurred.
  - January 30th a meeting occurred with Fort Leonard Wood about their support for Veterans.

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Action 3.4.1: To increase diversity of faculty and staff, provide incentives to the hiring departments that select qualified underrepresented minorities

- To demonstrate the dedication to departments that attract underrepresented minority or female faculty members, each department receives a $10,000 incentive to their E&E budget for every such faculty member hired. The department retains the $10,000 recurring funds as long as that faculty member remains with the department. Each year the executive director for strategy, planning and assessment and the budget director analyze each position to ensure where funds need to be allocated or, in some instances, removed from departmental budgets.
- Human resources, equity, and inclusion secured one-time funds to assist with the hiring process. A plan is currently under development for the best approach.

Action 3.4.2: To increase diversity of students, explore scholarship funding to be more competitive with underrepresented minorities/female/student recruitment

- University Advancement is working with donors who have committed to invest $1 million to be paid over time for underrepresented minorities.
- Rolla Rising Scholarship Endowments are being discussed with all donors and currently seven individual donors have been secured and one corporate donor.
- The Chancellor’s Scholarship was revised and includes one $1,500 runner-up scholarship and five $1,000 honorable mention scholarships, in addition to the 15 awards made.
- Scholarship funding sources for women include: Boeing, Ford, AT&T, Halliburton, and UTC.
- Scholarship funding sources dedicated for student diversity include: Ameren, Ballard, Carter, Caterpillar, Chevron, Emerson, Finley, GM, John Deere, NACME, NIDEC Motor Corporation Endowed Scholarship, and the Dr. Harvest and Shirley Collier Endowed Scholarship.

Action 3.4.3: Set up transfer articulation agreements with two-year institutions with large underrepresented minority populations

- In fall 2016, several articulation agreements with two year institutions and large underrepresented minority populations began in the development phase. The focused institutions are St. Louis Community College, the Metropolitan Community Colleges in Kansas City, Ozarks Technical College in Southwestern Missouri, and Mission College, a predominantly Hispanic-serving community college located in the Silicon Valley area.

Action 3.4.5: Develop and provide professional development and training for staff, faculty and students that provides awareness of diversity and inclusion issues and encourages them to develop skills that will make our campus a warm and welcoming environment

- An eight-week online course using the Canvas shell was created for faculty, staff, and students.
- Search committees are trained on diversity and inclusion.
- Fully-integrated a face-to-face Diversity 101 workshop into the monthly new employee orientation.
- Staff and students attended workshops on sexual discrimination – how to recognize it, how to prevent it, and what on-campus resources are available.
Action 3.4.7: Bring to campus underrepresented faculty as visiting scholars

- Human resources, equity, and inclusion collaborated with the College of Arts, Sciences, and Business to prepare a proposal for a visiting scholar program focusing on diversity scholarship.

Action 3.4.9: Review, revise and create policies that support work-life balance

- A Work Life Design portfolio of policies, procedures and programs was created and includes: Total Rewards, Campus Perks, Dual Career Couples Policy, S&T Helpers, Take Our Youth to Work Day, Community Volunteer Leave, Flexible Work Arrangements, Professional Development, Affinity Groups, Tuition Assistance, Wellness and Fitness Programs, Childcare Resources, Eldercare, Financial Literacy Programs and the Employee Assistance Program.
- The Flexible Workplace policy was implemented in fall 2015.
- Workshops have been provided on work-life balance.

Action 3.4.10: Evaluate and enhance faculty recruitment process and practice

- The recruitment process has been further revised. Revisions include: a review of the search committee composition, mandating wider outreach as a requirement (nontraditional outreach) and advertisements.
- The increased number of female faculty and underrepresented faculty hires demonstrates an improvement in the recruitment process.
- The faculty recruitment and retention committee is analyzing data to see who is leaving and the reasons why in order to develop a strategy for faculty retention. This analysis will be completed in 2017.
- Targeted advertising will continue to ensure that underrepresented minority and female faculty are appropriately represented and considered in the hiring process.

Action 3.4.11: Explore collaborative partnerships for early childhood education, child development programs and facilities to enhance faculty recruitment and retention. Evaluate opportunities through campus master planning process

- The Rolla school system is leading a community taskforce to study facility and funding options for early childhood education. Missouri S&T will continue to be an active participant in these conversations.

Action 3.4.12: Develop and deliver regular workshop training sessions for faculty and staff on compliance, Equal Employment Opportunity and recruitment practices

- A stand-alone seminar on ADA and FMLA is under development and should be launched in spring 2017.
- Monthly communication occurred to department representatives on any compliance issues.
- Workshops conducted by the employee assistance practitioner covered diversity and inclusion and recruitment practices.
- All search committee members are required to be trained on recognizing and reducing implicit bias.
Action 3.4.13: Design, launch and maintain a Diversity and Inclusion website to promote inclusion and diversity

- The diversity and inclusion website was launched in spring 2016. The website consolidated all diversity and inclusion efforts across campus and includes a monthly newsletter, workshop schedule, and helpful tips.

Action 3.4.14: Enrich campus commitment to diversity and inclusion through recruitment of student-athletes

- Athletics recruited 138 new student-athletes for Academic Year 2016-17, of which 107 were men and 31 were women, from 20 states and 5 foreign countries.
- Miner teams signed 19 prospective student-athletes to National Letter of Intents during the early signing period from Missouri, Iowa, Nebraska, Virginia, Colorado, Texas, Illinois, California, Kansas, and Oregon.
- Athletics increased collaboration with student diversity, outreach, and women’s programs to facilitate connections with employers and diversity groups.

Action 3.4.15: Enhance collaborations and opportunities to promote an inclusive campus community and develop cultural competence

- COER: facilitated a Boeing employee panel on diversity in the workplace as part of Boeing Week; coordinated and promoted Diversity in the Workplace discussion with AT&T and the psychology department; integrated diversity and inclusion elements within COER programming curriculum; and attended a conference on best practices for introducing diversity and inclusion themes in career-focused experiential learning.
- Counseling, disability support, and student wellness: had two counselors attend the Missouri Institute of Mental Health Suicide Prevention Conference which included sessions on diverse populations; clinical staff engaged in in-service training on counseling male students; and the case manager attended a focus group with IBIS Consulting.
- Leadership and cultural programs: co-hosted Stand Up Stand Out: Empowering Healthy Women, with Panhellenic Council, and the event featured a keynote alumni speaker with 80 participants.
- Leadership and cultural programs: coordinated a faculty and staff workshop on Managing Across Cultures with 11 participants; facilitated a Communicating Across Cultures workshop with 105 participants; provided $500 in sponsorship of Celebration of Nations; established the Cultural Programming Board consisting of a chairperson and seven diverse members from across campus collaborating to increase the scope and depth of cultural programming; hosted International Day of Peace and candle light vigil with 115 decorated luminaries and personal pledges to promote peace; facilitated the LGBTQIA Advisory Board meeting and fall Lavender Graduation with 12 participants; and partnered with the one book program to bring Coach Luma Mufleh to campus to increase awareness regarding refugees, 303 participants.
- Results from the LGBTQIA Advisory Board meeting included the Board committing to develop and present two programs this semester. One workshop will focus on how identity and perceptions of identity impact leadership, the other will center on being an ally, not only for members of the LGBTQIA
community but for anyone. Both workshops will be open to the campus community and more broadly focused than solely on gender identity or sexual orientation.

- Athletics: integrated STEP UP! training completion requirement for all intercollegiate teams; completed filming of RESPECT video featuring 11 student-athletes on the value of respect on campus and within society; and provided 11 educational opportunities promoting cultural appreciation with 826 students.

- Student wellness: facilitated 15 STEP UP! trainings for 452 students, faculty, and staff; hosted STEP UP! Night at a football game which included throwing 100 STEP UP! T-shirts; facilitated Sexual Assault Awareness Week collaboration between STEP UP! and Sigma Pi Epsilon which raised $1,200 to bring additional trainings on campus with 107 students; engaged 227 individuals during Take Back the Night which included a panel discussion with university police, institutional equity, diversity and inclusion, and a sexual assault nurse; and partnered with with Education Technology to develop a video.

- Residential life hosted Rolla-Con social justice workshop, a comic-con themed event with presenters from institutional equity, diversity, and inclusion, with 20 student participants.

**Action 3.4.16: Develop a diversity training workshop for recognized student organizations as part of a leadership training program**

- The director of student life is working with the equity, diversity, and inclusion office to develop a leadership training program.
- Greek Academy integrated institutional equity, diversity, and inclusion trainings for its members.

**Action 3.4.17: Develop ongoing Diversity Speaker Series to highlight specific issues/topics and to bring exceptional talent and diversity to Missouri S&T**

- In fall 2016, in conjunction with Boeing Week, a diversity panel was facilitated.

**Action 3.4.18: Explore creating a mini-grant program aimed at providing funding for programs and initiatives that promote diversity and inclusion**

- This action is currently in the exploration phase. Obtaining the grants listed at the beginning of this lever will help the campus further initiatives related to diversity.
Lever Summary:

Residential life established a partnership with the Writing Center that assisted in addressing challenges surrounding space by providing a venue for writing services within the Residential Commons (RC). The partnership engaged 351 students during the 12 hours per week the center has staffing at the Residential Commons. This simple and creative solution helped students stay in school who ultimately could become engaged alumni.

Student organizations are very popular on campus with 255 Recognized Student Organizations (RSO) which has increased by 15 percent since 2012. A majority of current students participate in one or more intramural activities, with 7,417 participants. As the student body is so heavily engaged, COER identified a need for increasing engagement between employers and RSOs. The result has increased student engagement with COER by 88 percent this fall. This level of engagement will create lasting relationships with students and is an integral piece for developing an engaged alumni base.

The Emerging Leader Institute (ELI) outcomes were very positive with 20 students earning certificates, 14 of those included honors. Twenty-one students created leadership development plans and reviewed them with their mentor. ELI individual workshops were evaluated and will be comprised as a comprehensive report. A post survey will be sent in spring 2017 to assess longer term impact on their leadership ability. ELI mentors conducted focus groups with participants and based on feedback, goal setting will be revised at the beginning of the program and creation of a leadership development plan will occur at the end of the program.
**Action 3.5.3: Create a multifaceted engagement program that brings students through graduation and to the Academy levels**

- COER hosted a networking event prior to the career fair that engaged 15 employers with students as part of a collaboration with Alumni Relations.
- MinerRama registered a record number of 205 organizations.
- Miner Alumni Association hosted Laughfest during homecoming and engaged 800 students.
- Minerfest Homecoming engaged 27 recognized student organizations with 950 participants.

**Action 3.5.7: Improve tracking measures of employment data and related feedback to enhance lifelong career development**

- COER continues to utilize and enhance standards for data collection.
- COER is collaborating with the registrar’s office on potential process of holding diplomas until outcomes survey is completed in order to collect career outcomes.
- COER has a 37 percent knowledge rate, 76 percent career outcomes rate for December 2016 graduate candidates. For August 2016 graduates: 87.35 percent knowledge rate and 82.18 percent career outcomes rate. For May 2016 graduates: 88.87 percent knowledge rate and 80.49 percent career outcome rate.
- COER issued fall semester career fair surveys to both students and employers. The results of the surveys led to modifications which have been implemented including changes to nametags, seeking lanyard donations from the Navy, and integrating parking lot attendants during career fairs.
- Integration of a data analyst in COER has streamlined data collection through refined methods of gathering information for internal and external constituents; separation of data for reporting allowed for more detailed reports of outcome data; developed a scorecard for employers based on recruitment majors to provide a customized recruitment plan; and developed reports to enhance data analysis for career development.

**Action 3.5.8: Promote “Miner for Life” strategies with student-athletes and extend this concept to encourage lifetime engagement**

- Dean of students revised outreach publications integrating Miner for Life into the brand concepts.

**Action 3.5.9: Strengthen residential living communities to develop lifelong leaders**

- Residential life: experienced a 3 percent increase in students residing in campus-approved housing (3,378 students); had 2,297 students in residence, representing a 2.5 percent increase; had 997 in Greek housing, representing a 4.6 percent increase; and 84 students in Christian Campus House, representing a 2.4 percent increase.
- Residential life integrated three new Learning Communities: 1) Entrepreneurship and Innovation – 24 students engaged with this community and visited local entrepreneurs, participated in a wellness program, and provided input on maker's space for University Commons; 2) Global Awareness Community – had 24 students who engaged in monthly dinners with faculty, participated in an interactive activity during Celebration of Nations and participated in International Affairs Conversation Partners program; and 3) Honors Housing Community had 50 students who are a part of the Honors Academy and engaged monthly in programs focused on peer mentoring and advising.
- Residential life collaborated with Dr. Audra Merfeld-Langston to develop a three-credit course targeted to Global Awareness and Entrepreneurial and Innovative Learning Communities to be ready in fall 2017. The course will feature a study abroad component to the Caribbean island of Martinique during spring 2018. This course counts toward the Global Studies minor.
- Entrepreneurship and Innovation Learning Community attended the St. Louis Startup Connection at Washington University, a showcase and resource fair for entrepreneurs, investors, and other members of the innovation community.

**Action 3.5.10: Promote early intervention engagement strategies for at-risk students**

- Student affairs developed an active engagement strategy: 1) performed Brief Alcohol Screening and Intervention for College Students (BASICS) training for residence hall advisors, counselors, and students in the training program; 2) completed a Victim Assistance Training for residence advisors; 3) participated in the Campus Save Committee meeting; 4) provided wellness information to transfer students; 5) participated in and promoted suicide prevention training; 6) enhanced the STEP UP! bystander intervention with additional implementation efforts, training, and promotion; 7) enhanced Walk a Mile/It's on Us programs; 8) implemented a tobacco and depression screening process; and 9) promoted ethical and healthy decision-making skills.
- Starfish S&T Connect retention solutions and early warning system for at-risk students was utilized. This system raises a red flag to faculty for any potential at-risk student, and students receive an email notification when they have been flagged. The program was promoted in emails, on Blackboard, and on the website. Starfish S&T Connect allows students to request appointments with instructors and identify tools and resources for success.
- COER: implemented the department ambassador program connecting career advisors with academic departments to provide services and programming designed to meet specific departmental needs; integrated marketing outreach to alumni on services and engagement opportunities; engaged 700 alumni recruiters during the career fair.
Lever Summary:

The Missouri University of Science and Technology Laufer Energy Symposium, along with the Missouri Energy Initiative and the American Institute of Chemical Engineers, sponsored an energy symposium in St. Louis. The Midwest Energy Policy Conference brought together key business and technical leaders in legacy and renewable energy technologies.

Dr. Joseph D. Smith, the Wayne and Gayle Laufer Chair of Energy, talked about energy resilience with a specific focus on microgrids and hybrid energy systems.

The conference provided diverse perspectives on today's most pressing energy issues facing the Midwest.
Action 3.8.2: Create a culture of sustainability on the Missouri S&T campus and within the community by delivering programs that increase sustainability awareness

- Center for Sustainability programs delivered: Earth Day, RecycleMania, Solar/Eco Villages Management and Tours, EcoMiner Recycling at sports events, and Sustainable Energy Conference in collaboration with sustainability offices at Ameren, Saint Louis University, and Washington University.
- The Student Council President is a member of the Strategic Sustainability Planning Committee.

Action 3.8.5: Create and promote an alternative transportation culture, focused around simple transportation methods including pedestrian, cycling, and energy efficient busing to improve alternative transportation infrastructure over the next five years

- The center for sustainability is collaborating with the city of Rolla for a bicycle-friendly campus, an application was submitted by engineering management.
- Public transportation remains a viable mode of transportation for Missouri S&T students. To promote energy independence and help protect the environment, an electric bus (the eBus) began routing students in FY14 and completes a loop around the Missouri S&T campus twice an hour from 7:30 a.m. to 4 p.m. Monday through Friday.

Action 3.8.6: Investigate existing and new courses for sustainability awareness for faculty, staff and students (targeting freshmen engineering, new faculty orientation and employee orientation)

- Missouri S&T currently offers minors in sustainability, global studies, and global sustainable economics.

Action 3.8.7: Identify additional sources of funding to enhance sustainability programs

- A sustainability fund is in place to support future projects. The center for sustainability has received several grants and contracts including City Utilities of Springfield. This action will continue to develop as new projects and initiatives are identified.

Action 3.8.8: Track energy, environmental and sustainable research on campus

- The Office of Sponsored Programs tracks research grants and contracts including those involving energy, environmental, and sustainability.
- The Office of Undergraduate Studies has modified its application process to include a checkbox for undergraduate research projects related to sustainability, this should assist with tracking.
- The geothermal project tracks usage and energy savings and provides internships for students involved in outreach and project result dissemination.

Action 3.8.13: Analyze new construction with U.S. Green Building Council LEED (Leadership in Energy and Environmental Design) principles, and pursue LEED certification when appropriate

- All new construction can be evaluated with LEED standards and principles. Physical facilities and construction management will continue to evaluate when appropriate.
- LEED principles were applied to the new James E. Bertelsmeyer Hall for Chemical and Biochemical Engineering; the Technology Development Center; and the Kummer Student Design and Experiential Learning Center.
• LEED principles have aided the campus in achieving a Silver STARS (Sustainability Tracking Assessment and Rating System) rating. This rating, performed by the Association for Advancement of Sustainability in Higher Education, evaluated the areas of education and research; operations and planning; and administration.
• Bertelsmeyer Hall received a LEED Silver rating in July 2015.

Action 3.8.15: Model sustainable practices to promote environmentally responsive residential living communities

• Student affairs installed a trash compactor and recycling bins in all apartments within University Commons to serve the residents.
• Student affairs reconfigured the trash area at Rolla Suites to expand recycling of food waste and other recyclables.

Action 3.8.16: Apply sustainability measures to ensure effective recycling and waste management initiatives

• Student affairs expanded pre/post-consumer food waste collection to include coffee grounds at all locations; Trim Tax initiative collected 8,362 quarts of pre/post-consumer food waste totaling $25,530 value for local farmers; and integrated the ToGo recycling container program at the Havener Center.

Action 3.8.17: Increase the visibility of Missouri S&T in the areas of energy, environment and sustainability

• Center for Sustainability director is on several boards to increase visibility and those boards are: Sustainable Ozarks Partnership, Fort Leonard Wood Institute, Missouri Center for Advanced Power (MOCAP), and Kaleidoscope Discovery Center.
• Microgrid Industrial Consortium launched with six founding members.
• Missouri S&T was recognized in Princeton’s Review’s 2016 Guide to Green Colleges.
Lever Summary:

Outcomes:

- University Advancement implemented a division-wide staff sustainability retention program integrating key concepts in talent management, inclusion, well-being, and return on investment. This sustainability program was evaluated and the results of the survey suggest the division values the program. The participants have experienced and increased sense of engagement, enhanced trust in the division, and an improved overall well-being.

- University Advancement launched the Rolla Rising match campaign for flexible scholarships and seven endowments were secured.

- As of December 31, advancement had raised $8 million in gifts. Of the $8 million, $2.8 is designated for endowment.

- University Advancement received a “sustained fundraising excellence” award from the Council for the Advancement and Support of Education (CASE). A five year period of results was examined to determine where the award was merited.
Action 3.9.15: Develop campaign proposal templates

- The campaign proposal first draft has been completed and is undergoing final refinement.

Action 3.9.16: Solicit leadership, major, and participatory gifts

- This process has launched and is currently underway.

Action 3.9.23: Explore the feasibility and resources required to create an online repository of personal giving records for donors

- The development process is underway.

Action 3.9.24: Plan and host recognition events for lab upgrade donors

- Upgraded labs in the pilot program were dedicated in 2015. Recognition events will continue in the future as additional labs are upgraded using $500,000 allocated to the colleges to develop a one-to-one matching program for equipment and laboratory renovation.

Action 3.9.25: Ensure major prospects are visited face to face annually

- Visits are being measured - 500 individual donors have been visited.

Action 3.9.32: Launch an Advanced Construction and Materials Lab campaign and track results

- The campaign has been launched, marketing materials have been created, and events have been held.

Action 3.9.33: Launch a Student Design Experiential Learning Center campaign and track results

- The campaign has been launched.
- The building plans are finalized and naming opportunities are being explored.

Action 3.9.35: Pilot a staff sustainability program and assess effectiveness

- The program has been piloted and results are being evaluated.
Lever Summary:

U.S. News received and analyzed data from more than 1,200 online degree programs. The rankings include programs that are completely online, though a program still meets the criteria if it has in-person requirements for orientations, testing, and support services. The rankings do not include blended learning programs, nor do they distinguish between the for-profit and not-for-profit sectors. Rankings are determined by factors including student engagement, faculty credentials and training, peer reputation, and student services and technology. Each ranking category weighs the factors differently, and all, except for online bachelor’s degree programs, weigh admissions selectivity.

U.S. News and World Report’s 2017 Best Online Programs rankings:

Fifteen online graduate degree programs at Missouri S&T are among the best in the country.

Missouri S&T’s online graduate programs in the computer information technology category tied for sixth overall and ranked third among public universities. Missouri S&T offers online graduate degrees in computer science and information science and technology.

The online graduate engineering programs ranked 16th overall and 12th among public universities. Missouri S&T offers online graduate degree programs in 12 engineering disciplines: aerospace engineering, civil engineering, computer engineering, electrical engineering, engineering management, environmental engineering, explosives engineering, geotechnics, manufacturing engineering, mechanical engineering, mining engineering, and systems engineering.

Missouri S&T’s online graduate business program in information science and technology tied for 16th overall and ranked 13th among public universities.

The online MBA program tied for 91st overall and 71st among public universities.
The Business Analytics and Data Science graduate certificate ranked second in the nation in Value College’s Top 50 Best Value Online Big Data Graduate Programs of 2016.

**Action 4.1.3: Create a uniform marketing strategy to raise visibility of distance and online programs**

- Developed marketing plan to communicate the benefits of the office to key customers.
- Drafted communication/marketing plan for Global Learning (ongoing).
- Incorporated campus brand refresh into existing materials.
- Recruitment efforts included attending six professional academic/industry events.
- Advertising through Google ads, Multiview, ASCE, ASME, IEEE, St. Louis Magazine, chamber memberships, Pandora, direct mail, and electronic email campaigns.
- Chamber membership in target markets.
- Boeing-specific recruitment/marketing efforts.
- Advertising at the St. Louis Engineer’s Club, St. Louis.
- Advertising in Construction News and Review (CNR) magazine.
- Advertising to graduating students at UMSL/Wash U cooperative engineering program.
- Advertising to graduating seniors in several departments at Missouri S&T.

**Action 4.1.4: Increase our focus on the professional non-credit distance education portfolio**

- Education Technology performed instructional design consultations for professional non-credit courses.
- Pursuing opportunities with companies who attended Missouri S&T Industry Day.
- Pursuing development of non-credit course for Engineering Ethics.
- Enhancing current non-credit offerings to improve mobile friendly experience.
- Global Learning is working on the expansion of non-credit courses, specifically on a power program and systems engineering.
- Two new non-credit opportunities are under development: engineering ethics and national trainings for paint and coatings with ACCO.
- Recently updated the agreement with Boeing for additional distance education courses.

**Action 4.1.6: Create an incentive program to encourage departments and faculty to offer more online, blended and distance courses**

- Learning Technology Portfolio – Kaltura/Mediaspace – was used on campus and by Video Communications Center for distance students.
  - Instructors created Kaltura Media content in the LMS (Canvas) that could be used for any course making it completely reusable content.
- Two $10,000 grant opportunities were awarded to faculty for conversion of their courses to a distance format.
- Global Learning funded development of one new certificate program with a $15,000 grant.
- Missouri S&T Provost's eFellows Program was established to improve the learning environment while preserving and maximizing the physical learning facilities available for instruction. Collaboratively with academic departments and the Educational Technology department, support is provided for the development of courses using best practices for eLearning. The 2017 call for proposals occurred this fall.
**Action 4.1.7: Leverage existing success and resources from distance education program to expand into more online or asynchronous course offering**

- Global Learning conducted a Video Communications Center (VCC) studio classroom utilization and revenue generation analysis that indicated additional offerings were limited by classroom availability. Results of this study were reviewed with the Space Committee for consideration of changes in how classrooms were used.
- The campus has allocated funds for two academic departments to create online and distance master’s courses, chemical engineering and mechanical engineering.

**Action 4.1.9: Create more online capability in classrooms**

- Hybrid Distance Room Project:
  - Engineering Management 103
  - Electrical Engineering 103
  - Psychology conference room
- Completed two new distance rooms in Bertelsmeyer Hall.
- Education Technology performed lifecycle maintenance – classrooms and CLCs.
- Two additional classrooms have been converted to the hybrid format.

**Action 4.1.10: Explore strategies to engage online learners in campus life**

- COER: Established liaison with Global Learning to integrate and revise services for online and distance learners; developed a marketing piece for inclusion in the Global Learning welcome packet; and attended commencement breakfast for online graduate students to discuss services.
<table>
<thead>
<tr>
<th>Campus or Unit:</th>
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<tbody>
<tr>
<td>Lever Number:</td>
<td>4.2</td>
</tr>
<tr>
<td>Lever Description:</td>
<td>Enhance instructional labs and methods of developing lab experiences</td>
</tr>
<tr>
<td>Lever Metric:</td>
<td>Increase the number of redesigned instructional lab courses by 5 (year five)</td>
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**Lever Summary:**

Missouri S&T strives to be a leader in how instructional labs for science and engineering courses are designed and delivered. This overall effort is known as DELTA, or Delivering Experiential Labs To All. The DELTA project began with the development of a set of eLearning models, processes, and strategies for the redesign of traditional laboratory courses for blended and online delivery. DELTA labs provide the relevant information and research to build and share a handbook which includes a comprehensive set of models for redesigning instructional laboratories in any engineering and science discipline. Several courses have been redesigned and piloted in both blended and online formats.
Action 4.2.1: Explore how to partner with other universities, community colleges, high schools or extensions to deliver lab experiences

- A portion of allocated funds were used toward configuring 11 laboratories for remote access.

Action 4.2.2: Develop model frameworks and strategies for evaluating and redesigning instructional lab courses for blended/online delivery

- Education Technology developed a handbook for instructor use on blended/online course delivery.
Missouri S&T reached out to the Council of Graduate Schools to conduct a site visit on the graduate studies office. This visit was performed by three deans of comparator university graduate departments. The charge was: 1) conduct an analysis on the strengths, limitations, and opportunities of the structure; 2) provide an assessment of online degree programs; and 3) complete a comprehensive study of the graduate office leadership and services. A strategic consultation report was provided and this report will be utilized to develop a plan for increasing graduate enrollment and providing students with the appropriate services.

Doctoral enrollment for fall 2016 was 624, representing a five percent increase over the prior year and a 21 percent increase over baseline. Enrollment in masters programs has increased 1.4 percent over baseline. The 2020 goal for Ph.D. enrollment is to add an additional 200-400 students and the campus is on track to achieving this goal.

Missouri S&T significantly increased funding for qualified Ph.D. and graduate students as part of a strategy to attract more students and strengthen its research programs. The initiative became effective in fall 2016. Any Ph.D. student on a 37.5 percent or greater full-time equivalent appointment received full coverage of tuition and supplemental fees. The same coverage extended to similarly qualified students pursuing master’s degrees in departments (English and technical communication, biological sciences, psychological science, business and information technology) where a Ph.D. is not offered. Missouri S&T is investing more than $3 million in new funds annually for the program. In fall 2016, 336 doctoral students and nine master’s students received the new funding.
As part of this initiative, Missouri S&T also revamped its Chancellor’s Distinguished Fellowship program for Ph.D. students. This nationally competitive program provides funding for U.S. citizens, U.S. nationals, or permanent residents who qualify. In addition to full coverage of tuition and fees, students eligible for the Chancellor’s Distinguished Fellowship will receive a $10,000 annual fellowship added to their appointment stipend.

**Action 4.5.3: (Recruit) Develop memoranda of understanding and articulation agreements with reputed national and international schools to recruit high quality doctoral students**

- Graduate studies staff visited seven cities in India during the fall 2016 semester aimed at recruiting students.
- The vice provost and dean for graduate studies represented Missouri S&T and participated in the American Council on Education (ACE) Internationalization Lab in fall 2016. Processes began to weave internationalization into strategic mission and goals by adding actions throughout the strategic plan.
- Graduate studies continues to collaborate with the vice chancellor for global and strategic partnerships and the international and cultural affairs office to promote internationalization efforts.

**Action 4.5.4: (Recruit) Develop a marketing plan to promote comprehensive Missouri S&T graduate leadership and excellence**

- The Graduate Leadership Development Program (GLDP) is continuing its fourth year. The member cohort has increased to eight students per calendar year.
- Experience S&T program was adjusted to become a one-to-one match with academic departments. The new VIP Experience S&T program was rolled out in December 2016.
- Missouri S&T is actively engaged with the National Graduate Engineering Degrees for Minorities (GEM) Consortium to increase participation of underrepresented minorities at the master’s and doctoral levels in engineering and science. Demonstrating active engagement with this consortium occurred this fall with graduate studies co-sponsoring the National GEM Consortium GRADLab in Columbia, Missouri. Eight minority students from Missouri S&T attended and 40 prospective minority students from other universities also attended.
- The university committee researched and developed a new distinguished fellowship aimed at promoting the values of diversity and inclusion. Several universities have fellowships dedicated to socio-economic status, first-generation U.S. citizens, first-generation college students, disabled, individuals who can demonstrate historical commitment to diversity and inclusion, or students who are underrepresented in their field of study. Eight revised Chancellor’s Distinguished Fellowship awards will be given annually. Of the eight awards, four will be dedicated for underrepresented minorities and female students to enhance student diversity.
- Chancellor Distinguished Fellowship has 22 current awardees.
- Recruitment staff attended: the Society of Women Engineers (SWE) fair, the National Society for Black Engineers (NSBE) fair, Tau Beta Pi engineering honor society fair, and several regional fairs in the fall semester. Recruiting staff also visited three historically black colleges and universities.
- Recruiting staff attended Oak Ridge National Lab’s ORAU Graduate Fair and sponsored a booth to increase name recognition to recruit top doctoral students. This fair will become an annual event.
Action 4.5.7: (Retain) **Conduct a feasibility study and develop a plan for a Graduate Resource/Success Center/Graduate Learning Commons to help students in the timely completion of their degrees, and to facilitate greater student/faculty/staff interaction**

- A Student Success Committee subcommittee on graduate student success is continuing for another year. The committee is exploring solutions to issues raised in the spring 2016 focus group and is currently working with graduate students.
- The Library’s Master Plan includes space for a Graduate Resource Center and this is a phase five development.

**Action 4.5.10: (Placement) Provide mentorship and networking opportunities for students by connecting them to experts in academia/industry/research labs; provide resources to present their research work at national/international conferences**

- Chancellor’s Distinguished Fellowship and Graduate Leadership Development students are given the opportunity to interact with university and community leaders regularly.
- The Council of Graduate Students (CGS) and graduate studies provide travel grants for up to 20 students to travel to conferences. In February 2017, ten grants will be extended.

**Action 4.5.11: (Recruit) Provide funds to encourage prospective domestic doctoral students to visit the campus for one day and/or a few weeks to work closely with a professor**

- In December 2016, a Doctoral Student Recruitment Grant program was rolled out. Academic departments could write for recruitment grants under two different tracks. Track one is recruitment of highly competitive underrepresented minority doctoral students (African American, Hispanic, Native American or Pacific Islanders) and/or female doctoral students. Track two is general recruitment of highly-competitive doctoral students.

**Action 4.5.13 (Recruit) Enhance implementation efforts for high quality international doctoral students**

- Graduate studies and international and cultural affairs meet monthly to discuss recruitment and work to identify ways to enhance the process.

**Action 4.5.15: (Retain) Examine graduate programs and reduce time-to-degree, where appropriate**

- An initial analysis on graduate time-to-degree has been performed but the data combines those Ph.D. students enrolling with a bachelor’s and a master’s degree together. The graduate office is correcting the data to separate those two groups so the data can be reanalyzed.

**Action 4.5.17: (Retain) Promote workshops/seminars/social events to encourage more camaraderie and exchange of research ideas among doctoral students from various disciplines**

- The second annual Three Minute Thesis (3MT) competition took place in October 2016. The 3MT, an academic competition, challenges graduate students to describe their research within three minutes to a general audience. It was designed to celebrate the discoveries made by students and encourages
communication. This event had 27 student participants and 15 judges from the campus and Rolla community. The winner will compete against students from other universities in April 2017 at the Midwest Association of Graduate Schools conference in Indianapolis.

- A technical editor was hired in August 2016 and held a thesis/dissertation workshop for 15 students. Two additional boot camps will be offered in the spring semester. The editor also offers walk-in writing sessions in academic departments, 10 have been implemented. The editor also has an open-door practice for providing immediate and quick one-on-one assistance for short documents.
- Graduate studies hosted seven workshops in fall 2016 including learning from LaTeX, formatting your thesis/dissertation and learning about Endnote.
- Graduate studies hosted a graduate family Halloween party in October with 60 people in attendance.

**Action 4.5.22:** (Recruit/retain/placement) implement comprehensive graduate student/program data collection mechanism, tracking mechanisms, (student inquiry thru placement), graduate learning outcomes rubrics, etc. to benchmark time-to-degree, doctoral retention, program improvement, timely response to student application/graduation status, and improve graduate student services

- Starfish S&T Connect was launched in fall 2016. Graduate studies staff utilized Starfish to keep track of student questions and issues. Students could check-in through the Starfish kiosk when they arrived in the office. In the fall semester, 326 students checked-in for an appointment.
- A graduate studies dashboard is under development.
- Graduate studies completed a thesis and dissertation defense rubric implemented across all units. The rubric included ratings for: an ability to apply disciplinary knowledge with critical problem solving skills, an ability to function in diverse learning and working environments, an understanding of professional and ethical responsibilities, an awareness of national and global issues, and recognition to engage in lifelong learning. The core areas are knowledge, communication, critical thinking, and professional development. All departments have complied with the new rubric and are submitting graduate learning outcomes to the graduate studies office. Utilizing the rubric demonstrates graduate learning outcomes in compliance with the Higher Learning Commission.
Lever Summary:

The Graduate Student Leadership Council and the Undergraduate Student Leadership Council in the College of Arts, Sciences, and Business operates as an active advising body serving the collective interests of both graduates and undergraduates in the college, providing a communication link between students and administration, and working to enhance the goals of the college and the greater university community. Students were nominated or were encouraged to apply to serve on the college leadership councils by department chairs and other campus administrators. Applications were vetted by the college senior leadership. The founding student members met monthly in the fall semester.

- Core Objectives of the councils:
  - To represent the college’s undergraduate student body
  - To serve in an advisory capacity to the vice provost and dean
  - To raise the visibility of the colleges and its undergraduate programs
  - To recognize undergraduate student achievements in the college
    - Student achievement: YeonKyung Lee, English and Technical Communication, was awarded $3,711 by the C.R. Anderson Research Fund Board of the Association for Business Communication for her research comparing social media content of U.S. and Korean consumer products and airline companies; compiling indicators of effectiveness related to cultural content. Based on the work, she received an internship with Southwest Airlines.
    - Student achievement: Casey Burton, chemistry, 2017 CACA Best Student Award winner. Casey is one of six finalists for the BioAnalysis Zone Young Investigator Award.
Action 4.6.1: Explore development of an online math assessment for incoming students

- The committee made the following recommendations: 1) create an equivalency table with ACT math score and corresponding math class. Data from the past three years of PRO sessions will be reviewed to create a grid of the ACT math score and which math class the student was assigned after the math placement test. This data will be used to create an equivalency table which will be used as part of the process of math placement for freshmen entering in 2017; 2) compare per-assigned math class to in-person testing at PRO. Prior to the PRO session students are assigned a block of courses, including a math course, based on their ACT math score. During 2017, the students will continue to take the in-person placement test to confirm the class assigned based on the ACT math score. Adjustments will be made during an advising session; 3) analyze the results. After the PRO sessions in 2017, data would again be analyzed to compare how many students needed a change of placement after the in-person testing. It would be deemed successful if less than 10 percent had to be changed from their prior assignment; and 4) decision moving forward, if the pilot is deemed successful, the equivalency table may be considered for use in 2018 to pre-assign the student’s math class.

Action 4.6.2: Develop and implement a campus structure of staff advisors for undergraduate students

- A plan is under development to hire non-tenure track faculty who would split appointments to serve as “super advisors” as well as teach within programmatic areas. This could provide instant relief for departments that need assistance in both advising and teaching loads.
- College of Arts, Sciences, and Business requires each department chair to teach at least one undergraduate course each academic year.

Action 4.6.4: Explore the feasibility of a Center for Advancing Faculty Excellence (CAFÉ)

- A steering committee has been created to guide this initiative forward. The center will provide resources that support faculty excellence in teaching, research, and creative activities. It will be a faculty-centric center involving high levels of faculty involvement.
- Current campus initiatives: Early Faculty Development Program, Teaching and Learning Sessions, and Freshmen Faculty Forum.
- The steering committee is exploring the gaps a CAFÉ can fill and what the faculty really want and need.

Action 4.6.5: Implement best practices and promote widespread use by the faculty, students and advising staff of the Missouri S&T Early Alert and Connect advising tools

- Campus staff members participate in regular meetings and share best practices with other system campuses.

Action 4.6.6: Create a “10 Before Tenure” program where untenured faculty can participate in 10 career development programs

- The provost’s office is reviewing the development of this program.
**Action 4.6.7: Enhance the new faculty orientation program**

- The current new faculty program begins with a two-day orientation. A campus welcome and strategic overview is provided by the Chancellor. Professors present on: “Teaching Expectations and Assessment,” “Developing Approaches and Viewpoints to Achieve Career Success,” “Getting Ready for your First Class at Missouri S&T,” “Diversity of Scholarship at Missouri S&T,” and “Working with Students.” The Provost discusses leadership and campus organization. An introduction to sponsored research is included. The library provides information on data management and scholarly tools. The campus promotion and tenure committee discusses the tenure process.
- After orientation has been completed, new faculty are connected with a mentor.
- Education Technology and CERTI worked collaboratively to provide quality professional development for new faculty.

**Action 4.6.8: Develop guidelines for faculty mentoring focusing on three core areas: teaching, research and service**

- The College of Arts, Sciences, and Business host’s regular meetings with subgroups of faculty (teaching professors, junior professors, female professors) to offer informal and formal mentoring and advising.
- The College of Engineering and Computing enhanced faculty mentoring by creating Mentoring Mondays and Feedback Fridays.

**Action 4.6.9: Explore the feasibility of a comprehensive staff mentoring program**

- Pilot programs are being explored.

**Action 4.6.10: Explore and create additional programs to assist in professional development, leadership and mentoring of graduate students**

- The Graduate Leadership Development Program (GLDP) provided Missouri S&T students from various disciplines to network and collaborate with graduate students from system campuses. GLDP increased to eight students per campus, previously five. The students assisted with the 3MT competition, logistics, set-up, and time-keeping.

**Action 4.6.11: Create and enhance resources for campus graduate staff and coordinators (e.g. Guidebooks, Staff Storm, Graduate Council meetings, etc.)**

- Graduate studies “Policy and Procedure Manual” was completed.
- Graduate staff storming sessions occur monthly to discuss common questions, troubleshooting, and additional information missing in the procedures manual.
Lever Summary:

The Burns & McDonnell Student Success Center (BMSSC) had a soft launch in fall 2012. By the spring of 2013, one advisor had been hired and several student workers (success coaches) were staffing operations. Each year the BMSSC’s advisory committee and Student Success Programs (SSP) evaluates, analyzes, and makes recommendations on enhancing and developing programs/events, additional support, tutoring, and mentoring. BMSSC is committed to ensuring that students have many opportunities for positive experiences and academic success.

The Student Success Mentor program consists of formalized assistance made available in the Student Success Center for students who may need early intervention to help them persist. These students are identified at admission. During their PRO day they visit with a success coach (trained student employee) along with their family or guests who attend PRO with them. During their first and second semester, the success coach informs students about available programs and resources.

The Student Veterans Resource Center celebrated its official ribbon cutting and Grand Opening Ceremony on November 11, 2016. Approximately 100 Missouri S&T students attended, along with 75 to 100 community members. After a “soft” opening in 2015-16 academic year, the SVRC is now fully operational. A professional student services specialist and U.S. veteran is at the helm. Four Missouri S&T students, also veterans, serve as counselors and advisors to veteran students of the US Armed Forces. The SVRC hosts lunch councils every other week where student veterans can connect with each other and offer feedback to faculty and staff. Individual sessions can be scheduled as needed with student veteran peer counselors. The SVRC offers a needed space where veterans can go for advice, counseling, or just to hang out. SVRC assisted or advised 104 student veterans last year. Nine student veterans were referred to another department or resource. Three graduating student veterans wore their veterans’ sash at graduation.
**Action 4.7.1: Explore the feasibility of a first-year success course**

- Elements of a first-year success course were implemented in freshmen engineering.
- The Chancellor’s Student Success Committee will be revisiting the feasibility and implementation of a first-year experience course.
- Advisors were added to assist students with their academic needs.

**Action 4.7.2: Identify the feasibility for restructuring freshman engineering**

- The College of Engineering and Computing is working with faculty on transforming freshmen engineering to encourage innovative thinking among students within the program.

**Action 4.7.3: Enhance student mentoring program**

- Faculty presence in the Student Success Center includes: Faculty Corner Brown Bag Lunches where students can eat with faculty; faculty office hours in the SSC; and outreach programs generated by faculty to bring in students which includes “How to Approach Faculty” and “Importance of Talking with Your Professor.”
- Opening Week is a program bringing in all new freshmen for orientation to campus a full week prior to the start of Fall Semester. 1,471 new students attended Opening Week in fall 2016, and they were matched up with 95 Missouri S&T upperclassmen who served as Freshmen Mentors. 25 additional upperclassmen serve as Transfer Student Mentors. This mentoring program offers new students the opportunity to connect with experienced Missouri S&T students and “learn the ropes,” leading to improved success. 91 percent of the 1,471 students agreed that Opening Week helped them to better understand how to be academically successful at Missouri S&T and 95 percent of the new students agreed that their mentor was helpful and knowledgeable about Missouri S&T. During Opening Week, students also have a chance to interact informally with faculty members; with 95 percent of new freshmen interacting with at least 1 faculty member.45 faculty members volunteered their time to welcome new students.

**Action 4.7.4: Generate a time-to-degree template and analyze baseline demographic data of graduate student cohorts for Ph.D. completion**

- Graduate studies is working on developing a dashboard. The executive director for strategy, planning and assessment will work with the department to create the dashboard in spring 2017.

**Action 4.7.5: Explore and identify graduate policies and procedures that impact the doctoral plan of study and students’ multiple career pathways (e.g. time limits, residency requirements, etc.)**

- Graduate studies collaborated with the Graduate Council and evaluated graduate stipends at comparator universities.

**Action 4.7.6: Implement a pilot program to assist graduate students with theses/dissertation completion**

- Graduate studies offered boot camps which assisted with thesis/dissertation completion.
Action 4.7.7: Explore additional work study opportunities and other student engagement programs

- In fall 2014, 30 low-income and/or underrepresented students with a projected below average retention rate, became part of an Institutional Work Study program funded by system as the President’s Comprehensive Retention Initiative (CRI). The objective of this action item is to explore and increase the number of engagement programs set up for students that have been identified as having a high probability of becoming a non-returning student. Included in this goal is to also secure funds to continue the Institutional Work Study Program. As anticipated the return rate of the 30 low-income and/or underrepresented students in the cohort had a first-year return rate (90 percent) which exceeded the fall 2014 FTC rate (87 percent). Historically this group retains around 75 – 78 percent. It was decided that the Institutional Work Study program could reduce it’s funding from $80,000 to $50,000.

- No new students were added to the Work Study program for fall 2015, as no funds were available to continue to fund the program. Students already in the program did continue in the program, with continued retention success. Additional funding was procured for freshmen in spring 2016 (these were students who were new freshmen in fall 2015), and 17 new freshmen were added to the IWS program. Because of the retention success of the program, $50,000 in additional funds were procured for fall 2016, allowing an additional 30 new students to enter the Institutional Work Study program.

- Of the original 30 Institutional Work Study students enrolled in fall 2014, 28 were still enrolled at Missouri S&T in Fall 2016 (a 93 percent freshmen – junior retention rate! One student who had dropped returned to campus, making this number higher than the freshmen-sophomore retention rate of the original cohort). Of the 17 awarded in spring 2016, 15 were still enrolled for fall 2016 (88 percent retention rate).

- For fall 2016, 31 new students were enrolled in the Institutional Work Study program. No first to second semester data are available yet for this cohort.

- Summarizing the work study efforts: fall 2014 through fall 2016, 78 students were enrolled in the Institutional Work Study program, and 74 were still enrolled in fall 2016. No retention numbers are available yet for fall 2016 – spring 2017 retention.

Action 4.7.8: Explore the feasibility of spring, summer and winter intersession courses

- The provost is reviewing the feasibility of intersession courses.

Action 4.7.9: Identify measures to enhance course enrollment projections and implement adaptive instruction funding model

- The registrar’s office has restructured the first-year course projection report to improve the consistency of formulas, expanded the courses included, and the affected department.

Action 4.7.10: Investigate offering courses in an innovative modular format

- The provost is examining the feasibility of an innovative modular format.
**Action 4.7.11: Identify strategies and technologies promoting awareness of Disability Support Services to meet the needs of a diverse student population**

- Counseling, disability support services, and wellness: integrated Dragon Naturally Software to be accessible from any campus computer; facilitated six sessions for Autism Spectrum Disorder group; created a study area for students registered with DSS; collaborated with UMSL, MU, and UMKC on revisions of the UM Collected Rules and Regulations to better reflect the operational needs of disability support; and collaborated with Education Technology to provide virtual software to students needing dictation software.

**Action 4.7.12: Provide early intervention strategies that promote self-management and enhance resiliency for a diversified student body**

- Athletics co-sponsored speaker, Jake Byczkowski, on Solo Cup Culture: Minimizing the Risks of an Alcohol-Soaked Campus Climate, 1,000 students attended.
- Counseling, Disability Support, and Student Wellness: completed 83 modules of Listen. Refer; facilitated 19 student confidentiality meetings; trained the counseling staff in trauma and impact; attended Young, Gifted, and at-Risk conference; and attended the Association for University and College Counseling Center Directors.
- The dean of students performed 194 UCARE referrals; and engaged the UCARE team in review of 51 in-depth cases.
- Student wellness: provided risk management training for Alpha Chi Sigma and Sigma Pi Epsilon with 36 students attending; facilitated 10 Alcohol BASICS sessions with 7 students; facilitated 21 Marijuana BASICS sessions with 10 students; engaged 23 constituents in six ATEAM meetings; and engaged the residential life staff on BASICS referral process and wellness initiatives.
- Housing Improvement and Retention Committee engaged student feedback which resulted in a rate increase for 2017-2018, to include “free” laundry service for students in all buildings.

**Action 4.7.13: Explore creating a multicultural center on campus with designated spaced for affinity groups**

- Institutional equity, diversity and inclusion along with student affairs are collaborating to determine the feasibility of a multicultural center.