Research Capabilities
2013
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We genuinely thank you for reviewing the Tennessee State University – Research Capabilities 2013 and it is with honor that we present you with this document.

Tennessee State University’s legacy of research began with the vision of Dr. Walter S. Davis, President (1943-1968), as he encouraged and led the faculty to “bring research to the campus.” Humbly expressed, Tennessee State University is recognized by the Carnegie Foundation for the Advancement of Teachers as a “Doctoral/Research University,” a designation which highlights high quality research and graduate programs which serve our students, the state, the nation, and the world.

We are engaged in scholarly research that covers biological science, chemical science, agricultural science, social science, engineering, physics, and astronomy. Our outreach to other universities and agencies extends beyond our four walls to include, local, regional, national, and global partnerships. Through these initiatives, we seek to inform and produce the next generation of global researchers by training our students in the best science and best practices in the field of research methodology.

Our faculty have been and continue to be actively engaged in research and are open to the pursuit of new research partnerships and collaborations. We sincerely appreciate you for reviewing Tennessee State University’s research capabilities and we welcome opportunities for future engagements with your research institutions and organizations, both in the United States and abroad.

We graciously say, “Thank you.”
The faculty in the College of Agriculture, Human, and Natural Sciences (CAHNS) have been engaged in conducting research through four departments – Agriculture and Environmental Sciences, Family and Consumer Sciences, Biological Sciences, and Chemistry.

The faculty in Agriculture and Environmental Sciences, and Family and Consumer Sciences have been engaged in conducting research and generating scientific knowledge in a variety of high-demand areas, including childhood obesity prevention; climate change; food safety; global food security; and sustainable bioenergy.

Classic and new technology, equipment, and science incorporated in implementing these research activities

- Inductively Coupled Plasma emission spectrophotometer (ICP)
- Gas Chromatograph (GC)
- Compound and stereomicroscopes
- Image analyzers
- UV-VIS spectrophotometers
- pH meters
- Analytical balances
- State-of-the-art Geospatial Information Systems (GIS) laboratory
- Biotechnology
- Next Generation Gene Sequencing System

These research activities have been funded by federal agencies including the United States Department of Agriculture (USDA), National Institute of Food and Agriculture (NIFA), Agricultural Research Service (ARS), and Tennessee State Department of Agriculture.

Focus of current funded research grants

- Keeping American agriculture competitive while ending world hunger
- Improving nutrition and ending childhood obesity
- Improving food safety for all Americans
- Securing America's energy future through renewable biofuels
- Mitigating and adapting agriculture to variations in climate
- Tennessee's nursery and ornamental plant industry
- Promoting the well-being of our communities and families
Impact

Researchers in the departments of Agriculture and Environmental Sciences, and Family and Consumer Sciences at TSU are dedicated to leaving a lasting mark on the world by addressing wide-reaching challenges and improving the lives and livelihood of its inhabitants. This dedication and the research it produces have resulted in significant strides in a variety of high-priority areas, including biofuel production, food systems and safety, food and nursery crop production, and water quality.

- Reducing grower costs and nursery crop contamination by developing a Japanese beetle quarantine treatment that has reduced the necessary insecticide rates by eight-fold;
- Identifying molecular controls that allow plants to develop tolerance to drought, salt and toxic ions in the soil, and developing plant lines that will perform well under stress;
- Helping small farmers to produce optimal switchgrass feedstocks for biofuel production by identifying optimal harvest timing;
- Enhancing the environmental stewardship efforts of farmers, landowners and homeowners to reduce the impact of chemicals such as pesticides and fertilizers on water quality in rural and urbanizing watersheds;
- Providing instrumental assistance to the Food Safety Inspection Service (FSIS), the USDA, and the FDA in protecting public schools from listeriosis infections; and
- Characterizing trends and changes in farm distribution and the supply of fruits and vegetables in the U.S. and assessing factors that contribute to the growth of the produce industry.

Academic Offerings

The departments of Agriculture and Environmental Sciences, and Family and Consumer Sciences currently offer the following academic degrees: B.S. (Agricultural Sciences, Early Childhood Education, Family and Consumer Sciences); M.S. in Agricultural Sciences; and Ph.D., Biotechnology Concentration.

Equipment and facilities available for conducting these research activities include

TSU’s College of Agriculture, Human, and Natural Resources has more than 52,000 sq. ft. of laboratory and office space on the main campus, including the Agricultural Information Technology Center (a smart video conferencing center). Off-campus resources include the state-of-the-art Otis L. Floyd Nursery Research Center in McMinnville, Tenn., plus more than 600 acres of field research space. In addition to the College’s facilities, our students and faculty utilize the TSU Core Laboratory Facility, a new $2 million laboratory for scanning electron microscopy, flow cytometry, proteomics and nano-technology research.
New Facilities
Field and Greenhouse Research Support Buildings
The Agricultural Biotechnology and Bio-security Center
A 25,000 sq. ft. research facility scheduled to open in Spring 2014: research laboratories, offices and class rooms. (shown below)

Centers or Institutes
Research and extension efforts of the College are carried out through a network of research centers and county offices throughout the state.
- The Institute for Food, Agricultural, and Environmental Research (IFAER)
- The Cooperative Extension Program (CEP)
- Four Centers of Research and Education, including the Center for Prevention Research, the Otis L. Floyd Nursery Research Center at McMinnville, the Agricultural Research and Education Center at Nashville and the Agricultural Research and Education Center at Ashland City.
The research capabilities for the Department of Biological Sciences lie in the broad area of cell and molecular biology. Faculty research activities involve studies of plant extracts and the effect on cancer cell growth and function, studies of the role of D3 receptors in neuronal development, studies of collagen assembly and trafficking, studies of the role of the spectraplakin protein, MACF1, in maintenance of brain tumors, studies of the use of microorganisms as bioinsecticides and as producers of antimicrobial and anticancer compounds, studies of inflammation cytokines in cancer biology, studies of genome variation in poultry and studies of global change ecology.

Classic and new technology, equipment, and science incorporated in implementing these research activities

- Bioinformatics
- Cell Culture Techniques
- Confocal Imaging
- Gel Electrophoresis, Imaging, and Documentation
- Microbial Cell Culture Techniques
- Real-Time PCR

These research activities have been funded by federal agencies including the National Institutes of Health (NIH), the United States Department of Agriculture (USDA), the Environmental Protection Agency (EPA), the Research Centers for Minority Institutions (RCMI), the National Aeronautics and Space Administration (NASA), and the National Science Foundation (NSF).

Focus of current funded research grants

- Global change ecology
- Genome variation in poultry
- Collagen IV Assembly and Trafficking

Impact

The Biological Sciences Department also makes a significant impact on education and outreach activities. Faculty in the department contribute significantly to the preparation of undergraduate and graduate students for careers in biomedical science. These efforts are supported by two federally funded programs. The first is the NIH funded Minority Access to Research Careers (MARC) program. This program seeks to increase the number of highly-trained underrepresented biomedical and behavioral scientists in leadership positions. The second is the NSF funded Historically Black Colleges and Universities-Undergraduate Program (HBCU-UP). The underlying purpose of the HBCU-UP is to develop pedagogies and methodologies for training undergraduates in the STEM areas. In addition, emphasis is placed on interdisciplinary enrichment of quantitative skills (mathematics and physics) of students in the biological sciences.
Academic Offerings

In addition to the B.S. in Biology degree program, the department also offers Master's of Science (M.S.) in Biology and Ph.D. in Biological Science degree programs. These programs are concentrated in the Cell and Molecular Biology area and focus on addressing biomedical and basic research questions. In addition, the faculty serve as panelist and evaluators for federal and private organizations, and they are active in their professional organizations working to address underrepresentation of minorities in science.

Equipment and facilities available for conducting these research activities include

- Laser Scanning Confocal Microscope: High resolution imaging of immunofluorescence phase contrast images, as well as three-dimensional reconstruction of imaging of the X, Y and Z planes.

- Tissue Culture Core Laboratory Space: The tissue culture core laboratory is a 120 Sq. ft. dedicated space for in vitro culturing experiments partitioned from the external environment by an 8’ x 3’ glass door.

- Animal Facility: The Small Animal Care Facility for housing rodent species is located on the 3rd floor of Harned Hall (Room 307 & 309) in a space totaling 351 square feet. Room 307 (191 sq. ft.) where animals are housed has one large hepa-filtered mouse rack (70 cages, “x” x 5” each) and one large hepa-filtered rat rack (36 cages, “x” x 8” each). The rooms have separate temperature, humidity, and light control systems from the general building. The cage racks have hepa-air filtering and automatic watering systems. The room can house a daily inventory of 280-300 mice and 100-150 rats, depending on animal size and physiological status. Room 309 (160 sq. ft.) contains a Basil 3500 cage and bottle washer, cage storage rack, freezer, cleaning, wash sink, and storage area. Research technical staff in the Department of Biological Sciences and individual investigators conduct daily care and management of laboratory animals.

- Real-Time PCR: Also called quantitative real time polymerase chain reaction (qPCR) or kinetic polymerase chain reaction is a laboratory technique based on the PCR, which is used to amplify and simultaneously quantify a targeted DNA molecule. We currently have the ABI 7500 Fast System, which has capabilities of 96 reactions per run.
Faculty in the Department of Chemistry have been engaged in conducting research activities specific to: cancer, environmental science, nano-science, atmospheric chemistry, synthesis of molecules with biomedical interest, synthetic method development, and polymer science.

**Classic and new technology, equipment, and science incorporated in implementing these research activities**

- IR, GC-MS, NMR, UV, Raman Spectroscopy
- Various Chromatographic Techniques
- High Resolution Imaging
- X-Ray Crystallography
- Confocal Imaging
- Live Cell Imaging
- Real Time In Vivo Imaging
- Real-Time PCR
- Nano-materials for Drug Delivery

These research activities have been funded by federal agencies including the National Institutes of Health (NIH), Department of Education (Title III), Minority Access to Research Career (MARC), United States Department of Agriculture (USDA), and the National Science Foundation (NSF).

**Focus of current funded research grants**

- Cancer research
- Drug-drug interactions
- Synthesis of biologically active compounds

**Impact**

The Chemistry Department also makes a significant impact on education and outreach activities. Faculty in the department contribute significantly to the preparation of undergraduate students for careers in biomedical science, chemical and pharmaceutical industries. These efforts are supported by two federally funded programs: 1) NIH funded Minority Access to Research Careers (MARC) program. This program seeks to increase the number of highly-trained underrepresented biomedical and behavioral scientists in leadership positions; 2) NSF funded Historically Black Colleges and Universities-Undergraduate Program (HBCU-UP). The underlying purpose of the HBCU-UP is to develop pedagogies and methodologies for training undergraduates in the science, technology, engineering, and mathematics (STEM) areas. In addition, emphasis is placed on interdisciplinary enrichment of quantitative skills (mathematics and physics) of students in the sciences.
Academic Offerings

The Chemistry Department offers undergraduate programs leading to B.S. degrees and a graduate program leading to an M.S. degree. Four different undergraduate curricula are available to students according to their individual interests. Similarly, two graduate curricula are available to students in the M.S. degree program. The Master of Science (M.S.) degree is offered in two concentrations – Chemistry and Biochemistry. Research is conducted in all areas of Chemistry.

Equipment and facilities available for conducting these research activities include

- Apparatus for Inert Atmosphere
- Atomic Absorption/ICP Spectrometer
- FT-NMR 300 and 400 MHz
- GC or Gas Chromatography
- LC or HPLC/ Chromatography system
- GC/MS
- LC/MS
- Multipurpose Electrochemical Apparatus
- Optical Spectrometers
- Protein purification, Electrophoresis, Imaging System and PCR
- Radiochemistry
- Raman/IR Spectroscopy
- Ultracentrifugation
- Material Science
- X-ray Diffraction
- Elemental Analysis
The College of Business is uniquely poised as a strong, robust and expanding educational, entrepreneurial and research engine, positively impacting the economic tapestry of Nashville, the State of Tennessee and the country. The College of Business at Tennessee State University was the first business school in Nashville accredited by the prestigious AACSB at both the undergraduate and graduate levels and the first public HBCU in the country to receive this dual designation. After initial accreditation in 1994, reaffirmation by AACSB International in subsequent years allowed the College to retain its revered status among business schools internationally.

To serve current and future student populations, the College of Business retains highly qualified and culturally diverse faculty with the recent addition of two funded Chairs, the Frist Chair of Excellence in Business and the Chair of Excellence in Banking and Financial Services. The College of Business is also home to a highly recognized scholarly publication, the Journal of Developing Areas. The scholarly research productivity of the faculty continues to be strong. In addition to their commitment to teaching and advising, College of Business faculty members stay current and active in their respective fields through a variety of research endeavors and participation in professional development opportunities. College-wide accomplishments during the past five years include:

- 223 articles in peer-reviewed journals
- 7 books (textbooks, professional/practice/trade, and/or scholarly)
- 12 chapters, readings in books (textbooks, professional/practice/trade, and/or scholarly)
- 127 peer reviewed proceedings from teaching/pedagogical meetings, professional/practice meetings, and/or scholarly meetings
- 65 peer reviewed paper presentations at teaching/pedagogical meetings, professional/practical meetings, and/or academic meetings

The College of Business advances the skills, knowledge and expertise of faculty with specialized backgrounds and experiences in areas of accounting, business management, economics, finance, and information systems and technology to provide quality outcomes for students and other constituents. Inasmuch, the faculty has been engaged in conducting applied, disciplined-based and pedagogical research.

Research activities conducted within these areas utilize

- Innovative Technologies
- State-of-the-Art Training Facilities
- Web-Based Study Strategy and Student Success Modules
- Baseline Data of Student Performance

These research activities have been funded by Tennessee Board of Regents, U. S. Department of Education (Title III and Student Aid and Fiscal Responsibility Act), Jacobs Engineering Group, U. S. Army (Mentor-Protégé Program), and Metropolitan Development Housing Authority.
Focus of current funded research grants

- Immigrant Entrepreneurs
- Undergraduate Education
- Retention and Success Progress
- Diagnostic Problem Solving
- LEED Silver
- Management of Water Systems
- Management of Bio-Pathogens
- Management of Indoor Air Quality
- Economic Impact

Impact

Research conducted within the College of Business continues to positively impact education as well as community and outreach activities. First, the College of Business was awarded a TBR Access and Diversity grant to examine the state of immigrant entrepreneurs in the Nashville area, which ultimately led to the establishment of the Nashville International Council of Entrepreneurship. Secondly, the College received Title III funds to enhance undergraduate education through innovative technologies and collaborative teaching and learning strategies to increase students’ learning, retention, persistence, and graduation percentages. Third, the College of Business was awarded grant funds from the TBR Access and Diversity Initiative to improve retention and success progress for those students on academic probation and suspension through intrusive advisement, study skills and student success strategies. Additionally, federal grant funds were received from Title III (Student aid in Fiscal Responsibility) for an initiative aimed at identifying reasons impacting students’ decision to attend an HBCU. Fourth, the College of Business conducted research for Jacobs Engineering Group that focused on appropriate methods for assessing and solving diagnostic problems relative to LEED silver, water systems, bio-pathogens, and indoor air quality. Lastly, the College of Business received funds from the Metropolitan Development Housing Authority to assess the effectiveness and overall management of community support services as well as the economic impact of the Hope VI HUD grant on the John Henry Hale community and the Nashville metropolitan area in general.

Academic Offerings

The College of Business offers the Bachelor of Business Administration to undergraduates in Accounting, Business Administration, Business Information Systems, and Economics and Finance. Concentrations are available in General Business, Supply Chain Management, Marketing, Management, Human Resource Management, Hospitality Management, Real Estate and Urban Development, Business Information Systems—Industry, and e-Business Technology. Additionally, the College offers minors in Business, Entrepreneurship, and International Business. At the graduate level, the Master of Business Administration is offered with concentrations in Accounting, Management of Information Systems, Finance, Supply Chain Management, and General MBA.

Equipment and facilities available for conducting these research activities include

- State-of-the-Art Facilities: Classrooms equipped with laptops and Smart Board interactive Whiteboard Systems.
- Web-Based Student Strategy Tutorial System: Twenty-two interactive modules that include video instruction, visuals and graphics.
The College of Education houses programs in teacher education, education administration (K-12 and higher education) and psychology. The faculty are engaged in research that examines disparities in education that have led to the development of strategies to re-address inequities in education. This research takes the form of the development of innovative models in instruction such as the integration of technology to influence student learning outcomes and strategies to increase representation of under-served populations engaged in science, technology, engineering, and mathematics (STEM) education. In addition, an active experimental psychology program engages in basic psychological science in the areas of cognitive psychology, neuroscience, behavioral psychology, and child development.

Classic and new technology, equipment, and science incorporated in implementing these research activities

- Electroencephalogram (EEG; Electrical Geodesics, Inc.)
- Amscope EPI Fluorescence: microscope with digital camera
- Biopac Systems, Inc.: student laboratory
- Neuropsychological tests battery

The research activities in the College of Education are funded by the National Science Foundation, U.S. Department of Education, Department of Health and Human Services, American Psychological Association, the State of Tennessee – Race to the Top Federal Funding, and the Tennessee State Department of Education.

Focus of current funded research grants

- Strengthening Instruction in Tennessee Elementary Schools – Mathematics (SITES-M) – First to the Top (FTTT)
- HBCU-UP National Science Foundation Experimental Psychology Teaching and Research Laboratory
- Mini-grant: “A Pilot Study of a Culturally Tailored Depression Inventory for African American Female Cancer Survivors”
- Multisystemic Impacts of Gender Roles on Men’s Engagement in Cancer Prevention
- Triple Impact Youth Empowerment Collaborative
- Career Counseling for Success (Improving the retention and graduation rates of undecided students).
- Broadening Participation Research. Career Commitment and Retention in STEM: Building the STEM Workforce.
- Scientific Epistemological View of Students at Four Higher Education Universities
- Base-TN Special Education Grant
- Accomplished Teaching, Learning, and Schools (ATLAS) Program i3 Video Grant
The research conducted in the College of Education specifically responds to disparities in educational and health outcomes. Through an examination of current teaching strategies, retention and graduation rates, and disparities in health, research efforts have resulted in improved strategies in STEM instruction, increased diversity in STEM fields, headway in understanding the strategies necessary to increase retention rates for African American and other underserved student populations, and better interventions for those underserved by the medical field.

Impact
The primary impact of the Experimental Psychology Teaching and Research Laboratory is to provide undergraduate Psychology majors with hands-on research experience using cutting edge technology to help launch underrepresented students into competitive psychology doctoral programs.

Academic Offerings
The College of Education offers programs at the Bachelor, Master (M.A.Ed., M.Ed., M.S.), Specialist (Ed.S.), and Doctoral (Ed.D., Ph.D.) levels in teacher education and education administration (K-12 and higher education). In psychology, programs are offered at the Bachelor, Master and Doctoral levels.
The College of Engineering faculty has been engaged in conducting research in many national and critical technology areas. Areas of interest are signal/image processing, bioinformatics, sensor fusion, applied intelligent systems, unmanned mobile robotics, and unmanned air vehicles, decision making processes, health monitoring (prognosis and diagnosis) of aircraft engines, wireless communication, robust control systems, cyber-security, renewable energy sources, virtual reality. Additional faculty interests include high performance computing, chemical sensing detection systems.

Classic and new technologies, equipment, and science incorporated in implementing these research activities

- Neural networks and fuzzy logic
- Real time image processing
- Layard sensing to retrieve right information
- Lithium ion battery technology
- Cloud computing
- Anomaly detection
- Autonomous robots
- Prognosis and diagnosis

These research activities have been funded by federal agencies including the Department of Defense (DoD), Department of Homeland security (DHS), National Science Foundation (NSF), NASA, DOE, Boeing, Rolls Royce, and Amazon.

Focus of current funded research grants

- Sensor Fusion
- Battery technology
- Health Monitoring
- Wireless Communication and networks
- Decision making using Robots, helicopters, and RF sensors
- Reliable communication in congested environments
- Cloud computing security
- Smartphone security
- Cyber Physical System security
- Bioinformatics
Impact

The Engineering Research Institute of the college also makes a significant impact on education and outreach activities. About 50% of faculty in the college contributes significantly to the preparation of undergraduate students for careers in critical technologies to meet the workforce needs of the nation. These efforts are supported by two Air Force Research laboratories, Air force Office of Scientific Research (AFOSR), and Army Research office. Cyber-security is supported by DHS, NSF, Boeing, AFRL, and AFOSR. The battery technology is funded by Air Force, Navy and Boeing. These programs seek to increase the number of highly-trained underrepresented engineers and scientists in leadership positions. The National Science Foundations (NSF) as supports the funded Historically Black Colleges and Universities-Undergraduate Program (HBCU-UP). The underlying purpose of the HBCU-UP is to develop pedagogies and methodologies for training undergraduates in the STEM areas. In addition, emphasis is placed on interdisciplinary enrichment of quantitative skills (mathematics and physics) of students in engineering and computer sciences.

Academic Offerings

The college offers a Master of Engineering degree with concentrations Biomedical, Environmental, Civil, Electrical, Mechanical and Manufacturing Engineering. The college also offers Master's of Science (M.S.), and Ph.D. degrees in Computer, Information and Systems Engineering, which is an interdisciplinary program that drives the strengths from computer science, electrical and mechanical engineering.

Equipment and facilities available for conducting these research activities include

- Cloud Data Center: The cloud data center comprises of over 50 servers, each with 6 cores, which provide 300 compute and storage nodes. The data center will provide support for massive scale data analytics for cyber security research.
- Networked Embedded System - A system of 10 autonomous robots, each equipped with a dual-core embedded computer, localization sensors and associated software to conduct research on distributed control systems and cyber physical system security.
- Mobile Robotics Laboratory: About 35 mobile and all terrain robots with cameras and lasers
- Automatic Target Recognition Testbed: Combination of seven IR and ER cameras mounted on building along with unmanned ground robots, and unmanned electric helicopter for military exercises.

Centers or Institutes

- Engineering Research Institute
- TIGER Institute
- Center for Battlefield Sensor Fusion
- Intelligent Tactical Mobility Laboratory
- Intelligent Control Systems Laboratory
- Design Methodology Laboratory
- Robotics and Intelligent Systems Laboratory
- Computer Integrated Manufacturing Laboratory
The College of Health Sciences is established to offer educational programs designed to produce allied health professions practitioners and to prepare individuals who are interested in pursuing careers as educators in the health professions; to encourage, develop and support interest in research; and to provide healthcare, when appropriate, and continuing education services to the community. The College houses degrees in Physical Therapy, Occupational Therapy, Nursing, Speech Language Pathology and Audiology, CardioRespiratory Therapy, Health Information Management, Public Health/Health Administration and Health Sciences; and Human Performance and Sports Sciences. All research endeavors within the College fall into one of three pathways: (1) collaborative research between faculty members in the department; (2) collaborative research between faculty members and students; and (3) collaborative research between faculty members in the department and other individuals outside the department and university.

Research activities include

- Utilization of scientific databases for literature reviews and development of evidence-based research papers
- Partnerships with local community resources such as high schools and senior living communities
- Educational outcomes research using data from within the program and the college
- Descriptive
- Auditory processing deficits and phonological processing
- Client Satisfaction
- Code Switching
- Concussion in middle school athletes
- Dialect modification and accent reduction
- Distance Education assessment
- Graduate school admissions
- AAE/Konglish and Hip Hop/KPOP
- Language and literacy skills
- Linguistic differences and cultural diversity
- Obesity, stroke and communication disorders
- Preschool teacher talk
- Retention in the STEM areas
- Social skills enrichment on pragmatic language and social competence
- Speech production of infants
- Supervisory needs assessment
- Treatment efficacy
- Treatment outcomes

For the College of Health Sciences, several research activities have been funded by agencies (state and federal) including the Tennessee Department of Health; National Institutes of Health; and Centers for Disease Control and Prevention.
Current funded research grants

- Breast cancer
- HPV among teens
- Health and Housing Insecurity of African American Women
- Neurodevelopmental and related disabilities
- Online Speech-Language Pathology Course Work Leading to Master’s Level Certification
- Preparing Bachelor Level Personnel for the Master’s Degree in Speech-Language Pathology to Work in the Public Schools of Tennessee

Impact

Faculty and students have had the opportunity to present on international, national, and local levels and have contributed significantly to the respective professions. Historically, a third of the students go on to publish their work in peer reviewed journals prior to graduation.

Academic Offerings

The College offers fifteen degrees and/or certificates: Associate of Applied Science in Dental Hygiene, Bachelor of Science in Dental Hygiene, Bachelor of Science in Health Sciences with five concentrations, Bachelor of Science in Health Information Management, Bachelor of Science in CardioRespiratory Care Sciences, Bachelor of Science in Health Care Administration and Planning, Master of Occupational Therapy, Doctor of Physical Therapy, Master of Science in Speech and Hearing Sciences, Master of Public Health with two concentrations, Bachelor of Science in Nursing and the RN-BSN Degree Completion Program, Associate Degree in Nursing, Master of Science in Nursing, and Bachelor of Science in Human Sports Science with four concentrations. All professional programs are fully accredited.

Equipment and facilities available for conducting research activities

The College possesses the equipment for testing, motor control and fine motor ability, range of motion, sensation, visual perception, cognition, development, and strength.

Health Sciences Clinics

The College offers two clinics open to the community: Dental Hygiene, and Speech Pathology and Audiology.
The College of Liberal Arts at Tennessee State University engages with rich intellectual traditions, promoting knowledge of global cultures, and developing vital career skills. Liberal Arts courses and programs prepare graduates for resilience and adaptability, lifelong learning, and leadership in a changing world. To that end, the faculty of the College are engaged in research areas that reflect knowledge and potential of new interdisciplinary fields while continuing work in the traditional academic disciplines at the heart of a university.

Research activities conducted within these fields include

- Studies in global perspectives on civil rights and justice issues
- Studies in African history and culture
- Articles on African American history and culture
- Publications in traditional studies in medieval, early English literature and history
- Publications in American history, literature, and culture
- Textbooks in general education in music and literature
- Studies in instrumental music history
- Studies in K-4 general music education
- Studies in 7-12 education in music, history, literature, language
- Entrepreneurship in music
- Studies in global perspectives in art
- Studies in criminal justice

These research activities have been funded by agencies including U.S. Department of Education, Title III; TSU Academic Affairs (release time); Institute of Museum and Library Services.

Impact

Research and scholarly activities in the College of Liberal Arts has made a significant impact on the education and outreach activities of the University. In fact, many of the international programs developed over the last five years at the University have been a direct result of the research and creative inquiry of faculty in the College of Liberal Arts. We believe that the Liberal Arts vision of education is about exploration and research. Therefore, we encourage and engage students in new ideas while teaching about traditional and historical contexts. Our students are involved in interdisciplinary and collaborative activities that provide a unique perspective on their studies and lives.
Academic Offerings

The College of Liberal Arts offers courses and programs in the arts, humanities, and social sciences, preparing students for a wide range of graduate and professional opportunities. Majors include Art, Communications, Criminal Justice, History, Political Science, English, Music, and Arts and Sciences (Interdisciplinary Studies), with minors in most of these areas and in Africana Studies, Geography, Foreign Languages (French and Spanish), Intelligence Studies, International Affairs, Philosophy and Religious Studies, and Women’s Studies. Also, courses in the General Education core are taught by faculty in the College.

Equipment and Facilities Available

- State of the art television and radio station in the performing arts center are available for research in Communications and other relevant areas.
- Digital graphic arts studio in Art is available for teaching and research in art and communications areas.
- Foreign Language laboratory is in the Humanities building for foreign languages and other language arts study and research.
- Computer laboratory for use of geography, criminal justice, and other areas in Crouch Hall for research and teaching. Faculty have computers, laptops, ipads and other equipment as requested for research.

Centers or Institutes

The iAMM Center/Institute is funded by a Title III grant for collaborative work with students on integrated arts, media, and music projects. The English Language Learning program is being established to assist students with language learning adjustment, especially students whose first language is not English.

The College of Liberal Arts developed special interests in global perspectives in civil rights and social justice issues in addition to significant creative activity in the arts (particularly art, music, and film) which focus on global perspectives. In all programs, publications, panel discussions, new courses, seminars, film and exhibits demonstrate the interest and enthusiasm with which our faculty seek new and different projects in the arts and humanities. The music, art, and communication majors demonstrate student research each semester in the Research Forum in the Arts, funded by TSU Research and Sponsored Programs. Many of the faculty have developed and led study abroad courses to places such as South Africa, Egypt, Germany, Sri Lanka, and Italy and have presented at conferences, published articles, and developed art exhibitions following these international trips.
The College of Public Service and Urban Affairs was established according to the following:

**Geier Consent Decree, December 19, 2000 (page 12 of 54):**

E. 1.a: Establishment of a College of Public Service and Urban Affairs and Program Exclusivity

The purpose of such a college would be to consolidate existing programs and academic departments within a coherent administrative structure augmented from time to time by new programs where the requisite demonstration of need can be established and the requirement of start-up resources met by the University.

The faculty in the College of Public Service and Urban Affairs has been engaged in areas of research that include:

- Leadership, curriculum design, and learn-centered paradigm
- Intergovernmental relations, public finance, public policy, performance measurement and management in public and nonprofit settings; economics of education
- Education policy, environmental policy, urban planning and policy, nonprofit management and community revitalization public sector productivity, accountability and policy, public administration, policy Analysis
- State Lottery policy impacts on adoption and education financing; casino gaming impacts on financing education
- Various other research projects strictly as the statistical methods faculty, which have included health policy research, local government research and school board survey research
- Public sector ethics and leadership
- Multiple areas of sociological research, especially political sociology and community-based sociology of knowledge (including comparative studies on religion)
- Aging, faith, meditation and alternative medicine, operational research in education, health care, and organizational development
- Social work profession innovation/improvement, student success, mentoring, and case management, integral theory (AQAL Cube).

Select faculty have research interests in environmental justice, transportation equity, public involvement, race and ethnicity, regionalism, social inequality, social justice, urban development, urban politics, historic development (metropolitan), and urban planning and policy; and representative bureaucracy and public service motivation.

**Classic and new technology, equipment, and science incorporated in implementing these research activities**

- Software, sources of information, laboratories, survey
- Statistical methods and analyses, program evaluation, socioeconomic analysis, spatial analysis, community impact assessments, and Geospatial Information Systems (GIS).

These research activities have been funded by the Spencer Foundation (University of Kentucky); Metropolitan Nashville Airport Authority (MNAA); Tennessee Advisory Commission; and various other agencies and departments of State of Tennessee.

**Focus of current funded research grants**

- Intergovernmental relations
- Public involvement in state agency of transportation
- Issues facing the elderly

**Impact**

- The MNAA project (Spring 2009) resulted in development of a survey instrument for workforce engagement which is still being used by the airport authority. The Spencer Foundation project resulted in three peer-reviewed journal publications to date and four national-level conference presentations. Insights from the research were also presented to relevant policy analysts and administrators at the Kentucky Education Research Roundtable. The ongoing Tennessee Advisory Committee for Intergovernmental Relations (TACIR) project (Fall 2012-Spring 2014) has generated multiple opportunities for faculty to present to audiences of state and local-level policymakers in various settings about the project design and interim results. Specifically,
products of the ongoing research to date include focus groups at the Tennessee Development District Association meeting (April 2013); presentations to the Commission (November 2012) and to the Tennessee Municipal League (June 2013); and an article in Tennessee County News (January/February 2013 issue). Students participation in the project includes an MBA student; a public administration Ph.D. student; and an MPA student.

- With some gaps in translation services, jobs, and transportation, a comprehensive array of social services is available to immigrants. However, these services are less accessible due to distance between location of services and immigrant neighborhoods. New models of offering physical education can increase physical health among MNPS students. Employers are willing to employ ex-offenders when the crime committed was not a felony or related to the business.
- TDOT Grant 2013-2014: Current funded research project will have an impact on communities throughout the four regions of Tennessee on public involvement strategies and help with TDOT’s overall public involvement plan.
- Research Alliance – TSU/FISK/VANDERBILT Alliance assists residents of the Cayce Homes in building leadership, community networks, and tools for empowerment, informing researchers in the areas of public housing redevelopment, community planning, and resident identity.
- Increasing social awareness and proposing policy directives.
- Paradigm shifts in leadership.

**Academic Offerings**

- Bachelor of Science in Social Work
- Bachelor of Science in Sociology
- Bachelor of Science in Urban Studies (traditional, online and accelerated)
- Master of Public Administration
- Master of Professional Studies (Regents Online Campus Collaborative fully online degree shared with other TBR schools)
- Master of Social Work (traditional and online)
- Ph.D. in Public Administration

**Equipment and Facilities**

- Laboratories, surveys, and other standard qualitative and quantitative methods of data collection and analysis.
- Computer laboratory.

**Centers and Institutes**

- Center for Aging: Research and Education Services (CARES). CARES has developed a website ([www.tnstate.edu/cares](http://www.tnstate.edu/cares)). CARES is also establishing new partnerships with local neighborhood communities to include: College Hill, Hadley Park, and Tomorrow’s Hope to develop and provide activities and projects for the aging community. CARES is cross collaborating with TSU’s Public Health program to submit a grant proposal for research on addressing aging factors in Davidson county. CARES is working with State Representatives to provide seminars and workshops on financial planning and resources for the aging community during the 2013-2014 academic year. CARES will celebrate 25 years of addressing elder abuse and prevention during the 2014-2015 academic year with planning and preparation beginning in 2013-2014.
- Institute of Government: The Institute of Government is in the planning stages in the College of Public Service and Urban Affairs.
The mission of the Center of Excellence in Information Systems is to provide an environment conducive to and facilities in support of interdisciplinary research in selected areas of information systems. The Center is a multidisciplinary research laboratory founded in 1986 as part of the state-wide Centers of Excellence program to increase the amount of research being done at state universities across Tennessee. The Center consists of researchers, support staff, and students in the areas of astronomy with automated telescopes, advanced control systems and systems identification, and applied mathematics. Graduate and undergraduate students are drawn from the computer science, physics, mathematics, and engineering curricula. The Center is located on the second floor of the Research and Sponsored Programs (RSP) building on the main campus.

**Thrust Area 1: ADVANCED CONTROL SYSTEMS & SYSTEM IDENTIFICATION**

The Advanced Control Systems and Systems Identification Group conducts a variety of research programs in areas related to optimal robust control and system identification theory and applications. Since 1986 this group has contributed to advancing new approaches to problems that arise in these areas.

Classic and new technology, equipment, and science incorporated in implementing these research activities

- Structural damage detection using neural networks
- Networked control systems via cloud-computing
- Cyber-Physical systems security
- Measurement based approach to control design
- Control of networked control systems
- Control applications to TCP/AQM systems
- Data based control design of digital PID controllers
- Robust control methodologies for structural health monitoring
- Automated fault accommodation for aircraft and spacecraft
- Model free design of dynamic controllers

Control Systems research activities have been funded by the National Aeronautics and Space Administration (NASA), the National Science Foundation (NSF), Army Research Office (ARO), the Boeing Company, and the State of Tennessee Centers of Excellence Program.

**Available Research Equipment**

- 10 Pioneer DX-3 Robots
- Quanser UAV Lab including 3 Quanser Q-Ball Quadcopter
- X4S, 1 Quanser Qbot, OptiTrack
- 1 Complete LABView based Data Acquisition System
- 1 ECP Magnetic Levitation Experiment System
- 1 Quanser Double Inverted Pendulum Experiment System

**Research Collaborations**

- Texas A&M University, College Station, Texas
- Chungbuk National University, Korea
Thrust Area 2: AUTOMATED ASTRONOMY

The Automated Astronomy Group conducts a variety of astronomical research programs with automatic (robotic) telescopes located at Fairborn Observatory in the Patagonia Mountains near Washington Camp in southern Arizona. Fairborn Observatory is a non-profit Educational Corporation dedicated to the design, construction, and operation of robotic telescopes. The Automated Astronomy Group has been active since 1989 and has research interests in long-term brightness and magnetic cycles in Sun-like stars, the search for planetary systems around other stars, chromospherically active (spotted) stars, the properties of binary and multiple stars, the structure and heating of stellar chromospheres, slowly-pulsating stars, and developing the capabilities of robotic telescopes for automated photometry, spectroscopy, and imaging.

Classic and new technology, equipment, and science incorporated in implementing these research activities:

- Precise, long-term brightness monitoring of Sun-like stars
- Search for and characterization of planetary systems around other stars
- Discovery and study of brightness variability in pulsating and magnetically active stars
- Three dimensional orbits and basic properties of binary and multiple star systems
- Instrument development for automated photometry, spectroscopy, imaging, and interferometry
- Development of robotic telescopes and techniques for automatic data acquisition

Astronomy research activities have been funded by the National Aeronautics and Space Administration (NASA), the National Science Foundation (NSF), and the State of Tennessee Centers of Excellence Program.

- NASA Marshall Space Flight Center – Robotic telescope and analysis support for magnetically active stars
- NSF RIMI – Robotic telescope and analysis support for magnetically active stars
- NASA MURC – Development of automated observatory and research program
- NSF CREST – Development of automated observatory and research program
- NASA Space Grant Consortium – STEM student support
- NASA Ames Research Center – Intelligent scheduling for robotic telescopes
- NSF AST – New robotic telescopes and spectroscopic instrumentation
- NASA Origins – Search for extrasolar planets
- NSF MRI – Three new 0.8 meter APTs
- NSF MRI – Design and construction of optical beam combiner for interferometry
- NSF MRI – Upgrades for the two-meter Automatic Spectroscopic Telescope
- NSF PAARE – New course development, new instrumentation, and student research participation
Impact of the Center of Excellence Programs

The Center of Excellence programs in the thrust areas provide educational and research infrastructure at TSU to support students pursuing graduate and undergraduate education in science, technology, and engineering fields, including many from disproportionately underrepresented minority groups. The activities advance discovery while promoting training by supporting undergraduate and graduate student research.

Academic Offerings

The Center of Excellence is not an academic department, but a number of the Center researchers in electrical engineering, mechanical engineering; mathematics, physics, and astronomy are tenured in academic departments. Also, an NSF PAARE grant currently supports the development academic courses for a new undergraduate astrophysics concentration.

Available Research Equipment [All items except VISION are located at Fairborn Observatory]

- Six 0.4 to 0.8 meter Automatic Photoelectric Telescopes (APTs) – Precise stellar brightness measurements
- 0.36 meter Automatic Imaging Telescope (AIT) – Extrasolar planet search and public outreach
- 2-meter Automatic Spectroscopic Telescope (AST) and echelle spectrograph – High resolution stellar spectroscopy
- EXPERT III – Fiber fed echelle spectrograph for precision radial velocities
- VISION – Optical beam combiner for Navy Prototype Optical Interferometer at Lowell Observatory
National Research Collaborations [selected]

- California Institute of Technology, Pasadena
- Carnegie Institute of Washington
- Catholic University of America, Baltimore
- Pennsylvania State University
- Georgia State University, Atlanta
- Central Michigan University, Mt. Pleasant
- Cornell University
- Georgia Institute of Technology
- Harvard-Smithsonian Center for Astrophysics
- National Center for Atmospheric Research, Boulder
- Indiana University
- Institute for Astronomy, University of Hawaii
- John Hopkins University Applied Physics Lab
- Kitt Peak National Observatory
- Lowell Observatory, Flagstaff
- Massachusetts Institute of Technology
- McDonald Observatory, University of Texas
- Northwestern University, Evanston
- Ohio Wesleyan University, Delaware
- Princeton University
- San Francisco State University
- University of California, Berkeley
- Space Telescope Science Institute
- Swarthmore College
- University of California, Santa Cruz
- University of Arizona, Tucson
- University of California, Los Angeles
- University of Florida, Gainesville
- University of Maryland, College Park
- University of Michigan
- University of North Carolina
- University of Washington
- Villanova University
- Yale University

International Research Collaborations [selected]

- Astronomical Institute of Potsdam
- Astronomical Institute of the Slovak Academy of Science
- Australian National University
- Centro de Astrobiologia, Madrid
- European Southern Observatory
- Finnish Center for Astronomy
- Herzberg Institute of Astrophysics
- Institut d’ Astrophysique de Paris
- Institute for Astronomy, Vienna
- Max Planck Institut for Astronomy, Heidelberg
- Nicolaus Copernicus Astronomical Center, Warsaw
- Polish Academy of Sciences, Torun
- South African Astronomical Observatory, Cape Town
- Sternberg Astronomical Institute, Moscow
- University of British Columbia, Vancouver
- University of Helsinki
- University of Toronto
Promoting Science Literacy

The mission of the Nanoscience and Biotechnology Core Facility (NBCF) is to cultivate a multidisciplinary approach to training the next generation of scientists and researchers by providing Tennessee State University faculty and students with state-of-the-art nanoscience and biotechnology equipment and proficiency, providing a greater understanding and appreciation of nanoscience and biotechnology, and providing collaboration opportunities with industry professionals.

The NBCF at Tennessee State University provides online information in nanoscience and biotechnology, web-enhanced courses and tutorials, and aims to stimulate curiosity while promoting science literacy.

Initial funding from the Air Force Office of Scientific Research, the Department of Defense Research and Engineering Office, and subsequent institutional support gave the Division of Research and Sponsored Programs the platform to build the 7,000 square feet of dedicated laboratory and office space as well as purchase an extensive list of multi-user equipment.

The course instruction and training for each instrument is led by a faculty researcher with expertise in one of the science, technology, engineering, or mathematics disciplines. In addition, the use of each instrument has been mastered by at least one graduate student who serves as the student expert and trains incoming students.

Instrumentation

- Hyper Spectral Imaging Microscope
- Submicron Particle Size Analyzer (Dynamic Light Scattering)
- Inductively Coupled Plasma Optical Emission Spectrometer (ICP-OES)
- Scanning Probe / Atomic Force Microscopes (SPM) (AFM)
- Ultracut UCT Ultramicrotome
- UV/Visible Spectrophotometer (UV Vis)
- X-ray Diffractometer (XRD)
- Scanning Transmission Electron Microscope
- Thermo Graphic Analyzer
- ICP Auto Sampler

The Nanoscience and Biotechnology Core Facility is located in the Research and Sponsored Programs building on Tennessee State University's main campus.
Learning Sciences

Learning Sciences is an interdisciplinary/multidisciplinary field that draws on multiple theoretical perspectives and research paradigms with the goal of advancing knowledge about human learning and development in formal and informal settings. Researchers in the Learning Sciences develop understanding about the nature and conditions of learning, cognition, material, social and cultural contexts. The intent of learning sciences research is to develop evidence-based claims about how people learn that have theoretical, practical, and pedagogical implications. Given this focus on interrelated theory and practice, Learning Sciences frequently involves carrying out design and implementation research. This research is intended to improve the education of all learners but often has particular emphasis on finding solutions for minority and disadvantaged students for whom achievement gaps are a continuing problem.

Tennessee State University’s Center of Excellence for Learning Sciences (TSU-COELS), in partnership with the Tennessee Departments of Human Services, Health, and Workforce Development as well as the Tennessee Head Start Association (THSA), has participated in numerous programs and projects which focus on service and contributions to public policy within Tennessee. The partnership of TSU-COELS and state organizations has a multidisciplinary mission that focuses primarily on the needs of Tennessee, but which is national in scope. A few of the accomplishments of this partnership include: (1) creating programs and projects which impact the quality of early childhood programs for Tennessee’s children, especially those within communities of highest need; (2) better preparation of Tennessee’s early childhood educators; and (3) influence on public policy.

Classic and new technology, equipment, and science incorporated in implementing these research activities

The Center aims to conduct research that addresses the needs and priorities of the educational community. The world today is more technologically complex and economically competitive which requires an approach to education that promotes the development of creative individuals who can develop new knowledge and continually further their own understanding. The Center continues to grow research in Learning Sciences by combining STEM (Science, Technology, Engineering, and Mathematics) education with experiential learning in the classroom, from elementary through higher education.

Currently, COELS has $6.6M in research and sponsored projects. Funding sources include Tennessee Department of Human Services, U.S. Department of Health and Human Services-Administration for Children and Families, the National Science Foundation, and the Tennessee Department of Health.

Impact

The potential impact would be to assess the probability of continued utilization of other professional development offerings through TECTA such as the follow-up Child Development Preparation online training and attainment of the CDA Credential. Professional development activities include university/college courses, pre- and in-service training sessions, observations with feedback, mentoring, coaching, and other forms of job-related technical assistance. In addition, the study of adult learners could be linked to age, educational background, and work history in order to structure future offerings by TSU-COELS and other higher education credential/teacher preparation programs in two- and four-year colleges and universities with in the TBR and supported entities.

Academic Offerings

Online Orientation and Training: TSU-COELS’ TECTA program, under contractual agreement with the Tennessee Department of Health (TDH) offers online orientations to TDH Home Visitors. This professional development in early childhood education provides 30 hours of educational opportunity for home visitors and 36 hours for supervisors. Current enrollees take a pre- and post-assessment.

TECTA creates academic courses for grantors (TDH grant: ECED 2003 Special Topics- ECED for Home Visitors at NSCC). TECTA holds the capability to create early childhood/social service coursework and training opportunities for diverse populations (home visitors, child care workers, parents, etc.)

Under the Contractual Agreement with the Tennessee Department of Human Services (TN-DHS) and TSU-COELS/TECTA, the Tennessee Child Care Training Online System (TCCOTS) is a service to provide TN-DHS child care licensed workforce with ongoing professional development opportunities. The TCCOTS platform utilizes a structural design that is compatible with the TECTA database that includes user demographic data as well as training content and usage data including Helpdesk support.

Curriculum Design and Development: Center staff have created and designed curriculum manuals for the SSCBT, TECTA (Orientations, TEC PAC, eLearn options, etc.), and TCCOTS programs.

Compensation (Wages And Benefits) of Early Childhood Educators: The TECTA program maintains a diverse student/participant body, many of whom are working in minimum wage jobs. TECTA’s support provides access to higher education and provides extensive data on this Early Childhood Workforce Systems initiative. TECTA’s workforce support includes a basic 30-hour non-credit bearing orientation course and financial support for academic courses that articulate from the Associates to Baccalaureate level. Overall, TECTA allows for professional development opportunities and supports public policy and services which improve the quality of care for Tennessee’s children.

Equipment and facilities available for conducting these research activities include

- TSU-COELS has the expertise to create a database for educational research.
- TSU-COELS has a full suite of video/audio recording and editing equipment and software.
- TCCOTS is an online training system that will allow for the creation of trainings related to child care/early childhood education, and abilities to collect demographic information on participants. The online program can also be expanded with new training modules.
Centers or Institutes

Tennessee Early Childhood Training Alliance (TECTA)
TECTA provides free training on research-based child development related concepts in the form of an institute for early childhood professionals annually (since 2009), which is expandable to any related population. In 2013, 250 people attended.

Social Services Competency Based Training [SSCBT]
SSCBT is a one-year competency-based program designed to improve the knowledge and skills of human service workers in Head Start community action programs and social service agencies across the country. The Center awards the SSCBT Credential upon completion of the program.

Tennessee CAREs Early Head Start Program
Since 1995, this Early Head Start program has provided coordinated comprehensive, intensive, and continuous support services to enable families to attain self-sufficiency, while recognizing the integrity and unique needs of these families and children. The program currently supports six child care centers across three counties in west Tennessee.

Tennessee Childcare Online Training System [TCCOTS]
The Tennessee Child Care Online Training System, or TCCOTS, is a learning portal designed by Early Childhood professionals that combines high-quality Early Childhood content with the convenience of an online training program.

TECTA Orientation
TECTA Orientation is a free 30-hour training program with a curriculum centered on professional core competencies that provides an academic gateway to coursework at TBR colleges and universities.

Child Development Associate [CDA] Credential Training
The council for professional recognition awards the CDA credential. A CDA assistance program is coordinated with the TECTA local offices to provide competency-based instruction, supervised field experiences, and advisement to caregivers.

Online Home Visitor CDA Credential Training
TECTA has begun a new pilot program which offers online orientation instruction, training and technical assistance for home visitors and their supervisors working for the Tennessee Department of Health. Following the online training, these home visitors participate in the online program of study and move on to receive the Home Visitor Child Development Associate (CDA) credential.

Tennessee Early Childhood Program Administrator Credential [TECPAC]
The Tennessee Early Childhood Program Administrator Credential (TECPAC) is awarded to child care program Administrators, Directors, and Assistant Directors following an eight month training academy. The Center awards the Administrator Credential upon completion of the Academy.

Learning Sciences focuses on the nature of learning, knowing, and understanding in a variety of settings. The Center provides professional learning opportunities within higher education institutions, workplaces, and computer-based environments, as well as other informal and non-traditional educational settings. Professional learning blends key experiences, individual attributes, environmental factors, and educational backgrounds to enrich the environment for optimal adult learning.
Tennessee State University has an international atmosphere on its campus, and inasmuch, has faculty engaged in international research and development, including projects, collaborations, and partnerships:

**College of Agriculture, Human, and Natural Sciences**

The International Agricultural Program (IAP) at Tennessee State University, is committed to the exploration, assistance, and cooperation with other countries, governments, and international organizations in the development of agriculture; institutions of education, research and outreach; rural and community development; and human resources.

Faculty and students have taken part in research abroad programs and hundreds of international students have selected TSU as the University of Choice for their higher education pursuits. The College also has an international faculty engaged in academics, research and outreach.

The IAP implements international training and other services for international students at TSU, sponsored by the U.S. Agency for International Development (USAID), the Food and Agriculture Organization of the United Nations (FAO), private and voluntary organizations, the U.S. Department of Agriculture (USDA), host country governments, and others.

**Training Programs:**

- Peace Corps Volunteers-Cameroon, Liberia, Niger, Senegal, and Burkina Faso
- Fruits and Vegetable Production-Honduras
- Agriculture Extension-Honduras
- Area Leadership Development-Cost Rica
- Watershed Management-Trinidad and Tobago
- Poultry Production and Management-Tanzania
- Agricultural Processing and Marketing-Malawi
- Primary and Secondary School Teachers-Guatemala
- Plant Pathology-Zimbabwe
- Soil and Water Conservation Construction of Water Harvesting Structure-India
- Food Safety and Security-Yemen, Algeria

**Biology**

Current and ongoing international partnerships had by faculty of the Department of Biological Sciences involve:

- Faculty collaborating with Scientists in China who serve as visitors at TSU to carry out global change research activities, which is supported by the Natural Science Foundation of China.
- Faculty collaborating with Scientists at the University of Perugia, Italy to study microbial interactions and adaptability, which is supported by the two universities (TSU and UP).

**Chemistry**

Collaboration with Universiti of Brunei Darussalam

**College of Business**

The College of Business has a contractual agreement with Tianjin Polytechnic University to deliver MBA courses to students in China and is currently conducting a feasibility study to examine opportunities for program delivery in India.
College of Education

Current international collaborations involve building the capacity of administrators in the areas of leadership and research training:

- Building the capacity of African-based researchers to improve the quality of research and its applicability to educational policy. (partnership with the Association for the Development of Education in Africa.)
- Building the capacity of educational leaders in K-12 and universities in Kurdistan.

College of Engineering

Student Exchange Program (Brazil, Turkey)

College of Liberal Arts

Faculty in the College of Liberal Arts are involved in collaborations, partnerships, and projects that include:

- Collaborations with students and faculty in Art, Communications, and Music in the iAMM project at TSU (interdepartmental research)
- MOU with Helwan University in Egypt is being renegotiated after the last five years
- Collaborative partnerships and faculty and student exchanges with universities in Turkey, particularly Inonu University with Music
- Partnerships with Metropolitan Nashville Public Schools (particularly with research in teaching)
- Partnerships with Centro Colombo Americano – Medellin, Colombia, South America (particularly with Music)
- New partnerships are being discussed with four Universities in Colombia, South America. Universidad Pontificia Bolivariana (UPB), Universidad EAFIT, University of Antioquia (UDEA), Universidad Tecnológica Del Choco’ Diego Luis Co’rdoba (UTC) will all develop faculty and student exchanges in the liberal arts with TSU. Exchanges are now in development.

Center of Excellence in Information Systems

International Research Collaborations

- Astronomical Institute of Potsdam
- Astronomical Institute of the Slovak Academy of Science
- Australian National University
- Centro de Astrobiología, Madrid
- Chungbuk National University, Korea
- European Southern Observatory
- Finnish Center for Astronomy
- Herzberg Institute of Astrophysics
- Institut d’Astrophysique de Paris
- Institute for Astronomy, Vienna
- Max Planck Institut for Astronomy, Heidelberg
- Nicolaus Copernicus Astronomical Center, Warsaw
- Polish Academy of Sciences, Torun
- South African Astronomical Observatory, Cape Town
- Sternberg Astronomical Institute, Moscow
- University of British Columbia, Vancouver
- University of Helsinki
- University of Toronto

College of Public Service and Urban Affairs

Faculty in the College of Public Service and Urban Affairs have engaged in international projects that include:

- Study Abroad program in Turkey (2014), two recent Study Abroad programs in China.
- Ongoing comparative studies: 1) diabetes among black people in Egypt and the U.S. and 2) a brief encyclopedia on black thought focusing on comparative Muslim jurisprudence, law, and justice.
- Colombian collaborations with universities.
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TENNESSEE STATE UNIVERSITY
Research Capabilities 2015