

Message from the Director

Dear MTSU Faculty, Staff, and Administrators,

We are delighted to share with you some of the ways in which the TN STEM Education Center (TSEC) is working with its partners to impact our local, state, and national stakeholder communities. In this Fall 2022 edition, we highlight outreach and research initiatives to empower educators for innovative practice in their learning environments and to create more inclusive and diverse spaces.

Dr. Jin and Mosley's USDA Deeper Learning project, for example, is supporting agricultural education teachers, and Drs. Bleiler-Baxter and Mosley's NSF INCLUDES increases awareness and responsiveness to students with disabilities. We're also encouraged to see that our efforts to develop leaders in STEM education are bearing fruit, including Dr. Gardner's selection to the Leadership on Deck Institute. TSEC continues to value making its activities visible to the broader STEM network through its dissemination at conferences, meetings, and in refereed publications. Lastly, we're hopeful the work we're engaging in sparks curiosity and interest in thinking about ways we might work together with you to realize the collective vision we share for helping others.

Thanks for taking the time to consider those possibilities as you read our Fall 2022 TSEC Newsletter.

Gregory T. Rushton, Ph.D.
TSEC Director



L to R: Sarah Bleiler-Baxter, Ph.D.; Sherry Schafer; Kevin Ragland, Ph.D.; Greg Rushton, Ph.D.; Andrea Reeder, MS; Chaney Mosley, Ph.D.; Casey Penston; Grant Gardner, Ph.D.; Not pictured Ying Jin, Ph.D.

Tennessee STEM Education Center

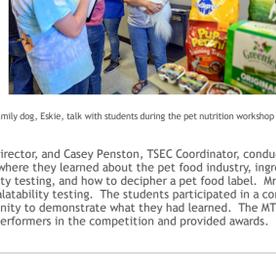
Community Outreach



TSEC to Lead Annual Southeastern STEM Education Research Conference (S²ERC)

This year's S²ERC conference will be hosted at Tennessee Tech University in Cookeville, TN on Friday and Saturday, January 13th - 14th, 2023. This event brings together great minds to engage in conversations about empirical studies in STEM education and their applications to practice in K-12 learning environments. For more information about the conference, please visit our [website](#).

Register to attend S²ERC



High school agriculture educators listen intently during the summer institute. (Photo courtesy of Ying Jin)



Different ways of teaching agriculture in high school classrooms are explored by agriculture education teachers during the institute. (Photo courtesy of Ying Jin)

Dr. Jin hosts agriculture education teachers for "deeper learning institute"

Ying Jin, an associate professor of psychology and TSEC associate director, hosted high school agriculture education teachers on the MTSU campus this summer for a "deeper learning" agriculture institute to help teachers explore instructional and assessment practices which focus on helping students develop communication, collaboration, critical thinking, and problem-solving skills.

The deeper learning institute is funded by a three-year, \$450,000 USDA grant that was awarded to Dr. Jin, Dr. Chaney Mosley, an assistant professor of agriculture education and TSEC associate director, and Dr. Song Cui, an associate professor of agriculture.

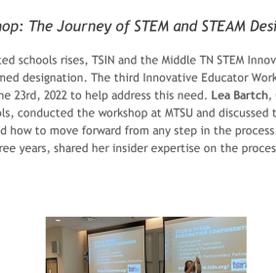
The teachers that attended the initial training this past summer then completed a project over the summer to implement in their own classrooms this year. The teacher professional development and classroom projects are designed to help students transition from multiple-choice and fill-in-the-blank tests to methods of learning and testing that focus on collaboration, critical thinking, and problem-solving.

The high school agriculture educators will return to MTSU for a refresher course during the summer of 2023. In the third year, of the grant, Dr. Jin, Dr. Mosley, and Dr. Cui will concentrate on project evaluation and sharing results with other professionals.

TSEC invites own furry friend to help teach pet nutrition at Raider Roundup

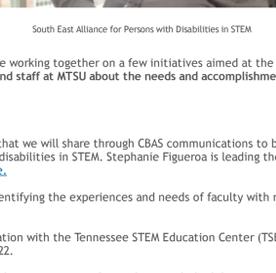
The MTSU School of Agriculture and MTSU Collegiate FFA hosted the fifth annual Raider Roundup September 21st on the MTSU Campus. The event featured 20-plus activities and brought 555 high school students to campus to observe demonstrations and compete in individual subject matter competitions.

Several partners from the College of Basic and Applied Science led workshops including the Data Science Institute, Department of Mathematical Sciences, MTEACH, the School of Concrete and Construction Management, and the Tennessee STEM Education Center.



Casey Penston, TSEC Coordinator, and her family dog, Eskie, talk with students during the pet nutrition workshop at Raider Roundup (MTSU photo by J. Intintoli)

Dr. Kevin Ragland, TSEC Associate Director, and Casey Penston, TSEC Coordinator, conducted a workshop on pet nutrition for a group of 24 high school students where they learned about the pet food industry, ingredients that are used in pet food, nutrients that pets need, palatability testing, and how to develop a pet food label. Mrs. Penston also brought along her Eskimo Spitz, Eski, to assist with palatability testing. The students participated in a competition following the workshop where they were given the opportunity to demonstrate what they had learned. The MTSU School of Agriculture and Collegiate FFA recognized the top performers in the competition and provided awards.



Sunshine, a Mini-Dachshund owned by Kevin Ragland and family, samples several foods, as middle school girls learn about the role of a pet nutritionist (MTSU photo by Cat Curtis Murphy)

TSEC at the Tennessee Girls in STEM Conference

The Tennessee Girls in STEM Conference was held on the MTSU campus on September 24th. Judith Iriarte-Gross, a professor of chemistry at MTSU and Women in STEM Center Director, was the organizer of the conference and originally launched the conference, previously known as MTSU Expanding Your Horizons. Many volunteers across campus and in the community volunteered to assist with the event, including Dr. Kevin Ragland of TSEC.

Dr. Ragland conducted a session on pet nutrition for a group of middle school girls where they learned about types of pet food, ingredients that are used in pet food, nutrients that pets need, and palatability testing. They also discussed the role of a pet nutritionist. Dr. Ragland also brought along his 13-year-old Mini-Dachshund, Sunshine, to serve as the official taste tester. Sunshine seemed to be the highlight of the session, and the girls enjoyed watching Sunshine testing the food, and Sunshine especially enjoyed the attention and treats.

Dr. Ragland awarded two grants from Battelle

The Tennessee STEM Education Center recently received two grants from Battelle Education to conduct STEM outreach and teacher professional development during the 2022-2023 academic year. The two grants are for a combined \$85,000. Dr. Kevin Ragland, TSEC Associate Director, is the principal investigator for both grants.

Funding from one of the grants (\$35,000) will be used to conduct workshops for K-12 teachers on strategies that expand the teaching and learning of STEM education. The second grant of \$50,000 will be used to create a Data Science Teacher Ambassador Program. TSEC will partner with MTSU's Data Science Institute to develop the program for middle and high school STEM teachers in Middle Tennessee.



TSEC Continues Yearly Innovative Educator Workshops to Develop Middle TN STEM Educators

TSIN and the Middle TN STEM Innovation Hub, hosted at TSEC, continued their long-standing collaboration this summer to bring exciting professional development credit opportunities to educators all over the mid-state through the annual Innovative Educator Workshop series. The day-long workshops offer catered lunch, mileage reimbursement, and small stipends alongside the expert knowledge offered by local educators. These speakers, leaders in their fields, guide middle TN k-12 teachers through many different challenges they may face, from school STEM designations to implementing experiential learning.

Innovative Educator Workshop: Process Oriented Guided Inquiry Learning (POGIL): The Fundamentals

TSIN and the Middle TN STEM Innovation Hub kicked off the workshop series this summer on June 14th by hosting the first of three Innovative Educator Workshops at MTSU's Science Building. The workshop featured Dr. Amy Phelps, a professor of chemistry at MTSU, who discussed the structure and implementation of the student-centered learning method, POGIL. Dr. Phelps sees POGIL as a means to help teachers formalize their efforts to engage students more fully in the learning process. In her workshop, participants engaged in POGIL-based learning, explored how POGIL activities are structured, discussed group formation, and wrestled with challenges of implementation related to bringing POGIL to a classroom.



Innovative Educator Workshop: Process Oriented Guided Inquiry Learning (POGIL): The Fundamentals



Innovative Educator Workshop: Incorporating Biotechnology in the Classroom

Innovative Educator Workshop: Incorporating Biotechnology in the Classroom

On June 16th, 2022, the workshop Incorporating Biotechnology in the Classroom was facilitated at Oakland High School by Melissa Bunch, TN. Teachers traveled from all over the mid-state to hear Mrs. Bunch share her expertise and to discover ways to introduce their classrooms to exciting biotechnologies. They discussed the incorporation of biotechnology into curriculum as well as how to start a biotechnology program at their school.

Innovative Educator Workshop: The Journey of STEM and STEAM Designation

As interest in STEM/STEAM designated schools rises, TSIN and the Middle TN STEM Innovation Hub recognize the need for guidance in undertaking this esteemed designation. The third Innovative Educator Workshop, The Journey of STEM and STEAM Designation, was held on June 23rd, 2022 to help address this need. Lea Bartch, Coordinator of Science and Social Studies for Murfreesboro City Schools, conducted the workshop at MTSU and discussed the process of STEM/STEAM designation, how to get started, and how to move forward from any step in the process. Mrs. Bartch, who has assisted TSIN with the designation process for three years, shared her insider expertise on the process and how participants could navigate common challenges.



Innovative Educator Workshop: The Journey of STEM and STEAM Designation

TSEC to pave opportunities for students with disabilities through the Southeast Alliance for Persons with Disabilities in STEM

TSEC Associate Directors Dr. Sarah Bleiler-Baxter and Dr. Chaney Mosley worked this past summer on the NSF-funded Southeastern Alliance for Persons with Disabilities in STEM (SEAPP-STEM) project, a subaward through Auburn University (PI Dr. Overton Jenkins). Seven undergraduate students engaged this summer in the SEAPP-STEM program and they were a great group! The participants are Justin Voodoo, Stephanie Figueroa, Morgan Allen, Armia Habib, Khadijah Alnassari, Sydney Wilson, and Mark Heath.

South East Alliance for Persons with Disabilities in STEM

Program leaders and participants are working together on a few initiatives aimed at the following goal: To support mutual learning among students, faculty, and staff at MTSU about the needs and accomplishments of students with disabilities in STEM.

The initiatives include:

Writing individual student profiles that we will share through CBAS communications to bring awareness to the needs and accomplishments of students with disabilities in STEM. Stephanie Figueroa is leading the charge on this initiative, and she has provided a personal [profile here](#).

Interviewing faculty in STEM and identifying the experiences and needs of faculty with respect to working with students with disabilities in STEM.

Planning a panel event, in collaboration with the Tennessee STEM Education Center (TSEC), for the campus community for National STEM Day, November 8, 2022.

Initial planning for developing a student organization for students with disabilities on campus. A historical perspective on MTSU's development of such initiatives was gained through our guest speaker in April, Sarah Calise, an archivist in the Albert Gore Research Center. Her [historical account](#), "Nothing About Us Without Us: An Overview of Disability History at MTSU," was really inspiring to the group.

The project will continue this Fall, but under a different name (and different NSF funding). The new project is called The Alliance of Students with Disabilities for Inclusion, Networking, and Transition Opportunities in STEM (TAPDINTO-STEM). The main difference is that SEAPP-STEM was an alliance of Southeastern institutions, whereas TAPDINTO-STEM is a nationwide alliance.

TSEC News

TSEC's Dr. Grant Gardner Selected for Esteemed Leadership Training Program

Dr. Grant Gardner (Associate Director TSEC, Associate Professor of Biology) was recently selected for the 2022-2023 cohort of the MTSU Leadership on Deck Institute. This is a year-long administrative leadership training program to assist a select cohort of 10 faculty in reflecting and cultivating leadership skills with the goal of being prepared to accept leadership positions at MTSU. The group meets once per month over the course of a year and engages in focused topical discussions, guest lectures, and other learning opportunities. The program culminates in the development of a leadership statement and a self-led leadership project.

Dr. Grant Gardner

Dr. Sarah Bleiler-Baxter

Congratulations to Dr. Sarah Bleiler-Baxter on her Promotion to Professor

TSEC would like to congratulate Associate Director Dr. Sarah Bleiler-Baxter on her recent promotion to full professor. We are extremely proud of her accomplishment and are truly thrilled to have such great minds as a part of our team. We are excited to see her celebrating important career milestones and we are grateful that TSEC has been a part of that journey.

Dr. Bleiler-Baxter is a professor of math sciences with a focus on the teaching and learning of proof, the role of instructor authority in the teaching and learning of proof, and collaboration between mathematicians and mathematics teacher educators.

The Associate Director Program at TSEC

TSEC is fortunate to have formal partnerships with faculty across STEM education on campus. One of the ways we achieve these partnerships is through the Associate Director program. Currently on staff we have the following four faculty participating as part-time Associate Directors at TSEC:

Sarah Bleiler-Baxter, Mathematical Sciences; Grant Gardner, Biology; Chaney Mosley, Agriculture; Ying Jin, Psychology

Dr. Grant Gardner (left) and Dr. Sarah Bleiler-Baxter (right) at TSEC Retreat

Our Associate Directors choose to partner with TSEC for various reasons, captured below by our TSEC-E-C acronym. If you are interested in learning more about this program, please contact Sarah Bleiler-Baxter (Sarah.Bleiler@mtsu.edu) for more information.

T-S-E-C

TIME. How do you find yourself needing more time to achieve research, outreach, and/or administrative goals in your academic life? TSEC Associate Directors receive reassigned time to achieve STEM Education goals outside of the realm of typical instructional responsibilities. Our Associate Directors have used their reassigned time to engage in the following types of activities: (a) grant-writing and project implementation, (b) research design/analysis, (c) administrative shadowing and campus improvement initiatives, (d) design and implementation of outreach initiatives.

SALARY. How could additional financial support help you achieve your research, outreach, and/or administrative goals related to STEM Education? TSEC Associate Directors have the opportunity to request supplemental funds for (a) summer salary supporting research, outreach, and/or administrative goals in STEM education, (b) professional travel related to STEM Education research, outreach, or professional development, and (c) resources supporting STEM Education initiatives, including technology, personnel, and academic resources.

EXPECTATIONS. How do expectations and accountability play a role in your professional productivity? TSEC Associate Directors receive direct support to identify potential areas of growth and areas of strength in their professional portfolio. Then, our Associate Directors work under the support of mentors who hold high-expectations for the success of their professional growth. In other words, our Associate Directors have mentors who believe in them and who want to see their impact and influence on STEM Education grow. It is an expectation that Associate Directors will develop in their role as leaders at the university (and beyond).

COMMUNITY. What aspects of professional community are present (or missing) from your current work in STEM Education? Our Associate Directors benefit from a close-knit group of like-minded STEM Educators who work together to support both individual and collective goals in research, outreach, and administration. TSEC Associate Directors are invited to participate in a wide-range of community-based professional development opportunities including (a) "Think-Tank" thought sessions, (b) Executive Leadership discussions, and (c) professional development retreats.

Recent Activity

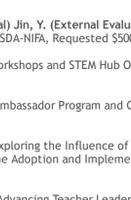
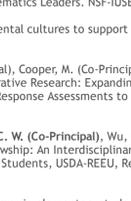
Highlights from TSEC's 2022 Fall Retreat

This summer, the TSEC team, guests, and University of Nebraska-Lincoln STEM Center Director, Dr. Wendy Smith, traveled to a local Tennessee state park for the annual TSEC retreat. The two-day event was designed to bolster bonding and productivity, including quality professional development opportunities and fun activities. Their time together was described as "intellectually stimulating" by one participant.

The goal of the retreat was first to connect and build more meaningful relationships away from day-to-day pressures and hectic schedules while enjoying an inspiring natural setting. Secondly, to reflect on the Center's past, present and future, with a focus on learning and growing. The team recognized and celebrated the impact of certain people on the trajectory of the Center, and its accomplishments.

Programming included sessions on strategic planning but also touched on inspiring and thought-provoking issues such as emotional success, gratitude and compassion, innovative leadership, and how to have productive disagreements in the workplace.

It was said later by one participant, "The moment we wrapped up the retreat, I started looking forward to the next one!" Click here to learn how you can partner with TSEC!



Grants

Bleiler-Baxter, S. (Principal). Stimulating Progress through Autonomy, Relatedness, and Competence (SPARC) in Undergraduate Mathematics Leaders. NSF-IUSE, Requested \$150,000.

Gardner, G. (Principal). Delphi Study of Departmental cultures to support GTA TPD. NSF-ECR, Requested \$500,000.

Haudek, K. (Principal), Henderson, R. (Co-Principal), Cooper, M. (Co-Principal), Kaplan, J. J. (Principal), Jin, Y. (External Evaluator). "Collaborative Research: Expanding a National Network for Automated Analysis of Constructed Response Assessments to Reveal Student Thinking in STEM." NSF, \$1,700,000.00.

Jin, Y. (Principal), Cui, S. (Co-Principal), Mosley, C. W. (Co-Principal), Wu, Q. (Co-Principal), Ragland, K. D. (Co-Principal), Agri-Analytics Fellowship: An Interdisciplinary Approach To Expanding Career Pathways for Undergraduate Students, USDA-REU, Requested \$749,443.00.

Mosley, C. (Principal). Promoting agricultural literacy in elementary students through little free libraries. Nutrien Ag Solutions, Awarded \$5,000.

Ragland, K. D. (Principal), Mosley, C. (Co-Principal) Jin, Y. (External Evaluator). AgXplore Curriculum Training for Middle School Teachers, USDA-NIFA, Requested \$500,000.

Ragland, K.D. (Principal). Innovative Educator Workshops and STEM Hub Operations. Battelle Education, Awarded \$35,000.

Ragland, K.D. (Principal). Data Science Teacher Ambassador Program and Coding Outreach. Battelle Education, Awarded \$50,000.

Reid, J. (Principal), Gardner, G. (Co-Principal). Exploring the Influence of Biology Graduate Student Professional Identity and Networks on the Adoption and Implementation of Evidence-Based Instructional Practices. NSF-ECR, Requested \$500,000.

Rushton, G. (Principal). Collaborative Research: Advancing Teacher Leadership by Advantaging Systems (ATLAS). NSF, Requested \$672,212.

Schrodt, K. M. (Principal), Barksdale, B. A. (Co-Principal), Fields, R. S. (Co-Principal), Hooser, A. (Co-Principal), Carter, J. L. (Co-Principal), McClain, J. B. (Co-Principal), Evert, K. A. (Co-Principal), Jin, Y. (External Evaluator), Caring Writing Communities: Supporting Elementary Writers Academically and Emotionally through Trauma-Informed Writing Pedagogy, Office of Elementary & Secondary Education, \$1,776,429.00.

Zhang, H. (Principal), Lei, M. (Co-Principal), Jin, Y. (External Evaluator), "Interdisciplinary Collaborative Robot for Agricultural Engineering," Sponsored by NSF REU, Federal.

Publications

Cortes, K. L., Reid, J. W., Fallin, R., Hao, J., Shah, L., Ray, H. E., & Rushton, G. T. (2022). A Longitudinal Study Identifying the Characteristics and Content Knowledge of Those Seeking Certification to Teach Secondary Biology in the United States. *CBE—Life Sciences Education*, 21(4), ar63. <https://doi.org/10.1187/cbe.21-08-0220>

Couch, B., Wybren, E., de Araujo Bryan, M., Niravong, T., Jin, Y., Bowen, C., Barnes, E. M. (2022). Exploring Undergraduate Biology Students' Science Communication about COVID-19. *Frontiers in STEM education*, 7, 1-10.

Criswell, B., Smith, W., Gonczi, A., Ahrens, S., Yow, J., Lotter, C., Rushton, G.T., Polizzi, J. & Barth, S. (2022). Viewing STEM teacher leadership through a communities-of-practice lens. In Lauren M., Travis Y., & Betty C. (Eds.) *Research in practice: Preparing and retaining K-12 STEM teachers in high-need school districts* (pp. 355 - 395). American Association for the Advancement of Science. <https://doi.org/10.1176/aaas.add8007>

Ekmecki, A., Aqazade, M., Callard, C., Gibson, D., Rushton, G.T., & McGraw, R. (accepted). The role of self-efficacy, leadership, school-work environment, diversity beliefs, and social network in teacher retention. Proceedings of the 44th Conference of the North American Chapter of the Psychology of Mathematics Education. Philadelphia, PA: PME.

Jin, Y., Rushton, G. T., Biennial Conference on Chemical Education, "Assessment Instruments: Design, Development, and Evaluation," American Association of Chemistry Teachers, West Lafayette, IN, United States of America. (August 2022).

Mosley, C., Flatt, B., & Altman, C. (2022). An examination of advertising and marketing for career academies. *The CTE Journal*, 10(1), 83-96. Retrieved from https://www.thectejournal.com/uploads/1/10/6/8/10686931/volume_10_number_1_summer_2022_complete_issue.pdf

Reid, J. W., Hardee, A. B., Criswell, B. A., Elrod, M., Berryhill Jr., S. B., & Rushton, G. T. (2022). Empowering teacher leaders: The role of research in changing teacher leaders' sense of themselves as professionals. *International Journal of Leadership in Education*. <https://doi.org/10.1080/13603124.2022.2045629>



Tennessee STEM Education Center

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Contact TSEC

Thank You to our TSEC Faculty and Staff

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- Kevin Ragland, Ph.D., Associate Director
- Casey Penston, Coordinator
- Sarah K. Bleiler-Baxter, Ph.D., Associate Director
- Grant E. Gardner, Ph.D., Associate Director
- Ying Jin, Ph.D., Associate Director
- Chaney Mosley, Ph.D., Assistant Director
- Sarah Gwinn, Grant Writer
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- Shaghayegh Fateh, Graduate Assistant
- Andrea Reeder, Graduate Assistant
- Brooke Busbee, Undergraduate Student Worker

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