THE UNIVERSITY OF TENNESSEE KNOXVILLE

# Entry Points: Post-Secondary Programs and Pathways

**University of Tennessee, Knoxville,**

College of Education, Health, and Human Sciences (CEHHS)

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# Executive Summary

As demand for data science and artificial intelligence (AI) skills accelerates across industries, universities are increasingly challenged to design educational pathways that are both accessible and adaptable. This white paper highlights insights from the Entry Points webinar on "Post-Secondary Programs and Pathways", which convened leaders from North Carolina State University, Middle Tennessee State University, and the University of Tennessee, Knoxville to share practical strategies for building and sustaining data science and AI programs.

Spanning undergraduate, graduate, and educator preparation initiatives, the discussion explored how institutions are developing programs that meet learners at multiple entry points while responding to evolving workforce needs. From specialized undergraduate academies to interdisciplinary graduate degrees and teacher training pipelines, these case studies provide concrete examples of how universities are embedding data and AI education across the academic spectrum.

By examining these exemplary programs, this white paper highlights a range of adaptable strategies that institutions can tailor to their unique contexts and goals. The pages that follow are organized by the specific programs discussed during the webinar.

## Guest Speakers

- **Dr. Rachel Levy,** North Carolina State University, Professor and Executive Director, Data Science and AI Academy
- **Dr. Hollylynne Lee,** North Carolina State University, Distinguished University Professor of Mathematics and Statistics Education
- **Dr. Ryan "Seth" Jones,** Middle Tennessee State University, Associate Professor
- **Dr. Keith Jacks Gamble,** Middle Tennessee State University, Chair and Professor
- **Dr. Louis Rocconi,** University of Tennessee, Knoxville, Associate Professor
- **Dr. Joshua Rosenberg,** University of Tennessee, Knoxville, Associate and Haslam Family Professor

## Featured Programs

- **North Carolina State's Data Science and AI Academy** — An undergraduate initiative preparing students across disciplines for data-intensive careers, https://datascienceacademy.ncsu.edu/
- **ESTEEM Project** — E-modules enhancing data science and statistics education in preservice teacher preparation, https://research.ced.ncsu.edu/esteemhub/
- **Middle Tennessee State's Leadership in Teaching Data Literacy Concentration** — An Ed.S. program preparing educational leaders to implement data literacy initiatives in K-12 schools, https://www.mtsu.edu/program/administration-and-supervision-teaching-data-literacy-ed-s/
- **University of Tennessee, Knoxville's** Computing, AI, and Data in Education (CADE) Program, https://cehhs.utk.edu/tpte/about-tpte/interdisciplinary-learning-and-teaching-ilt-in-early-childhood-design-and-technology-and-stem-unit/computing-ai-and-data-in-education-cade/

## Data Science and AI Academy at North Carolina State University

At North Carolina State University, Dr. Rachel (Ray) Levy leads the Data Science and AI Academy and the development of the ADAPT model (All-Campus Data Science and AI Project-Based Teaching and Learning), a university-wide initiative designed to redefine student engagement through applied, project-based learning. Dr. Levy fosters research partnerships within the university and beyond while guiding the design and implementation of ADAPT and engaging national and international audiences. The ADAPT model centers on hands-on, project-based coursework that replaces traditional exams with evaluations based on projects, presentations, and applied work, and is guided by 10 common learning elements emphasizing data perspectives, practices, and discoveries. The program prioritizes workforce preparedness by enabling students to make meaningful choices about datasets, topics, and communication methods, building real-world decision-making skills. Highly interdisciplinary and flexible, ADAPT engages faculty across all 12 NC State colleges and supports participation at multiple skill levels through 1-credit courses offered at the 200 (introductory), 400 (skills-based), and 500 (research-focused) levels, allowing integration into majors, minors, and certificate programs. The initiative has scaled rapidly, enrolling students from more than 170 majors and expanding course offerings in response to demand, with participants consistently reporting improved career readiness, particularly in interviews, applications, and professional experiences.

## The ESTEEM Project at North Carolina State University

At North Carolina State University, Dr. Hollylynne Lee leads the ESTEEM (Enhancing Statistics and Data Science Teacher Education: Transforming & Building Community) project, an NSF-funded, multi-institutional initiative aimed at transforming undergraduate teacher preparation so future educators are equipped to teach statistics and data science with confidence and competence. ESTEEM brings together partners including Eastern Michigan University, University of Southern Indiana, and The Concord Consortium, and is guided by three core objectives: conducting a landscape study of teacher preparation programs, building a networked improvement community, and developing accessible, high-quality instructional materials. A key outcome is a suite of modular, online teaching resources—first developed in 2016—that can be flexibly integrated into diverse programs, including foundational modules and those focused on statistical association and inferential reasoning, all designed to support both content knowledge and instructional practice across online, hybrid, and in-person settings. In its current phase, ESTEEM 2 expands into data science, emphasizing the full data investigation cycle, engagement with real-world datasets, and communication and storytelling with data, while also contributing tools such as box plots, regression, and simulations to CODAP (Common Online Data Analysis Platform). Through open-access materials, collaborative partnerships with organizations like the National Council of Teachers of Mathematics and the American Statistical Association, and a growing networked community, ESTEEM functions as both a resource hub and a catalyst for institutional change, enabling programs to better prepare K–12 educators for teaching statistics and data science.

## The LEADS Project at Middle Tennessee State University

At Middle Tennessee State University, Dr. Ryan "Seth" Jones and Dr. Keith Jacks Gamble direct the LEADS program, an NSF-funded initiative designed to build both data science expertise and leadership capacity among K–12 educators. LEADS builds on more than a decade of institutional investment in data science and is structured as both an Educational Specialist (Ed.S.) degree and a broader collaborative project, supported by interdisciplinary teams and partners such as The Concord Consortium, with classroom implementation supported through tools like CODAP. Central to the program is a district-based partnership model that engages teachers in grades 4–9 alongside district liaisons, ensuring alignment with local priorities and sustained impact. The curriculum integrates two strands: a data science component that progresses from foundational concepts to applied statistical practices and data ethics, culminating in classroom-based capstone projects, and a leadership strand that develops teachers' ability to lead teams, shape instructional change, and cultivate a leadership identity. Additional program features, such as immersive "LEADS Days," cross-district collaboration, and ongoing site-based support, reinforce these goals. Early outcomes indicate meaningful shifts in teacher confidence and professional identity, with participants already taking on leadership roles through professional development facilitation, grant activity, and the launch of data science initiatives in their schools. Overall, LEADS offers a comprehensive, practice-oriented model that positions educators as key drivers in scaling and sustaining data science education through a combination of technical training, leadership development, and strong district partnerships.

## Data Science and AI Education Programs at The University of Tennessee, Knoxville

At the University of Tennessee, Knoxville, Dr. Joshua Rosenberg and Dr. Louis Rocconi highlight a growing ecosystem of educational pathways designed to meet rising demand for data science and artificial intelligence (AI) expertise in education. Together, these pathways reflect UTK's broader commitment as a land-grant, Research 1 institution to accessible, applied, and interdisciplinary training. This commitment is evident across four primary pathways: a Graduate Certificate in Educational Data Science, which equips students with practical data analysis and visualization skills through project-based learning; the Intercollegiate Graduate Statistics and Data Science Program, a flexible, university-wide option for students to pursue a minor or second master's credential tailored to their discipline; a newly launched Master of Science in Computing, AI, and Data in Education, which integrates AI, computing, and data science across methods, design, and pedagogy tracks; and the PhD in Evaluation, Statistics, and Methodology, which provides rigorous doctoral training with applications in data science, evaluation, and research. Across these offerings, UTK navigates key challenges around balancing accessibility with technical depth, aligning programs within institutional structures, and supporting students' primary goals to apply, teach, or otherwise advance data science and AI. Collectively, these pathways illustrate a flexible and evolving model for integrating data science and AI into education, while underscoring the complexities inherent in shaping new programs within a rapidly changing field.