THE UNIVERSITY OF TENNESSEE KNOXVILLE

Entry Points: National Frameworks and Recommendations

University of Tennessee, Knoxville,

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

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Executive summary

As national attention to data science, computing, and artificial intelligence (AI) education continues to grow, educators and policymakers are increasingly challenged to design coherent learning pathways that prepare students to engage critically with data across K–12 and higher education. This white paper highlights insights from the "National Frameworks and Recommendations" webinar, which brought together leaders from the National Academies of Sciences, Engineering, and Medicine, Data Science for Everyone, and the American Statistical Association to discuss emerging frameworks shaping data science, statistics, computing, and AI education from kindergarten through college.

The webinar explored three major national initiatives: the National Academies consensus study on foundational data and computing competencies for K–12 education, the K–12 Data Literacy and Data Science Learning Progressions, and the forthcoming 2026 revision of the GAISE College Report, which for the first time explicitly integrates data science into undergraduate statistics education. Across these efforts, presenters emphasized interdisciplinary integration, conceptual understanding, ethical engagement with technology, authentic use of real-world data, and the importance of coherent educational pathways that support learners across grade levels and disciplines. By examining these complementary frameworks, this white paper highlights emerging strategies for integrating data science and AI competencies into existing curricula while supporting equitable and future-ready learning experiences. The pages that follow are organized around the three national initiatives featured during the webinar.

Guest Speakers

- **Nicholas Horton,** Amherst College, Beitzel Professor of Technology and Society (Statistics and Data Science), National Academies Consensus Study on Data and Computing Competencies for K-12
- **Shaundra "Shani B" Daily,** Duke University, Cue Family Professor of the Practice in Electrical and Computer Engineering, National Academies Consensus Study on Data and Computing Competencies for K-12
- **Zarek Drozda,** Data Science 4 Everyone, Executive Director, Framework for K-12 Data Literacy and Data Science Education
- **Kate Miller,** Concord Consortium, Research Associate, Framework for K-12 Data Literacy and Data Science Education
- **Jamie Perrett,** Brigham Young University, Associate Professor, GAISE College Report
- **Patti Frazer Lock,** St. Lawrence University, Professor of Mathematics and Statistics, GAISE College Report

Featured Programs

- **National Academies Consensus Study on Data and Computing Competencies for K-12 —** https://www.nationalacademies.org/projects/DBASSE-BOSE-23-04
- **Framework for K-12 Data Literacy and Data Science Education —** https://datasciencelearning.org/
- **GAISE College Report —** https://www.amstat.org/education/guidelines-for-assessment-and-instruction-in-statistics-education-(gaise)-reports

National Academies Consensus Study on Data and Computing Competencies for K-12

Dr. Nicholas Horton of Amherst College and Dr. Shaundra "Shani B" Daily of Duke University presented findings from the recent National Academies of Sciences, Engineering, and Medicine consensus study on foundational data and computing competencies for K–12 education. The study argues that data science, computer science, artificial intelligence, and statistics should not be treated as isolated disciplines, but instead integrated coherently across existing curricula beginning in early education. The committee identified seven cross-cutting competencies—problem posing and solving; producing and working with data; abstraction, algorithmic thinking, and automation; probability and inferential reasoning; models and representations; technology and society; and data and computing systems—that are already partially embedded within mathematics, science, and related subjects. Rather than adding entirely new requirements to an already crowded curriculum, the report emphasizes making these competencies more explicit through interdisciplinary instruction, hands-on and digital learning experiences, and progressively sophisticated engagement from kindergarten through high school. The presenters highlighted the importance of teacher preparation, equitable access to computing resources, and collaboration across disciplines to build a more coherent and future-ready STEM education ecosystem capable of preparing students for an increasingly data-driven and AI-enabled world.

Framework for K-12 Data Literacy and Data Science Education

Zarek Drozda and Kate Miller presented key points from the K–12 Data Literacy and Data Science Learning Progressions, an interdisciplinary framework designed to guide the integration of data science education across K–12 curricula. The Progressions development was a national initiative led by Data Science for Everyone and the Concord Consortium in collaboration with educators, policymakers, researchers, industry leaders, and students. The framework reflects growing momentum across more than 35 U.S. states and international education systems to expand data literacy, statistics, computing, and AI-related competencies in schools. The presenters emphasized that the work complements and extends the recent National Academies of Sciences, Engineering, and Medicine consensus study by providing a practitioner- and policy-oriented perspective focused on implementation. Through a large-scale stakeholder engagement process, the project identified and prioritized key competencies such as data storytelling, probabilistic reasoning, critical analysis of claims, ethical and responsible data use, visualization, and communication. These competencies were organized into five learning strands—dispositions and responsibility, creation and curation, analysis and modeling, interpretation of results, and visualization and communication—with detailed grade-band progressions extending across K–12 education. The framework is designed to support interdisciplinary integration into mathematics, science, social studies, English language arts, and computer science while also informing the development of dedicated high school data science pathways. The presenters underscored that the work is iterative and collaborative, with ongoing efforts focused on aligning the progressions with national standards, refining curricular priorities, and supporting educators in preparing students for a data-rich and AI-driven future.

GAISE College Report

Jamie Perrett and Patty Frazer Lock presented the ongoing revision of the College GAISE (Guidelines for Assessment and Instruction in Statistics Education) Report, a long-standing initiative of the American Statistical Association designed to improve statistics and data science education at the undergraduate level. Originally launched in 2005 and revised in 2016, the GAISE framework has significantly influenced introductory statistics instruction by shifting emphasis away from rote algebraic manipulation and toward conceptual understanding, real-world data, active learning, technology use, and statistical literacy. The forthcoming 2026 revision expands the framework to explicitly include data science education while maintaining its core mission of preparing students to reason effectively with data and make evidence-based decisions. The revised recommendations emphasize conceptual understanding over formulas, communication and storytelling with data, ethical and inclusive practices, multivariable thinking, and the integration of modern computational tools, including AI-supported analysis. The presenters highlighted the importance of helping students not only perform analyses, but also interpret, communicate, and critically evaluate data-driven conclusions in authentic contexts. In addition to updated instructional recommendations, the report includes student learning outcomes, assessment examples, and guidance for introductory data science courses across a wide variety of institutional settings. The revision also reflects broader efforts to align undergraduate data science education with emerging disciplinary competencies and workforce needs while ensuring that introductory courses remain accessible, inclusive, and engaging for diverse student populations.