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Editorial: A Report on NTLS 2025: A Call for Theoretically Grounded Research in Technology and Teacher Education

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The editorial summarizes results of the 2025 National Technology Leadership Summit as well as papers published in the current issue of this journal.

On September 18-19, 2025, leaders from educational associations, editors of educational technology journals, policy makers, and representatives from corporate and nonprofit entities convened in Washington, DC, for the 2025 National Technology Leadership Summit (NTLS). Support for this year's Summit was provided by the National Education Association (NEA), which served as the venue for the Summit, EdThena, Google, BranchED, and the Society for Information Technology and Teacher Education (SITE), a long-term partner of NTLS.

This year's summit began with a welcome from Monica Washington, Director of Teacher Quality at NEA, followed by updates from Cassandra Herring of BranchED, Jennie Magiera of Google for Education, and Adam Gellar of EdThena. Important updates were also provided by Monya Ruffin, Deputy Directorate Head, STEM Education, within the Division of Research on Learning in Formal and Informal Settings at the National Science Foundation.

Consistent with past practice, NTLS hosted a panel featuring presidents of teacher educator associations discussing pressing issues at the intersection of technology and teacher education and a panel featuring editors of educational technology journals. This year's editors' panel was moderated by Stephanie Moore, editor of the journal of *Computing in Higher Education*, and was structured around one of the articles she coauthored in the special issue of the journal examining the Research We Need (see Moore, Stefaniak, & Reeves, Eds).

The article, "The Research We Don't Need Will Persist Until We Dismantle The Systems That Sustain It" (Schmidt et al., 2025), examined historical shortcomings of educational technology research and argued for a shift toward impactful research that offers theoretical and practical value. Editors noted the overwhelming number of submissions related to AI and the challenges in maintaining quality. They explored questions such as, What might be considered the type of research we don't need? What are significant challenges where our research could make a significant contribution, and what would we need to make that research happen? What role can editors play and how can we collaborate with each other?

The 2025 NTLS was organized around three strands: (a) Grand Challenges in Technology and Teacher Education led by Natalie Millman, Stephanie Moore, and Jason Trumble; (2) Picturing the Theory of GenAI in Education, led by Todd Cherner and Torrey Trust; and (3) Reciprocal Innovation through NTLS Innovation Centers, led by Glen Bull, Elizabeth Langran, Mike Searson, and Roger Wagner. A summary of deliberations from each strand is provided here, with the assistance of strand leads.

Grand Challenges in Technology and Teacher Education

Natalie B. Milman, Stephanie Moore, and Jason Trumble

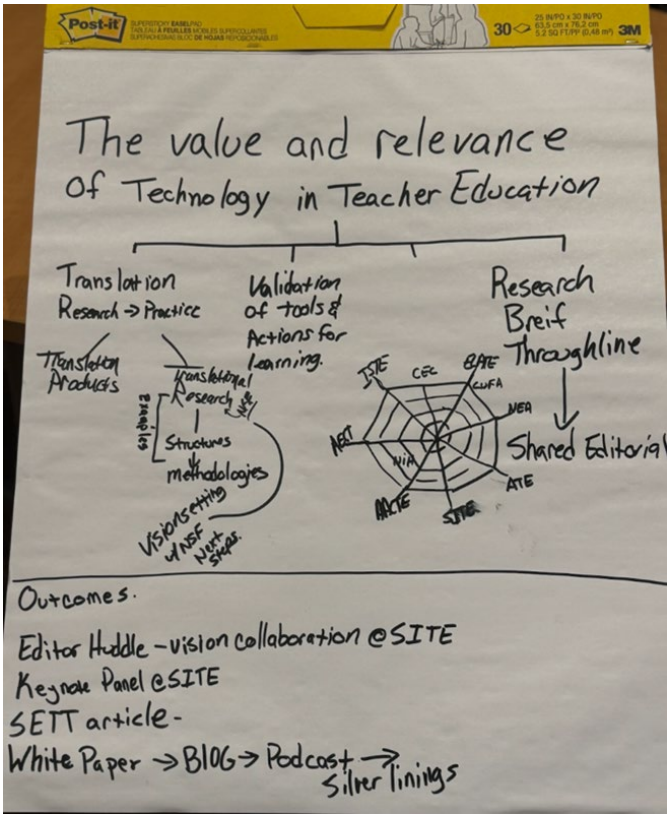
The NTLS Grand Challenges in Technology and Teacher Education strand was led by Natalie Milman, Stephanie Moore, and Jason Trumble. The strand's purpose was to build on Moore's (2025) call for "grand challenges in instructional design and technology" (p. X), and the intersection of technology and teacher education with this focus. The primary objectives were as follows:

1. Identify grand challenges in technology and teacher education.

2. Evaluate identified challenges based on their appropriate scale, urgency, and potential for transformative impact.

The process started with an examination of the need for research on educational technology to focus on solving problems instead of centering on tools. Presenters also defined grand challenges (see Figure 1) and discussed "What are grand challenges in technology and teacher education?" resulting in deeper exploration of the question, "What is the value and relevance of technology in teacher education?"

Figure 1
Grand Challenges in Technology and Teacher Education



The Need for Translational Research

A recurring theme of the Grand Challenges in Technology and Teacher Education strand was the disconnect between research and practice. Despite growing educational technology research in teacher education, the translation of findings into usable, field-validated practices remains limited. Participants emphasized the need for translational research, research that bridges the gap between scholarship (i.e., research findings) and teaching-learning practices in real classrooms with diverse learners, contexts, and technology tools.

Translational work should not merely describe design processes but demonstrate what works, where, why, and for whom. It should yield translational products. Drawing on the National Science Foundation models, participants called for clarity in defining translational research in education and distinguishing it from related methodologies such as designed-based research (DBR).

While decades of work have sought to integrate technology into teacher education, the field continues to wrestle with the profound tension between the use and purpose of technology in education, as well as its longstanding techno-solutionist, techno-determinist stances. Too often, the rationale for technology in education has been framed narrowly on

problems, as well as on its ability to make the teaching-learning process more effective, efficient, economical, or engaging, instead of preparing learners to thrive in a technology-mediated world. The Grand Challenge the field of teacher education faces is not simply how to integrate technology, but how to center technology as a means of learning for the future for both teachers and students.

Relevance and the Purpose of Technology in Teacher Education

Participant conversations began with the fundamental question, Why are we using technology in teacher education?Technology is not inherently valuable because it improves test scores or expedites grading. Its value lies in its capacity to shape the conditions for future learning by equipping teachers and their students with the tools, dispositions, and literacies required to live and learn in a digital society.

Yet, teacher education often lags behind the realities of contemporary learners. While many teacher candidates text, post, and collaborate in multimodal spaces, their preparation remains grounded in practices and tools of a prior generation. Moreover, knowing how to use technology is different from understanding how to use it for pedagogical purposes. Developing technology, pedagogy, and content knowledge, also known as TPACK, (Mishra & Koehler, 2006) is essential. If teacher preparation fails to reflect the evolving technological landscape, it risks irrelevance.

From Integration to Centering Learning

Participants challenged the notion of "technology integration," arguing that integration alone implies technology as an add-on rather than a driver of transformative learning. Instead, the group proposed a reframing: centering instructional technology for future learning. This shift emphasizes the alignment of technology with learning sciences, theory, and pedagogy, moving beyond curriculum design toward understanding *how* and *why* learning happens in technology-rich contexts.

Teacher educators must ask these questions:

- How can technology situate teaching within a frame of future value for the learner?

- How do we move from transactional uses of technology to meaningful, theory-informed practices that center learning?

Building Research-Based Capacity

Central to this challenge is research-based capacity building for all stakeholders, including teacher educators, editors, authors, teachers, and parents. Capacity building involves cultivating not only technological skills, but also data literacy, reflective inquiry, and an understanding of technology's role in human learning and development.

The group underscored that *teacher educators* must be learners themselves, engaging in imaginative inquiry and reflective practice. Teacher preparation programs can serve as testbeds for innovation, spaces to design, trial, and evaluate the pedagogical use of technology before scaling to broader contexts.

Breaking the Cycle and Reimagining Teacher Preparation

To elevate teacher preparation's relevance, participants called for breaking the cycle of replication, where teacher educators teach as they themselves were taught. Reimagining teacher preparation requires confronting shifting contexts, evolving student needs, and emerging modalities of communication and collaboration.

This reimagination must include reconsidering frameworks like TPACK and Teacher Educator Technology Competencies (Foulger et al., 2017), ensuring that teacher educators develop the competencies necessary for leading technology-enhanced learning. As one participant noted, "Adapt—or go." The future of teacher education depends on its willingness to evolve.

A Call to Collective Action

To move this work forward, participants proposed several actionable steps:

- Collaborative Editorial Initiatives: Coordinated "editor huddles" and cross-journal editorials to align language and priorities around translational research.

- Panels and Roundtables at the SITE conference: Sessions designed to map, exemplify, and advance translational research, featuring scholars, practitioners, and agency representatives.

- Partnerships with Accrediting Bodies: Engaging CAEP and AAQEP in understanding and recognizing the value of technology in teacher preparation.

- Annual Research Briefs: Summaries of progress and insights distributed to accreditation and policy organizations to expand impact beyond the academic echo chamber.

- Cross-Media Dissemination: Podcasts and white papers to share evolving definitions and examples of translational research in accessible formats.

Toward a Shared Vision

The challenge before us is clear: *To make technology in teacher education matter*. Doing so requires more than new tools or frameworks. It demands a recentering of learning as the core purpose of educational technology. It calls for research that is not only rigorous but relevant and for scholarship

that translates meaningfully into the realities of classrooms and their communities and in myriad contexts.

Picturing the Theory of GenAI in Education

Todd Cherner and Torrey Trust

GenAI continues to be a disruptive technology in education. Researchers, practitioners, and teacher educators have responded by producing several theoretical frameworks to inform how instructors at all levels can use genAI for teaching and learning. However, there are gaps in the existing frameworks, and the Picturing the Theory of GenAI in Education strand responded by identifying where those gaps are and how to fill them.

Strand Work Overview

To structure the working group, Todd Cherner and Torrey Trust first reviewed several existing theoretical frameworks for education, in general, before focusing on those explicitly designed for genAI. During the review, participants formed small groups to critique the frameworks further and identify opportunities for creating new ones where none existed. Next, participants completed a series of ideation activities in their small groups to brainstorm new frameworks needed to fill the gaps. The strand leaders then provided participants with working time to complete an initial draft of the framework, and subsequently deliver a short, lightning presentation of the framework to their peers for feedback. After receiving the feedback, participants used their remaining time to draft a short explanation of their framework, including an introduction, presentation of the framework (including a visual), and use cases.

Next Steps

Following NTLS, the strand leaders asked their members to return home and complete their explanations. In mid-October, the strand leaders, along with Richard Hartshorne and Rhonda Christensen, edited and submitted the proposed frameworks to the *CITE Journal* as an editorial. In addition, the strand leaders proposed a formal symposium to be presented at SITE 2026 in Philadelphia.

Conclusion

From the start, Cherner and Trust wanted an outcome for their working group. Their goal was to harness the group's collective knowledge and create a focus, which would result in the dissemination of that collective knowledge. As this group advances its work, the members have produced four viable frameworks that will be useful for guiding how genAI is used in educational contexts.

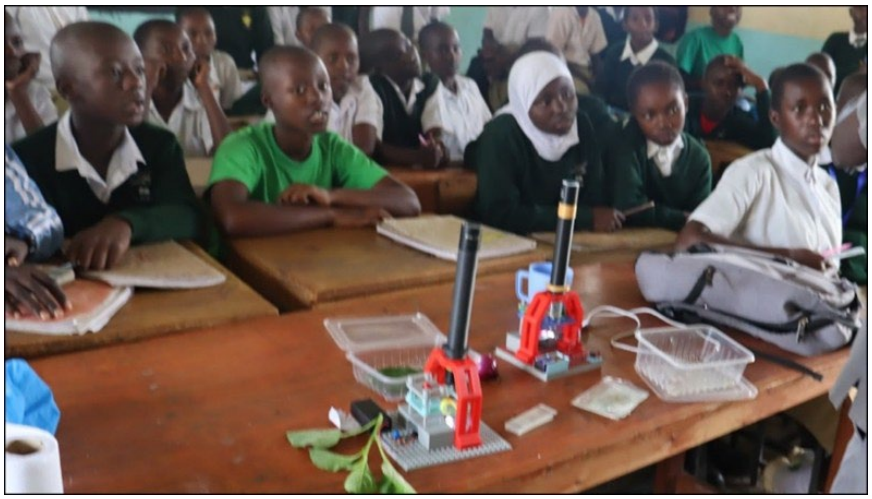
Reciprocal Innovation Through NTLS Innovation Centers

Glen Bull, Elizabeth Langran, Mike Searson, and Roger Wagner

The STEM strand explored effective use of school makerspaces for science and engineering education. This work builds upon and extends work at prior summits. One of the project's goals is to enable engineering students to design and fabricate scientific tools and instruments for science classes. Engineering students gain the opportunity to work on an authentic project in their school. Schools benefit by gaining scarce resources for science classes (Berry et al., 2024).

The NTLS 3D-printed microscope is one of the tools developed through this initiative. (Shapiro et al., 2025). One of the NTLS participants, Cameron Denson, is piloting fabrication of the NTLS microscope by high school engineering students through the Math and Science Education Network organized by the Friday Institute at North Carolina State University. Parallel pilots are taking place in Kenya and Uganda in East Africa (see Figure 2).

Figure 2
Students in Kenya With NTLS 3D-Printed Microscopes



Based on the pilot experience with the NTLS 3D printed Microscope, participants in the 2025 NTLS STEM strand adopted the following criteria for future candidates for development:

1. *Low Threshold for Adoption*: Innovations that are widely adopted have a low threshold. Ideally, scientific tools and instruments should be feasible for those with limited experience to replicate in school makerspaces.

2. *Widely Used in Science Classes*: For the same reason, the innovation is more likely to be disseminated if it is a tool or instrument that, like a microscope, is applicable for a range of uses in science classrooms.

Based on these criteria, participants identified development of an NTLS 3D-printed digital scale as the next priority for development. A balance is an essential tool used in chemistry, physics, biology, and earth science:

- Chemistry: Measuring reactants, calculating molarity
- Biology: Measuring specimens, food samples for nutrition studies
- Physics: Mass measurements for density, momentum experiments
- Environmental science: Soil samples, pollution studies

Designing and fabricating a digital scale also incorporates a number of engineering concepts:

- Load cells and strain gauges
- Digital signal processing
- Calibration techniques
- Precision vs. accuracy concepts.

Representatives from the International Technology and Engineering Education Association and the Association for Science Teacher Education are participating in this development effort. Once this tool is developed and piloted in schools, it will be submitted for publication in the NTLS Educational CAD Model Library. The goal is to complete development and testing by the 2026 National Technology Leadership Summit.

Description of Current Issue

This final 2025 issue of the *CITE Journal* aligns nicely with the themes and priorities discussed at NTLS, particularly the call of theoretically grounded and translational research that meaningfully informs practice.

The CITE-English Language Arts Education section features two articles as part of a special issue that will continue into 2026, each examining different forms and modalities of digitally networked texts. Designed as a resource for teacher educators, the issue supports efforts to help educators as they "engage with pre and in service teachers about the complexities of digital texts and how to teach them" (Garg et al., 2024). The first article, "Pixels, Prose, and Literary Knowledge Production: Cultivating Aesthetic Literacies Through Audiovisual Essay Composing," explores an early-career teacher's experience creating audiovisual essays informed by aesthetic literacies and youth interpretive communities.

The second article, "Examining Educators' Social Media Use to Support Digital, Civically Engaged English Teaching," examines the use of preservice and in-service teachers' use of social media, civic engagement, and English disciplinary instruction. Together, these articles offer valuable insights for educators learning to teach with digital, networked texts in

ways that blend traditional scholarly practices with creative and critical expression (Aleo, this issue).

The CITE-Current Practice and CITE-Social Studies Education sections address theoretically informed approaches to the use of genAI in education, an area emphasized at NTLS. In "CIVIC: Five Pillars for Using Artificial Intelligence in Social Studies," the CITE-Social Studies Education section introduces a theoretical framework consisting of five pillars for integrating AI in social studies education. Grounded in existing literature, this framework offers practical strategies for supporting educators incorporate AI in ways that support student learning while addressing issues of bias and ethical responsibility.

In the CITE – Current Practice section, "Don't Force It": An Action Research Study on AI Integration in Undergraduate and Graduate Teacher Education Coursework" presents an action research study that examines the implementation of AI tools in undergraduate and graduate teacher education courses. This study identifies both benefits and challenges of AI integration and underscores the need for greater guidance and modeling of effective use of AI tools.

The CITE-General section presents the first part of a special issue on technology leadership. The initial set of three articles focuses on technology leadership in higher education, while the second part will address K-12 education. These articles present systematic literature reviews that examine technology leadership across key constituents, including instructional designers (Qian & Hassan, this issue), teacher educators (Hassan et al., this issue), and higher education administrators (Carlson et al., this issue). Collectively, the articles illuminate contextual factors that shape leadership practices, influence pedagogical decision-making, and inform how educator and administrator preparation programs can better support leadership amid rapid technological changes.

The last article in the Seminal Articles section highlights the groundbreaking contributions of Bob Tinker, who pioneered the use of computers and probeware in science education. Bob Tinker was honored with the 2025 NTLS Educational Leadership Award, established to: "recognize individuals who significantly advanced effective use of technology in teaching and teacher education over the course of their lifetimes" (Bull, 2025, this issue).

We hope readers enjoy these articles. As always, we encourage responses to the above manuscripts.

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