

From the Editor

Coalescence of a Field

It seems fitting that this, my final editorial, would address the issue of educational relevance which the profession has struggled with for as long as I have been a member of it. Specifically, this editorial explores what I perceive to be a transformation that may well be the harbinger for a long-awaited coalescing of our field. For decades, the academic domain tasked with promoting technological literacy and developing human capability in the designed world has been a discipline divided by geography, culture, and vernacular. Whether operating under the banner of Technology Education (TE) in some regions, Design and Technology Education (DTE) in the United Kingdom, or Technology and Engineering Education (TEE) in the United States, these subfields have long functioned in relative isolation, bound largely by a shared focus on material manipulation (the doing) but separated by distinct epistemological and philosophical traditions. This historical fragmentation often obscured the universal nature of what our educators might actually be observed teaching in their classrooms around the globe, leaving the profession vulnerable to shifting political whims and the uncertainties of educational identity.

Not intended to be an in-depth empirical investigation of this long-standing issue, this editorial draws on my own observations over the past four decades of trends in international research. Through my own personal lens, it appears that in recent years a strong undercurrent has been quietly and fundamentally reshaping what historically has been an internationally fractured discipline. The gradual confluence of research focused on the transdisciplinary cognitive demands of Technological/Engineering Design Based Learning (T/E DBL) has provided an empirical baseline that transcends regional culture and vernacular. By analyzing the immense mental modeling, metacognitive regulation, and heavy working memory demands imposed on learners navigating ill-defined design problems, international scholars have increasingly provided evidence that designing is a highly rigorous, universal cognitive architecture. This line of research has resulted in a growing consensus regarding the importance of cognitive research among our scholars, and catalyzing a profound shift in what we are choosing to substantiate our place in the educational landscape. Concurrent with this shift is the steady elevation of our discipline from disparate craft-based traditions into a more globally recognized field of academia.

This shared understanding is forging a powerful, unified identity. Specifically, it is a transition toward international solidarity that anchors our collective future not singularly in the hands-on (tool use) approach, but universally in the minds-on (use of tool) pedagogy of design based learning which teaches students to think critically, regularly engage in iteration as a method of refining concepts requisite for understanding, and then capitalize on

newly acquired understandings to conceive of satisficing solutions. Over the past several decades, this movement toward a unified academic identity has been heavily anchored in the cognitive architectures of T/E DBL. The impetus for this evolution, however, began quite some time ago.

Historical Fragmentation

In 1985 the change in name from Industrial Arts Education to Technology Education in the U.S. signaled a recognition in the profession of the need to keep pace not only with technological change, but with a changing educational landscape challenging the relevance of the discipline as a school subject. In the decades that followed, this context of technological and educational change brought with it, among other things, a need within the profession for a research agenda focused on legitimizing the field as a school subject.

Studies such as the one conducted by Foster in 1992 investigated the topics and methods of graduate student research as a plausible gauge of the direction of research in technology education. Results indicated that program evaluation, largely through surveys, was the most common topic and method. Not long afterwards, Zuga's 1994 analysis of research conducted between 1987 and 1993 in technology education found most were curricular in nature, with little attention focused on the intrinsic educational value of the field, its unique approach to problem solving, or the cognitive demands inherent with technological design. Several years later Lewis (1999) attempted to give focus to our research agenda by proposing potential areas of research that were "compelling because: (a) they relate fundamentally to the basic claims of the field, (b) they remind us that technology education ultimately is about learning and teaching and the primary actors in that enterprise must be brought into sharper focus, and (c) they share and conform to conceptual frameworks (such as situated cognition and constructivism) that unite technology education with other school subjects" (p. 43). More than the first two, it was his third point of using research to unite technology education with other subjects and focus on the cognitive benefits of T/E DBL that took root among the science, technology, and engineering education researchers. In the following decades, scholars in the U.S. and internationally increasingly prioritized investigations evidencing the link between intentional transdisciplinary learning in T/E DBL and the resulting cognitive benefit of enhanced conceptual understanding.

Confluence of Cognitive Research

In the years between 2000 and 2026, research focused on T/E DBL published in major technology and science education journals revealed a gradual transitioning away from curricular, skill-based (the doing) foci to those focused more on demonstrating cognitive connections and promotion of conceptual understanding. To highlight this transition, listed below are a select few authors who published research in a variety of research journals (full references

provided) during this timeframe directly or indirectly emphasizing connections between T/E DBL and conceptual understanding:

International Journal of Science Education – France, 2000
Journal of Technology Studies – Barak, 2000; Akpan, Etim, & Udoh, 2026
Journal of Industrial Teacher Education – Kolodner, 2002
Cognitive Studies: Kolodner, 2002
National Center for Research on Evaluation – Shavelson, Ruiz-Primo, Li, & Ayala, 2003
Journal of Research in Science Teaching – Fortus, et. al., 2004, 2005; Lewis, 2005; Puntambeker & Kolodner, 2005
Design and Technology Education: An International Journal – Norman, 2007; Atkinson & Davies, 2012; Chandrasekera & Mihandoust, 2020
Journal of Technology Education – Dunham, Wells, & White, 2002; Doppelt, et. al., 2008; Dixon & Johnson, 2012; Dixon & Lammi, 2014; Wells, et. al., 2016; Wells, 2010, 2016
Journal of Educational Technology and Society – Li & Tsai, 2007
International Journal of Technology and Design Education – Barak & Waks, 2000; Doppelt, 2009; Williams, 2011; Buckley, Seery, & Canty, 2018; Barak & Yuan, 2022
Journal of Curriculum Studies – Lewis, 2012
International Journal of STEM Education – Kelley & Knowles, 2016
Australasian Journal of Technology Education – Barak & Albert, 2017; Barak, 2020
Journal of STEM Education Research – Oner & Capraro, 2025

Similar trends can be observed in the published proceedings of key international conferences such as the PATT, ICTE, TENZ, etc. held between 2016 and 2026. A review of the proceedings from these conferences over the past decade reveals that a high percentage of papers are rife with research connecting T/E DBL with the development of higher order thinking, cognitive capabilities, and designerly knowledge acquisition. Furthermore, as demonstrated through the select sampling of participating institutes of higher education listed below, papers delivered at these conferences disseminate the research findings from scholars both within and outside of our profession hailing from countries around the world:

Australia (PATT: Australian Catholic University | TENZ: Curtin University; University of Sydney; Edith Cowan University | ICTE: University of South Australia; University of Melbourne)
China (PATT: Hubei University of Technology; Nanjing Normal University; Beijing University of Technology; Renmin University of China; Capital Normal University)

Germany (PATT: University of Koblenz; Carl von Ossietzky Universitat Oldenburg)

Ireland (PATT: Athlone Institute of Technology; University of Limerick; Technological University of the Shannon)

Japan (TENZ: Saitama University; Shiga University; Kanagawa University; Naruto University of Education; Hokkaido University of Education | ICTE: Shinshu University; Nara University of Education; Shizuoka University; Teikyo University; Oita University)

Netherlands (PATT: Delft University of Technology, University of Applied Sciences, Utrecht)

New Zealand (PATT: University of Waikato, Victoria University, Wellington; University of Auckland Waipapa Taumata Rau | TENZ: University of Auckland; University of Canterbury)

Norway (PATT: Oslo Metropolitan University)

Republic of Korea (ICTE: Chungnam National University; Kongju National University; Korea National University of Education | TENZ: Gyeongin National University)

South Africa (PATT: University of Johannesburg)

Sweden (PATT: Linköping University; KTH Royal Institute of Technology; Karlstad University; Halmstad University; Uppsala University)

Taiwan (PATT: National Taiwan Normal University; Shih Hsin University | ICTE: National Kaohsiung Normal University; TENZ: National Central University)

United Kingdom (PATT: University of Exeter, University of Sunderland, Liverpool John Moores University; Nottingham Trent University; University of Glasgow | TENZ: Goldsmiths, University of London)

Researchers presenting their findings at these conferences are not necessarily intentionally attempting to legitimize technology education (TEE or DTE) as a school subject, but their findings non-the-less provide evidence for legitimization. And that evidence resides within the common emphasis on demonstrating the value of imposed cognitive demands that are inherent to the T/E DBL approach. This growing body of empirical research is increasingly demonstrating that designing T/E solutions is not merely a procedural sequence, but a rigorous cognitive process. These scholars are documenting the high cognitive demands naturally imposed on learners as they navigate ill-defined problems, requiring concurrent management of working memory, transdisciplinary and domain-specific knowledge, and both physical and conceptual tool manipulation. The transition from isolated skill acquisition to design-based learning has resulted in a growing international focus on metacognition. Learners engaged in T/E DBL must constantly evaluate constraints, optimize solutions, and tolerate ambiguity, all of which require

cognitive behaviors that remain identical whether a student is in a TE/TEE/DTE program, or a program within one of the core sciences (physics, chemistry, biology, etc.).

Perhaps of greater importance, accumulated research establishes that technological literacy relies on specific designerly heuristics and a capacity for internal mental modeling. This empirical consensus is effectively shifting the international view of the field from a hands-on (doing) focus to a distinct, highly demanding minds-on (cognitive) discipline. This shared cognitive framework has been instrumental in facilitating international solidarity, and stimulating consensus regarding the universal underlying mental processes associated with the designerly way of coming to know. The gradual coalescing of the field over the last few decades reflects a move away from fragmented provincial identities toward a global community bound by a singular ontological truth: the field studies and develops human capability in navigating the designed world.

Toward a Unified Identity

As noted at the outset, this editorial is not meant to be a full research treatise empirically demonstrating a research trend. Instead, it presents the case for this trend based on decades-long personal observations of a field dedicated to promoting T/E DBL as the signature pedagogy, and the designerly way of knowing as a knowledge acquisition heuristic unique unto our field. It is from this vantage point that I contend there is a gradual converging of cognitive research internationally from our community of scholars that is ultimately investigating and documenting how engaging students in T/E DBL enhances their capacity to think critically. This shared research agenda marks a definitive shift away from the historical fragmentation that once siloed the profession to one gradually unifying as a field of academia identified by a pedagogy that intentionally capitalizes on the cognitive and iterative demands of technological and engineering design-based learning to enhance conceptual understanding.

Moving forward, this unified identity is affording the field the opportunity to speak with a collective, authoritative voice on the global educational stage. At the core of this identity is our unique approach to knowledge acquisition based on the heuristic of designerly ways of knowing. As we look to the future, our shared research infrastructure and conceptual alignment provide a robust platform to advocate for technological literacy of all learners in an increasingly complex, technological world. By celebrating our diverse regional histories while rallying around a singular, cognitively anchored identity, the profession is increasingly recognized as one that cultivates the critical thinkers, ethical designers, and innovative problem solvers tomorrow demands.

Coda: Change is the Only True Constant

“The universe is in perpetual flux; you can never step twice into the same river.”

— Heraclitus, *Fragments*

Today, philosophically speaking, the idea that change is the only true constant is no more evident elsewhere than in the never ending process of technological change. We who are members of a field dedicated to promoting technological literacy are all too familiar with the impacts that constant technological advances have on society. One such technology that forever changed the world was the Gutenberg press invented by Johannes Gutenberg in the 15th century. The introduction of moveable type provided all of society with access to the printed word and the knowledge, perspectives, and insights those words conveyed. Today the Gutenberg equivalent is arguably the Internet which provides all of society with instant access to a global collective of information. The impact of this modern-day technological invention has been swift and far-reaching. One poignant example is reflected in the declining consumption of information presented through the printed word. Specifically, the demand for information in printed form is fading rapidly as the global society now prefers digital content that is accessible anytime and from anywhere.

The impact of this technological advance has spread far and wide, and in the scholarly realm it has resulted in a precipitous decline in the printed versions of our research journals. Like so many others, the *Journal of Technology Education (JTE)* is not immune to this decline in demand for printed journals. In fact, we are saddened to report that the number of subscribers to the printed version of the *JTE* has dropped to a point where the cost of producing the printed journal is no longer sustainable. In light of this, we have no options other than to follow suit with other research journals and move the *JTE* completely online in a digital version only. This issue, Volume 38, Number 1, will be the last hard-copy, printed version of the *JTE*. This issue of the *JTE* brings to an end a 38-year period of publishing the Journal in both print and online formats. Also coming to an end in 2026 is my role as the *JTE* Editor. As of this issue, Philip A. Reed, currently Associate Editor, will be transitioning into the role of *JTE* editor to begin January of 2027.

JGW

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