

Design Future(s) Collective: New Directions for Educational Design Research

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Abstract: Advancing new directions in design research is crucial, especially as our understanding of learning is confronted by novel semi-autonomous and AI technologies, social phenomena, and global environmental crises. This symposium seeks to advance a vision for the future(s) of educational design research and consider questions that rupture core assumptions about design in the learning sciences. These include who and what design agents are, how sustainability can become core to educational design, and how design processes and responsibilities can shift considering new design purposes and partners. The papers present four contributions to design research, allowing us to explore: (1) Commitments and groundings for design, (2) lifecycle approaches made visible when materials are treated as contributors, (3) the importance of new co-analysis approaches, and (4) the unfinished and unexpected nature of educational design.

The importance of expanding design research in the learning sciences

As issues of social, ecological, and economic sustainability meet accelerated technological advancements, educational design research can play a vital role in preparing people to address pressing global challenges. In the learning sciences, design-based research is a foundational logic of inquiry used to construct, test, and advance theoretical insights about learning and learning processes through iterative design (e.g., Sandoval, 2014). Design research is understood as generating theory in the form of frameworks encompassing what learning is and how it happens in the context of design interventions (diSessa & Cobb, 2004). Over the past thirty years, design research methodologies and related approaches (e.g., formative interventions, social design experiments, and collaborative design) have supported innovations in learning theories, the design of learning settings, and high-quality educational technologies.

In recent years, approaches to design research in education have begun to shift as new questions and challenges have become visible. One example of this is novel co-design approaches, such as design-based industry partnerships (Pepler & Schindler, 2021) that consider how learning theory can inform highly volatile market-driven contexts. Another example is approaches that explicitly attend to the axiological dimensions and subject-subject relations inherent in partnering, particularly toward the end of disrupting and reorganizing systems of power (Bang & Vossoughi, 2016; Gutiérrez & Jurow, 2016). Other emerging design-research approaches pivot toward considering tangible and digital realities in the design process, including the active role of materials (Giaccardi & Redström, 2020).

With this symposium, we seek to further develop educational design research in light of perspectives that trouble the stance of humans as primary agents, learners, and designers within the learning sciences. This shift has occurred theoretically through research from embodied, multimodal, materialist, and posthumanist perspectives on learning (e.g., Ma, 2016; Pahl & Rowsell, 2013; Wong et al., 2024; Keune, 2024; Pepler et al., 2020). The shift also has pragmatic roots, driven by advanced technologies that co-engage in creation processes (e.g., Lim et al., 2024; Mitterberger & Dörfler, 2024). And perhaps most consequentially, it is fueled by new and pressing global challenges that call for solutions that extend far beyond individual development toward partnering in collectives of humans and non-humans (Barad, 2007; Braidotti, 2013).

Workshop/Approach

This symposium proposal is the outcome of a two-day meeting at the Technical University of Munich Raitenhaslach Academy Center in Burghausen, Germany. The meeting explored emerging directions in design research and their role in advancing knowledge about learning. Twelve invited interdisciplinary and international participants joined the meeting, the authors of this proposal, including (1) learning sciences scholars advancing design research from varied perspectives, (2) digital literacy scholars with foci on maker-centered approaches and materialities who informed novel theoretical orientations for design, and (3) architecture scholars from built urban environments research, structural architecture, and digital and robotic fabrication. At the workshop, participants presented posters and material artefacts that exemplified their approaches to design through illustrative cases (Figure 1; top center image is based on Park & Wilmes, 2019).

Figure 1

Impressions of the Design Research Cases that Informed the Symposium Contributions



Through poster presentations and discussions, we attended to how the cases helped provide concepts and tools in relation to a central question: *How can design address pressing issues in education?* The shared thinking illuminated throughlines across the cases. We then elaborated these throughlines in small groups and further developed them in whole group conversations. Collectively, we documented the artifacts and conversations through photographs, notes, and written reflections. After the workshop, we consolidated the documented cumulative thinking in the form of the symposium that we share with the wider learning sciences community.

Symposium questions and structure

The ISLS 2025 symposium will continue to work to articulate a vision toward the future(s) of educational design research as we consider questions that rupture core assumptions about design in the learning sciences. Who and what are active design agents? Who and what is design(ed) for? How can ecological, social, and economic sustainability become core to educational design? How do design processes need to shift to contribute to new knowledge about how people learn and about change that extends beyond one human life? What are the

responsibilities of designers, and how do we make these responsibilities visible? We explore these questions through a discussion of four *contributions* organized as paper presentations. These are: (1) Commitments and groundings for design, (2) agentive materials and designers, (3) co-analysis in the design process, and (4) the unfinished and unexpected nature of design. A strong undercurrent that runs beneath all four contributions is that the participatory nature of design should be informed by ethics, (embodied-)socio-material practices, histories, and documentation of the relational, speculative, and affective character of design—including senses, feelings, beliefs, and convictions circulating during design. The symposium invites wonderings about these undercurrents to further articulate and broaden our collective imagination about the future(s) of educational design research. The symposium will include a framing and introduction of the cases by the co-chairs, followed by presentations of the four contributions and close with a discussion that includes discussant remarks and active audience engagement through further questions and reflection.

Contribution 1: Commitments and groundings for design

Jasmine Y. Ma, Jennifer Rowsell

During the *Design Future(s)* meeting, an abiding intention was to explore and reimagine the notion of design to reclaim histories and disrupt more traditional, instrumental ways of defining what counts as design-based research. Stepping outside of technical and iterative design phases, what role do contexts, identities, material histories, politics, and backgrounds play during design research processes? Are there ways to locate a designer's convictions, ethical stances, and beliefs to actively identify and respect them during design iterations? Can histories and legacies sediment into designs? What helped our discussions was thinking about epistemic commitments—how designers enter design research from a stance, belief system, and set of values and convictions that unfold epistemologies. Goffman's (1979) notions of *footing* and *grounding* took prominence during our discussions about specific case studies. *Footing* is a change to framing events. It is a change in ways of orienting and aligning events around language used; actions enacted; discourse and ideas circulated; histories privileged; modes used; and senses ignited. So, footing can give design research more nuanced, political, and disruptive perspectives about design. Then, there is *grounding*, that provides ways to examine closely the role of power, ideology, and social change. These are bigger, macro concepts that are the landscape for design contexts. Taking seriously Goffman's notions of footing and grounding, the footing of "participants" (designers, learners, bodies, matter) depends on the grounds that are constructed for them—how they are positioned and repositioned. Grounds shift in ongoing activity (for us this is design research activity). We are thinking of this as *grounding*. We then ask: How do we keep complexity in the idea of grounding?

Rather than reduce design to modes privileged by factory models or linear, lock-step ways of conceptualizing design, we believe that groundings and footing coexist and converge in design and design practices—that is, design can create openings for complexities to come together in new and liberating ways (i.e., not bound to standardized, linear, and/or neurotypical norms; Shannon, 2020). Through all aspects of grounding (materials, space, time, bodies, senses), there is immanence/becoming. Shifting grounds, or grounding, is necessary for becoming. This moves design research away from top-down, normative design endeavors (whether the top is researchers, or disciplines, or other dominant/normative actors).

Example cases

For the symposium, we will use the terms *footing* and *grounding* to interpret telling case studies. The four cases help us disrupt top-down, disciplinary hegemonies to create a space of speculation and sociocultural framings of conditions around design work that account for embodiment, affect, and materialisms on the move (Bang, 2020). Presentations in the symposium call into question terms like 'conjecture' and 'measurements,' because these latter constructs are rooted in more cognitive and psychological accounts of design work. A conjecture represents an unproven claim that needs unpacking, provability, through a series of design steps. Deconstructing a term like 'conjecture' and examining design commitments and Goffman's notions of footing and grounding allows us to reveal politics, structures, regimes, and rules of design. Collectively, we consider instead the social, the felt, the speculative and provocative that can be found in design-based research (Gutiérrez et al., 2019). This line of questioning, theorizing and thinking helps us locate agency and relationality during design work and it gives us space to explore a designer's stance, beliefs, convictions, values, and backgrounds (Bang, 2020; Rowsell, 2020). Design needs to be seen within lived experience by actual people in particular places. This moves from treating the sociopolitical as "context" to a commitment that the sociopolitical is everywhere and unavoidable. Starting design research from commitments that are always shaped by the sociopolitical and sociohistorical organizes and

re-mediates design research. Our argument is that we must be explicit about design commitments that ground social design experiments to underscore the footing of the design—its histories, its reclaimed traditions, its roots.

Community-based intergenerational making for grounded design work

In this research vignette, young and old design and make together in a community space to find footing through inter-generational design that forge belonging and grounding as a part of an urban makerspace research study.

Material inquiries and engagements with architecture students

Matter brings footing for architecture students documenting and analyzing material properties by designing small constructions. The act of improvising with materials - sensing weight and heft to build - this research vignette illustrates how matter gives footing within design practices.

Crocheting for footing and grounding

To activate and understand math principles through matter, children understand patterns and proportional thinking through crocheting on looms. The vignette shows how design events can be reframed through a footing lens when children experiment with wool and needles to solve math principles.

Reframing self by grounding ideas in Cindy Sherman conceptual photographs

In this research study, teenagers find footing by designing conceptual portraits in the style of Cindy Sherman. Both footing and grounding are actualized in this vignette to show how teenagers embed agency in design processes by grounding it in a particular aesthetic.

Discussion

These telling examples from four different research studies apply Goffman's concepts of footing and grounding to illustrate an alternative framing of design commitments beyond top-down, more traditional approaches to design-based axiologies.

Contribution 2: Lifecycles in design: Materials as active contributors

Anna Keune, Eve Manz, Kathrin Dörfler

Approaches in the learning sciences increasingly appreciate agents other than humans as *collaborators* and active contributors to learning. For instance, research on prototyping as learning highlights the importance of capturing contributions of materials to collaborative learning processes and design outcomes in addition to people's contribution (Seitamaa-Hakkarainen et al., 2022). Increasing AI and semi-automated robotics used in and for learning contribute to questions about who and what are active contributors to learning and design. Such questions do not only have a technological grounding. Instead, they are increasingly important considering global environmental concerns for sustainability, as well as empirical educational research centering on how environmental forces shape learning (Hecht & Jadallah, 2023; Eglash et al., 2020).

In our considerations of who and what is an active contributor to design (and, by extension, contributor to knowledge on learning), we built on this emergent work. We also drew from our own design processes and from posthumanist and socio-material philosophies (Barad, 2007; Kuby & Rowsell, 2017; Pickering, 1995; Taylor & Iverson, 2013) that called us to trouble that stance of *humans as the dominant designers* and *materials as dominant tools* for—or mediators of—design (Keune, 2024). This involves considering participants, including non-human participants, in webs of (often shifting) relations as collaborator (Keune, 2024). For instance, Knorr Cetina (2001) writes about how a molecular biologist describes her relationship with the protein she was working on:

“Well, the protein, because it has previously been a problem, the protein is a bit more moody. I think about it, I get more visual, I treat it differently, in one word, I pay more attention to it, it's more precious. I don't handle it routinely yet...it takes on aspects of some personality, depending on whether it has been cooperative or not. If it's cooperative then it becomes a friend for a while, then I am happy and write exclamation marks in my book.” (pp. 188-189)

This quote suggests that when we see materials as active, they can tell us new insights and make new imperatives and responsibilities visible, opening worlds that extend beyond our default time- or activity-bounded conceptions. Reflecting on these works in relation to our own design practice (with earth-based construction materials, naturally growing materials, and arts-based generative AI) led us to recognize the need to *consider lifecycles in design*. Lifecycle approaches are increasingly necessary, both in relation to new emerging technologies and the kinds of

problems design must orient to. For example, within construction, there is a need to consider design for disassembly to enable the possibility to re-use whole parts of buildings in different constructions rather than demolishing an entire building also considering the duration of the used material durability (e.g., around 80 years for concrete) to account for possible shifts in the social life of built environments. Further, the lifecycle approach requires a shift in methodology to help trace design processes, considering slow material movements and forces (compared to human movements) that grow and live outside of human life (e.g., decomposition, material life of a material erosion of human-made material mixtures like concrete and cement).

Example cases

The promise of robotic clay printing as a way to learn about the lifespan of design

In this research example, young people engage with robotic clay printing for the purpose of learning about the sustainable future of construction. Learning activities were designed to address several aspects of the lifecycle of construction, including how novel robotic extrusion technologies influence material efficiency (e.g., reduction of material used in mixtures), effective processes and labor use due to simultaneous construction (e.g., on-site printing and assembly; reduction of noise pollution), improved interdisciplinary communication (e.g., architects adapt digital plans to tangible issues on the construction site), and designing for disassembly (e.g., considering what material combinations, connections, and geometric shapes to use to be able to reuse parts of a building for unknown social circumstances within an 80-year lifespan of materials used for construction).

The maple seed as hinge between the classroom investigation and complex world

In this design, the maple seed becomes a material collaborator, both for children and for the designers of the learning environment (researchers and teachers working together). As children plan a science investigation into which seeds travel by wind, they propose holding each seed in its seed case (samara) in front of a fan, then seeing how far it travels and marking or measuring distances. They predict that the maple seed will travel by wind, drawing on the wing-like shape of the samara and their experience seeing seeds spin. As the children hold it in front of the fan, others shout, “Go, maple seed!” But it simply drops. Children’s excitement and frustration is palpable: “Turn the fan up!”; “It did not fly but it would outside!” As children seek to explain why the maple seed did not travel, new aspects of its flight become visible and important: It is located high up on the tree, it points downward, it pushes on the air as it falls, it may not travel far, and how far does it need to travel anyway? In this work, we collaborate with the maple seed. It functions as a hinge between the classroom and the world. Children critique the classroom investigation keeping in mind how it does not represent the ecological relationships and longer time span central to the maple seed’s travel and (possible) growth in its lifespan and context. Their material engagement with the seed makes these “lacks” (in the investigation’s representation of complex processes) visible (Knorr Cetina, 2001).

Discussion

Such approaches present performable and tangible opportunities to grasp responsibilities that extend beyond us, for example, into complex webs of relations and into new scales of time. These are essential for the questions of sustainability before us (e.g., Haraway, 2015; Puig de la Bellacasa, 2017; Kimmerer, 2013). As Puig de la Bellacasa (2017) writes, these perspectives “incit[e] us to enlarge our ontological and political sense of kinship and alliance, to dare in exercises of category transgression, of boundary redefinition that put to test the scope of humanist visions of care and thus disrupt existing articulations of concerns” (p. 73). In classrooms studying biological phenomena, we need children to experience the limitations of what they can “know” about trees with life spans on a scale we cannot fully represent in classrooms, who must be our partners in modulating heat and oxygen. Robotic extrusion processes with earthen materials for co-construction present opportunities to reshape the field of construction by thinking beyond the lifespan of one building and beyond people as partners in creating built environments while also sending a clear message that young people can be the future of construction.

Contribution 3: Co-analyses within design processes

Kylie Peppler, Pierluigi D’Acunto, Sara Wilmes, Chris Siry

As researchers engaged in design research (Brown, 1992) we look to new futures and hope-filled possibilities of what *could be* through our work in education. We tease apart the question; *how can we purposefully incorporate collaborative approaches and analyses in our methodologies?* This is a vast question with a range of groundings and solutions. We work from the argument that within design research processes, opportunities for collaborative methods such as co-analysis are often overlooked. Here, we take co-analysis to mean purposely carrying out our

research in ways that afford space for honoring multiplicities in perspectives, voices, materials, and world views, and engaging in collaborative design research processes that value the presence of these multiplicities.

We turn to this question of collaboration and co-analysis as we are living at the precipice of a technological age when our standing as humans within human-technological assemblages continues to shift. We seize this opportunity to embrace our multi-human-ness, and work to retain the dynamic polyphony and heteroglossia of our differences (Bakhtin, 1981) in ways that enrich our analysis. This symposium supports our call to inspire our colleagues to embrace multiplicity and multiple perspectives through taking-up *collaborative* methodologies, as a purposeful move to bring in more human-ness, to resist flattening, to complexify design research that embraces diverse multi-perspectival ways of coming together to bring forth multitudes of understandings. We share examples from our research incorporating co-analysis as a starting point for discussion of what *could be* in our future education design research projects.

Example cases

Through the examples we will share, detailed below, we will approach questions such as, who or what agents/entities are in co-operation? What relationships are there in our methods and how can we open them up? How can we embrace the differentials and open our processes to embrace and work from multiplicity, affect, messiness, ranges of timescales in our co-ness? How can we open relations?

Co-Analysis with elementary teachers through the design process

In this example we share collaborative analysis with primary teachers in STEM teaching in diverse multilingual primary classrooms, as we engage in collaborative reflection on practice (Wilmes et al., 2018). Dialogic collaborative processes (Siry & Zawatski, 2011) allow for shifting and changing views on subjects, students, and relative to oneself, grounded in what is possible now, with a view on what could be possible in our future teaching and research practices.

Small-group architectural collaborations with students and materials as design co-partners

In this example, groups of architecture students developed projects to showcase how materials can serve as active design partners, with a focus on collaborative teamwork and constructive critique (Keune et al., 2025). The students designed sculptures of household objects in static equilibrium and, through group work, learned to coordinate effectively with one another while integrating materials as co-partners in the structural design process.

Involving participants in co-analysis

Drawn from an international study on the impact of community arts programs over the life course, researchers designed a new process for facilitating high-quality, ground-up co-analysis (Corbin, 2017; Belgrave & Seide, 2019) with leaders from a wide range of arts organizations. Working together to inductively group and name a multitude of outcome statements from participant interviews into categories, the collaboration yielded a comprehensive taxonomy of community arts program outcomes, highlighting the complexity and richness of program impacts while fostering shared insights across organizations and regions.

Bringing multiple perspectives into conversation

In this example, multiple perspectives invited productive tension around urban development and sustainability with stakeholders in community architecture processes. In public conversations, tenants witnessed the effects and affects of urban development that severely threatens their neighborhoods' social cohesion. The conversations are recorded, transcribed and edited by the speakers and published. The conversations create new and diverse perspectives in urban transformation processes that contest dominant narratives and open for more embedded spatial design possibilities.

Discussion

We offer these examples to inspire researchers to embrace collaborative and equity-focused approaches in ways that illuminate mutuality, mutual influence, and messy relationships and to further conversations about co-analysis in ways that deepen our perspectives.

Contribution 4: Unfinished and unexpected nature of educational design

Kristiina Kumpulainen, Meike Schalk, Naomi Thompson

As educational designers, we believe that it is necessary to account for the *unfinishedness* and *unexpectedness* of the world and educational contexts, embracing timescales (pasts, presents, futures) and material entanglements in

the design process. We ask, how do epistemologies, ontologies, and axiologies of unfinishedness and unexpectedness allow for educational design that can lead to new directions, agencies, and collaborations?

Many design researchers acknowledge that education and its spaces are messy and complicated and that educational design projects take significant time and effort to imagine, implement, and understand. However, there is still pressure for researchers to engage in design that leads to finished objects or outcomes. As the world is unfinished, changing and difficult to predict, embracing unfinishedness and unexpectedness allows us to see educational design as an ongoing and ever-evolving process. The notions of unfinishedness and unexpectedness also allow us to rethink the feasibility and sustainability of educational design, recognizing that designs *live* and change in educational contexts across time and space.

We argue that by appreciating and recognizing different timescales of design and understanding designers—and their materiality—as participants and collaborators who enter and leave educational design at certain points changes our view of educational design as having definite beginnings and endings. Acknowledging and appreciating the different timescales and materiality of educational design will respect the history of places and the experiences of communities, creating paths for responsible and sustainable futures.

Example Cases

Drawing from three empirical examples, we demonstrate what it means to take into account the “unfinishedness” and “unexpectedness” in educational design.

Carbon science workshop

One author co-led a workshop designed to expose teens to multiple topics of carbon science and genres of creating writing to allow the teens to use science and creating writing toward individual projects. The workshop educators sought to provide time for the writers to finish their final projects and perform them at a public reading upon the workshop conclusion. However, by the last day of the workshop, few, if any, of the teens had “completed” their writing projects. While we meant to collect final versions of their projects, we collected a combination of drafts and marked-up versions of the projects. As we started analyzing the artifacts that came from the workshop, we were initially concerned that we did not have finished products to be able to analyze. We felt we had left the work unfinished, impacting not only our ability to share useful insights from the experience, but also doing a disservice to the youth by not providing them enough time to write all they wanted. However, as we began to read, we found incredible examples of a range of writing techniques, creative use of science in story- and worldbuilding, and diverse expressions of emotion and identity across the writing projects. Despite feeling unfinished, the workshop unexpectedly allowed deep insights into teen identity development and conceptual learning. The projects they started may never be finished, and by embracing that messiness, we honor the experiences and agency of the teens who are at a stage of life where they are continuing to develop and grow more into themselves.

Built environments

There is a record of intentionally left unfinished buildings in architecture, designed as a strategy to be taken over and completed by the inhabitants themselves according to their own economies, cultural expressions, spatial organizations, norms and values. After a one-day workshop about architecture and planning designed by MA architecture students for local children in a Stockholm suburb undergoing transformation, educators and students reflected on the necessity of designing for the *unexpected* and the *unfinished*. How, as an instructor, do you prepare yourself? And how can you lead a workshop while staying open to the children’s ideas? The time aspect became a central focus in the discussion, some parts took longer than expected and some much less time. The flexibility and openness to changes were crucial for the workshop to work. It became visible how important the time span of single activities and breaks are. The workshop remained unfinished; instead, a poster showcased a web of connections and coexisting ideas and became a representation of the working process, collaboration and learning rather than a clear conclusion. This insight inspires the thought that learning as a continuously ongoing and always unfinished activity allows for reframing our engagement as educators with people, places and materialities to be meaningful even in brief encounters, if we prepare for unfinished learning outcomes rather than for defined results.

Storytelling

Our third example discusses how appreciating the unfinishedness and unexpectedness of design in environmental education research and practice can open transformative spaces for relating, learning and becoming with the more-than-human world. The example draws on an ethnographic study of the educational potential of stories, storytelling, art, and augmented technology as animated means to immerse children in places and their ecologies, attending to human and nonhuman relations. Instead of presenting places to children as objects to learn about, the emphasis is on children’s wonder, experiential and immersive outdoor engagement through folk tales and crafting and communicating their own stories (Kumpulainen et al., 2023a, 2023b). The research shows how augmented

storying drew children into playful and imaginative dialogues about their relations with the more-than-human world that also decentered humans and, instead, situated humans as part of complex relations and spatiotemporal geographies. The interconnectedness that emerged in the children's augmented storytelling was intertwined with material relationships, experiential connections, cognitive processes, emotional attachments, and affective responses, as well as philosophical and moral considerations regarding humanity's relationship with the more-than-human world (Kumpulainen et al., 2023a, 2023b). The findings highlight the significance of the unfinishedness and unexpectedness of educational design in creating opportunities for children to relate, learn and become with the more-than-human world.

Discussion

Our examples illustrate how the unfinishedness and unexpectedness of educational design can lead to increased agency and shared ownership, relationality across human and non-human participants, alleviate some of the pressure for perfect designs, and honor the full and complicated experiences of the people, materials, and spaces we design with and for.

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Acknowledgments

Work included in this symposium was supported by TUM Institute for Advanced Studies, Raitenhaslach Akademie Zentrum, Institute for Ethics in Artificial Intelligence, SFB/Transregio 277 "Additive Manufacturing in Construction – The opportunity for big change" TRR277/2 (2014 - 2027); DFG Project number 414265976, the Wallace Foundation, Maker Literacies, the Luxembourg National Research Foundation “SciTeach Reflect” (INTER 18015913), SSHRC Insight Grant (Grant number 435-2017-0097), the National Science Foundation (DRL 1749324). Authors are listed alphabetically by first name.