

*Position Paper***The Possibilities and Limits of the Structure–Agency Dialectic
in Advancing Science for All**Kris D. Gutiérrez¹ and Angela Calabrese Barton²¹*Graduate School of Education, University of California, Berkeley, California*²*Department of Teacher Education, Michigan State University, East Lansing, Michigan**Received 5 February 2015; Accepted 6 February 2015*

Abstract: In this special issue, the structure–agency dialectic is used to shift the analytic frame in science education from focusing on youth as in need of remediation to rethinking new arrangements, tools, and forms of assistance and participation in support of youth learning science. This shift from “fixing” the individual to re-mediating and transforming the functional system is key to reimagining new forms of learning and doing science that are tied to the imaginings of new futures, trajectories, and identities. In this manuscript, we discuss the major contributions of these studies in the special issue. In so doing, we seek to lay out both the possibilities and limits of the structure–agency dialectic in advancing science for all. We suggest that social and pedagogical imaginaries enable one to move the structure–agency dialectic towards transformative ends. We further suggest that to account more actively for how position and power shape the ways in which individuals seek to take action, the meanings they ascribe to such action, symbolically and otherwise, we must be ready to interrogate the relation between structure and agency and issues of equity and consequential and valued forms of science learning in local environments and in larger educational systems. © 2015 Wiley Periodicals, Inc. *J Res Sci Teach* 52:574–583, 2015.

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Structure–Agency Dialectic

All human activity is always socially organized; in fact, as McDermott and Raley (2012) have argued, “the social world is always well ordered” (p. 372). Let us consider a common scenario and set of assumptions about successful students in a science classroom as an example of this social order and its local complexity. Akira is the top student in her science class. Not only is she the best reader in the class, she is familiar with and can detail her understandings and arguments with care and precision. While there is no doubt that Akira is an accomplished student with her own history of engagement in a range of practices, how we understand and the assumptions we hold about her status in the social order of the classroom is often misunderstood as a sole accomplishment. However, if we were to document carefully and observe how the social life of the classroom gets constituted, we could unpack how learning and its social situation get organized in ways that make Akira the “best” student in the class. We would ask ourselves: What work gets done for this to happen? What gets organized and reorganized in the classroom? And in what ways does this positioning of youth influence how science learning is accomplished?

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As long as learning environments value who is at the top and as long as we hold different assumptions about the potential and possibility of other students—particularly youth from nondominant communities—our analyses would reveal that for Akira to be the “best,” children around her have to be positioned differently and tools differentially available. Institutions, people, tools, and practices—imbued with and embedded in histories—help to structure social life and the participation structures of learning activity in the classroom. Attention to these processes makes the relation between structure and agency more evident. Understanding their mutual constitution helps us understand the ways “small events are the playhouse for large-scale social forces” (McDermott & Raley, 2012, p. 375). Here the social situation of learning is profoundly influenced by larger social and historical structures. It is this interplay that also pushes us to attend closely to social processes that help connect the local to larger societal forces (Erickson, 2004).

In this special issue, the structure–agency dialectic calls attention to how human activity is embedded in structured historicity. Individual and collective action is enabled and constrained by the social structures-in-motion, both in-the-moment and over time. At the same time, such activity can reinforce or reform the patterns of social relations, which make up these structures. Giddens (1984) has written extensively about this dialectic (which he refers to as structuration theory) in terms of the “duality” of structure and agency in time and place. For Giddens, the very day-to-day of social activity is always under production and reproduction, as structures and action form and inform the other. The view is meant to stand in contrast to deterministic accounts of human action that position individuals as constrained by external factors beyond their control.

The structure–agency dialectic provides conceptual and analytic tools for re-reading and re-naming some of the enduring equity dilemmas faced in science teaching and learning, offering inroads to seemingly intractable problems. For example, the challenge of preparing white middle class people to teach effectively and justly in classrooms, schools, and communities different from their own has been a fundamental equity challenge faced primarily by youth of color. Rodriguez’ (2015) contribution in this issue highlights how a structure–agency dialectic lens offers what we think of as a new pedagogical imaginary—a view of learning to teach that moves us away from “narratives of despair” (that tend to focus only on the struggles of the participants while ignoring their abilities to affect their own working contexts), and towards a vision of what is possible under new arrangements, supports, and ways of seeing learning. He further shows us that such agentic acts are always in-the-making, always taking new form, as new realities come into being. Gary, the teacher in his study, had to grapple with dynamic and instrumental notions of culture as he sought to enact a culturally relevant curriculum among his students within/against a school culture that valued a more reductive mindset of what it means to learn in science. Teaching with an equity orientation required Gary to practice pedagogical metacognition, enabling him to see how his own subject position opened and foreclosed opportunities to engage science as an expansive, cultural practice in ways that did not reify the cultural communities of science or his students.

Yet, as implied in Rodriguez’ manuscript and across the manuscripts in the special issue, the structure–agency dialectic, as it has been theorized, does not account for the complexities of the real-world struggles that make up life in classrooms and communities. To date, much of the literature on the structure–agency dialectic has left a lot unexplained and little room for resistance, social change, or the social/pedagogical imaginary (Ahearn, 2001). Imaginaries “are both structures and actions. . . shaped by and shaping agency” (O’Reilly, 2014, p. 229). Imaginaries relate past, present, and future, enable or restrict action, and open up new ways of thinking about possible worlds. To the structure–agency dialectic, imaginaries come into being through the ongoing re-mediation of structures upon which new meanings are negotiated, as individuals collectively work to understand and envision new possibilities for knowing, being, and becoming in science. For Pérez (1999), the imaginary is a decolonial project in which politics and social

issues are negotiated. As Dominguez (2014) argues, the pedagogical imaginary involves more than identifying “a problem, constraint, or tension, and seek to solve it, but rather to actively engage oneself in the application of social imagination” (p. 67) toward some consequential end.

A more expansive approach to making sense of the structure–agency dialectic and how it frames opportunities to learn and become in science is important in moving forward an equity agenda in science education. For example, Bang and Marin (2015) illustrate why it is important to make sense of how the historicity of structures shape the ways in which epistemologies and ontologies become settled in the design of learning environments. Here we hope to push further on the possibilities, as well as the limits of the structure–agency dialectic, especially with regard to equity concerns. We want to make two points and discuss these points in light of the manuscripts. First, we argue for the importance of the social and pedagogical imaginaries in enabling one to move the structure–agency dialectic towards transformative ends. Second, we argue that to account more actively for how position and power shape the ways in which individuals seek to take action, the meanings they ascribe to such action, symbolically and otherwise, we must be ready to trouble what is meant by structure and agency, and scales of structure and agency. In line with the authors, we are mindful of the limits that such dichotomies construct in imagining new futures and new trajectories for youth and their teachers.

The Pedagogical and Social Imaginaries

In this special issue, several of the authors use the structure–agency dialectic to shift the analytic frame from focusing on youth as in need of remediation to rethinking new arrangements, tools, and forms of assistance and participation in science learning. This shift from “fixing” the individual to re-mediating and transforming the functional system is key to reimagining new forms of learning and doing science that are tied to the imaginings of new futures, trajectories, and identities (Gutiérrez, Morales, & Martinez, 2009).

Bang and Marin’s article tackles this idea directly with its focus on the structural principles of the settled expectations of nature–culture relations. These authors illustrate how western science has led to settled accounts of nature–culture, which both organizes most of biology, restricting “allowable content” in ways that prevent security and agency among Indigenous communities. However, these restrictions, while powerful over time and space, are not completely intractable. As they note, “settled expectations act as restrictive structural principles, but when they are excavated through engagement with cultural practices and pedagogical forms, expansive forms of time-space and nature–culture relations in activity can open.” Bang and Marin show how structure and agency, even though acting on the other, are not as distinct as they have been written to be. The possibilities of expanding the very socio-ecological relations beyond normative forms demand disruption and expansion of “temporal and spatial constructions and agentic ontologies from settler-colonial constructs of peoples and lands.” These authors illustrate how leveraging ecologically and historically valued cultural and pedagogical forms served both to desettle normative epistemological stances and to generate expansive opportunities for learning.

We suggest that such disruptions and expansions might be viewed, in part, as social and pedagogical imaginaries of robust learning ecologies. These imaginaries are places where expectations can become unsettled, generating new practices grounded in the world as it is, and the world as it could be (Boal, 1974/1979). In these imaginaries, youth are positioned as protagonists or designers and co-designers of their own trajectories and futures. Within Bang and Marin’s frame, different epistemological origins are more than valued, their stances are central to understanding science sociohistorically and in ecologically valid and principled ways.

Justine Kane (2015), in her manuscript, describes the co-construction of contested spaces, another form of the pedagogical imaginary, which allow teachers and students to try out new ways

of knowing, being, and becoming in science. These spaces destabilize normative expectations in how they allow for different kinds of tools and roles to be shared in the classroom space, positioning students and their histories in more productive ways. As Kane points out, it is within these contested spaces that students (and teachers) engage in gendered and racialized performances as a visible and important part of doing science. These contested spaces shift how we might see African American students, like Tamara and Corey, and their claimed words and meanings, as integral to the intellectual life of the classroom.

We see the social and pedagogical imaginary and its insistence on reframing discourses and teachers' positionality playing out in the manuscript authored by Cory Buxton and coworkers. By focusing on teacher agency in school reform, Buxton et al. (2015) describe how teachers facing similar structural obstacles exhibited different tolerances for challenging those obstacles. The authors adopt the idea of "multiplicities of enactment" to re-frame discourse of fidelity. Rather than understanding how teachers take up reforms in standard ways—which marginalizes the importance of students, context and teacher histories—the authors make sense of the different enactment patterns as a reflection of teachers' agentic choices within and against structural limitations. This new pedagogical imaginary offers a way to merge structure and agency in transformative ways. The authors were able to identify enactment patterns that enabled teachers to take ownership of the reform practices in ways that were lasting, flexible, and responsive to ongoing changes in their classroom contexts. This is much different than framing teacher action as a form of limited fidelity or inadequate implementation. Teachers are re-positioned as agentic actors in science education reform, doing more than improving teaching, but also changing the structures within which teaching and learning occur. The teachers in their study indexed their agency in practice in a variety of ways, slowly but surely transforming structures in their school.

The pedagogical imaginary is also a place of creative tension. Wenner and Settlage (2015) illustrate this point as they examine the roles that principals of "high performing elementary schools" serving nondominant communities play in making possible meaningful science instruction. Collectively, these principals engage in the practice of "buffering" teachers in their schools from external policies. Buffering, as developed in this manuscript, sits at the tension between policy and practice, pressing against both in ways that make meaningful teaching possible. To buffer well, principals must creatively envision how to reconfigure structures to shield teachers from a range of intrusions that interfere with teaching. Studies such as this one require us to examine, in finer grained ways, the conditions and supports that enable principals to imagine new structures and courses of action collaboratively with different stakeholders, especially under challenging circumstances. The authors suggest that buffering, or developing the capacity to imagine solutions to problems of practice from a structure–agency lens, is a skill principals must master. However, we believe that there is more to framing how principals make sense of historicized understandings of the normative practices as a part of imagining new school structures and actions that serve nondominant populations; it is more than learning a skill at work here.

Position and Power

A second set of manuscripts offers insight into the ways in which the agency-structure dialectic might more actively account for how science learning and teaching are "intercultural processes taking place at the powered boundaries of race, culture, language, and subject matter" (Warren & Rosebery, 2011, p. 98). These studies reveal, to differing degrees and ways, how individuals seek to disrupt sociohistorical locations through positioning and performances, even when they are pitted against uneven power relations. The question is why some efforts at transforming structures open up and sustain equitable and just opportunities while others become foreclosed. These studies collectively remind us that students' and teachers' lives are always

embedded in particular historical power configurations of time and space, which shape both real and imagined opportunities for learning.

Creating new pedagogical spaces that reshape teacher and student power boundaries is critical to imagining new possibilities for expansive forms of student learning and development. Rivera Maulucci and coworkers (2015) suggest that moving science teaching and learning to new physical spaces where the rules for participation are different offers this possibility. As the teachers in their study moved science learning into the museum or their professional development communities, they had new tools and rules for participation upon which to push back against the school-related structures that limited their engagement with students—the content knowledge demand, the time to do science, and the needs of the dual language learners. The museum, for example, offered new possibilities for interacting that allowed both teachers and students to express a greater agency in science.

These expansive spaces of learning are not only physical reconfigurations, as in the case above. Martin & Carter (2015) show how preservice teachers use virtual spaces to reposition themselves as powerful, agentic and capable people in science and community, even when the sociohistorical structures which frame their participation constrain opportunity. Using positioning theory, these authors examine agency as distinct from social structure, with its own purposes and properties. Their positioning analysis illustrates how people leverage historically available structural resources to cultivate social identities and negotiate meaning in their own contexts and on their own terms. Their positioning analysis suggests that human activity, bounded by space-time in the social world, can never be adequately explained using reductive notions of learning, behavior, or intention. For example, we see how Ecocarmie's learning ecology and the choice to move her reflections from a private class assignment to a public forum of her choosing supported a kind of connected learning that created the space for her to take action and to cultivate the resources necessary for her own agentic "re-positioning," as well as for developing educational sustainability (EfS).

Scales of space-time matter, as well, in how we understand the disruption of sociohistorical positions towards more expansive learning opportunities. Varelas and coworkers (2015) reveal how agency can accrue over time, as small events, in their role as playhouses for larger social forces, disrupt oppressive forces in the classroom (McDermott & Raley, 2012). Each disruption becomes a moment where ideas, tools, and bodies can refigure learning, giving rise to new relationships and opportunities for meaning making. Their analysis shows how such small moments supported one young man, Carlos, as being seen as a knowledge broker, science authority/scientist, and author by his teacher and his peers. In taking up these roles, he was positioned as an active meaning maker, even when his actions, on the surface, did not align with the forms of participation or expectations of normative classroom practices. As a result, the ways in which Carlos constructed his agency afforded a new pedagogical imaginary that could support his teacher in recognizing the many ways in which he (and his peers) made meaning, as well as planning for them as opportunities for learning. As the authors write, "It means that teachers project and imagine for themselves what the *possibilities* of student response might be."

In contrast to the previous manuscript, Carlone, Johnson and Scott present longitudinal data of young women in school science to illustrate how in some classroom contexts agency to perform one's identity (e.g., as a girl) forecloses agency to perform other identities (e.g., as a smart science student). In presenting a case of one girl's (Carlone, Johnson and Scott, 2015) gendered performances in science over the course of 4th through 6th grade, the authors suggest that throughout Mirabel's schooling, classroom structures became more restrictive in ways that limited her opportunities to engage in meaningful school science over time. The authors looked analytically for "cracks and crawl spaces in existing social structures" where Mirabel might

creatively leverage resources from family and community towards transformative ends. What they found was that the structures themselves “loomed too large” limiting opportunity for Mirabel to engage in science. By the end of the sixth grade, Mirabel’s agentic move involved walking away from science.

Mirabel’s story, as presented, is not encouraging for it illustrates an ever-increasing constrained opportunity to learn and become in science. This account stands in contrast to the findings presented by Martin & Carter or by Varelas et al., where possibilities for becoming in science appeared to expand for students. Does this contrast in findings suggest that the cracks made to structures are only momentary portals for learning and becoming in new ways? We view the potential cracks made to structures as spaces of possibility for the pedagogical imaginary, where the roles, rules, and tools that shape activity and becoming can be remixed towards expansive new worlds. However, like Carlone et al., we wonder how these cracks might be detected and expanded by Mirabel and by the meaningful others in her life, so that they become something more than momentary.

Designing for New Pedagogical Imaginaries

These studies help us to interrogate what is meant by structure and agency because they ask us to look at different scales of structure and space-time. By shifting our analytic gaze, we open ourselves to the possibilities of better noticing which tools and practices travel, for whom, and in what ways across different space-time scales, as learning takes place.

At the same time, we are left wondering what new conceptual and methodological frames might help to transform, rupture, or transform structures—especially structures that have been built over time and sustained through sociohistorical narratives and forms of power and privilege. What approaches or tools do we need within the research community to better notice and understand the actions that youth take towards the futures they desire? Are youth, like Mirabel or Carlos, for example, disassembling structures in ways we cannot yet see with the frameworks and tools we employ? How might we better notice youth’s movement across space-time in ways that push us, as researchers, to disrupt traditional bounded accounts of youth learning and development? We think these questions are especially important for our work with youth from nondominant communities.

We offer social design experiments, as one such design approach organized around sociocultural and proleptic views of learning—that is, learning is understood as the “organization for possible futures” (Gutiérrez, 2008, p. 154; Gutiérrez & Vossoughi, 2010). Within this design-based approach, youth engage in expansive forms of learning that connect learning across relevant ecologies, principally peer and youth cultures, and academic and home communities “in ways that enable students to become designers of the own social futures” (Gutiérrez, 2008, p. 156). With consequential and equity-oriented forms of learning as their object, social design experiments leverage everyday and school-based knowledge, including a variety of text structures, conventions, dispositions, and engagement with a range of texts fundamental to the development of new futures for youth from nondominant communities. Of significance, social design experiments flip the frame by focusing on designing, re-mediating, and re-imagining new systems and structures, rather than employing reductive conceptions of learning and learners. Grounded in the idea that change in the individual involves change in the social situation itself, designing for consequential and meaningful learning requires a new social imagination in which participants engage in learning in ways that preserve a productive tension between the everyday and school-based and prepare them for future learning across a range of ecologies, including the academy.

In line with this view, as we have learned in this special issue, individuals and the social, cultural, and historical contexts in which they live and learn, are mutually constituted. A central

thesis cutting across the manuscripts is that the “problem” to be solved (e.g., low achievement, interest, etc.) is understood as an emergent property of the organization of the learning ecology itself and its history, rather than located in any one individual, such as the student or the teacher. If we juxtapose the structure–agency dialectic with the transformative aims of social design experiments, we can begin to see how studying and designing for change requires one to focus on the very contradictions to which this dialectic calls attention.

The following example illustrates the possibilities of one such social design experiment.

One of us (Kris) designed and led an innovative learning ecology that brought together children (Grades 2–5), undergraduate teacher education students, undergraduate and graduate researchers and university faculty to collaborate in technology rich STEM practices. This designed environment fostered young people’s engagement with new media and technological/scientific design, as it mediated novice teachers’ pedagogical engagement with cultural historical theoretical tools and new pedagogical arrangements. Organized around play and the imaginary situation and joint-mediated praxis, youth from largely nondominant communities and adult (amigas/amigos) from the university had ongoing opportunities to investigate scientific and health-related topics, and gain expertise as designers in cyber environments.

The learning environment was a welcoming space. Walking through the library, one encountered small groups of children filming each other on different cameras, laughing out loud as they acted out lines from a script they co-authored. Others huddled together in joint problem-solving at the marble wall as they built designs to allow marbles to travel far and fast as they rolled, jumped, and skipped along creative pathways. Some children authored video games using youth-friendly software (e.g., AgentCubes) on a set of laptops. And still others sat at tinkering tables with batteries, bulbs, wires, clips, and other items one might use to build complex circuits. All the while undergraduates tested out their “light pedagogical touch” with the youth—that is, listening and learning from and with the children, giving just enough assistance in ways that opened up new forms of participation and reciprocal relations of exchange. Learning here is viewed as a joint accomplishment—with bodies, ideas, tools, laughter, and talk constantly moving within and across these different learning spaces to build new relations and understandings.

One afternoon, a group of children, preservice teachers, and university researchers (faculty and graduate students) sat together around a making and tinkering table with various projects involving conducting thread, batteries, bulbs, switches, fabric of all sorts, cotton, buttons, ribbon, and more. The combination of everyday and technical materials was intriguing and inviting. The children and adults worked together, playing different roles. One adult was threading needles with the conducting thread. Another was engaging one young girl in conversation about why the light bulb she sewed on a piece of material was not lighting up. Another young girl, Melanie (pseudonym), was telling stories about her baby sister who just turned 1 year old, as she fiddled with different materials. She talked about how she loved to play with her sister, and to take care of her. When asked what she was working on, she said that she was building her little sister a “dream light”—just like the kind you can buy in stores. Dream lights (e.g., Dreamlites) are light-up pillows by Pillow Pet[®], and are designed to project stars onto the ceiling when turned on at night. Melanie worked diligently on this project. She had to figure out how to put a circuit together that included a battery, bulb, switch and conducting thread. She incorporated some ideas shared by the undergraduate teachers and other children at the table, while also rejecting others for technical, aesthetic, and practical reasons.

As Melanie threaded the needle with the conducting thread, she talked about how she helped her mom sew at home. She also talked about how she was concerned that the switch she was to sew into the pillow could be turned on easily. The pillow also needed to be safe for her sister to handle because she was so young. This was a highly complex problem that required her to navigate

multiple layers of the problem at once. As she worked, her friends told her what a great job she was doing, and several started to follow her lead, designing dream lights of their own.

Melanie's actions were framed around an outcome in science that mattered to her: A functioning dream light for her sister. While she did not express direct interest in science when asked (T: Do you like science? M: I don't know.), she was deeply engaged at the tinkering table—both with the task and with the people around her. The assortment of materials helped her to imagine the possibility of making a dream light—an idea encouraged by her peers and the adults at her table. The task was not straight-forward for either her or for the adults at the table. None had a recipe to follow or blueprint for how to design a dream light or how to support a young person in doing so. However, they had materials, time, and the permission to take risks and try out ideas and ways of interacting towards the goal, in this moment, of building a dream light. This was not accomplished in a single effort. Melanie had to test different batteries and different switches until the dream light worked. Melanie and the people around her engaged in the relational and dynamic work of leveraging her experiences with sewing at home with her mother, her ingenuity, and her scientific sense-making towards the assembly of a closed circuit. Her position as an older and responsible big sister led her to be concerned with safety in ways that expanded her interest and thinking about the role of switches in circuits—that is, how they work, how to build one into her design, and how to make it accessible for small hands.

Melanie's re-organization of ways of being in worthwhile practices at the tinkering center supported her appropriation of scientific ideas, while also sustaining the value, history, and integrity of the everyday genre of making something meaningful while appropriating school-based knowledge and tools. The learning ecology, in which Melanie created her dream light, was designed to make these more expansive sociocultural, political, and material structures visible and available for engaging with science in collaborative, playful, and creative ways typically not available in science class. The preservice teachers had the opportunity to test out relating to, supporting, and learning from Melanie in ways that school structures often prevent.

The dialectic between structure and agency helps us to see how individual actions, as occurring in particular times and places, are both constrained and enabled by the social structures therein. However, the social design experiment in which Melanie took part afforded opportunities to disrupt and re-imagine the dialectic by allowing for a new social and pedagogical imagination in which to learn. As a social design experiment, everyday repertoires and scientific knowledge were reorganized in ways that foregrounded as necessary the tension between different forms of knowledge and practices and sought to maintain the value, history, and integrity of the everyday. Within this approach, the emphasis is on understanding and leveraging learners' history of involvement with particular practices in and out of school (e.g., science, math, literacy, etc.) rather than focusing on perceived deficits in students' learning of school-based knowledge. This is particularly important for both new teacher and students in light of historical power relations that decenter valued community and familial practices (Gutiérrez, 2014).

Looking Ahead

We have offered social design experiments as one way to co-construct new pedagogical imaginaries with teachers and youth. However, we remain concerned with how to further envision alternatives to the normative ways in which the structure–agency dialectic plays out in learning environments or to create opportunities for us to see the ways in which youth already imagine new cracks to structures as they navigate their worlds. As we read the powerful stories about student and teachers across the manuscripts, and how their trajectories get shaped and sometimes constrained over time, we cannot help but wonder how we might read their stories differently if we could participate with them across a range of settings. What if we engaged with youth on Saturday

morning with their grandmothers or in the evening with family and friends? Would we name their trajectories or repertoires of practice or their resilience differently? What if we spent time with teachers outside of school, as they participated in activities with youth in their communities? How might we understand their work as teachers differently? Cutting across these questions, we also feel that it is important to ask explicitly how race and power are indexed in particular moments both inside and outside the classroom, and how the meanings taken from these moments carry into and out of science class?

These questions are especially important for youth from nondominant communities, who may be physically present in science classrooms, but not participating with science in ways that may integrally value their lives and needs. We wonder what we lose when we only examine structure–agency without taking into account the broader ecology in which we can view learning as movement. The theoretical metaphor of “learning as movement” orients us to attend to the ways learning takes hold as people and tools move across settings of everyday life, as well as how youth develop, repurpose tools, reorganize practices, and expand repertoires (Gutiérrez, 2014). All practices are produced locally by social actors and in specific contexts. Yet, as these studies remind us, such practices are shaped by social and cultural structures, which themselves are embedded with particular histories. Still, human activity is not fully determined by these larger structures. How local practices, at a given place and time, innovate can shift the balance in what or who counts and why (Erickson, 2004). Without studying practices, people, or phenomena across settings (whether it is a social design experiment or other approaches), we may not be able to see how relationships, tools and power shift, or how they might open up and foreclose different opportunities to learn and develop. Studying people, practices or phenomena across ecologies may open up the lens in ways that push us to see the fuller range of possibilities for learning and becoming.

How we, as a field, seek to understand the possibilities for learning and becoming and how these are dynamically shaped by the structure–agency dialectic is critical. Inequality—in terms of income, opportunity, and educational resources—continues to grow globally, disproportionately affecting nondominant communities. Unless the field is willing to design for new possibilities for engaging with and in science in ways that are attuned to the histories and cultural practices of learners and teachers, then any reform effort will likely fail. Indeed, we note again that, “Small events are the playhouse for large-scale social forces” (McDermott & Raley, 2012, p. 375). What happens in science learning environments, whether it involves Akira rising to the top of her class or Mirabel tuning out, is forged over time by actors and tools, and tied to the on-going formation of forces in sociocultural time/space. How these forces are disrupted should be central to the work of our community—as they are certainly central to consequential forms of learning and the development of new social futures.

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