

Learning in Diversities of Structures of Social Practice: Accounting for How, Why and Where People Learn Science

Philip Bell^a Carrie Tzou^b Leah Bricker^c AnnMarie D. Baines^d

^aUniversity of Washington, Seattle, Wash., ^bUniversity of Washington, Bothell, Wash.,

^cUniversity of Michigan, Ann Arbor, Mich., and ^dSan Francisco State University, San Francisco, Calif., USA

Key Words

Cultural learning pathways · Learning across settings · Science learning ·
Sociomaterial practices

Abstract

This paper outlines a theoretical framework intended to provide a more ecological and holistic accounting of how, why and where people learn in relation to constructs of human difference – race, class, disability designation, etc. – as learners circulate across places and associated operating value systems over multiple timescales. The framework for *cultural learning pathways* is an application and elaboration of Ole Dreier's theory of persons in diversities of structures of social practice with a focus on the learning of disciplinary practices and the development of discipline-related identities. We summarize relevant learning phenomena along extended cultural pathways from three team ethnographies of science learning. We outline how power-related issues associated with privilege and marginalization are attended to in relation to the social, cultural, and material circumstances of learning within and across environments and discuss future research opportunities.

Copyright © 2013 S. Karger AG, Basel

The literatures related to learning and education are strongly balkanized by subject matter and by the kind of learning context (e.g., formal vs. informal education) [Bransford et al., 2006]. Scholarly efforts are under way to transcend these divides and to develop a more holistic and nuanced accounting of how, why and where people learn. We argue that we lack theoretical and empirical accounts of how individuals and groups accomplish learning that is meaningful to them across settings over long time periods in relation to multiple cultural value systems – or how such learning is impeded. In this paper, we describe and apply a theoretical framework we have

developed over the past 8 years of ethnographic work to account for what we describe as *cultural learning pathways* – connected chains of personally consequential activity and sense-making – that are temporally extended, spatially variable, and culturally diverse with respect to value systems and social practices.

Lemke [2000] outlined an ambitious research agenda to explore learning across broad timescales and a variety of settings in relation to emotional and cognitive phenomena. Lee [2008] provided a related argument for the centrality of researching the fundamental variation in the cultural experiences of people within and across communities as a strategy for creating scientific accounts of learning and development that are more robust, generative, and representative of social life. An interdisciplinary group of scholars following a similar line of thinking distilled academic literatures related to learning in and out of school environments within diverse communities, and they advanced 3 central concepts and associated learning principles [Banks et al., 2007]. The 3 conceptual ideas – life-long, life-wide, and life-deep learning – highlight the foundational influence of temporal, spatial, and value-driven dimensions of learning and development, respectively.

Life-Long, Life-Wide, and Life-Deep Learning

Life-long learning is a familiar notion that refers to the acquisition of fundamental cultural, social, and cognitive abilities developed over the life course from infancy to old age. Significant abilities – including literacy in a subject matter, problem-solving practices, and forms of expertise related to the diversity of social domains – develop over the course of years through deliberate practice, social supports, metacognitive reflection, and identification with relevant practices. We theorize how learning pathways are architected and disrupted over relatively long stretches of time, from moments on up to months and years, as we account for learning and development (e.g., how a learner is brought into a new learning experience based on a prior life interest or practice that is being actively built upon).

Life-wide learning acknowledges that learners navigate across diverse social niches, or locations, as they routinely circulate through everyday settings, activities, and social groups – from classroom to home, from afterschool programs to neighborhood venues, from informal designed settings like science centers to interconnected, media-rich online spaces. These locations vary broadly in terms of their social and material arrangement and with respect to the social expectations associated with individual and collective participation. Learners need to figure out how to adapt their abilities, interests, and identities across a diverse set of locations on a routine basis as they attempt to accomplish their goals or respond to the interests of other social actors. When they are successful, this allows learners, sometimes in collaboration with other social actors in the setting, to create connected and thereby extended learning pathways that learners can benefit from (e.g., when a child's out-of-school interests, knowledge or expertise gets leveraged in a moment of classroom instruction).

Life-deep learning acknowledges that all participation in social practices is a value-laden endeavor. That is, learning and development are deeply guided by spiritual, religious, ethical, moral, and social value systems that operate within social groups. There are often multiple value systems operating within a given location, and they are inherent features of social life in life-wide and life-long dimensions. Within and

across situated events, value systems influence the arrangements and evaluation criteria for people's participation in activity, help define the learning outcomes that are promoted or discouraged, and help specify the kinds of persons, or practice-linked identities, that are desirable or undesirable. New educational experiences along a learning pathway are always realized in relation to the operating value systems present within a specific place. For example, the multiple value systems associated with the culture of a specific informal educational institution and those of the family members visiting it shape how the family engages in learning experiences in that context.

The life-long, life-wide, and life-deep learning concepts allow us to better understand the learning opportunities and impediments faced by learners. For example, some educational inequalities are manufactured through life-deep processes that do not recognize the valued practices of some while exalting the valued practices of others in a normative logic [see related work by Bang & Medin, 2010; Calabrese Barton & Tan, 2009; Heath, 1990]. In some of our ethnographic work around environmental science education, we have found that certain environmental narratives privilege certain environmental practices (i.e., not driving a car, not drinking out of plastic water bottles) without consideration for the diversity of cultural values and lived experiences of youth [Tzou & Bell, 2012]. For some of the shared educational outcomes broadly held in society, there are large variations in life-wide learning supports and opportunities to learn across communities.

These variations influence what positions people occupy and confront as they move from one social context to another, driving their participation in different ways in particular contexts [Dreier, 2009]. In our ethnographic work on students with disabilities, variations in life-wide supports greatly impacted how youth perceived their abilities and identified as learners, depending on their access to valued rights and opportunities [Baines, 2012]. There are long-term consequences in terms of life-long expertise development because of structural inequalities associated with access to credentialed experts in high-prestige areas of knowing – which matters greatly if it takes expertise to make expertise [Bransford & Schwartz, 2009]. The life-long, life-wide, and life-deep concepts help us move to a more holistic understanding of learning and development and to transcend the long-standing balkanizations in our theorizing and research findings. We will build upon these general concepts that serve to dimensionalize learning across time, space and values as we define our cultural learning pathways framework in the next section.

The Cultural Learning Pathways Theoretical Framework

Because significant learning, especially the learning associated with life course outcomes, is accomplished across settings over developmental time in relation to variable and often competing value systems, we need a conceptual framework that highlights relevant dimensions of how, where and why people learn. That is, we need to account for how individuals and groups arrange or transform the conditions of their own learning in relation to their expectations, interests, concerns, and available resources, as well as how such acts of agency and activity within situations are impeded, resisted, or even co-opted. We approach this theoretical goal from a situated learning stance, understanding that the social and material pragmatics of sense-making and action are paramount in learning. The situated nature of learning is a

central scientific fact established over the past two decades [Lave, 1987; Lave & Wenger, 1991; Pea & Brown, 1991]. In this section we outline a specific framework to advance a theoretical lens for accounting for learning phenomena, building on dozens of allied ethnographies and educational design studies. We also liberally build upon the theorizing of Ole Dreier about persons in diversities of structures of social practice [Dreier, 2008, 2009].

Our theoretical framework attempts to account for cultural and cognitive dimensions of learning and development. Important variation across human cultural systems is largely accomplished by orienting to the leading cultural group affiliations – often multiple ones within a particular case – that shape the learning pathway accounts being documented, analyzed, and theorized. In the 3 cases reported below, we have examples of how ethnic and racial group affiliation can strongly constrain disciplinary learning and identification, how meaningful expertise development is accomplished within a family of limited financial resources, how formal disability designations can adversely shape learners, and how resistance can be mobilized to counter the marginalization. We subscribe to the critical perspective that acts of marginalization, exclusion, and oppression as well as acts of privileging, support, and inclusion need to be empirically visible within our accounts of social life and learning so that we are able to better understand how such acts are socially produced [Latour, 2005].

In the broad sense intended here, learning is accomplished across settings (i.e., translocally) by persons acting within diversities of structures of social practice. As summarized by Dreier [2009]:

[People] live their lives by participating in many diverse contexts. These contexts are local settings which are materially and socially arranged in particular ways to allow for the pursuit of particular social practices within and beyond them; *they are re-produced and changed by their participants and separated from and linked to other social contexts in a more comprehensive structural nexus of social practice* [emphasis added]. Accordingly, we must study persons as participants in and across particular contexts. (p. 196)

It is important to realize that persons can, and often have to, exercise agency in these settings as they construct, leverage, repurpose, and transform social and material arrangements in order to provide meaningful, cross-setting connections related to their goals and concerns. Gutiérrez's use of the *third space* concept helps highlight the hybrid practices that can be juxtaposed or coordinated within a particular learning environment [Gutiérrez, 2008]. The focus is on the modes of participation, which are afforded or constrained as persons attempt to coordinate and accomplish what they take to be personally consequential progress. One example of this is when students manipulate and alter the social structure of schooling for their own purposes. Most interesting to us is the ways in which youth repurpose existing social structures to resist and acquire power when they are in disenfranchising social positions [Tzou & Bell, 2012]. These efforts represent sophisticated and deliberate attempts to challenge expectations, escape negative perceptions, and pursue their true interests. In the case of one student with autism, this meant joining the debate team in an effort to be seen as intellectual and prove to others that he 'overcame his autism' [Baines, 2012]. Another example is when a youth in the midst of classroom instruction hacks, and thereby repurposes, the math assessment technology as a tool that then allows him to pursue his gaming-related interests [Bricker & Bell, 2012]. Such cases exemplify what Dreier [2009] describes as a consequence of the 'mismatch between arrangements and

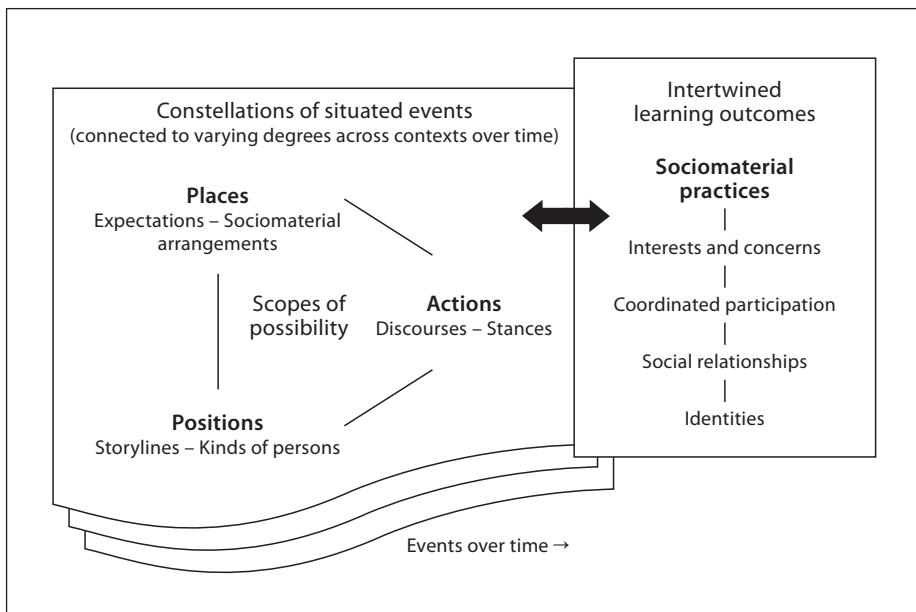


Fig. 1. The cultural learning pathways theoretical framework.

intentions,’ which drive individuals to either change their intentions or alter their life pathways. In order to account for these diversities of social practices, we articulate a theoretical framework focused on understanding the variegated cultural learning pathways that are unfolding, or that persons are trying to unfold, at any given historical moment across the sociodemographic diversity of the community involved.

Figure 1 outlines the major conceptual constructs and some of the conceptual relationships associated with the cultural learning pathways framework. The model is a theory of learning in the context of social practices. As shown on the right, we focus on a range of specific learning outcomes – abilities or capacities – associated with social practices that persons develop through cultural experiences. Through our ethnographies, our developmental reconstruction (e.g., through the construction of retrospective learning biographies) or documentation of learning and expertise, we have found that **development starts with a focus on the ontogeny of interests** [Barron, 2006; Bell, Bricker, Reeve, Zimmerman, & Tzou, 2012; Hidi & Renninger, 2006]. That is, the experiences people encounter which **initiate extended pathways of deepening participation through a stabilization of situational interest** (e.g., around a domain topic, practice, social relationship). This includes a focus on elective personal and/or community interests. Getting a hamster as a pet might at first be just an exploration of an interest in caring for an animal of one’s own. Over time, this might evolve into further learning about hamsters, their eating and exercise habits, and their life cycle [Zimmerman, 2012]. **Learning pathways also result from personal or shared concerns, challenges or desires** (e.g., in relation to a pressing circumstance, threat, or opportunity). Such concerns are broad and varied, from working to improve the academic achievement of youth in specific subjects, to protecting one’s community from envi-

ronmental hazards or eventualities, to responding to an institutionalized form of discrimination (e.g., the exclusion of particular sociodemographic groups of students from extracurricular activities as described in the case study below). In this framework, interests or concerns can both lead to goal-directed learning, and learning experiences can result in the identification of new interests and concerns.

As initial interests and concerns are attended to, pursued, and mitigated by individuals and groups, people come to participate in specific forms of social practices in increasingly sophisticated and socially coordinated ways. In some cases, individuals deepen their participation in social practices that are established and evolving. In other cases, individuals do not become more central participants of a particular practice, but they do come to participate in a practice with others in a coordinated manner that is still authentic to the work. In our ethnographies, we have documented cases of precocious expertise in such domains as athletics, technology, and design and building while we have also documented youth who regularly participate in such practices in more legitimate peripheral ways.

Regardless, social practices are multifaceted human endeavors that span situations and have complex temporal rhythms from moment to moment; they compete for attention with the range of practices present within specific settings, and at times come to be combined with other social practices in amalgams of activity. For these reasons, it is important to recognize that the work of individuals as they attempt to engage in coordinated participation happens within the context of diversities of structures of social practice. A learner in a science classroom may be trying to pursue a personal learning agenda while the teacher is facilitating a competing learning agenda. Negative perceptions of a learner's ability to pursue or succeed in certain activities can restrict or completely eliminate his/her access to desired opportunities, as documented in cases of students with learning disabilities. In another example, a learner may get support from his or her teacher to learn a particular topic of mathematics in a disciplinary discourse that is different from the one used by parents at home. We have documented cases where the mathematical discourse and problem-solving practices in a first-generation immigrant home varies significantly from that associated with the math education reform efforts being implemented in the school. Saxe and Esmonde [2005] highlight a unique case of how school reform efforts can actually shift the meaning of specific mathematical terms from their original socio-historical meaning in the community. Specific domains encountered across contexts can involve competing practices and linguistic registers which learners then need to negotiate in their learning processes.

Learning is fundamentally a social endeavor from this theoretical perspective; therefore, the development of pragmatically useful and/or meaningful *social relationships* is a necessary part of learning experiences. In this way, social relationships become both a means and an end of the learning process. People learn in ways that relate to the interests and expectations of other social actors in their lives, in ways in which they are accountable [Bruner, 1996]. As persons come to participate in a coordinated manner in diversities of social practices, social supports are central to making progress along cultural learning pathways [Barron, 2006; Bell, Bricker, Lee, Reeve, & Zimmerman, 2006; Bell et al., 2012].

Finally, all situated learning is centrally about becoming – about developing stabilized and flexible identities [Lave & Wenger, 1991]. There is growing attention in the learning sciences to practice-linked identities that develop through sustained partici-

pation in social domains – and the cultural processes associated with such domain identification [Bell, Lewenstein, Shouse, & Feder, 2009; Gee, 2004; Herrenkohl & Mertl, 2010; Nasir & Hand, 2008; Penuel & Bell, in preparation]. Deep disciplinary learning involves coming to identify with such pursuits, appropriating the discourses of affiliated communities, seeing value in the related enterprises relative to personal commitments and goals, wanting to contribute to these enterprises, and coming to be recognized as a developing expert in associated domains [Brickhouse, Lowery, & Schultz, 2000; Calabrese Barton & Brickhouse, 2006; Lave & Wenger, 1991; see Bell et al., 2009, for a synthesis of related literature]. Any given person also has to coordinate multiple practice-linked identities in relation to his or her life history and social circumstances. Specific identities held or pursued by an individual might be in conflict, or they may relate to challenges that complicate the learning process. For example, stereotype threat can be viewed as resulting from identity contingencies that come to be triggered in social environments [Steele, 2010]. The pursuit of specific practice-linked identities hinges upon an understanding of the social practice landscape (i.e., the social geography as it relates to disparate enterprises and domains), navigation knowledge related to the pursuit of practice-linked learning in support of identification [e.g., Stevens, O'Connor, Garrison, Jocums, & Amos, 2008], as well as access to events that open up available *scopes of possibility* for learning and identification. Taken together, these dimensions (interests and concerns, coordinated participation, social relationships, and practice-linked identities) highlight the learning outcomes of central interest to the cultural learning pathways framework, and they highlight specific learning processes associated with these outcomes as represented on the left side of figure 1.

In cultural and cognitive terms, extended learning of the kind accounted for by this framework should be viewed as occurring across contexts in the midst of *connected constellations of situated events*. Such learning is accomplished across developmental timelines, typically in a variety of locations that have shifting and enduring qualities. Learning is viewed as constellations of multimodal, *discursive actions* made in the midst of situational circumstances. Through their actions, persons express stances that relate to their developing commitments, concerns, and identities in the midst of unfolding events to the degree afforded by the context. These stances could, for example, be a stance on an ongoing struggle [Sheehy & Leander, 2004], or a response to social positioning. Often, individuals are trying to leverage or transform a social circumstance in ways that relate to aspects of the social practice related to past and future events. Stances are shaped in relation to the sets of social positions available to an individual or group from moment to moment – the rights and responsibilities associated with taking action within a given setting [Harré, Moghaddam, Cairnie, Rothbart, & Sabat, 2009]. Positions are constituted by connecting prevailing cultural storylines to particular individuals in the context of situated events. In some cases, such positioning is done in relation to broader social identities and ‘kinds of persons’ in ways that are socially problematic [Wortham, 2004, 2005]. In other cases, youth can be given social positions that relate to their socially perceived areas of developing expertise and desirable kinds of persons. In this latter case, social reputations can both mark and make expertise. For example, a boy who starts playing computer games at 3 is socially positioned as a ‘gaming expert’ for years to come; he is given substantial resources and additional opportunities to learn, protected from other responsibilities that would interfere with his gaming and is socially positioned as a teacher of more novice gamers [Bricker & Bell, 2012]. In another case, a girl who expresses an interest

in animals is then repeatedly positioned and resourced to participate at deeper levels including taking care of multiple pets at home, giving advice to peers, and volunteering at a local pet store so that she can learn to care for a broader variety of animals [Zimmerman, 2012]. A teenager who is known for his early interest in military history and family ties to the armed forces is given opportunities to participate in the Young Marines and police shadowing programs where he is positioned as a ‘charismatic leader,’ challenging the Asperger’s syndrome diagnosis he carries at school [Baines, 2011].

Learning happens in relation to the social and material circumstances of particular places or locations. This is particularly important for social practices like those associated with science, technology, engineering and mathematics (STEM) pursuits in that they tend to make stylized use of specific materials in specific places imbued with political, epistemic, and social power [Latour, 1995; Rouse, 1996]. Places associated with the pursuit of STEM-related interests and practices are not neutral settings. They are ‘politicized, culturally relative, historically specific’ and ‘socially constructed’ [Rodman, 1992] and are perceived by us through our own cultural lenses and value systems [Casey, 1996]. In contrast to being merely a backdrop against which interesting social activity occurs, place is simultaneously structured by and structures human activity. By seeing places from a materialist perspective, in our case we see context as ‘an ongoing process’ [Sheehy & Leander, 2004, p. 3], intertwined with practice. In this way, the materiality of place helps us understand actions and positionality in social activity.

Persons trying to extend their learning pathways in the context of an event in a particular location are often tasked to construct or refine sociomaterial arrangements that support the desired actions. Places are also unique in that group, organizational, and institutional activities often shape very specific social expectations for participation and learning. In this way, the institutional constraints of places [Dreier, 2009] have the power to invite or prohibit opportunities for action [Lefebvre, 1991], and therefore the power to position actors within places as having certain rights and duties. Schools often focus learning experiences on shared educational goals for all students. Parents often try to cultivate particular forms of social engagement for their children. Informal educational institutions have structural constraints that shape patterns of social activity within those locations.

Taken together, these dimensions of a specific constellation of situated events – actions, positions and locations – strongly define the particular scopes of possibility for participants. They can restrict participation and marginalize students. They expand the relevance of a learner’s background in relation to specific aims. They highlight the pragmatic conditions under which participation, learning, and identification are ultimately accomplished.

Learning Phenomena along Cultural Pathways

Our empirical studies of extended learning pathways have identified specific phenomena that help explain aspects of process, progress, and complication in the context of social practices, and in some cases the phenomena have opened up new lines of research (e.g., developing metrics for STEM identification within designed curricular experiences based on qualitative case studies of STEM identification processes across settings). In the following sections we summarize a series of case studies to depict the

processes by which the learning goals (shown on the right in fig. 1) are leveraged and expanded upon through a series of connected moments of participation in sets of social practices. Participation is viewed through a focus on the scopes of possibility that arise in relation to: (a) the social and material construction of the place, (b) the social positions (i.e., rights and responsibilities) that arise from storylines and desired ‘kinds of persons,’ and (c) the learners’ actions taken within settings in relation to their discursive repertoire and the stances they signal in the midst of the action. In the first case, we see how a learner, often with the support of others, works to repurpose specific places in order to further his own expertise development and how such efforts are sometimes easily afforded in some settings or actively resisted in others. In the second case, we see how the ethnic affiliation of a group of youth is used to position them adversely in an informal learning environment and how that is tied to prevailing storylines about the cultural group in the broader culture. In the third case, we document how a youth with a formal disability designation succeeds in learning to participate in a high-academic practice (forensic debate) despite racial and academic stereotypes about who can successfully participate. Taken together, the cases highlight a range of social processes that inform the extended learning pathways of the youth.

Persistent Repurposing of Contexts for the Development of Personal Expertise

Typical cognitive accounts of expertise development have not pursued the systematic study of the extended social and material conditions under which learning happens over extended time scales, across disparate settings, and in relation to varied value systems. Most individuals are able to develop significant competence or expertise in specific social domains that are personally consequential [Nisbett, 2009]. It is also the case that the development of expertise is also prone to opportunistic influences from varied circumstances [Gladwell, 2008]. We do have extensive accounts of the elective learning of science and technology within particular settings or social contexts [Crowley & Jacobs, 2002; Heath, 1990; Stevens, Satwicz, & McCarthy, 2008]. However, we are still in need of cultural accounts of sociomaterial learning processes that span multiple years and dozens of social contexts, especially as it relates to race, class, and gender.

Through a team ethnography of science and technology learning, we investigated the cognitive, social, and cultural processes associated with how elementary youth, many from first-generation immigrant families, engaged in science and technology learning across dozens of social settings and over the course of 4 years [for a more complete summary of the study, see Bell et al., 2012]. Across multiple cases, we documented persistent attempts by youth to repurpose the local arrangements and activities of a setting to serve longer-term interests in domains or developing affiliations with specific domain communities.

One phenomenon we have identified relates to learner stance-taking within specific sociomaterial places in relation to desired actions and deliberate practice for expertise development. This stance-taking of learners relative to various aspects of their practices happens in relation to the positioning and evaluation criteria that are operating in particular situated places and across those places. We have documented how Sam (pseudonym), a fourth grader at the time of his enrollment in the ethnography, pursued his developing interest in design and building practices across social

settings [Bricker & Bell, in review]. His parents and others in his life familiar with his practices positioned him as developing sophisticated engineering-related practices, and Sam himself adopted this stance and insisted that his practices helped him learn to see structurally. During their enrollment in the study, the family had relatively limited financial resources, although they expended significant effort and capital to support Sam's building practices over the course of years, which enabled Sam to continue honing his existing building practices and, over time, learn affiliated practices such as game design and computer-aided structural design. Through coordinated participation, Sam and others in the structural nexus of his building practices produced, reproduced, and/or changed the sociomaterial settings in the various contexts Sam frequented so that he could pursue his engineering-related interests [Dreier, 2008]. For example, at home he engaged in extensive hobbyist building pursuits aided by commercially available products such as Legos, Bionicles, and K'Nex. At a local science center, he monopolized physical exhibits for extensive periods of time that allowed him to engage in design and problem-solving practices through personally imposed challenges.

At the time of Sam's enrollment in the aforementioned ethnography, school was one of the few contexts that did not allow any significant repurposing relative to Sam's building and design interests. Furthermore, Sam was positioned as a student with a problematic academic identity; some of his teachers saw him as perpetually off-task and resistant to instruction, and Sam himself at times cultivated this problematic academic identity as a form of resistance to the structures of sociomaterial practices in school, which did not support his interests and stripped him of opportunities to showcase his developing engineering-like practices. In the context of this negative positioning in school, Sam reported that he spent his time in school deconstructing his physical environs in his mind (i.e., 'seeing in structures') as a way to continue his pursuit of his desired expertise. In a number of our ethnographic case studies, we have seen similar stance-taking efforts where learners attempt to repurpose a situated event to pursue a longer-term practice of interest. Some environments have a welcoming scope of possibility for such moves (e.g., the science center context in Sam's case), and others have competing social practices that make such moves difficult or impossible (e.g., the schooling context in certain instances).

Sam's case highlights the ways in which different contextually based sociomaterial interactions involving discursive action and social positioning afforded Sam very different scopes of possibilities and, thus, resulted in different outcomes related to his developing engineering-related practices. The cultural learning pathways framework allows us to theorize about these varying situated events relative to learning. In addition, the framework enables us to better understand how these events and storylines are connected (or not) over time and in ways that speak to phenomena such as developing learning pathways, identity formation (both positive and negative), and coordinated participation in social activity (both in the service of developing interests and in taking a resistance stance to dominant power structures).

Place, Positioning, and Identity in Environmental Education

The following case study provides an example of how learning pathways can be shaped by aspects of place, positions, and the actions those positions afford. Nasir

[2012] argues that learning environments, both formal and informal, have the potential to offer learners access to 'identity resources' that individuals choose either to take up or not based on their own personal identities and narratives. These resources can align with the social and racialized identities of youth to support learning and identity formation simultaneously. Aspects of these supportive learning environments include positioning learners as being competent and as developing experts [Bell et al., 2012]. This is exemplified in the following fieldwork segment:

High school youth from a community-based environmental justice education group on a Superfund site attend a work party at a local, urban farm. The farm provides individual families a way to grow their own food and donates fresh, organic produce to the local food bank, elementary school, and senior housing in the community. The youth are there for a work party in which many members of the community are also in attendance, but the purpose of the day ('community service') is not explained to the youth. When we get there, a man [one of the organizers of the volunteers] points out where the wheelbarrows and shovels are, says something to the kids in Spanish (he is white) and we follow him after we each get a wheelbarrow. We get to a large, tarp-covered pile of compost. The smell is immediately overpowering. I can only shovel three or four times before I have to stop and step away. As we look around the farm, we notice that other people are at small plots, stringing strings across small stakes in the ground, digging small holes with spades. In contrast, we have clearly been given the hardest job (and the smelliest). When I make a comment to Gabriela (another instructor) she says that every time she comes here to volunteer, this has happened – that people give them the stinkiest jobs, the hardest manual labor, because they think 'here come the Mexicans, ready to do hard labor, give them the hardest job'. It turns out that our job is to shovel the compost into the wheelbarrows, haul it across the farm, dump it onto a few long plots to make the beds, and repeat. (excerpt from field notes March 14, 2008)

Within the constructs of our cultural learning pathways framework, we would argue that the farm as a historicized, politicized place had the potential to offer the youth resources to frame their actions as helping their community and to position the youth as advocates and activists within that frame. Community service as a form of organized social activity was, however, never made explicit to help the youth understand the purpose for their activities at the farm. In addition, by being positioned immediately as 'other' by being spoken to in Spanish (when the rest of the volunteers were being spoken to in English), the youth were positioned on the margins of activity from the outset. Wilkinson and Kitzinger [2003] argue that positioning people in terms of their category memberships, as 'Spanish-speaking others,' for example, assumes a culturally based explanation for behavior or, in this case, for their assigned roles. Because the youth and adults were positioned in this way, major social divisions of ethnicity and, we would argue, power, were made visible and salient.

Furthermore, without the framing around community service, there were no 'identity resources' [Nasir, 2012] available for the students to try on different roles and responsibilities other than those with which they came to the community service day. These included, in the words of Gabriela, 'Mexicans' doing 'hard labor.' Dreier [2009] argues that positions invite different scopes of possibilities for action within different social contexts. In our framework, therefore, we can understand the scopes of possibility available to the youth that day. The social organization of the task before us that day, not only shoveling the compost but the obvious difference between this task and the others in which the volunteers were engaged, constrained the actions and opportunities for learning available to youth in that place as well as clearly defined their role in the farm as place. The youth were cognizant of this po-

sitioning. During the habitat restoration, Miguel says: ‘Mexicans don’t do this kind of work for free. Why do you think we’re the only Mexicans out here?’

We can understand the connection that both Gabriela and Miguel made between racialized identities and manual labor as reflecting dominant political discourses of oppression that link certain racial groups to certain types of labor. It is this act (doing hard labor) in *this* place (on the farm) with *this* particular positioning (as Mexicans) that framed particular scopes of possibility and resulted in *this* particular set of learning outcomes. Different social positions and sociomaterial arrangements might have opened up the possibility of rendering the same set of actions (shoveling compost and doing hard labor) as empowering rather than oppressive.

Perceptions of Ability as Narrowing or Expanding the Scopes of Possibility

While we have discussed how learner stance-taking and empowering, place-based frames of possibility can reposition and redirect youth’s learning trajectories, social perceptions about who can successfully participate continue to impact young people’s access to valued opportunities. For students with formal learning disability designations, for instance, the perceptions of others can often frame their disability as a fixed entity uniformly affecting their particular scopes of possibility. Examining how these students learn and participate in a variety of social and material contexts reveals that school-based disability labels themselves (and the perceptions of ability that follow) can often restrict participation and marginalize students.

In a team ethnography of high school students with social and learning disabilities, we investigated how high school youth with formal disabilities participate across a variety of educational contexts in ways which vary quite dramatically in terms of the available learning opportunities, how others perceive their potential, and how their own beliefs about what they were capable of achieving [Baines, 2011]. We specifically focused on educational contexts that emphasized sustained project-based pursuits that geared towards specific learner interests (e.g., an alternative high school with outside mentoring from professional musicians, an afterschool and summer forensic debate club, the elective pursuits of home life). Because our framework maintained that people live their lives by participating in many materially and socially arranged contexts, we studied these same youth in everyday contexts such as formal schooling, home contexts, and community settings. Through detailed analysis of social- and self-perceptions of ability, these cases documented how the scopes of possibility for meaningful participation vary in ways not reflected in their explicit disability designations or implicit assumptions about where and how they could participate.

In the lives of these students, the social perceptions of ability (and subsequent positioning of students’ potential) were deeply connected to the values and images of success in particular locations such as in the intellectually challenging world of high school debate. In one case study, a beginning debater, who we will call Devin Foster, struggled not only to grasp the basics of debate and participate in local tournaments but also have his expertise valued by his teammates [Baines, Bell, & Peck, in review]. As an African American male with a learning disability, Devin did not fit the typical image of a successful debater and had to continuously position his intelligence to suit the demands of the activity. His strong self-perception played an essential role in his participation and helped him withstand the negative perceptions

of the new debate coach and many teammates. Despite Devin's self-perceptions, the new coach continued to position him as not having the deep interest or intellectual ability for debate and temporarily removed him from the team regardless of recent tournament success. Her assumptions about the intellectual and personal requirements of debate were initially taken up by other members of the team. Over the span of several months, the coach's discourse regarding success was revoiced by a group of student leaders who began discouraging students of color from continuing on the team. After receiving outside coaching with a different instructor, Devin experienced notable success at a tournament and was celebrated by his teammates, causing them to reframe and reexamine their assumptions about his potential and stop attending sessions with the new coach.

This particular instance demonstrates how self-perceptions and the perceptions of others interact and influence one another in complex ways in the midst of connected constellations of situated events. Multiple structures of social practice (e.g., around disability designation, racial membership) can reinforce marginalization and exclusion for learners from historically nondominant groups. As with the case of Devin, these perceptions of ability can also shift over an entire cultural learning pathway, can be challenged in the course of single moments in time, and do not necessarily have to be dictated by fixed labels and diagnoses. Devin's experience highlights how particular storylines (i.e., related to the abilities of specific groups) can strongly shape social processes that constitute social positions that either narrow or expand the scopes of possibility for learners related to participation and identification. In this way, the cultural learning pathways framework allows us to understand how acts of exclusion are socially produced and are often taken for granted as part of the natural order of society, even influencing how young people view one another. It is the unconscious nature of such assumptions about intelligence and success that can have far-reaching and often harmful consequences for students' future pathways and identities. These disabling practices permeate everyday interactions and communicate low expectations, restrict opportunities, or reveal academic stereotypes, all of which can damage a learner's view of his or her potential.

In the context of this framework, Devin's actions also illustrate how, while his learning is situated in larger social structures, he still works to transform the conditions of his learning by positioning himself as 'smart' and capable enough to do so. Interviews with Devin over the course of his debate experience revealed that he was fully aware of how he was being positioned but that he would 'prove that everyone was wrong about him.' This case demonstrates the role and power of personal stances about desired interests and goals and how learners struggle to challenge conflicting positions if they restrict their access to these pathways. While young people like Devin may be able to recognize how they are positioned, our model emphasizes the importance of available, structured resources to expand their possibilities for action and change.

Conclusions

In this paper we have been operating from the stance that if we are to take conceptual issues of race, class, and other dimensions of human difference into account scientifically in our accounts of learning, development and education, we need theo-

retical frameworks that allow us to understand the social and material conditions under which relevant phenomena are carried out in everyday life, across settings, over developmental timescales, and in relation to multiple operating value systems. Only then will we be able to understand how conditions associated with educational privilege and inequality are produced within the contextual pragmatics of everyday life. Only then will we be able to understand how to intentionally shift the social and material circumstances associated with aspects of learning and development that are desired within specific communities or more generally. Our theoretical and empirical stance on accounting for issues of power resembles that of Latour [2005] who focuses on ‘the practical means, that is the mediators, through which inertia, durability, asymmetry, extension, domination is produced’ within social contexts (p. 85). In that sense, we seek to document empirically how acts of racism, exclusion, marginalization, privilege, and inclusion operate within social circumstances and how actors contribute to, resist, or ignore those processes.

We have outlined the theoretical framework we are using to account for cultural learning pathways that are temporally extended, spatially variable, and culturally diverse with respect to value systems and social practices. With the theoretical goal of focusing on the dynamically evolving scopes of possibility or learning in light of diversities of structures for social practices, we focus on contextual dimensions of places, positions, and actions occurring in relation to the interests, forms of participation, social relationships and varied identities tied to multiple social practices that make up the learning influences and outcomes. From separate team ethnographies of learning across time and place, we highlight three sets of phenomena that can be studied and explained from this theoretical perspective. We have shown how learner positioning and stance-taking across settings helps us understand when and how learners are able to repurpose and focus the activities occurring within contexts to their own long-term learning goals – or how those actions are resisted. We have documented how racial stereotypes operate to narrow scopes of possibilities for specific sociodemographic groups of youth within the banner of inclusion within valuable learning experiences. We have shown how the social perceptions of learner ability within a social network can serve to exclude students of color from educational experiences they perceive to be high-prestige. We have focused on select phenomena from our ethnographic research. In our related design-based research we shift the conditions of learning in order to support extended learning pathways and domain identification of learners. By attending to the extended cultural learning pathways of youth across diverse communities, we believe we can better understand and intervene to promote educational equity and social justice.

Acknowledgments

We extend deep gratitude to the youth, families, and educators who participated in the studies reported in this article. This work was conducted as part of the Learning in Informal and Formal Environments (LIFE) Science of Learning Center (<http://life-slc.org/>) through grants from the National Science Foundation (NSF), specifically awards 0354453, 0835854, 0528725, and 1038836.

References

- Baines, A.D. (2011). *Identities in motion: An ethnographic study of disability labels, social categories, and the everyday lives of youth* (unpublished doctoral dissertation). University of Washington, Seattle.
- Baines, A.D. (2012). Positioning, strategizing, and charming: How students with autism construct identities in relation to disability. *Disability and Society*, 27, 547–561.
- Baines, A.D., Bell, P., & Peck, C.A. (in review). Identities in motion: Competence and disability on a high school debate team.
- Bang, M., & Medin, D. (2010). Cultural processes in science education: Supporting the navigation of multiple epistemologies. *Science Education*, 94, 1008–1026.
- Banks, J.A., Au, K.H., Ball, A.F., Bell, P., Gordon, E.W., Gutiérrez, K.D., & Zhou, M. (2007). *Learning in and out of school in diverse environments: Life-long, life-wide, life-deep*. Seattle: LIFE Center and Center for Multicultural Education (University of Washington).
- Barron, B. (2006). Interest and self-sustained learning as catalysts of development: A learning ecology perspective. *Human Development*, 49, 193–224.
- Bell, P., Bricker, L.A., Lee, T.R., Reeve, S., & Zimmerman, H.T. (2006). Understanding the cultural foundations of children's biological knowledge: Insights from everyday cognition research. In S.A. Barab, K.E. Hay, & D. Hickey (Eds.), *Proceedings of the Seventh International Conference of the Learning Sciences (ICLS)* (pp. 1029–1035). Mahwah: LEA.
- Bell, P., Bricker, L.A., Reeve, S., Zimmerman, H.T., & Tzou, C. (2012). Discovering and supporting successful learning pathways of youth in and out of school: Accounting for the development of everyday expertise across settings. In B. Bevan, P. Bell, R. Stevens, & A. Razfar (Eds.), *LOST opportunities: Learning in out of school time* (pp. 119–140). London: Springer.
- Bell, P., Lewenstein, B., Shouse, A.W., & Feder, M.A. (Eds.) (2009). *Learning science in informal environments: People, places, and pursuits*. Committee on Learning Science in Informal Environments, Board on Science Education, National Research Council. Washington: National Academies Press.
- Bransford, J.D., & Schwartz, D.L. (2009). It takes expertise to make expertise: Some thoughts about why and how and reflections on the themes in chapters 15–18. In K. Anders Ericsson (Ed.), *Development of professional expertise: Toward measurement of expert performance and design of optimal learning environments* (pp. 432–448). Cambridge: Cambridge University Press.
- Bransford, J., Stevens, R., Schwartz, D., Meltzoff, A.N., Pea, R., Rochelle, J., & Sabelli, N. (2006). Learning theories and education: Toward a decade of synergy. In P. Alexander & P. Winne (Eds.), *Handbook of educational psychology* (2nd ed., pp. 209–244). Mahwah: Erlbaum.
- Bricker, L.A., & Bell, P. (in review). 'I want to be an engineer': Network, framing, and positioning dynamics associated with youth STEM learning and expertise development in and out of school.
- Bricker, L.A., & Bell, P. (2012). 'GodMode is his video game name': Situating learning and identity in structures of social practice. *Cultural Studies of Science Education*, 7, 883–902.
- Brickhouse, N.W., Lowery, P., & Schultz, K. (2000). What kind of girl does science? *Journal of Research in Science Teaching*, 37, 441–458.
- Bruner, J. (1996). Foreword. In B. Shore (Ed.), *Culture in mind: Cognition, culture, and the problem of meaning*. New York: Oxford University Press.
- Calabrese Barton, A., & Brickhouse, N.W. (2006). Engaging girls in science. In C. Skelton, B. Francis, & C. Smulyan (Eds.), *The SAGE handbook of gender and education* (pp. 221–235). London: Sage.
- Calabrese Barton, A., & Tan, E. (2009). Funds of knowledge and discourses and hybrid space. *Journal of Research in Science Teaching*, 46, 50–73.
- Casey, E.S. (1996). How to get from space to place in a fairly short stretch of time: Phenomenological prolegomena. In S. Feld & K.H. Basso (Eds.), *Sense of place* (pp. 13–52). Santa Fe: School of American Research Press.
- Crowley, K., & Jacobs, M. (2002). Building islands of expertise in everyday family activity. In G. Leinhardt, K. Crowley, & K. Knutson (Eds.), *Learning conversations in museums* (pp. 333–356). Mahwah: Erlbaum.
- Dreier, O. (2008). *Psychotherapy in everyday life*. Cambridge: Cambridge University Press.
- Dreier, O. (2009). Persons in structures of social practice. *Theory and Psychology*, 19, 193–212.
- Gee, J.P. (2004). *Situated language and learning: A critique of traditional schooling*. Florence: Psychology Press.
- Gladwell, M. (2008). *Outliers: The story of success*. New York: Little, Brown, and Company.
- Gutiérrez, K.D. (2008). Developing a sociocritical literacy in the third space. *Reading Research Quarterly*, 43, 148–164.
- Harré, R., Moghaddam, F.M., Cairnie, T.P., Rothbart, D., & Sabat, S.R. (2009). Recent advances in positioning theory. *Theory and Psychology*, 19, 5–31.
- Heath, S.B. (1990). *Ways with words: Language, life, and work in communities and classrooms*. Cambridge: Cambridge University Press.

- Herrenkohl, L.R., & Mertl, V. (2010). *How students come to be, know, and do: A case for a broad view of learning*. Cambridge: Cambridge University Press.
- Hidi, S., & Renninger, K. (2006). The four-phase model of interest development. *Educational Psychologist*, 42, 111–127.
- Latour, B. (1995). The ‘pedofil’ of Boa Vista: A photo-philosophical montage. *Common Knowledge*, 4, 147–187.
- Latour, B. (2005). *Reassembling the social: An introduction to actor-network theory*. New York: Oxford University Press.
- Lave, J. (1987). *Cognition in practice*. New York: Cambridge University Press.
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.
- Lee, C.D. (2008). The centrality of culture to the scientific study of learning and development: How an ecological framework in education research facilitates civic responsibility. *Educational Researcher*, 37, 267–279.
- Lefebvre, H. (1991). *The production of space*. Malden: Blackwell Publishers.
- Lemke, J.L. (2000). Across the scales of time: Artifacts, activities, and meanings in ecosocial systems. *Mind, Culture, and Activity*, 7, 273–290.
- Nasir, N.S. (2012). *Racialized identities: Race and achievement among African American youth*. Stanford: Stanford University Press.
- Nasir, N.S., & Hand, V. (2008). From the court to the classroom: Opportunities for engagement, learning, and identity in basketball and classroom mathematics. *The Journal of the Learning Sciences*, 17, 143–179.
- Nisbett, R.E. (2009). *Intelligence and how to get it: Why schools and cultures count*. New York: Norton & Company.
- Pea, R., & Brown, J.S. (1991). Preface. In Lave, J., & Wenger, E. (Eds.), *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.
- Penuel, W.R., & Bell, P. (in preparation). Transforming identity trajectories as a focus for learning research and a goal for educational design.
- Rodman, M.C. (1992). Empowering place: Multilocality and mulivocality. *American Anthropologist*, 94, 640–656.
- Rouse, J. (1996). *Engaging science: How to understand its practices philosophically*. Ithaca: Cornell University Press.
- Saxe, G.B., & Esmonde, I. (2005). Studying cognition in flux: A historical treatment of Fu in the shifting structure of Oksapmin mathematics. *Mind, Culture, and Activity*, Special Issue: Combining longitudinal, cross-historical, and cross-cultural methods to study culture and cognition, 12, 171–225.
- Sheehy, M., & Leander, K.M. (2004). Introduction. In K.M. Leander & M. Sheehy (Eds.), *Spatializing literacy research and practice* (pp. 1–15). New York: Lang.
- Steele, C.M. (2010). *Whistling Vivaldi and other clues to how stereotypes affect us*. New York: Norton and Company.
- Stevens, R., O'Connor, K., Garrison, L., Jocuns, A., & Amos, D.M. (2008). Becoming an engineer: Toward a three dimension view of engineering learning. *Journal of Engineering Education*, 97, 355–368.
- Stevens, R., Satwicz, T., & McCarthy, L. (2008). In-game, in-room, in-world: Reconnecting video game play to the rest of kids' lives. In K. Salen (Ed.), *The ecology of games: Connecting youth, games, and learning* (The John D. and Catherine T. MacArthur Foundation Series on Digital Media and Learning, pp. 41–66). Cambridge: MIT Press.
- Tzou, C., & Bell, P. (2012). The role of borders in environmental education: Positioning, power, and the paradox of categories. *Ethnography and Education*, 7, 265–282.
- Wilkinson, S., & Kitzinger, C. (2003). Constructing identities: A feminist conversation analytic approach to positioning in action. In R. Harré & F. Moghaddam (Eds.), *The self and others: Positioning individuals and groups in personal, political, and cultural contexts* (pp. 157–180). Westport: Praeger.
- Wortham, S. (2004). The interdependence of social identification and learning. *American Educational Research Journal*, 41, 715–750.
- Wortham, S. (2005). *Learning identity: The joint emergence of social identification and academic learning*. Cambridge: Cambridge University Press.
- Zimmerman, H.T. (2012). Participating in science at home: Recognition work and learning in biology. *Journal of Research in Science Teaching*, 49, 597–630.