

Chapter 5

History, Culture, Emergence Informing Learning Designs

Donna DeGennaro*

New understandings about learning are reconceptualizing our definition of what it means to know. It is also increasing our questions about how knowledge materializes. What becomes eminently clear is that knowing and learning is a complex process. Kelly and Sezen refer to this complexity as they discuss the shift from an individual to a social view of learning. Their chapter *Activity, Discourse, Meaning* reflects upon the shift in science education to articulate potential new research directions for the field. The chapter describes that these prospective directions arise from the movement away from behaviorist models and toward constructivist ones. These research trajectories are not only an outgrowth of this shift, but also a reflection of the limitations of conceptual change theory. Rather than offer a comprehensive research direction for science education, Kelly and Sezen highlight three particular themes. These include examining knowing as developing within a contextualized set of practices that include thinking, acting, or speaking, attending to the social and personal construction of learners' identities and finally, questioning whose and what knowledge is true, correct, and privileged.

This response to Kelly and Sezen's analysis of the changing landscape of science education and what it means for potential research directions has a particular intention. The aim in this response is to offer a reflection of how the field of cultural sociology is assisting in uncovering this complex process. Further, its purpose is to extend the conversation in the areas projected by these authors. Like Kelly and Sezen, I do not attempt to provide a comprehensive survey of the field. Rather, I offer an extension of *Activity, Discourse, Meaning* by focusing here on their main three points: contextual learning, social and personal identity, and legitimating knowledge as a means of continuing the conversation of the shifting inspection of conceptual change. More specifically, I examine Kelly and Sezen's three points by bringing a cultural sociology theory to the forefront of these discussions to suggest the implication for the design of learning environments.

* D. DeGennaro, University of Massachusetts-Boston

Learning as Contextual

Over the past century, researchers have shifted their understanding of how students generate and change their conceptual understandings. No longer do researchers adhere to the philosophy that learning is an exact science where the instructor can stimulate and elicit anticipated responses from the individual. Additionally, research has extended beyond the expectation that an individual's cognitive conception is the single element affected by the learning process. Transcending these individualistic constructs, research has come to illustrate that the process of learning is an intricate dance between "behavior" (actions in the world) and cognition (learning inside the head). Behavior here is reconceptualized as developing ways of being through social and cultural practice (Vygotsky 1978). The interconnectedness of being in the world and in the head is currently understood more deeply as having historical as well as social and cultural roots. From this viewpoint, neither the individual nor the mind is the sole "organism" in the learning process that adapts, alters, and changes over time. "Knowing" is a dialectical bond that shapes and is shaped by structures of activity with and through our being in the social world. This shift from an individualistic to a collective view of learning brings to question how conceptual change relates to social learning.

Kelly and Sezen address the shift to a social view when they note the limitations of conceptual change. Specifically, they assert that conceptual change lacked attention to the process of knowledge construction. Instead, conceptual change research looked at the initial state of knowledge and this initial state was "measured" by students' language or description of concepts. This is problematic for two reasons. First, one's language cannot fully demonstrate individual "knowing" because it is built through personal experience. In their social contexts individuals develop social practices reflected in talking, communicating, acting, and sense making. These ways of knowing and being in turn influence the ways that learners not only describe what they know, but also how they enact their knowledge. Thus, to fully understand what a learner describes, he or she must also be observed in praxis (Roth et al. 2002). In either descriptions or enactments, the instructor potentially (and often times) views the learner's language and actions from a dominant perspective. Since we are products of our own social and cultural ways of coming to know and the descriptions are relative to our experiences, the validity of this interpretation comes into question. Thus it is possible that the instructor may hear the learner's description through his or her own lens of what is deemed "correct." In this light, the instructor may misinterpret the learner's meaning. What has become evident is that ways of knowing are varied across cultures and thus the learner's discussion or engagement in understanding concepts is often personally discordant with the teacher's culture and therefore misconstrued by the teacher. More frequently, we observe that social and cultural contexts are inextricably connected to the interpretation of and enactment in learning practices. For this reason, viewing conceptual change through language and descriptions alone neglects to take into account—and often misinterprets—the possible contextual understandings and methods of engagement.

This is further evidenced in questions raised by Kelly and Sezen related to another limitation of conceptual change. The authors state that, “students’ initial knowledge was labeled as misconceptions, rather than plausibly useful concepts that could potentially assist them to develop more robust, generalized concepts.” The learner’s existing knowledge cannot only be realized as an initial state of conception or misconception. Rather, it must be understood as contextual and through a social and cultural lens. Researchers have brought to light the importance of “initial knowledge” not only to assess previous and but also cultural knowledge. The combination of these aspects of student’s current knowledge is referred to in the learning sciences field as “learner-centered” environments. Learner-centered environments place the learner in the center of designing learning experiences by focusing on learner’s skills, practices, and beliefs that he or she brings to the classroom (Bransford et al. 2000). This initial knowledge is not considered a misconception, but rather knowledge with sociocultural connections. Gaining insight into and knowledge of a learner’s starting point, the teacher can build upon the learner’s initial knowledge. It is well established that all knowledge is built from existing pieces that are combined and recombined in new relational experiences. Thus, it is essential to assess these existing pieces as historically, culturally, and socially constructed knowledge. Both the concepts and the forms by which these concepts come to be constructed are part of what the learner knows and is an inherent part of how one comes to interpret and build new knowledge.

With attention to initial knowledge from a social and cultural view, we can more effectively design learning experiences that allow students to meaningfully construct knowledge. Creating learning experiences that resonate with the learners themselves offer unique opportunities. Through engaging them in their own ways of learning and from their historical, social, and cultural worlds, we can help students develop tools to identify when their concepts work and do not work. It is then that learners become agents of learning in their own right. Additionally, by creating ways for students to see where their concepts work and do not work, they can come to see the potentials and limitations of these concepts. Rather than assuming a restructuring of a conceptual map in the brain alone, it is through the social experience with and through others that brings about conceptual change. Without uncovering and examining student’s initial knowledge as contextualized, instructors are less likely to successfully bring learners to build upon or change their existing beliefs about what they know.

Social and Personal Identities

Rethinking conceptual change as connected to social experience has implications for and attachments to personal and social identities. Kelly and Sezen assert that identity research in science education has focused on, among other things, ethnic membership, gender, and social status. Specifically, the authors discuss the correlation between ethnicity and discursive practices for learning science, gender influences and the resistance of activity as well as identification with scientific

roles, and status and seeing one's self as part of a science community. These themes not only arise out of social interactions, but also from the histories that emerge from our local contexts. To be sure, research related to historical influences on our social and cultural practices suggests an inextricable connection to our identities. The relationship between history and identity brings to light the possibilities for authentic participation and enhancement of progress toward group membership. This research suggests that there is a critical element of history in not only shaping one's identity but in shaping practices as learners move from one context of participation to another.

It can be alleged that consciously, but most often unconsciously, we are our histories. History shapes and is shaped by structures, representations, and rituals (Tobin 2006). This is not to assert that our histories determine our trajectories. Rather, it is to suggest that our histories relate to how we develop our ways of being and acting in the world. In our own homes and societies, we develop identities that form our perspectives, our socialization with others and our participation in the world. Our histories that shape us, however, are not static. Alternatively they are a continuous flux of social practices, to which each new generation contributes, while inevitably transforming our identities and our world (Vianna and Stetsenko 2006). Our histories are an evolution within our own ethnic groups, and as we interact across groups our identities change as well. Researchers have considered this a kind of border crossing. Studies illustrate that as students move across boundaries (streets, homes, school, etc.), they do not distinctively leave social and cultural configurations and ways of seeing themselves behind. Instead, learners' actions and expectations as well as their ways of viewing the world continue to permeate the boundaries of new experiences. At the same time, the intersecting practices in these new experiences reciprocally affect existing worldviews and in turn reshape aspects of identity. In this sense, the boundaries between the streets and learning contexts are porous. Moreover, the students' organizing social and cultural patterns in the world are carried into their learning environments as well as shaping them and being shaped by them. With each new experience, the identities of learners are enacted, constructed, and reformulated as they cross boundaries of experience. Our constructions of reality, our conceptual understandings, become shaped by our experiences and the personal lens we develop comes through our historical experiences, historical experiences that we carry with us across borders.

What becomes apparent is the dialectical relationship between personal identity and social context. That is, the experiential worlds belong to individuals, but, in the course of social interaction, these individual worlds become adapted to one another. No individual development or experience comes without his/her historical and present experience in the socially and culturally constructed world. As Roth et al. (2008) note:

There is a mutually constitutive relation linking individual and collective—being always is being singular plural (e.g., Nancy 2000). For each individual, all other individuals constitute a (cultural) context, so that the individual can be rightfully thought only in and through its relation to all the others. Nothing that can be observed involving human beings and no observation made can be reduced to the individual; anything that articulates sense *inherently and always* is shared, intersubjective, and hence cultural. (pp. 253–254)

Whereas it might be the case that individuals undergo an internalization process as Kelly and Sezen suggest, this internalization is never truly individual. Specifically, learning is never realized, interpreted, or conceptualized without the social process. “We cannot look at our experiential worlds from the outside. We construct them from the inside and have usually lived a good many years in them before we begin to wonder where they came from and what they ‘really’ are” (von Glasersfeld 1993, p. 29). These personal identity constructions that are seen from the “inside” are created through “dialectical reorganization and textual translations” of past and present events. There is an element of personal and social history that simultaneously shapes these aspects of identity. Starting from our histories, our socially constructed selves continue to emerge throughout our ongoing social experiences. We are becoming hybrids of our experience; a conglomeration of past, present, and future represent our identities.

Within this view, research has given us insights into how identities play into the nature of emergent learning designs. When our histories accompany our entry into the classroom, they potentially conflict or cohere with teachers’ historical identities. Kelly and Sezen discuss identity as an “achievement of a person’s activity that is constrained or supported by situational constraints in the field of participation.” These supports or constraints can take on different forms. In situations where the identities are from markedly different worlds, constraints for our learners’ agency and participation are likely. That is the structures of participation often inhibit learners from drawing upon or enacting their cultural knowledge. In this case, learning designs remain inflexible and disconnected for our learners’ worlds. Supports, however, can occur under different circumstances. For one, when cultural histories are similar, there are little changes in identities and little social distance between the learners and the instructor. Thus, supports for participation and enacting one’s identity often appear seamless, leaving minimal chances for identities and learning structures to undergo any change. On the other hand, when social distances are more significant, the difference between the learner and the instructor becomes salient. Awareness of social distance and personal identity can materialize and simultaneously incite developments in identity. This second possibility can be advantageous for learners and for learning designs. As I have seen in my own research and experience, when the designer of the learning environment comes to see the learners’ identity and becomes aware of their own, the contradictions become forms of insight into learners’ social and cultural practices. The different histories and identities offered opportunities for shifting structures of learning designs that more adequately engaged the learners.

No matter the amount of social distance, learners’ and instructor’s cultural worlds are often inharmonious. The levels of dissonance will vary in different learning environments. Regardless, the intersection of dissonant worlds provides extraordinary opportunities for organically emergent learning designs. On the one hand, if the instructor holds on to his or her expectation and rigidly imposed design, learners remain distant from their own learning. Lave (1997) states that “the more the teacher, the curriculum, the texts, and the lessons ‘own’ the problems or decompose steps so as to push learners away from owning problems, the harder

it may be for them [students] to develop the practice” (p. 33). In contrast, points of contradiction can give rise to new methods of engagement. Awareness of and attention to histories, and collectively shaped identities of all participants is important in creating continuously meaningful learning experiences. This implies that to support conceptual change structures of learning must be malleable and emerge with the unfolding understandings of cultural and social practices. In such designs learners can appropriate their historical identities and the practices that accompany them. With this flexibility comes an openness to realize that historical and social knowledge must be valued and validated.

Learning Whose Knowledge?

Currently, science education has an end goal of ensuring students learn particular facts and theories of scientific disciplines. This presupposes the existence of a correct and rationalized truth or body of knowledge. This body of knowledge becomes valued over other types of knowledge. A social view of learning is in stark contrast to this model. Socially constructed knowledge is viewed as being developed with others and through various perspectives. Further, social learning values multiple knowledge sets. Researchers see a pluralistic understanding in and across the world as more fruitful. In an interview, Appiah (2006) describes the necessity of accepting pluralism in the world in order for a more cohesive democratic existence. He says, “Cosmopolitans think that there are many values worth living by and that you cannot live by all of them. So we hope and expect that different people and different societies will embody different values, yet live in harmony” (p. 6). An aspect of this new cosmopolitanism relates to knowledge in that it asserts that our knowledge is imperfect, provisional, subject to revision in the face of new evidence. In scientific communities, knowledge is constantly undergoing changes as multiple perspectives intersect, frame questions, and formulate meanings.

As different perspectives emerge, the questions of whose knowledge and under what circumstances become increasingly important. To be sure, Kelly and Sezen provide examples of how social and institutional power structures have influenced a dominant knowledge base and in addition, particular curricular choices. Further, they point to the more recent phenomenon of activists, citizens, and environmentalists as voices in the dialogue that now challenge the definition of legitimate scientific knowledge. The questioning of dominant knowledge results in these authors promoting “not only to examine the ways that what gets taken for knowledge is interactionally accomplished, but also to step back and assess the extent to which learning provides students with knowledge relevant to their everyday experiences in the world they enter.” This promotion of connecting learning to relevant experiences deserves discussion as we consider the important question of “whose knowledge?” Tapping local knowledge is important not only for making curricular decisions, but also for the organization and reorganization of designed learning environments.

Various studies focus on tapping local knowledge to ensure effective and authentic participation. The following examples give rise to the ways in which structures of participation change as they connect less with a set of concepts and truths and more closely to a community connection that reflects a resonance with social and cultural practices. One example of the research in this area is from Roth and Lee (2004). These authors argue that science literacy has focused on a set of facts and theories that more often than not lack a relationship to the learner's community. These authors demonstrate their proposal that scientific literacy is not a set of disconnected facts by illustrating how becoming "scientific" is in fact a social practice. The authors demonstrate how social practice cannot be focused on teaching the individual as separate from context because the individual is inherently connected to one's community. The implication is that science can be accessible to all when it is considered as a set of resources that can be drawn upon in everyday practice from these community connections. Validating local knowledge and its association within one's community gives learners an entry point as well as a connection between home and science. Bringing in these different perspectives of knowledge interpretation may very well give rise to a fluctuating "what" and "how" in designing learning experiences and asserting a particular knowledge set. Rather than an outside entity determining what students learn, learning designers need to connect to what people need in their communities as well as when they need it.

Tan and Barton (2008) similarly scrutinize the efforts of the current "*Science for All*" initiative. In asserting that science for all be reconceptualized, these authors investigate not only at whose knowledge, but knowledge for what purpose. They argue that science for all needs to transcend the construct that science education ensures a solid national economy. With this current emphasis on skills, theories, and the economy, learning experiences remain distanced from social and cultural participation in every day life. To bring this issue to light, Tan and Barton study the individual identities of different female students to try to gain insight into how they connect to learning science. Their findings suggest that an alternative look at the personal participation practices in the community requires attending to what knowledge sets are important to or embedded in the situated and local lives of the community. Tan and Barton reinforce that the practices of students need to be connected to local participation and involvement of the family, community or science. This resonates with other research that calls for allowing students to bring in their lives and experiences to learning environments so that they can build, question truths, and incite dialogue. Students can see the "viability and comparability of alternative explanations (including Western science) testing ideas of criteria of 'being' and bringing into the open underlying assumptions about the nature of evidence" (Malcolm 2003, p. 36). In reconceptualizing learning environments as accessing and enacting community-constructed knowledge, a powerful notion of the "relationship between science, location, knowledge production and learning" (Tan and Barton 2008, p. 69) becomes recognized.

One interpretation of these studies suggests several foundational design principles. These include: a constant uncovering of community connections and

needs, a formatively assessed set of experiences that make such connections, and a continued iteration of the learning goals, structures and methods of engagement. When instructors engage learners in knowledge that is not resonant with that of the local community, they run the risk of sending a message that threatens the long and rich histories of knowing. What is brought to mind in relation to accepting community knowledge is the need for altering power structures. Instead of external impositions of particular facts and theories, learning designs work toward realizing the power of local knowledge. As local forms of knowledge are supported they will intersect with dominant views to formulate new practices. Overlapping cultural forms (science communities, researchers, learners and instructors), the learning structure adapts by “enabling new forms of societal activity that is collectively generated” (Roth and Lee 2004, p. 286). This becomes increasingly visible in the technological communities that afford social and collaborative knowledge constructions.

In our learning designs, we can emulate this type of knowledge construction by pointing out to our learners that knowledge is tentative and situational. We can support the contribution of conceptual change as a learning process, while also emphasizing knowledge as a process. That is, teaching knowledge tentativeness as well as bringing to light how and why facts change over time. In doing this, we also foster fluid, flexible, and emergent learning experiences rather than rigid approaches to learning. The fluidity materializes as we shift our concentration away from teaching known knowledge and toward valuing local knowledge bases and skills that contribute to constructing a scientific knowledge community. Emergent modes of participation become visible with openness to seeing knowledge as a social and cultural process connected to our communities rather than a set of disconnected and foreign facts. This requires an acceptance of learning with and from others. It requires an awareness and assessment of our own realities and constructions. The realization of other’s knowledge and validity, consideration, and acceptance of that knowledge implies the need to move toward a social view of learning and away from a particular conception of truth. When we are able to see our knowledge and ourselves as other, then we can begin to find contradictions in our learning designs and bring to question what we teach, why, and for whom. As we emphasize learning as a social process and the viability of knowledge in the moment, we can be in the constant practice of reinventing and affording the emergence of learning environments and then perhaps, science for all.

Closing Remarks

Kelly and Sezen argue that the shifts in conceptual change perspectives bring us new and positive directions in science education. In this response, my aim was to extend some of the themes that Kelly and Sezen raise and suggest how these ideas come together to inform considerations for designing learning environments. Within this conversation was a surreptitious support for rethinking conceptual

change. Reorganized, conceptual change places attention on contextual knowledge as connected to initial learning, historical influences that shape and reshape identity, and the importance of local and community knowledge. In viewing science learning as a set of complex processes, we more closely examine the inter-relationship between individuals and their social contexts. Learning from an altered conceptual change framework becomes an intersection of individual and collective practices that involve multiple structures, including the intersecting cultures of our teaching, learning, and scientific communities. As we realize that multiple structures overlap and give rise to the complexity of our participation, we see the importance of bringing multiple ways of knowing to the process of learning. The ways of coming together to know are invariably connected to the historical, cultural, and social knowledge that we embody.

This change asserts particular considerations for learning designs. For example, learning designs consider learners' contexts. In our designs, we must realize that contexts situate and cultivate ways of knowing and interpreting as well as developing purpose for learning science. In addition, our histories shape our unfolding identities. These identities are inherently collective and develop in practice. To foster new possibilities of engagement, our designs need to find ways to raise awareness of our own, as well as our learners' histories. Finally, our designs need to privilege local and community knowledge. This validates local knowledge and community needs and affords an expanded array of purposes for learning science. The possibility assumes collective ways of knowing as well as appreciation and acceptance for different ways of seeing the world. Like any discipline, how we define conceptual change and what this means for our design of learning environments will continue to evolve. The definition and what it means for learning science will emerge and grow based upon our own social and personal experiences, through our own identity development, and through our own emerging ideas as our "knowledges" intersect through conversation and practice with others.

References

- Appiah, K.A. (January 1, 2006). *The case for contamination*. New York Times. Accessed January 25, 2009 at http://www.nytimes.com/2006/01/01/magazine/01cosmopolitan.html?_r=1&pagewanted=1
- Bransford, J., Brown, A., & Cocking, R. (2000). *How people learn: Brain, mind, experience, and school committee on developments in the science of learning*. Washington, DC: National Academy Press.
- Lave, J. (1997). The culture of acquisition and the practice of understanding. In D. Kirshner & J.A. Whitson (Eds.), *Situated cognition: Social, semiotic, and psychological perspectives* (pp. 63–82). Mahwah, NJ: Lawrence Erlbaum.
- Malcolm, C. (2003). My father is always right. *Labtalk*, 47 (5), 36–39.
- Roth, W.-M., & Lee, S. (2004). Science education as/for participation in the community. *Science Education*, 88, 263–291.
- Roth, W.-M., Lee, Y.-J., & Hwang, S.W. (2008). Culturing conceptions: From first principles. *Cultural Studies of Science Education*, 3, 231–261.

- Roth, W.-M., Tobin, K., & Zimmermann, A. (2002). Coteaching/cogenerative dialoguing: Learning environments research as classroom praxis. *Learning Environments Research*, 5, 1–28.
- Tan, E., & Barton, A.C. (2008). Unpacking science for all through the lens of identities-in-practice: the stories of Amelia and Ginny. *Cultural Studies of Science Education*, 3, 43–71.
- Tobin, K. (2006). Aligning the cultures of teaching and learning: Science in urban high schools. *Cultural Studies of Science Education*, 1, 219–252.
- Vianna, E., & Stetsenko, A. (2006). Embracing history through transforming it: Contrasting Piagetian versus Vygotskian (activity) theories of learning and development to expand constructivism within a dialectical view of history. *Theory & Psychology*, 16, 81–108.
- von Glasersfeld, E. (1993). Questions and answers about radical constructivism. In K. Tobin (Ed.), *The practice of constructivism in science education* (pp. 23–38). Washington, DC: AAAS Press.
- Vygotsky, L.S. (1978). *Mind in society*. Cambridge, MA: Harvard University Press.