

Researching Patterns of Participation in Network-Mediated Classroom Activities

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The wealth of activities supported by networked classroom technologies calls for expanded definitions of learning (e.g., beyond individual-focused) to capture the potential richness of the knowledge and meaning constructed and to gauge access to powerful discourses (e.g., mathematical/scientific practices, ways of speaking and acting; Gee, 1999; Moschkovich, 2001). Theories that treat learning as changing participation in culturally valued activities offer useful tools for analyzing learning, teaching, and design in connected classrooms.

Participatory frameworks are powerful in capturing the richness of activity in connected classrooms by supporting research designs that:

- Focus data and analysis on **learning as changing participation**, supported by networked technologies, in culturally valued activities, or in activities that build knowledge and skills important to engagement in practices that are central to both school and other communities;
- Examine the ways in which networked activities tie classroom learning to the broader disciplinary community of practice (e.g., mathematics or science), *and* to knowledge, skills and practices students gain as members of their home communities;
- Focus data and analysis on the nature of what is learned in the problems posed and activities orchestrated (e.g., connection to practices, discourse, knowledge of disciplinary community of interest) in networked activities.

Specific theories inform examination of such things as:

- Students' movement from everyday or spontaneous concepts to formal or scientific concepts, mediated by social interaction in connected classrooms (cf., sociocultural, sociohistorical theories; Vygotsky, 1987)
- Issues of activity structures, participation, identity and community in classroom communities of practice (cf., legitimate peripheral participation and situated social practice theories; Lave & Wenger, 1991; Wenger, 1998), with networked technologies serving to focus participants' mutual engagement in the joint enterprise of the community i.e., learning, and shaping their shared mathematical and/or scientific repertoire (e.g., ways of approaching tasks, speaking, negotiating meaning and knowledge).
- Cross-case analyses of classrooms with and without networked tools, treating learning "as structured by activity, and research [as] examining the emergent structure of activities that... link one social activity to another and thus organize learning and cognition across activity contexts" (Rogoff, 1995, p. 129) (cf., sociocultural, sociohistorical theories; Wertsch, 1995; Cole, 1988; Gutierrez, 2002).
- Examining the mediating role of connected technologies, or how, for example, anonymity and the public display of emergent dynamic systems influence in unique ways what students learn (cultural historical activity theory; Cole & Engestrom, 1993; Leontiev, 1978).

Drawing on multiple theoretical perspectives adds explanatory power

Gutierrez and Stone (2000) argue for the “principled and strategic use of a combination of theoretical and methodological tools ...to make visible and document the intricate and dynamic social processes” (p. 150, 151) involved in classrooms. For example, research in CATAALYST classrooms that drew on theories of activity, discourse and reasoning, the mutually constitutive relation between classroom interaction and mathematics or science content would capture structural, interactional, and relational dimensions of classrooms. Specifically, given the focus on group-level engagement in networked classrooms, activity theory (Cole & Engestrom, 1993; Gutierrez & Stone, 2000; Leontiev, 1983) could highlight important intricacies in the development of powerful discourse. Such a project would emphasize participants’ roles, classroom rules, mediating artifacts (e.g., connected technologies), community (e.g., classroom), subjects (students, teacher), and object (e.g., mathematical reasoning, learning).

Drawing on Brown et al.’s (1993) work on shared construction of knowledge and reasoning in classrooms would then turn attention explicitly to the fact that: “... learners of all ages and levels of expertise and interests seed the environment with ideas and knowledge that are appropriated by different learners at different rates, according to their needs and to the current state of the zones of proximal development in which they are engaged” (p. 193). Their work and Vygotsky’s (1987) on the movement from everyday speech to the formal speech that characterizes mathematics or science could inform researchers’ examination of group-level development of discourse in connected classrooms.

Finally, Stroup, Ares, and Hurford’s (2004) work that explores networked classrooms as social spaces that emerge from activity within a discipline could direct attention to the mutually constitutive relation between content and activity. This approach recognizes the dialectic that exists between mathematical/scientific concepts and ideas and the sociocultural milieu in which classroom learning and teaching exists. Our idea of social space is very explicit in its attention to the structuring functions of mathematical and scientific concepts and ideas, in addition to framing networked classroom activity in terms of mediating artifacts, discourse, and participation. Together, then, these three theoretical and methodological frameworks could ground a powerful research design that would answer both whether and, more importantly, how networked classrooms bolster rigorous learning.

Access to powerful reasoning and discourses in the disciplines is a hallmark of these classroom technologies, but how and for whom?

There are high demands on both students and teachers in these classrooms, given the important focus on inquiry, investigation, and discussion. Given that many of these technologies are poised to become widely available and that research and development are still in the early stages, all involved in these projects should, I argue, be paying explicit attention to the affordances and challenges tied to these classroom technologies for students who have traditionally been underserved in schools. Participatory theoretical frameworks can guide research design to:

- Focus data and analysis on who participates in what ways; the use of multiple representations of phenomena, electronic and physical gestures, and discussion in connected classrooms invites varied, multilevel analyses of participation.
- Focus data and analysis on what kinds of opportunities to engage in powerful discourse and reasoning are available and for whom; the variety indicated above may provide

particularly rich opportunities for underserved learners to contribute to and participate in network-mediated learning.

Specific theories inform examination of such things as:

- The ways in which connected classroom activities invite students' and teachers' use of traditionally underserved students' cultural practices (e.g., mathematical, scientific knowledge, skills gained through participation in home community practices; patterns in argumentation, language use, etc.) as resources for rigorous academic learning (cf., funds of knowledge; Moll, Gonzalez, Civil, and colleagues; 1992; 1995, 2001; Warren, Rosebery, Conant and colleagues; 2001).
- The design of culturally responsive classroom technologies – Carol Lee's (2003) work in literacy challenges “designers of learning environments to consider how cultural practices, especially among student populations of color and those living in poverty, may offer opportunities to improve the design of learning technologies” (p. 42). Nicole Pinkard (2001) provides two examples of such technology-supported learning activities designed to leverage “contextually familiar text” and “culturally defined oral language skills possessed by African-American children [to] serve as critical bridges for developing their early literacy skills” (p. 19). Little to no work has been done to date in culturally responsive design in networked classrooms, or outside literacy learning. This area remains a wide-open and critically important feature of design and implementation, and the nature of networked technologies is such that research along these lines could make a substantial contribution.

Background: My primary goals in CATAALYST-related research are to explore participation, agency, and discourse in classrooms, with a particular focus on supporting the rigorous academic learning of historically under-served students. An example of previous work that has similar theoretical grounding is “Constructing Literacy: How Goals, Activity Systems, and Text Shape Classroom Practice”(Ares & Peercy, 2003), that identifies and describes features of classroom context that were important in shaping students' participation in the emerging community of literacy practice. The importance of exploring the mutually constitutive relation between students' developing literacy knowledge and skills, and classroom contexts and practices was illuminated by the identification of activity systems and texts as important dynamic structures. Recent work with Walter Stroup and Uriel Wilensky adds attention to the mediating role of their networked technology in the construction of mathematical and scientific discourse. “A Dialectic Analysis of Generativity: Issues of Network Supported Design in Mathematics and Science” (Stroup, Ares, & Hurford, 2004) proposes a model for networked teaching, learning, and design that treats mathematics and science as (1) constructed in socio-cultural contexts, and (2) as a way of structuring our understanding of and design for group-level teaching and learning. “Group-Level Development of Powerful Discourses in Mathematics: Networked Classroom Technologies as Mediating Artifacts” (Ares, Stroup, & Schademan, 2004) investigates the influence of the networked technology in supporting students' construction of discipline-specific discourse and practice. These studies provide a theoretical framework and methodology for attending to language, students' cultural practices, *and* content as resources in connected-classroom learning environments.