

## **Mathematics Teaching-Research Journal On-Line**

A peer-reviewed scholarly journal

Editors: Bronislaw Czarnocha (Hostos Community College)

Vrunda Prabhu (Bronx Community College)

Anne Rothstein (Lehman College)

City University of New York

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### **Agency, Identity and Achievement: Building Understandings of the Emergence of Scientific Literacy in Marginalized Student Populations**

Research Interests of Rowhea Elmesky

Science education, as it has been actualized for disadvantaged populations, contributes to the social reproduction of individuals' positions in society. Since success in the area of science serves as a central key for unlocking doors to higher education and to a vast range of career opportunities, there are severe consequences when culturally marginalized and economically disadvantaged students "fail" (according to standard measurements) to achieve highly in science. Marginalized youth living in poverty in large urban centers are among those most disadvantaged in schools and in society at large, and hence represent the focal population with whom my research interests lie.

I hold strong convictions that science education should not be about stratifying students or maintaining the current stratifications in place. Thus, I maintain a research focus that searches for understanding how science education can be a transformational force in the lives of all children. While my interests include studying the role that macro-level factors (e.g., societal racism, adequate science classroom facilities and resource access) play in shaping inequitable science classrooms, I predominantly conduct research that builds understandings of how teaching and learning practices (meso-level) and classroom interaction dynamics (micro-level) shape the emergence of science literacy among economically disadvantaged, culturally marginalized youth. I articulate a research agenda that places attention more centrally upon the students and on building understandings of how their embodied resources are accessed and appropriated, both consciously and unconsciously, in ways that may mediate their modes of participation in science class and lead to their empowerment or disempowerment as science learners as well as to their identification with science as a discipline. Specifically, I am committed to: 1) developing new ways of defining and recognizing student achievement in science classrooms; 2) studying student practices as resources that can promote and/or truncate their power to act (agency) as science learners; and 3) formulating understandings of how and why students' identities may shift to include or exclude perceptions of being successful science learners.

In conducting science education research, I utilize sociocultural theoretical lenses to a) illuminate classroom practices as forms of enacted culture, b) acknowledge the dialectical

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relationship between classroom structures and student agency, and c) view identity as a mediated outcome of classroom participation. My focus upon students' embodied practices has arisen from understanding that much of what occurs in the classroom is unconscious and originates from multiple realms both outside and inside of school. I study embodied resources as ways of being that develop in multiple places and may include specific knowledge, values, skills, morals, aspirations, rituals, beliefs, goals or interests as well as manners of interacting, communicating or moving. Identifying how students access and activate these resources toward their own goals in science learning contexts becomes central in considering how youth can re-position themselves with power, authority and respect in the science classroom. That is, by studying how they access their own resources in learning science, I can learn how students may experience shifts in their identification with science as a discipline.

Research concerned with expanding the existing conceptualizations of science and science achievement, recognizing student agency, and enhancing students' identification with science calls for particularly unique research designs. That is, since marginalized children living in economically disadvantaged circumstances represent a silenced group in schools (and in society), I am interested in considering how the research process (and not just the research findings) can be transformative. To this end, I focus upon utilizing critical ethnography since it is concerned with the empowerment of those involved and monitor the authenticity of the study, or the extent to which the research is educative, empowering, fair and catalytic, by introducing unique research group dynamics and nontraditional approaches to data and artifact collection and analyses. Thus, the roles of the research participants can expand as data are collected, produced and analyzed in a joint effort. In addition, I value holding research meetings with the teacher(s) and student researchers in the form of cogenerative dialogues or collective conversations in which all members accept responsibility for understanding classroom activity, with a commitment to blur power differentials amongst the researchers, to provide a space for building common theoretical language, and for developing analytical skills such as video microanalysis.

In conclusion, for decades upon decades, scientific literacy and science education have been situated within a culture of science that values the individual over the collective, the abstract over the contextualized, and the objective over the emotional. Unless students learn to communicate scientific literacy in ways that are recognized and acknowledged in the dominant society, science as a field remains inaccessible by the majority of marginalized populations. In my research endeavors and associated publications, I

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attempt to augment the limited literature that implores the nation to expand our definitions of scientific literacy, by recognizing and acknowledging students' ways of being as useful resources for mediating their participation in science classrooms and forming a positive association with science. Hence I remain committed to studying how scientific literacy and identity emerge through multiple forms of participation and are socially mediated by agentic access and appropriation of resources in hopes of making important strides toward improving the quality of science education experiences for marginalized children.

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