Title of Project:
Scientific Inquiry as Social and Linguistic Practice:
Language Socialization Pathways in a 9th Grade Physics Class

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Summary of Research Findings

Introduction

Students designated as English Learners (ELs) by the U.S. public school system consistently score lower on standardized tests than their native-English speaking peers (National Center for Education Statistics, 2013). In some cases these performance gaps persist after students exit English as a Second Language (ESL) programs (Short, 2002). ELs are identified for special education services at higher rates than their native English-speaking peers (Sullivan, 2011), and ELs are more likely to live in poverty and to drop out of high school than their mainstream peers (U.S. Census Bureau, 2011). In addition, ELs and other language minority students who come from an array of racial and ethnic minority groups are underrepresented in STEM (science, technology, engineering and mathematics) fields.

Improving education for language learners in STEM requires teacher educators in content areas, such as the sciences, to view the language of science as an object of study and as an object that requires explicit classroom instruction. Popular approaches to integrating language and content instruction (e.g., Echevarria, Vogt & Short, 2013) provide content area teachers with some of the instructional skills needed to simultaneously promote students' development of language and content knowledge. However, case study research reveals that students need more than skills and knowledge in order to appropriate "smart science student" identities (e.g., Carlone, Haun-Frank & Webb, 2011; Brown, 2004, 2006). In order to meet the societal goal of promoting language learners' access to mainstream careers in the sciences, we must explore not

only how ELs learn language and content, but also how EL students construct disciplinary identities as they participate in scientific investigations in science classroom communities.

Methodology

The research described in this report draws from a physics classroom ethnography that employs a language socialization framework and a social semiotic approach to across event discourse analysis (Wortham & Reyes, 2015) to understanding how three bilingual Latina students are socialized into or out of student *science expert* identities through peer interactions during scientific inquiry tasks (i.e., tasks that pose questions or problems rather than present a set of facts).

Research questions. I ask the following research questions about the classroom community and the socialization pathways of the three focal participants:

1. (a) What local identity models are associated with success during inquiry instruction in one 9th grade physics class? (b) How do students discursively construct these identities?
2. (a) What pathways of socialization do three bilingual Latina students undergo while participating in science inquiry labs? (b) How do these pathways relate to students' language and science content learning?

I answered these questions by collecting ethnographic (e.g., field notes, artifacts, etc.) and discourse data (video and audio recordings) in one 9th grade physics classroom during the 2014-2015 Academic Year. From the over 200 hours of recordings I collected, I selected three individual lab tasks to serve as the focal events in my corpus. Altogether my corpus contained almost nineteen hours of peer interaction.

Participants. The school, Science For All Academy (SFAA; all names for places and persons are pseudonyms) was a district run science-focused charter school. The focal participants in this study are three bilingual Latina students who were all 14 years of age at the beginning of the study. Rose was born in the U.S. but did not identify herself as an American; in addition, she regularly spent time with family in Mexico. Gu Jun Pyo was born in Peru and immigrated to the U.S. when she was approximately eight years old. OneDirectioner emigrated from the Dominican Republic two years prior to the start of this study and she was classified as an English Learner as a result of testing at the school. There were no other Latina students in the diverse classroom in which this research was conducted although there were three Latino students as well. Most students in the classroom were native English speakers. The teacher was in his 13th year of teaching at the time of the study and he held state teaching endorsements in multiple physical science domains (e.g., physics, earth science, etc.) and in teaching English as a Second Language.

Findings

In answering my first research question I found that students in this classroom constructed three different identity models associated with academic success: the *good assistant*, the *good student*, and the *science expert*. I refer to each of these positions as identity models for "success" because occupying one of these roles lead to explicit and implicit positive feedback from students' peers and the teacher. The identity positions were marked linguistically by how and when students used: scientific vocabulary, stance-taking behaviors, peer nominations,

evaluations of peer performances, permission, and silence. Students also varied in how they used or controlled materials and with whom they consulted when they were uncertain in how to proceed with their tasks (e.g., the teacher, other *science experts*, etc.). The identity positions were somewhat flexible in that an individual could occupy two identities in one interaction (e.g., the science expert and the good student) or a student could occupy different identities in different lab groups. This finding is significant because it challenges the idea that there is one presentation of the "good science student" identity in a classroom. Classroom discourse studies that focus only on teacher-lead classroom discourse in whole class discussions fail to account for the ways that peer interaction can inform disciplinary identity development. This is particularly important to consider in classrooms where students often work in groups and in classrooms where only a few students dominate whole class discussions. For some students, their only verbal contributions to classroom discourse come during peer interactions. This dissertation demonstrates how students position themselves and how others position them with respect to disciplinary identities in one science classroom. In addition, my analysis of how students developed and articulated positions of expertise demonstrates that "science discourse" during lab tasks may include little science vocabulary even when scientific concepts are being implicitly negotiated. As a result, the language of expertise in science classrooms is not composed only (or even primarily) of the lexical items of the scientific discipline, but of the pragmatic strategies necessary for negotiating social status.

In answering my second research question I found that there were limitations on the flexibility of the identities that the three focal participants constructed over the course of the inquiry tasks in my corpus. For example, Rose was positioned as a *good assistant* by her peers and via her own actions in the first two labs. In the third lab she attempted to be recognized as a *science expert* but she was denied a position of expertise due to her lack of knowledge on how to use the lab computer. Tracing and comparing the socialization pathways of the three girls revealed four generalizations that have important implications for teacher education.

First, disciplinary identities are co-constructed among peers during lab tasks. When considering students' agency as language learners, we must consider how peer language socialization constrains this agency. Second, students from families with higher socioeconomic status and scientist parents more readily achieved *science expert* status in their peer groups. This dissertation demonstrates *how* children reproduce the social hierarchies present outside of the classroom when they work in groups without teacher intervention. Third, Mock Spanish (Hill, 1999, 2008) appeared to serve as an important resource for socializing Spanish-speaking students into roles of marginal participation in their peer groups. Fourth, the teacher's instructional choices directly and indirectly influenced peer interaction in profound ways even when he spent little time with individual groups. Three teacher practices directly influenced peer socialization: lack of instruction on how to operate as a collaborative group, lack of adequate instruction on how to use lab equipment, and requiring students to learn what they missed after school absences by talking with peers. In many ways the teacher of this physics class was exemplary, however, these three practices negatively impacted the language and content learning opportunities of the Latina students in this classroom community.

Implications for Teacher Education

In my dissertation I discuss the implications of these findings for research on classroom discourse, language socialization, Latino/as in STEM, and teacher education. I share here my suggestions for how to apply my findings to language teacher education, and in particular to the preparation of mainstream (K-12) teachers for working with language learners in their content areas. First, I advocate for teachers to be trained in classroom discourse analysis. By learning how to analyze classroom interaction in their own classrooms, teachers will gain the reflective and analytical skills that are necessary to address the various socialization phenomena occurring in their classrooms.

Second, if students are required to use specialized equipment in order to complete a task as a group, teachers must ensure that all students know how to use this equipment. By relying on students to teach one another how to use equipment without accountability for doing so, the teacher in this study inadvertently reinforced social hierarchies that were present outside of the classroom. Students who knew how to use equipment did not teach other students how to use it; rather, they used this knowledge to control the group tasks.

Third, teachers should consider how to create rotating positions of leadership in their classrooms and how to support students in developing the expertise they need to become leaders through the use of explicit instruction. Teacher educators and researchers need to conduct more research in this area to test the effectiveness of different approaches for teaching students group leadership and group participation skills. Instruction that prepares teachers to identify the language demands of content-area tasks should include attention to peer group interactions.

Lastly, in my dissertation, I advocate for the creation of a multilingual science fair in the school in which I conducted this study as a means to elevate the status of Spanish and by extension the Spanish-speakers in the school community. The school in which I conducted this research is uniquely situated with a mission to serve diverse students, passionate teachers who share this mission, a science-focused curriculum, an annual internal science fair already in place, and access to resources at local universities. For these reasons, a multilingual science fair would be plausible in this context, but it is not a one size fits all recommendation. My research demonstrates that native and non-native English speaking students' language ideologies related to speaking Spanish and English were interwoven with students' abilities to articulate science expertise in one 9th grade physics classroom. Similar phenomena are likely at work in other schools and classrooms where the statuses of students' L1 languages and cultures are not being promoted by students and teachers. Teacher educators must consider how they prepare teachers of linguistically and culturally diverse students to promote rather than denigrate the status of students' home languages. How teachers elevate the status of students' home languages will vary based on their students and teaching contexts, but teachers must be taught to recognize that failure to do so could inadvertently impact students' disciplinary identity development. Taken together, the suggestions outlined here begin to address the identity-related needs of English Learners in science classroom communities.

References

Abedi, J. (2006). Psychometric issues in the ELL assessment and special education eligibility. *The Teachers College Record, 108*(11), 2282-2303.

Agha, A. (2007). *Language and social relations*. Cambridge,UK: Cambridge University Press

Alemán, E. (2006). Is Robin Hood the "Prince of Thieves" or the pathway to equity? *Educational Policy, 20*(1), 113-142.

Alemán, E. (2009). Leveraging conflict for social justice: How "leadable" moments can transform school culture. *Journal of Cases in Educational Leadership, 12*(4), 1-16.

Atkinson, J. M., & Heritage, J. (Eds.). (1984). *Structures of social action: Studies in conversation analysis*. Cambridge,UK: Cambridge University Press.

Atkinson, D. (2011). Introduction: Cognitivism and second language acquisition. In D. Atkinson (Ed.), *Alternative approaches to second language acquisition* (pp. 1-23). New York, NY: Routledge.

Bailey, B. (2001). Dominican-American ethnic/racial identities and United States social categories. *International Migration Review, 35*(3), 677-708.

Baquedano-López, P. (2000). Narrating community in doctrina classes. *Narrative Inquiry, 10*(2), 1-24.

Barrett, R. (1999). Indexing polyphonous identity in the speech of African American drag queens. In M. Bucholtz, A. C. Liang, & L. A. Sutton (Eds.), *Reinventing identities: The gendered self in discourse.* New York, NY: Oxford University Press.

Basu, S. J., & Calabrese Barton, A. (2007). Developing a sustained interest in science among urban minority youth. *Journal of Research in Science Teaching, 44*(3), 466-489.

Beckett, G. H. (2005). Academic language and literacy socialization through project-based instruction: ESL student perspectives and issues. *Journal of Asian Pacific Communication, 15*(1), 191-206.

Bernard, H. R. (2006). *Research methods in anthropology: Qualitative and quantitative approaches*, 4th edition. Lanham, MD: Altamira Press.

Bloome, D., Carter, S., Christian, B., Otto, S., & Shuart-Faris, N. (2005). *Discourse analysis and the study of classroom language and literacy events: A microethnographic perspective*. Mahwah, NJ: Lawrence Erlbaum Associates.

Brayboy, B., & Dehyle, D. (2000). Insider-outsider: Researchers in American Indian communities. *Theory Into Practice, 39*(3), 163-169.

Brown, B. A. (2004). Discursive identity: Assimilation into the culture of science and its implications for minority students. *Journal of Research in Science Teaching, 41*(8), 810-834.

Brown, B. A. (2006). "It isn't no slang that can be said about this stuff": Language, identity, and appropriating science discourse. *Journal of Research in Science Teaching, 43*(1), 96-126.

Brown, B. A., Reveles, J. M., & Kelly, G. J. (2005). Scientific literacy and discursive identity: A theoretical framework for understanding science learning. *Science Education, 89*(5), 779-802.

Bucholtz, M. (2011). *White kids: Language, race, and styles of youth identity*. New York, NY: Cambridge University Press.

Bucholtz, M., Barnwell, B., Skapoulli, E., & Lee, J.-E. J. (2012). Itineraries of identity in undergraduate science. *Anthropology & Education Quarterly, 43*(2), 157-172.

Bucholtz, M., & Hall, K. (2008). Finding identity: Theory and data. *Multilingua: Journal of Cross-Cultural and Interlanguage Communication, 27*(1-2), 151-163.

Bucholtz, M., Skapoulli, E., Barnwell, B., & Lee, J.-E. J. (2011). Entextualized humor in the formation of scientist identities among U.S. undergraduates. *Anthropology & Education Quarterly, 42*(3), 177-192.

Bucholtz, M., & Hall, K. (2004). Language and identity. In A. Duranti (Ed.), *A companion to linguistic anthropology* (pp. 369-394). Oxford, UK: Blackwell.

Calabrese Barton, A. (2001). Science education in urban settings: Seeking new ways of praxis through critical ethnography. *Journal of Research in Science Teaching, 38*(8), 899-917.

Calabrese Barton, A., & Tan, E. (2009). Funds of knowledge and discourses and hybrid space. *Journal of Research in Science Teaching, 46*(1), 50-73.

Carlone, H. B. (2012). Methodological considerations for studying identities in school science: An anthropological approach. In M. Varelas (Ed.), *Identity construction and science education research: Learning, teaching, and being in multiple contexts.* (pp. 9-26). Rotterdam, NE: Sense Publishers.

Carlone, H. B., Haun-Frank, J., & Webb, A. (2011). Assessing equity beyond knowledge-and-skills-based outcomes: A comparative ethnography of two fourth-grade reform-based science classrooms. *Journal of Research in Science Teaching, 48*(5), 459-485.

Carr, E. S. (2010). Enactments of expertise. *Annual Review of Anthropology, 39*, 17-32.

Cazden, C. B. (1988). *Classroom discourse: The language of teaching and learning*. Portsmouth, NH: Heinemann Educational Books, Inc.

Cazden, C. B. (2001). *Classroom discourse: The language of teaching and learning*. Portsmouth, NH: Heinemann.

Chavez, C. (2008). Conceptualizing from the inside: Advantages, complications, and demands on insider positionality. *The Qualitative Report, 13*(3), 474-494.

Cho, J., & Trent, A. (2006). Validity in qualitative research revisited. *Qualitative Research 6*(3), 319-340.

Chun, E. (2007). *The meaning of mocking: Stylizations of Asians and preps at a U.S. high school.* (Unpublished dissertation). University of Texas at Austin.

Chun, E. W. (2001). The construction of white, black, and Korean American identities through African American vernacular English. *Journal of Linguistic Anthropology, 11*(1), 52-64.

Cole, K. (2002). *Negotiating the 'daily calendar': A language socialization perspective of diverse learners in a mainstream science class.* (Unpublished dissertation). University of Wisconsin, Madison.

Cole, K., & Zuengler, J. (2003). Engaging in an authentic science project: Appropriating, resisting, and denying "scientific" identities. In R. Bayley & S. Schecter (Eds.), *Language socialization in bilingual and multilingual societies* (pp. 98-113). Clevedon, UK: Multilingual Matters.

Doughty, C., & Williams, J. (Eds.). (1998). *Focus on form in classroom second language acquisition*. Cambridge, UK: Cambridge University Press.

DuBois, J., Cumming, S., & Paolino, S. S. C. D.. (1992) Discourse transcription. *Santa Barbara papers in linguistics: volume 4*: University of California, Santa Barbara, Department of Linguistics.

Duff, P. A. (1995). An ethnography of communication in immersion classrooms in Hungary. *TESOL Quarterly, 29*(3), 505-537.

Duff, P. A. (2002). The discursive co-construction of knowledge, identity, and difference: An ethnography of communication in the high school mainstream. *Applied Linguistics, 23*(3), 289-322.

Duff, P. A. (2004). Intertextuality and hybrid discourses: The infusion of pop culture in educational discourse. *Linguistics and Education, 14*(3), 231-276.

Duff, P. A. (2008). *Case study research in applied linguistics*. New York, NY: Taylor & Francis Group.

Duff, P. A. (2010). Language socialization into academic discourse communities. *Annual Review of Applied Linguistics, 30*, 169-192.

Duff, P. A., & Talmy, S. (2011). Language socialization approaches to second language acquisition: Social, cultural, and linguistic development in additional languages. In D. Atkinson (Ed.), *Alternative approaches to second language acquisition* (pp. 95-116). New York, NY: Routledge.

Echevarria, J. (2005). Using SIOP in science: Response to Settlage, Madsen, and Rustad. *Issues in Teacher Education, 14*(1), 59-62.

Echevarria, J., Vogt, M. E. J., & Short, D. (2013). *Making content comprehensible for English learners: The SIOP model, 4th edition*. Upper Saddle River, NJ: Pearson.

Eckert, P. (2000). *Linguistic variation as social practice: The linguistic construction of identity in Belton High*. Malden, MA: Blackwell.

Eckert, P. (2008). Variation and the indexical field. *Journal of Sociolinguistics, 12*(4), 453-476.

Eckert, P. (2012). Three waves of variation study: The emergence of meaning in the study of sociolinguistic variation. *Annual Review of Anthropology, 41*(1), 87-100.

Edwards, A., & Westgate, D. P. (1994). *Investigating classroom talk*. London, UK: The Falmer Press.

Edwards, A. D., & Westgate, D. P. G. (1994). *Investigating classroom talk, 2nd edition*. London, UK: The Falmer Press.

Egbert, J. (2013). *Toward a linguistic taxonomy of English academic writing*. Paper presented at the University of Utah student Conference in Linguistics, Salt Lake City, Utah.

Egbert, J. (2014). *Reader perceptions of linguistic variation in published academic writing*. (Unpublished dissertation). University of Arizona, Tuscon.

Evans-Pritchard, E. E. (1937). *Witchcraft, oracles and magic among the Azande*. Oxford, UK: Clarendon Press.

Fishman, J. A. (1972). Language use in mutilingual societies. In J. B. Pride & J. Holmes (Eds.), *Sociolinguistics: Selected readings* (pp. 15-32). Middlesex, UK: Penguin.

Foley, D. E. (2000). The politics of studying Raza Unida politics: Reflections of a white anthropologist. In R. R. Flores (Ed.), *Reflexiones 1999: New directions in Mexican American Studies* (pp. 51-80). Austin, TX: Center for Mexican American Studies.

Foucault, M. (1980). *Power/knowledge: Selected interviews and other writings 1972-1977*. New York, NY: Pantheon Books.

Gallas, K. (1995). *Talking their way into science: Hearing children's questions and theories, responding with curricula*. New York, NY: Teachers College Press.

Garrett, P. B. (1999). *Language socialization, convergence, and shift in St. Lucia, West Indies*. (Unpublished dissertation). New York University.

Garrett, P. B., & Baquedano-López, P. (2002). Language socialization: Reproduction and continuity, transformation and change. *Annual Review of Anthropology*, *31*, 339-361.

Gee, J. (2005). Language in the science classroom: Academic social languages as the heart of school-based literacy. In R. Yerrick & W. M. Roth (Eds.), *Establishing scientific classroom discourse communities* (pp. 19-37). Mahwah, NJ: Lawrence Erlbaum.

Gee, J. (2011). *An introduction to discourse analysis: Theory and method*. New York, NY: Routledge.

Gee, J. P. (1996). *Social linguistics and literacies: Ideology in discourses*. London, UK: Taylor & Francis.

Geertz, C. (1973). *The interpretation of cultures: Selected essays*. New York, NY: Basic books.

Gibbons, P. (2003). Mediating language learning: Teacher interactions with ESL students in a content-based classroom. *TESOL Quarterly, 37*(2), 247-273.

Ginsberg, D. (2015). Multimodal semiotics of mathmatics teaching and learning (Doctoral dissertation). Retrieved from ProQuest. (ISBN: 9781339311517)

Glesne, C. (2011). *Becoming qualitative researchers, 4th edition*. Boston, MA: Pearson.

Gumperz, J. J., & Cook-Gumperz, J. (2008). Studying language, culture, and society: Sociolinguistics or linguistic anthropology? *Journal of Sociolinguistics, 12*(4), 532-545.

Halliday, M. A. (1994). *An Introduction to functional grammar, 2nd edition*. London, UK: Edward Arnold.

Halliday, M. A. K. (1975). *Learning how to mean: Explorations in the development of language*. London, UK: Edward Arnold.

Hanrahan, M. U. (2006). Highlighting hybridity: A critical discourse analysis of teacher talk in science classrooms. *Science Education, 90*(1), 8-43.

Harklau, L. (2003). Representational practices and multi-modal communication in US high schools: Implications for adolescent immigrants. In R. Bayley & S. Schecter (Eds.), *Language socialization in bilingual and multilingual societies* (pp. 83-97). Clevedon, UK: Multilingual Matters.

Hatch, J. A. (2002). *Doing qualitative research in education settings*. Albany, NY: SUNY Press.

Hayes-Harb, R., Nicol, J., & Barker, J. (2010). Learning the phonological forms of new words: Effects of orthographic and auditory input. *Language and Speech, 53*(3), 367-381.

Heath, S. B. (1983). *Ways with words: Language, life and work in communities and classrooms*. Cambridge, UK: Cambridge University Press.

Heath, S. B., & Street, B. V. (2008). *On ethnography: Approaches to language and literacy research*. New York, NY: Teachers College Press.

Heller, M. (2001). Legitimate language in a multilingual school. In M. Heller & M. Martin-Jones (Eds.), *Voices of authority: Education and linguistic difference* (pp. 381-402). Westport, CT: Ablex.

Hill, J. (1999). Language, race, and white public space. *American Anthropologist, 100*(3), 680-689.

Hill, J. (2008). The everyday language of white racism. Chichester, UK: Wiley-Blackwell.

Hornstein, N., Nunes, J., & Grohmann, K. (2005). *Understanding minimalism*. Cambridge, UK: Cambridge University Press.

Hymes, D. (1972). On communicative competence. In J. B. Pride & J. Holmes (Eds.), *Sociolinguistics: Selected readings* (pp. 269-293). Middlesex, UK: Penguin.

Jacoby, S. (1998). *Science as performance: Socializing scientific discourse through the conference talk rehearsal.* (Unpublished dissertation). University of California, Los Angeles.

Kamberelis, G., & Wehunt, M. D. (2012). Hybrid discourse practice and science learning. *Cultural Studies of Science Education*, 1-30.

Kärkkäinen, E. (2003). *Epistemic stance in English conversation: A description of its interactional functions, with a focus on I think*. Amsterdam, the Netherlands: John Benjamins.

Kelly, G. J. (2012). Expanding discourse repertoires with hybridity. *Cultural Studies of Science Education*, *7*(3), 535-539.

Kermes, H., & Teich, E. (2012). Formulaic expressions in scientific texts: Corpus design, extraction and exploration. *Lexicographica, 28*(1), 99-119.

Labov, W. (2002). Book review: Linguistic variation as social practice by Penelope Eckert. *Language in Society, 31*(2), 277-284.

Latour, B. (1999). *Pandora's hope: Essays on the reality of science studies*. Cambridge, MA: Harvard University Press.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge, UK: Cambridge University Press.

Lee, O. (2003). Equity for linguistically and culturally diverse students in science education: A research agenda. *Teachers College Record, 105*(3), 465-489.

Lee, O., Buxton, C., Lewis, S., & LeRoy, K. (2006). Science inquiry and student diversity: Enhanced abilities and continuing difficulties after an instructional intervention. *Journal of Research in Science Teaching, 43*(7), 607-636.

Lee, O., & Fradd, S. H. (1998). Science for all, including students from non-English-language backgrounds. *Educational Researcher, 27*(4), 12-21.

Lemke, J. (2000). Across the scales of time. *Mind, Culture and Activity, 7*, 273-290.

Lemke, J. L. (1990). *Talking science: Language, learning, and values*. Norwood, NJ: Ablex Publishing Corporation.

Lewis, J., Menzies, H., Najera, E. & Page, R. (2009). Rethinking trends in minority participation in the sciences. *Science Education, 93*(6), 961-977.

MacSwan, J., & Rolstad, K. (2006). How language proficiency tests mislead us about ability: Implications for English language learner placement in special education. *The Teachers College Record, 108*(11), 2304-2328.

Marshall, C., & Rossman, G. (2011). *Designing qualitative research, 5th edition*. Thousand Oaks, CA: Sage.

Martin, S., & Siry C. (2012). Using video in science teacher education: An analysis of the utilization of video-based media by teacher educators and researchers. In B. J. Fraser, K. G. Tobin, & C. J. McRobbie (Eds.), *Second international handbook of science education* (pp. 417-433). Dordrecht, the Netherlands: Springer.

Massoud, L. A., & Kuipers, J. C. (2008). Objectification and the inscription of knowledge in science classrooms. *Linguistics and Education, 19*(3), 211-224.

Maybin, J. (2003). Voices, intertextuality and induction into schooling. In S. Goodman, T. Lillis, J. Maybin & N. Mercer (Eds.), *Language, literacy, and education: A reader* (pp. 159-170). Staffordshire, UK: Trentham Books.

Meek, B. (2001). *Kaska language socialization, acquisition, and shift*. (Unpublished dissertation). University of Arizona, Tuscon.

Mehan, H. (1979). *Learning lessons: Social organization in the classroom*. Cambridge, MA: Harvard University Press.

Mehan, H. (1998). The study of social interaction in educational settings: Accomplishments and unresolved issues. *Human Development, 41*(4), 245-269.

Mendoza-Denton, N. (2008). *Homegirls: Language and cultural practice among Latina youth gangs*. New York, NY: John Wiley & Sons.

Miller, E. R., & Zuengler, J. (2011). Negotiating access to learning through resistance to classroom practice. *The Modern Language Journal, 95*, 130-147.

Moje, E. B., Collazo, T., Carrillo, R., & Marx, R. W. (2001). "Maestro, what is 'quality'?": Language, literacy, and discourse in project-based science. *Journal of Research in Science Teaching, 38*(4), 469-498.

National Academy of Sciences. (1996). *National science education standards*. Washington, DC: National Academy Press.

National Academy of Sciences. (1997). *Science for all children: A guide to improving elementary science education in your school district*. Washington, DC: National Academy Press.

Norris, J. M., & Ortega, L. (2000). Effectiveness of L2 Instruction: A research synthesis and quantitative meta-analysis. *Language Learning, 50*(3), 417-528.

Norton Peirce, B. (1995). Social identity, investment, and language learning. *TESOL Quarterly, 29*(1), 9-31.

Norton, B., & McKinney, C. (2011). An identity approach to second language acquisition. In D. Atkinson (Ed.), *Alternative approaches to second language acquisition* (pp. 73-94). New York, NY: Routledge.

O'Barr, W., & Atkins, B. (1980). "Women's language" or "powerless language". In S. McConnell-Ginet, R. Borker, & N. Furman (Eds.), *Women and language in literature and society* (pp. 93-110). New York, NY: Praeger Publishers.

Ochs, E. (1979). Transcription as theory. *Developmental Pragmatics*, *10*(1), 43-72..

Ochs, E., & Schieffelin, B. (1984). Language acquisition and socialization: Three developmental stories and their implications. In R. Shweder & R. LeVine (Eds.), *Culture theory* (pp. 276-320). Cambridge, UK: Cambridge University Press.

Ochs, E., & Schieffelin, B. (2008). Language socialization: An historical overview. In N. H. Hornberger & P. A. Duff (Eds.), *Encyclopedia of language and education, volume 8: Language socialization* (pp. 3-16). New York, NY: Springer.

O'Connor, K. (2003). Communicative practice, cultural production, and situated learning: Constructing and contesting identities of expertise in a hetereogeneous learning context. In S. Wortham & B. Rymes (Eds.), Linguistic anthropology of education. Westport, CT: Praeger.

Philips, S. (1993). *The invisible culture*. Long Grove, IL: Waveland Press.

Philips, S. U. (1983). *The invisible culture: Communication in classroom and community on the Warm Springs Reservation*. Long Grove, IL: Waveland Press, Inc.

Ready, D. (2010). Socioeconomic disadvantage, school attendance, and early cognitive development: The differential effects of school exposure. *Sociology of Education, 83*(4), 271-286.

Richards, J. C. (1987). The dilemma of teacher education in TESOL. *TESOL Quarterly, 21*(2), 209-226.

Rifkin, W. D., & Martin, B. (1997). Negotiating expert status: Who gets taken seriously. *IEEE Technology and Society Magazine*, Spring.

Rochin, R., & Mello, S. (2007). Latinos in science. *Journal of Hispanic Higher Education, 6*(4), 305-355.

Rosebery, A. S., Warren, B., & Conant, F. R. (1992). Appropriating scientific discourse: Findings from language minority classrooms. *The Journal of the Learning Sciences, 2*(1), 61-94.

Rymes, B. (2009). *Classroom discourse analysis: A tool for critical reflection*. Cresskill, NJ: Hampton Press, Inc.

Rymes, B., & Anderson, K. (2004). Second language acquisition for all: Understanding the interactional dynamics of classrooms in which Spanish and AAE are spoken. *Research in the Teaching of English*, *39*(2), 107-135.

Rymes, B. R. (2001). *Conversational borderlands: Language and identity in an alternative urban high school*. New York, NY: Teachers College Press.

Rymes, B. R. (2003). Relating word to world: Indexicality during literacy events. In S. Wortham & B. Rymes (Eds.), *Linguistic anthropology of education* (pp. 121-150). Westport, CT: Praeger.

Saville-Troike, M. (1982). *The ethnography of communication: An introduction*. Oxford, UK: Basil Blackwell.

Schleppegrell, M., & Achugar, M. (2003). Learning language and learning history: A functional linguistics approach. *TESOL Journal, 12*(2), 21-27.

Schleppegrell, M. J. (2004). *The language of schooling: A functional linguistics perspective*. Mahwah, NJ: Lawrence Erlbaum Associates.

Schleppegrell, M. J., Achugar, M., & Oteíza, T. (2004). The grammar of history: Enhancing content-based instruction through a functional focus on language. *TESOL Quarterly, 38*(1), 67-93.

Schleppegrell, M. J., & Colombi, M. C. (2002). *Developing advanced literacy in first and second languages: Meaning with power*. Mahwah, NJ: Lawrence Erlbaum.

Schleppegrell, M., & O'Halloran, C. (2011). Teaching academic language in L2 academic settings. *Annual Review of Applied Linguistics, 31*, pp. 3-18.

Seedhouse, P. (2004). *The interactional architecture of the language classroom: A conversation analysis perspective*. Malden, MA: Blackwell.

Settlage, J., Madsen, A., & Rustad, K. (2005). Inquiry science, sheltered instruction, and English language learners: Conflicting pedagogies in highly diverse classrooms. *Issues in Teacher Education, 14*(1), 39-57.

Sewell, W. (1992). A theory of structure: duality, agency, and transformation. *American Journal of Sociology, 98*(1), 1-29.

Sherif, B. (2001). The ambiguity of boundaries in the fieldwork experience: Establishing rapport and negotiating insider/outsider status. *Qualitative Inquiry, 7*(4), 436-447.

Shuman, A. (1986). *Storytelling rights: The uses of oral and written texts by urban adolescents*. Cambridge, UK: Cambridge University Press.

Silverstein, M. (1976). Shifters, linguistic categories, and cultural description. *Meaning in anthropology*, *1*, 11-55.

Siry, C. & Martin, S. (2014). Facilitating reflexivity in preservice science teacher education using video analysis and cogenerative dialogue in field-based methods courses. *Eurasia Journal of Mathematics, Science & Technology Education, 10*(5), 481-508.

Sullivan, A. L. (2011). Disproportionality in special education identification and placement of English language learners. *Exceptional Children, 77*(3), 317-334.

Tan, E., & Calabrese Barton, A. (2008a). From peripheral to central, the story of Melanie's metamorphosis in an urban middle school science class. *Science Education, 92*(4), 567-590.

Tan, E., & Calabrese Barton, A. (2008b). Unpacking science for all through the lens of identities-in-practice: The stories of Amelia and Ginny. *Cultural Studies of Science Education, 3*(1), 43-71.

Tan, E., & Calabrese Barton, A. (2010). Transforming science learning and student participation in sixth grade science: A case study of a low-income, urban, racial minority classroom. *Equity & Excellence in Education, 43*(1), 38-55.

U.S. Census Bureau. (2011). *American community survey*. Retrieved May 7, 2012, from http://www.census.gov/acs/www/

U.S. Department of Commerce. (2011a). *Education supports racial and ethnic equality in STEM*. Retrieved January 14, 2012, from http://www.esa.doc.gov/sites/default/files/reports/documents/educationsupportsracialande thnicequalityinstem_0.pdf

U.S. Department of Commerce. (2011b). *STEM: Good jobs now and for the future*. Retrieved January 15, 2012, from http://www.esa.doc.gov/sites/default/files/reports/documents/stemfinalyjuly14_1.pdf

Vickers, C. H. (2007). Second language socialization through team interaction among electrical and computer engineering students. *The Modern Language Journal, 91*(4), 621-640.

Viechnicki, G. B. (2008). Grammatical processes of objectification in a middle school science classroom. *Linguistics and Education: An International Research Journal, 19*(3), 244-264.

Wortham, S. (1994). *Acting out participant examples in the classroom*. Philadelphia, PA: John Benjamins.

Wortham, S. (2001). *Narratives in action*. New York, NY: Teacher's College Press.

Wortham, S. (2006). *Learning identity: The joint emergence of social identification and academic learning.* New York, NY: Cambridge University Press.

Wortham, S. (2008). The objectification of identity across events. *Linguistics and Education, 19*(3), 294-311.

Wortham, S. E. (2005). Socialization beyond the speech event. *Journal of Linguistic Anthropology, 15*(1), 95-112.

Wortham, S., & Reyes, A. (2015). *Discourse analysis beyond the speech event*. London,UK: Routledge.

Zappa-Hollman, S. (2007). Academic presentations across post-secondary contexts: The discourse socialization of non-native English speakers. *Canadian Modern Language Review/La Revue canadienne des langues vivantes, 63*(4), 455-485.

Zwiers, J. (2008). *Building academic language: Essential practices for content classrooms, grades 5-12*. San Francisco, CA: John Wiley & Sons.