

Martha M. Canipe – Research Statement

Despite recognition that it is important for students to have high-quality science experiences throughout elementary school (National Research Council, 2007), less time is spent teaching science than either reading/language arts or mathematics in elementary schools across the United States (Banilower et al., 2013). Additionally, science in elementary schools is often taught as a collection of facts and vocabulary (Banilower et al., 2013) rather than in ways consistent with current best practices for teaching science that encourage teachers to engage students in doing science (National Research Council, 2012). Furthermore, in the United States a demographic gap exists between K-12 students, who are becoming more diverse, and their teachers, who although there has been growth in the number of teachers from diverse backgrounds, are still primarily White women (Nieto & McDonough, 2011). It is important that science be taught in elementary classrooms and that science is taught in ways that make it accessible to students from diverse backgrounds. Therefore, my research interests center on understanding how to better prepare elementary teachers to teach science in ways that will support the learning of all students. I have approached this challenge through research in three related areas: 1) preservice elementary teachers' identities as teachers of science and teachers of students; 2) innovative approaches to preparing elementary teachers to teach science; and 3) preparing teachers to support English language learners in science classrooms.

Elementary teachers are generalists, expected to teach science as well as mathematics, reading, writing, and social studies. Therefore it is not surprising that preservice elementary teachers often see themselves as teachers of all subjects rather than specifically as science teachers (Davis, Petish, & Smitley, 2006). Envisioning oneself as a science teacher is an important part of becoming a science teacher (Davis et al., 2006), and an individual's identity as a teacher impacts how they act as a teacher as well as how they understand what it means to be a teacher (Sachs, 2005). My dissertation research focuses on understanding preservice elementary teachers' identities as teachers of science as well as their identities in relation to their students. I am particularly interested in preservice teachers' identities as teachers of students from diverse cultural, linguistic, and economic backgrounds. In this research, I use the constructs of identity stories (Sfard & Prusak, 2005) and identity work (Carlone, 2012) to explore how preservice elementary teachers' identities shape their teaching in elementary classrooms. In this work I examined not only the identity stories told by preservice teachers themselves, but also those stories told about them by their mentor teachers, science methods course instructors, and student teaching supervisors.

This work has shown that some people's stories are more influential than others on preservice teachers' enactments in the classroom. Preservice teachers' perceptions of who has expertise in a particular area may influence whose stories are most influential in terms of preservice teachers' identities. For example, stories told by a mentor teacher with many years of experience as a teacher of English language learners may be more influential for the preservice teachers' identity as a teacher of ELL students and less influential for the identity as a teacher of science. While much work on preservice teacher identities has considered identity development solely from the perspective of the preservice teacher, my exploration of the stories told by the preservice teacher as well as those told about them by others has allowed me to develop deeper understandings of preservice teachers' identities. Based on this work, I was selected to participate in the Sandra K. Abell Institute for Doctoral Students (SKAIDS) and I will present my work as part of the SKAIDS session at the 2016 NARST Conference. Additionally, this work was funded by a grant from the University of Arizona Graduate and Professional Student Council.

Another challenge for preparing elementary teachers to teach science is the traditional model of teacher preparation in which preservice teachers are expected to apply what they have learned in their university classes in the context of field placement classrooms. In these field placements

preservice teachers work with mentor teachers who may or may not share similar ideas about what it means to teach science. These differing ideas can produce tensions as preservice teachers learn to teach science using inquiry-based principles. As a graduate research assistant working on Beyond Bridging, an NSF-funded project, I explored how preservice elementary teachers learned to teach science and mathematics through co-learning with mentor teachers. One line of this research focused on how preservice and mentor teachers negotiate meanings during co-learning events. In this work I used Wenger's (1998) modes of belonging framework to analyze preservice and mentor teacher contributions to meaning-making conversations during a co-learning event. Co-learning events brought preservice and mentor teachers to learn together about principles of teaching inquiry-based science lessons. This work showed that the ways in which mentor teachers responded to preservice teachers' contribution influenced how preservice teachers were able to participate in the negotiation of meanings within the group. A second line of research examined how preservice elementary teachers used inquiry science principles to plan and teach science lessons in their student teaching placement classrooms. This research used practicality theory (Janssen, Westbroek, Doyle, & Van Driel, 2013) to explore how preservice teachers used principles of inquiry science teaching to address practical problems in their student teaching placement classrooms. This work showed that preservice teachers adapted principles from the methods course in order to make them practical for the context of their student teaching experience. I co-presented papers on these studies at the 2014 and 2015 NARST conferences. I co-authored with Dr. Kristin L. Gunckel a manuscript on the first study that was recently submitted to the *Journal of Science Teacher Education*.

An additional concern that arises for teachers in increasingly diverse classrooms is how to support English language learners in content-based language development. I am currently working as a graduate research assistant on the Secondary Science Teaching with English Language and Literacy Acquisition Project (SSTELLA), an NSF-funded project focused on exploring how preservice and beginning teachers support English language learners in secondary science classrooms. In particular, SSTELLA is investigating how teachers use authentic language practices in the context of the science classroom as well as how they contextualize science lessons in ways that are relevant to learners. While SSTELLA focuses on secondary classrooms, many of the principles for authentic language use are applicable in elementary science classrooms as well.

My future research will continue to explore preservice elementary teacher identity as teachers of science in diverse classrooms and mentor-preservice teacher co-learning. Given that identity development is influenced by context, my next steps are to extend my examination of preservice elementary teacher identity work beyond the context of the student teaching experience to science methods courses and early years of teaching. I also plan to develop long-term partnerships with local schools in diverse settings to grow co-learning communities that support preservice and inservice teachers as teachers of science and explore identity development in these contexts. Understanding the development of elementary teachers' identities as teachers of science and students is critical to supporting the education of elementary teachers who will be successful teachers of science.

References

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