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The viability of portraiture for science education research: learning from portraits of two science classrooms

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<abstract>

The purpose of this paper is to describe the relevance of a qualitative methodology called portraiture for science education. Portraiture is a method of inquiry that blends art and science by combining the empirical aspects of inquiry with the beauty and aesthetic properties. This method encompasses all aspects of a research study, including protocol, data collection and analysis, and presentation of findings. To examine the viability of portraiture as methodology for science education researchers, we provided two portraits of science teachers and their classrooms to illustrate how context played a significant role in teachers' experiences and how it influenced their classroom pedagogy. The implications of this work show how portraiture can support deep, dynamic understanding of context in science education. This work also illustrates the importance of attending to relationships and voice, both of which are often lacking in science education research.

Keywords: portraiture; qualitative inquiry; critical events analysis; rural education; urban education; teacher education

Introduction

Portraiture is a method of inquiry in which researchers “create a narrative that bridges the realms of science and art, merging the systematic and careful description of good ethnography with the evocative resonance of fine literature” (Lawrence-Lightfoot, 2005, p. 6). The researcher, or portraitist, combines scientific aspects of inquiry through systematic use of observation, interviews, and other forms of data collection to describe phenomena, while simultaneously capturing the beauty and aesthetic properties of phenomena. It is a methodological approach that encompasses all aspects of a research study, including the protocol, data collection and analysis, and presentation of findings (Yazzie, 2002). Through scientific writing, we endeavored to create authentic portraits of classrooms in which we studied.

Lawrence-Lightfoot (1983), who established portraiture, suggested there is much to learn from examining deeply the stories of classroom life, which in turn can inform more general educational processes. Portraiture is useful for educational research because it bridges narrative inquiry with an empirical understanding of classroom contexts and processes (Lawrence-Lightfoot & Davis, 1997). In portraiture, findings are developed with the same analytic rigor as other qualitative methods, as it simultaneously attends to human connections between researcher and participants. Lawrence-Lightfoot declared the uniqueness of portraiture is in the realm of social science inquiry while noting its roots date to the eighteenth century as it is framed through the lens of ethnography and phenomenology. However, it was designed to reach a broader audience rather than just informing the academy. Portraiture guides the construction of a story and then relates the story to its wider contexts in society and culture and “seeks to illuminate the complex dimension of goodness” (Lightfoot & Davis, 1997, p. xvi). Lawrence-Lightfoot

explored this voice of goodness as a counterpoint to the dominant culture in which methods and tools were influenced by a positivist paradigm. Portraiture documents a complicated view of strong teaching, with a deep appreciation for its failures and imperfections. In this way, goodness is much more than a one-dimensional account; it is “a mixture of the parts that produce the whole” (Lawrence-Lightfoot, 1983, p. 23). This whole includes the structures, the people, relationships, goals, curricula, and voice. In this we find the purpose of our portraiture study – to inform general contexts of science education from specific details of knowledge gained from teachers and their classrooms, and more broadly, to clarify the viability of portraiture as methodology for science education research. To do this, we explain how portraiture guided our study and then provide two portraits that illuminate the dynamic, multifarious influences on science teachers and their practice. Although portraiture has been used commonly in other areas of educational research (Hackmann, 2002; Harding, 2005; Lynn, 2006), only a few studies in science education have employed portraiture (Larkin, Seyforth, & Lasky, 2009; Mulholland & Wallace, 2005). In the literature review, we draw on prior empirical studies from a variety of fields to show how portraiture has been used to frame, conduct, and guide aspects of qualitative inquiry.

Literature review

In *The Good High School: Portraits of Character and Culture*, Sara Lawrence-Lightfoot (1983) presented portraits of six high schools, two urban, two suburban, and two private, which were widely regarded as exemplary. The purpose was to describe the organizational cultures of these schools and uncover the implicit values and decision-making that guided and fostered their particular cultures. She focused on the leaders at each school, painting three-dimensional

depictions, and supported these portraits with details about each school, the students who attended them, and the communities in which each were situated. In her analysis, Lawrence-Lightfoot clarified her assumptions, vulnerabilities, and biases, and brought her own voice squarely into the text, a critical component of portraiture that sets it apart from other forms of qualitative inquiry. Instead of taking a third-person position as neutral observer, she wrote herself into the portrait as a participant.

In comparing portraiture to other forms of qualitative inquiry, Lincoln and Guba (1985) suggested one of the most notable differences between portraiture and other qualitative inquiries is the final portrait in which “voice” plays a central role. “Voice” is the lens through which the portraitist sees and documents reality. In this way, it is more than an interpretation – it is a framework for what the researcher sees and how s/he views it. For readers, this is evident in the researcher’s use of “I” statements in the narrative portrait. In doing this, the researcher brings to bear on the portrait in his/her own life story, ideological commitments, familial, cultural, and educational experiences (English, 2000) while closely attending to the voices of participants and their experiences.

As a qualitative methodology, researchers utilize portraiture with a variety of theoretical constructs. For instance, Chapman (2005) combined portraiture with critical race theory to explore the contextual layers that influenced interactions of a White English teacher and her multiracial students in a school that was recently desegregated. She found the teacher’s and students’ participation in the research heightened their awareness of how context and interactions influenced their perceptions of one another. Similarly, Lynn (2006) combined portraiture with critical race theory to discern the ways in which race and gender interacted in the life of a young Black male teacher to construct a unique set of experiences for him.

Harding (2005) drew on the major aspects of portraiture to present the case of one White female educator who taught in a racially diverse classroom. Harding presented two emergent themes from her data: the construction of an urban identity, which shaped the teacher's choice to teach students of color; and the teacher's use of culturally relevant pedagogy intended to promote student empowerment. Harding showed how a complex network of ideas about education, personal and professional experiences, and school factors informed a teacher's classroom practices.

Many qualitative studies in science education present findings in the form of narrative portraits, but for our purpose, we included only those studies that explicitly appropriate the methodology outlined by Lawrence-Lightfoot and Davis (1997), as these studies draw on portraiture methodology as a way of both framing *and* conducting qualitative research.

The methodology of portraiture

Portraiture is a type of narrative inquiry, which has become increasingly visible in social science research (Lieblich, Tuval-Mashiach, & Zilber, 1998). Narrative inquiry acknowledges that communities share knowledge through sharing stories, and portraiture is a type of methodology that includes participants in this endeavor. Portraiture guides the construction of a story and relates the story to wider contexts in society and culture. Lawrence-Lightfoot indicated there is much we can learn from examining deeply the specific, which in turn, informs the general. To do this, Lawrence-Lightfoot and Davis (1997) suggested five essential features for framing a portraiture study; these include *context*, *voice*, *relationship*, *emergent themes*, and *aesthetic whole*. Following Lawrence-Lightfoot and Davis's model, we explicate below how each of the five features pertained to our study.

The scientific features can be seen in the methodological structure, i.e., the study context, data sources, data collection and analysis. To be sure, portraiture draws on the same types of rigorous, systematic data collection and methods of analysis as other types of qualitative research, from structural and thematic analysis to performance analysis and case study. The aesthetic features are encapsulated in voice, relationship and aesthetic whole of both the research process and the final narrative portrait. Indeed, it is precisely these aesthetic features that differentiate portraiture from traditional ethnographic research in which the researcher acts as detached observer, or at best, a participant observer. Rather than take a third person position in the research setting and work under the pretense of objectivity during data analysis, the researcher fully embraces the relationships forged with participants during data collection and acknowledges his/her own subjectivities during analysis and interpretation. Finally, the scientific and aesthetic features of portraiture are dialectical – relationships support data collection, as without trust between researcher and participants there is little chance of capturing authentic data. Similarly, coherent composition of an aesthetic whole indubitably relies on careful, comprehensive analysis of data. In short, it is difficult to separate scientific and aesthetic aspects as they inextricably connect the framing and composition of portraits.

Context, voice and relationship

Moje, Collazo, Carillo and Marx (2001) suggested context not only shapes science learning and teaching but also the act of research in classrooms. Lawrence-Lightfoot (1997) expanded on the traditional research definition of context, noting two different types of context: internal context and personal context. For our study, internal context was the physical setting in which our study took place; this served as a reference point for understanding what participants said and did.

Personal context included our purpose for undertaking the study, the types of data we gathered, and the stance or perspective we brought to each setting.

The internal context for our first portrait was the kindergarten classroom of Ms. E¹ at the Frankie Woods McCullough Elementary School, all-girls, science-focused academy located in an urban area in northwest Indiana. The majority of the 433 girls who attended this school lived in one of two public housing developments located within four blocks of the school. The student population of the school was 99% Black and 1% Multiracial. Additionally, 88% of the students qualified for free lunch. The internal context for our second portrait was the community and classroom of Emily Hobson², a middle school science teacher who had more than 20 years of teaching experience. Emily taught in a rural community located about 50 miles from the nearest Midwestern urban center. The majority of students at her school were White, with 12% representing racial minorities. About 58% of students qualified for free or reduced price lunch.

Our portraits of Ms. E and Emily Hobson were explorations into context. The purpose of the first portrait was to understand the place where Ms. E taught. After observing Ms. E for a short time, [Author 1Cassie](#) realized that Ms. E had a special way of talking science to the girls. As a science educator, [Author 1Cassie](#) studied the ways in which teachers infused equitable discourse practices into their science classrooms. From our initial observations, we noticed these equitable discourse strategies but also noted that Ms. E was able to do this by understanding the place she was teaching. It was clear that in order to understand *how* Ms. E taught was to understand *where* Ms. E taught. Thus, portrait one was an exploration into place as context.

The purpose of the second portrait was to elicit the people, experiences, and events that influenced Emily Hobson's choice of teaching as a profession and her experiences in learning to

¹ We are using the names that the teachers prefer in this study. Ms. E preferred a formal pseudonym while Emily requested a more casual pseudonym.

²Names of both teachers are pseudonyms.

become a science teacher. It was clear from [Author 2 Amy](#)'s first interactions with Emily that she saw herself as a life-long teacher. Moreover, Emily had committed herself to continuous professional development throughout her career. [Author 2 Amy](#) was interested in elucidating why and how Emily's professional identity was formed and clarifying the ways in which her professional identity was enacted in the classroom. Thus, portrait two was an exploration into experience as context.

Lawrence-Lightfoot (2005) suggested that personal context includes researchers' identities and experiences are critical to how they listen, interpret and compose the portrait. As researchers, we brought our full selves, including our subjectivities, previous experiences, and ideological commitments into this study. To be sure, we acted as participant observers in both settings and this is evident in the narrative portraits, as our voices are explicit in the use of the word "I". Our voices, as well as the voices of our participants, can be found throughout the portraits; it constitutes our interpretations and representations of the participants. Behar (1996) asserted the use of "I" is epistemically more difficult than a researcher who distances him/herself in an objective third person stance. As researchers, we were responsible for managing the tension between personal disposition and rigorous skepticism (Chapman, 2005). Indeed, our observations could have been replicated without our subjectivities; however, taking an objective stance would have diminished the care and deep commitment we took to fully capture the experiences of our participants and the contexts in which they worked.

Taking a first person stance required explicit acknowledgement of the connections between our subjectivities and the participants in the study. Such acknowledgment made us more vulnerable to being intensely affected by participants and the setting. Yet, we believed this was necessary to fully comprehend the contexts we were studying. We captured our experiences in

the setting in order to clarify how it influenced us. ~~Author 1~~Cassie described this in her field notes:

As a White woman, raised in the Midwest with lots of land in her backyard, there are very obvious characteristics that make me an outsider to McCullough. First of all, I am white. Being White in this 99% African American school makes me stand out, not only because of my skin color but also because of my culture. I dress differently. I talk differently. I am different. I acknowledge this because I generated a different story than the one they might tell; therefore, portraiture is extremely important. Because I need to create the portrait with the subject's help, to get it right, to make it authentic. However, there are several reasons why I am not only an outsider to this place but have become an insider. I have been visiting the school for two years in order to work with the teachers and conduct research on the girls' perceptions and views of science. The teachers know who I am. The students think of me as the "science lady who likes to ask them questions" or simply as Ms. (~~Author 1~~Cassie's first name). The principal hugs me and gives me little gifts. I do not feel uncomfortable in the school. When a White woman is researching African American girls and teachers, in the back of my mind is, "Shouldn't someone who is African American be researching this place?" Undoubtedly, the answer is, "Yes". However, I have been afforded the opportunity to be allowed into this school, and to document good practice in an urban setting. Because of my constant collaboration with the members of this community, there is something to be gained in this cross-cultural collaboration.

This outsider perspective allows me to look into the school and perceive differently than the students, parents, teachers, and administrators see them. I notice the care that goes into the bulletin boards that seem to change every week. I see the little girl in the back of the room that looks tired and bored. I hear the croupy cough that reminds me of my sick boys at home. I watch the girls eat apples together and share them without any encouragement from the teacher. I smile when I see a teacher bent down showing a girl how to tie her shoe using the same 'bunny in the hole' trick my dad taught me.

Likewise, [Author 2 Amy](#) described her own perceptions of being an insider-outsider during the study:

While Emily and I have an established relationship based on our previous work together, I feel as if I have begun anew with this "portrait" of Emily. She has permitted me inside the very personal world that has shaped her particular views of teaching and learning, whereas previously I had acted as an outsider, a researcher-observer in her classroom. Allowing someone into this world by sharing personal experiences through anecdotes and stories, Emily has given me insider status. I believe this requires trust and mutual respect, because without it, Emily has no vested interest in sharing herself with me. Certainly, this is made easier by the fact that we are both White, middle class women. Thus, we don't have race, class or gender to immediately divide us. The initial interview allowed me to forge some additional personal connections with her, albeit quid pro quo. She intimated her rural upbringing and the influence of outdoor play. I shared with her

my own small town Midwest roots, my childhood love of the outdoors, and my wonderment over all things wild and free. In this we had a common connection – a love of science rooted in childhood experience.... Yet in the time I have spent with Emily, I have not always felt like an insider in her world. While the administrators and teachers at the school have been welcoming, the rural community is tight-knit and skeptical of strangers. Yesterday, I had a crystallized moment in which I realized I am not completely an insider. As I walked down the hall towards Emily’s classroom, students were reluctant to initiate exchanges with me or even to say hello, even though they had looks of recognition when they saw me. Despite this, I mustered a smile and a friendly hello. During the same visit, I attempted to talk to a group of girls during their lab activity about what they were learning. They were at first hesitant to share, but began to open up as our exchange extended. While a bit disheartened by how little progress I have made in gaining acceptance in Emily’s classroom, I have to acknowledge that I am not a member of this rural farm community, but rather a university researcher from the “big city.” Such interactions make me acutely aware of my status in Emily’s world. [FN/09/11/09]

Our perspectives as participant observers ebb and flow many times during our studies – from feeling like an insider to feeling like an outsider and back again. We were challenged not only to negotiate these roles, but also to reflect on how and why it happened during particular times. Behar (1996) suggested value in researchers describing their personal subjectivities and shifting perspectives; in our case, identifying and grappling with our subjectivities was justified as a way to capture our shifting perspectives of insider-outsider status as participant-observers during the research process. Reflection on our subjectivities also made us explicitly aware of the

nature of our relationships with participants.

Lawrence-Lightfoot and Davis (1997) suggested the development of relationships is critical to portraiture; it is through relationships that "...access is sought and given...trust built, intimacy negotiated, data collected, and knowledge constructed. Relationships are never static – they are dynamic, evolving, and fluid" (p. 135). Relationship building was crucial for us to gain intimate access the teachers and their schools so we could authentically represent them. We had been afforded opportunities to work in the schools with the teachers for two years prior to conducting this study. This allowed us to build foundations for relationships with the teachers, the school and the community. We drew on this foundation to forge even stronger relationships with them during the study. As trust was built between the participants and us, communication flowed more easily and data collection became part of daily ritual. For portrait one, learning the names and the faces of the girls was a priority so that [Author 1Cassie](#) could call the girls by name, converse authentically with them, and provide an accurate portrayal in field notes. For the second portrait, relationship was essential for gaining access to the teacher's personal and professional experiences in education. Without such relationship, the teacher would not have felt open enough to trust us with her life stories, nor allow us to observe her classroom. [Author 2Amy](#) attempted to negotiate relationships with students in the classroom when feasible but did not disrupt classroom instruction. Talking to students before and after class, during small group discussions and hands-on activities helped [Author 2Amy](#) get to know the students and their perspectives.

Data sources and collection. We gathered two main sources of data: field notes of classroom observations and teacher interviews (see Appendix 1 for interview protocol). [Author 1Cassie](#) interviewed Ms. E several times during the study. As this study rested heavily in both cultural

and local context, [Author 1Cassie](#) conducted a life history interview (see Appendix 2 for examples of semi-structured life history questions) with Ms. E before observing her classroom.

Through this interview, [Author 1Cassie](#) was able understand why she became a teacher, her educational background and her science experiences. The second interview sought to clarify where the teacher perceived science and science learning to occur, how she dealt with moments when the students were confused, and her overall ideas about the purpose of science education (see Appendix 3 for examples of semi-structured interview questions). Subsequent interviews clarified classroom lessons, the teacher's perceptions of her science instruction and the learning that took place during lessons, and to corroborate or refute [Author 1Cassie](#)'s perceptions of the class (see Appendix 4 for examples of semi-structured interview questions).

To generate detailed accounts of Emily's experiences, [Author 2Amy](#) conducted three in-depth, narrative interviews with Emily that lasted 1.5 to 2.5 hours each and a series of shorter interviews that took place in Emily's classroom. [Author 2Amy](#) used semi-structured interview questions (see Appendix 5 for examples of interview questions) based on Webster and Mertova's (2007) guidelines for narrative interviewing. During the first interview, [Author 2Amy](#) elicited stories about the teacher's educational background, why she pursued a teaching career, and formal and informal experiences with learning and teaching science. In subsequent interviews, Emily shared experiences with living and working in a small rural community and the ways in which this influenced her classroom practice. Interviews with Emily were evenly spaced throughout the study, occurring at the beginning, middle and end. [Author 2Amy](#) also engaged in a series of classroom observations, approximately 3 days per week for 8 weeks, to collect primary data about the ways in which Emily's professional identity played out in her classroom practice.

Emergent themes

Searching for patterns or emergent themes is the fourth component of portraiture. This systematic and rigorous process of empirical description, interpretation and analysis was used to forge a series of images that comprised the final narrative portraits. Portraitists join many qualitative researchers in flexibility and iterative research design. Our research design was iterative; as we collected the data, we began immediate analysis, which subsequently informed our later observations and interviews. We talked with participants about our initial ideas and conducted additional interviews and observations based on these initial analyses. We also engaged in member checking with our participants and used their insights to enhance the final narrative portraits.

As a type of narrative inquiry, portraiture is event-driven. The identification of key events and the details was critical for understanding the storied lives of teachers and the schools. In our study, we employed critical events analysis (Webster & Mertova, 2007) to analyze participants' narratives. Critical events analysis occurred in several stages. For both interviews and classroom observations, we transcribed the discourse verbatim into text. For interview transcripts, we read line-by-line through them to identify *critical*, *like*, and *other* events related to each teacher's self-described impact on her perceptions of herself and the way she viewed teaching and learning. Generally speaking, *critical* events were those that had life-changing or strong formative consequences for the teacher, they were unplanned, and they evoked intensely personal and/or strong emotional involvement. *Like* events were those events that further illustrated, confirmed or repeated the teacher's experiences in the critical event. *Other* events were those that took place at the same time as the critical events and may or may not have been directly related to the

critical event, but were essential for understanding the teacher’s experiences. Table 1 summarizes these events.

[Insert Table 1 here]

We analyzed events in the classroom using a modified version of Reighart and Loadman’s (1984) system of content analysis. First, we read through a few transcripts of classroom observation to develop an initial set of categories that captured different types of experiences in the classroom. For portrait one, the types of experiences were: reading aloud, science activity, general classroom activity, or field trips. For portrait two, the types of experiences were teacher-led lectures, whole class discussion, teacher demonstrations, small group discussions, and hands-on activities. Once we developed categories related to types of experience, we used these to guide our second level of analysis, which was to identify critical, like and other events related to the context of interest. For portrait one, the context of interest was Ms. E’s and the students’ understanding of place. For portrait two, the context of interest was the practical manifestation of Emily’s professional identity.

After identifying critical, like and other events across our entire data set, we reviewed the events to discern commonalities. From these commonalities, we developed themes that served to structure our portraits. For portrait one, the themes were: understanding the school, understanding the classroom, understanding the science lab, understanding the teacher, and understanding the girls. For portrait two, the themes were: the influence of early educators, early induction years in urban schools, and coming into her own as a science educator.

Aesthetic whole

Ultimately, our study resulted in the production of an aesthetic whole – the final narrative

portraits. Producing the narrative portrait was less codified and structured than identifying and naming emergent themes; it was simultaneously systematic and creative, structured and organic, disciplined and intuitive. It included four dimensions: conception, coherence, structure and form (Lawrence-Lightfoot, 1983). Conception involved drawing on emergent themes and organizing them as collective experience. It allowed us to control the development of the story, participants and themes into a single coherent portrait that was logical and consistent in relation of parts to whole. Guided by emergent themes, we attempted to structure the portraits with enough sequence to provide stability, yet formed the final narrative portraits with enough complexity, subtlety, and nuance to draw readers into the text (Lawrence-Lightfoot & Davis, 1997).

Chapman (2005) asserted the essential role of researchers in ensuring the voices presented in the final portrait adequately represent the complexities of participants' lives and the contexts influencing the choices they make. Using voice-as-interpretation (Chapman 2005), we listened actively for the story of our participants. Guided by the emergent themes, we translated the contexts and actions of participants into the narrative portraits. This involved stitching together the teachers' voices and ours, using the emergent themes as a guide. As with other forms of aesthetic expression, our voices as participant observers were both central and peripheral to the work; we weaved it judiciously throughout the narrative, yet placed emphasis on the experiences and voices of the teachers (Lawrence-Lightfoot 2005). Finally, we used voice-in-dialogue (Chapman 2005) to create a space in which participants understood their voices were valued. This space included time for participants to comment, make suggestions, and discuss the narrative portraits we had composed. We asked much of our participants, and they came to trust us – so to be true to them we needed to respect their perspectives regarding the narrative portraits.

Findings

Portrait one

As context is critical to creating portraits, this first portrait is representative of this multi-layered context including the school, the classroom, the science lab, the students and teacher, and the political structures. Through our lens as researchers, this portrait is intended to provide the reader with insight into the place where science learning occurred to demonstrate the importance of close attention to context in science education research.

'This seemed to fit us': understanding the school

On a crisp fall day in late September 2008, I walk down to the elementary wing of Frankie Woods McCullough Science Academy for Girls known by most simply as, "McCullough," to interview the girls about their upcoming science fair. During this short walk, I check out the classroom doors. Flanking on either side of the doors is the girls' recent work. A bar graph shows how many first grade girls prefer red or green apples. Surrounding the third grade door are mystery stories. On each classroom door is a sign with the name of the teacher and the grade of the students colored in red and black, the school colors. In 2005, the girls voted on school colors and the mascot when McCullough became a gendered school. The girls chose the butterflies as the mascot. Thus, Frankie Woods McCullough Science Academy for Girls became the butterflies.

Butterflies are all over the school. They are on every bulletin board, hanging from the ceiling, sign, and school information letter. When I speak to the principal, Mrs. Prince, about the choice, she remarks:

It was a perfect choice. Like the girls are going through their own metamorphosis as caterpillars that become butterflies. And haven't you noticed, that most mascots are about winning or fighting something? Bears. Cougars. Tigers. This seemed to fit us and the girls. [FN/09/05/2007:1]

This was my first peek into how this school was constructed specifically for these girls. Not only were the girls a part of the decision-making for school colors and a mascot, but the community was also involved in the naming of the school³ and the decision to be a science academy. The community felt it would help the girls succeed and debunk stereotypical views of girls not being able to do science [FN/09/05/2007:35]. This school understands their girls and this place so deeply and that as a researcher I would need to do the same.

“Back to your seats, butterflies’: understanding the classroom

Outside the kindergarten classroom is a sign that reads, “Loving Kindergarten Teacher-Ms. E”. Ms. E and her class are seated comfortably on a rainbow rug in the back of the classroom reading in a book about caterpillars. She has a warm smile on her face and displays an intense concern for the girls. She is often squatting down whispering encouragements to the girls, rubbing their backs or replacing missing plastic barrettes that fall off their braids. If a student is struggling, she holds her hand and walks them over to another student and allows that student to explain the concept to her. There is energy to her classroom but it is meticulously controlled. Not with loud commands, but touches, looks, and whispers. She rarely sits and is seemingly inexhaustible. For

³The school was named after Frankie Woods McCullough, a community member who believed in education and service. She died in 2004 before the decision was made to name the school after her. Her picture hangs in every classroom with the quote, “I believe we are put on this earth to learn and do service” below her picture. Her son and daughter are still heavily involved in the school.

example, she leans over to Shaya and whispers, “I really love when you use your words to explain when something is wrong. I am proud of you for doing that.” (FN/09/09/09:12)

The girls sit “criss-crossed applesauce,” the saying Ms. E uses for cross-legged, in a semi-circle surrounding her. The girls gaze intently in Ms. E’s direction some of them are sitting up on their knees so they get a better view of the pictures. Other girls lean cozily up against each other as if they have no notion for one another’s personal space. She pauses to ask a question about when caterpillars change into butterflies and what scientists call that change. The girls were whispering to each other, trying to come up with the word by tapping their foreheads. “Metamorphosis,” she declares and the girls on cue respond, “Met-a-mor-pho-sis!” and laugh, and giggle. Ms. E finishes the story – the caterpillar becomes a butterfly. She closes the book, hugs it to her chest, smiles and directs them, “Back to your seats, butterflies.” The girls clap, flap their arms like wings, fly around the room like butterflies, and then quietly climb into their seats.

Investigate your world: understanding the science lab

The girls begin the short walk down the hallway to the elementary science lab. There is plenty of walking space, tables with tiny chairs for the small girls, and a bean-shaped reading table converted to a microscope station. There is a table with science books scattered on top. The title of one book reads, “Investigate Your World.” The microscopes sit one per table. The four seasons’ dioramas the kindergartners created last year are perfectly in place on the shelves, which line the back wall. A local scientist donated a telescope, which points towards the window, begging to be used. There is a “word wall”, with the words “habitats”, “food chain”, and “predators” on the wall. Above the sink are warnings about chemical spills and general science lab safety. Plastered all over the walls are pictures of African American scientists and detailed

step-by-step instructions of the scientific method outlining from “Make a Hypothesis” to “Draw a Conclusion.” Although this “method”, the traditional scientific method, often reinforces a normative view of the nature of science (McComas, 1996) and can marginalize students from diverse backgrounds (Calabrese Barton, 2007a), in this school a sincere attempt is evident at creating a science and student-friendly environment. This points to another way this school understands these girls and also provides a physical space for the girls to learn science.

‘When your mom’: understanding this science teacher

As Ms. E teaches her kindergarten girls science, she blends knowledge from home and school to produce a congruent space where the students feel comfortable using their knowledge and language in the classroom. She has an uncanny ability to relate to the girls and describe new science vocabulary words using concrete examples from their lives. During an introductory discussion on diffusion, one of the girls does not understand the word, “spread.” When Ms. E is attempting to explain the movement of particles such as “spreading across the room.” Ms. E describes it as “when you spread peanut butter on bread” and when the little girl comments her mom makes her sandwiches, she says; “when your mom puts lotion on your legs and arms” The girl nods and begins spreading her shapes on her desk. This combination of social, scientific, and instructional discourse points to the ability to understand the place, which includes these girls. Ms. E’s ability to integrate discourses by understanding the place and the girls is a way in which Ms. E constructs a space in which the girls’ knowledge and discourse are accepted in this classroom.

Ms. E approaches teaching science by integrating science throughout the other areas of curriculum such as math and reading. Although she is adept at relating new science words to her

students by using their language, she is fearful in stepping too far from the curricula the School Board demands. During our discussions of the upcoming lessons, she is often found pulling out her district curricula guide checking off the standards the lesson meets [FN/09.09.09:5]. Ms. E is like other urban teachers who are often faced with strict demands placed on them by many levels of bureaucracy including federal, state, and district requirements (Calabrese Barton, 2007b). Ms. E's ability to balance these political structures with science teaching illustrates her ability to understand the place in which she teaches and her students' live.

She is in her 19th year of teaching and has been a part of McCullough since it opened its doors in 2005. Growing up in East Chicago as one of the youngest children out of nine, Ms. E remarks that she became a teacher because of a childhood game she would play with her older sisters:

Well, it started off when I was a little girl- my sister wanted to be the teacher all the time and I was the younger one so of course I had to listen and do exactly what she wanted me to do. We used to play school in the garage and I think to come to liking [listening to her]. But I always wanted to be that leader role. I never got an opportunity to – so um, that always stayed in my mind. About being a teacher. [TI/Mrs.R/09/09/09:13-14]

And a leader she is – in this school, she is a member of every task force initiated by the district or school such as the School Improvement Plan, the School Renovation Committee⁴, and the Technology Committee. She leads professional development sessions at McCullough and attends

⁴ In fall 2011, McCullough changed locations, moving down the street into a newly renovated school. The School Renovation Committee was a part of the design for the school. Ms. E is in charge of the elementary classrooms, science laboratories, and greenhouse.

professional development programs offered to her throughout the school year and summer.

When asked her about her success at McCullough she boils it down to:

...being involved with the community. For example, I want them to know that I am part of this community. I don't live far from them- I attend a church service or two in the neighborhood. If they invite me to a potluck or dinner, I go. I go to the school board meetings and encourage parents to go. Here, in this community, they want to see you around. I visit every home before my students come to my classroom. I find out what the parents do for living and help them to see the importance of volunteering in the classroom. I have all kinds of adults in my classroom. It is a give and take. Sometimes it is hard to have them present but I think it is worth it. Then if I am struggling with something with their child. The conversation is easier. I invite them to all the field trips. I take a lot of field trips and so I need their help. The first field trip there is usually only 3 or 4 adults but by the end of the year almost every child has a parent, grandparent, aunt or uncle with them. [TI/Mrs.R/09/09/09:25-32]

This attention on the community is way for Ms. E to construct a place where the community is honored in her classroom.

'These girls deserve to work in a science lab': understanding these girls.

When I enter Ms. E's room in August 2009, she has 29 students – a record for this time of year.

“Typically, the girls trickle in until late September. Not this year. This year we will have to split the classroom by that time,” she predicts. “Mrs. Prince's heavy involvement in kindergarten

enrollment must have worked. Usually on the first day of school I only have 3 or 4 girls” [TI/Mrs.R08/28/2009:08]. The girls are each seated at a small desk with a chair. The desks are arranged in pairs facing each other in three parallel lines with a desk capping each end. Two 8 x 10 tables are placed at either end of the lines, “The overflow” as Ms. E calls it. There is a bean-shaped reading table at the one end of the classroom and a reading rug at the other. Along the north side of the classroom are cabinets and hooks for the girls’ coats, backpacks, and lunches. Ms. E’s desk sits at the southern end of the classroom in front of the windows. Her desk appears well used even though she rarely sits there. The floor has free space for the girls to roam and even with all the stacks and crates – it is organized. On the school-issued, blue-trimmed bulletin board are the days of the week, the four seasons depicted with images of trees in each season, and a calendar that Ms. E adds a number two in the shape of either an apple for September, a pumpkin for October or other significant object related to the month. These signs are used every day and placed at the bottom of the bulletin board so the girls can reach them. At first, their placement appears off center, but after a few days its purposeful placement is revealed – the signs are for the students’ use – not for outsiders. Similarly to how the science lab is constructed, Ms. E’s ability to understand the girls creates a learning environment suitable for kindergarteners.

The room is crowded, but has a feeling that it is both well used and comfortable. Upon entering the space, my eyes are drawn to the reading rug at the front of the room because this is usually where the girls are found – seated cozily on the rug facing Ms. E. When asked about her preference for the reading rug, she remarks that classroom discussions flow more easily on the rug, and states, “When the girls are all cozy on the rug, they are leaning on each other and holding hands, there is a sense of family and makes me feel I am creating a home here. Yes, I make them raise their hands but they all speak and listen to each other.” [FN/09/25/09:3-6]

Another typical place where Ms. E is often present in the science lab. Her preference for doing science in the science lab became clear early in this study. She comments:

I wanted the girls to have many experiences with science but also in many places. The [elementary] school up the street has everything, computer labs, science labs, fancy equipment, and then they [the students] all go to the same middle school and the same high school. I want to be sure my girls know what a science lab is and how to use the tools. (I/09/22/09:7)

Even when it may be easier to do some of the science lessons in the classroom because the girls and the materials are already there, she insists on utilizing the space for science. En route to a field trip, she offers her reasoning for using the science lab, “These girls deserve to work in a science lab. That is why we⁵ created it. So they would have the same experiences as other students outside of Gary” [I/09/11/09:10]. It is not that she associates science, as only in the science lab, it is that she wants the girls to have the same opportunities as other students who will attend schools with fancier science labs.

By teaching science in the science lab, she is intentionally constructing the space of school science by providing the students with a physical space for the girls to learn science. In science education focus on getting students and teachers to understand that science is conducted outside the confines of the science lab (Aikenhead, 1996). However, Ms. E understands that other students in suburban areas will have experiences in science labs and she wants her students to succeed in science and knows that in order to do so they need to be able to compete with them

⁵ In 2007, the elementary teachers with the help of the school nurse transformed an unused elementary classroom into a science lab for the elementary students.

in “school science.”

Portrait two

I had spent considerable time with Emily Hobson prior to this study, first getting to know her in a professional development institute for science teachers, then acting as a researcher in her rural middle school classroom. During this time, I came to know a dynamic and highly personable woman who seemed to almost effortlessly engage her students in science learning. I also observed her commitment to the rural community she served, not only by drawing community connections into the curriculum, but also through her involvement in fundraising and outreach programs. Her efforts had drawn notice from the community and she was a frequent spotlight in the local newspaper. I undertook the current study to better understand the origins of her beliefs and practices about science teaching and learning. Since Emily’s level of competency and commitment to teaching is what we strive for as teacher educators, I hoped this study would shed light on how the experiences that shaped her professional identity might be translated in teacher education programs.

Realizing her calling to teach: the influence of early educators

One morning Emily and I sat near the window in a local café, sharing coffee and pastries as she weaved her stories of growing up in a rural town, learning about soil and insects from her father, an agricultural researcher, and discovering her love of teaching. Although I had thoughtfully prepared questions to draw out the narratives of Emily’s experiences, her loquacious style made these prompts largely unnecessary. Among these stories were those about her precocious interest in science and the influence of early educators. In fact, what was most prominent in her

narratives of realizing her calling to teach were the stories of formative relationships with others, those who showed her the importance of education. She indicated these relationships were critical to the inception of teaching as a profession, as if she would not have come to this realization alone. She shared a turning point in her education when she was encouraged to become a peer tutor:

And then in seventh and eighth grades, we could be tutors. I remember Mrs. Grigsby, our counselor. Oh, I loved her! She was the consummate grandmother. She called me into her office, "Now Emily, we'd very much like for you to be a tutor for some students here that are not performing up to their potential." And that was when it hit me...[pauses] that was it. I remember, even back then, I thought, "You know what? I think I want to do this." I mean that was 34 years ago and I still remember it. I know that sounds insane, but you remember everything about teachers. But that's when I knew wanted to teach middle school. And if I can actually make them like school and like science, then I'm two for two. [11/20/10/2009]

Although she credited her parents with fostering an early interest in science, she also shared several stories of formal educators who kept her on a science path. For instance, about her high school biology teacher she stated:

My high school biology teacher, Mr. Seaver, he was a hoot. One day he walked in and he tossed ears of corn that had purple and yellow kernels on the table. He said, "This is genetics. What can you do with this ear of corn?" And I'm like, "Oooh! This is so cool!"

That was so much fun because I remember you were looking for an answer, but the answer's not at the back of the textbook. [11/20/10/2009]

And later she shared an experience with a college chemistry professor:

I mean I was in Chem 111, the basic chemistry for educators. I can't even remember the professor's name, she was horribly boring, but my friend was in Chem 115 and he would say, "You have to come with me to class. Rumor has it Dr. Jones is going to do a sodium demonstration." So I would go to Jones's class with James and we would sit in like the sixth or seventh row. It was awesome. One day he exploded a helium-filled balloon and then a hydrogen-filled balloon. And then he was like, "Do you understand why the Hindenburg blew up?" Those kind of professors are the ones, especially the ones who knew your name...they would say here's how it works, here's why it works, and here's how it applies to the real world. The professors that really struck me were the ones, first of all, who cared, but also showed me what you could use in science. Here's why. Here's how. [11/20/10/2009]

Emily's emotive tone was noticeable as she shared with me these stories of influential teachers. To me, it appeared her stories were grounded in the affective – hand gestures, facial expressions, rises and falls in the intonation of Emily's voice as she spoke fondly of these teachers reinforced the genuine respect and admiration she had for them. Another notable aspect of Emily's narratives that resonated with me was the notion of caring; it repeated many times in her stories about teaching and learning. While early mentors explicitly had fostered a love of

learning and an affinity for science, implicitly they also showed her the necessity of caring in education – that is, relationships based on respect, dignity and mutuality. Caring is personified when the teacher places foremost students’ learning, and students are responsive, indicating they have received the teacher’s caring and have been shaped by it (Raider-Roth 2005). In caring relationships, teachers value and appreciate students’ needs and interests, and actively focus on how those needs and interests can be incorporated into students’ academic and social development (Thayer-Bacon 2004). This is an important component of her own philosophy as a science teacher, and is evident in the way she approaches her own students. Among those influences, she credits one practicum mentor as important for helping her realize caring as a basic component of teacher-student relationships:

Miss Patty was the consummate mothering type. I thought, “I can't do that. I'm not touching these kids.” That's the first thing [college educators] tell you. She said, "You have got to throw that out the window. Can you tell me that you're going to refuse a kid's hug?" It's about the connection between you and your students, and Ms. Patty taught me that. You've got to have a connection with them in order to teach them. [I1/20/10/2009]

Emily’s early experiences fostered an affinity for lifelong learning about the natural world. Her early teachers not only showed her the wonders of nature, but also the importance of compassion and caring in education. She learned teaching was not a profession in which one can remain detached and unemotional. Forging personal relationships imbued with compassion, acceptance, patience, and affection were necessary for educating students. As she intimated the need for caring relations in education, I found myself allying myself with her point-of view. I,

too, had caring and compassionate educational mentors who showed me the necessity of positive relations in the classroom. In this way, we shared a common understanding of what it meant to be an effective educator; this is, not just one who trains students to develop a certain set of skills, but rather, one who helps students discern their place in the classroom, among their peers, and part of the community at large. Doing so requires intimate, trusting relations with students.

Finding her place in the profession: early induction years in urban schools

Although extremely self-effacing, Emily's narratives were filled with implicit claims of tenacity and courage. Overcoming obstacles was a persistent theme in her experiences as both a student and a teacher. She credited neither intellect nor special ability to her success as a teacher, but rather her willingness to remain persistent and surmount adversity in learning to become a competent educator. Emily's early inservice years serve as an example of overcoming obstacles in rough and tumble experiences of learning to teach. During her first three years, she worked in special programs for at-risk youth in two urban schools. Emily shared anecdotes related to her first years as an inservice teacher:

I got a job in Kingston my first year out [of college]...It was called the CARE program. It was a brand new program and they didn't have textbooks, they had no curriculum, they had nothing. It was for the at-risk. I taught the kids nobody else wanted. I had one kid who had a congenital retinal disease and was going blind. I had four or five students with rap sheets longer than my left arm. I had one kid, on the last day [of school], he had been beaten by his father. And I didn't even know what I was doing because I didn't have any special ed background. I had no experience to prepare me. I had one methods course and

it was all about how to fill out paperwork. I mean it was a shock. I taught everything except social studies. I had sixth, seventh, and eighth grades, so I would get there at six in the morning and I would leave at nine or ten o'clock at night. [I1/20/10/2009]

Emily spent a good deal of time during her interviews discussing the highs and lows of these experiences, and the complex, intertwined emotions, such as shock, feelings of helplessness and frustration, which accompanied her early years of teaching. Her narrative here portrayed a bounded educational system that limited her capacity to adequately support her students. As a first-year teacher, she related that in this urban school, institutional structures diminished her ability to competently educate the at-risk and low SES students who filled her classroom. As Emily looked back in retrospect, she concluded while she was offered a job most experienced White educators would not want, it was one that afforded her with many fundamental lessons about teaching a diverse population of students:

I think I defeated the purpose of the program. I was supposed to teach those kids, but really they paid me to learn how to teach. The rest of it was just muddling through, surviving. You know, people would tell me oh, don't take it personally, but when I would have kids come in with fresh bruises from the night before or fresh cigarette burns that was when I really learned it's not about me. It's about what this kid is going through. So I learned empathy, sense of humor, and compassion from those kids. There's no such thing as black and white in middle school education. It's all grey. And again, that's a method, not an educational theory, which you chuck out the window. I really consider all those years as part of my preservice because it just was learning how to teach. [I1/20/10/2009]

Here Emily alluded to the experience from which she learned the most about teaching. Although she made only a passing comment here, it was a theme to which she repeatedly returned to in her narratives; that is, practical classroom experience during early induction years, not preservice college education, taught her the professional skills necessary for becoming a competent science educator. As a teacher educator, it was difficult for me to remain neutral while she asserted the impotence of her preservice education. Like many other teachers I have worked with, she believed that the practical lessons of learning how to teach came from hands-on experience, not developing an understanding of educational theory in a college classroom. Yet, in Emily's classroom and others, I have witnessed teachers enacting the educational theory they overtly reject in conversation. For instance, in my observations of Emily's classroom, I found she regularly incorporated student-driven inquiry in her classroom teaching, which was closely aligned with the research-based *National Science Education Standards* (National Research Council, 1996). In a sense, Emily's pedagogical choices and instructional strategies adhered to educational theory, even if she did so tacitly. This was manifested in many ways, such as hands-on activities in which students posed questions and designed their own investigations, when they worked collaboratively to solve a problem she had posed or when they delved into a local issue related to science. For instance, when learning about watersheds she had challenged the 7th graders to investigate types and sources of pollution in the local creek. When I asked her why she didn't simply rely on the textbook for information, she responded:

The textbook is too global. How are World Rivers relevant when they have Honey Creek in their backyard? How did we pollute the Creek? This is real world. They walk out in

front of the school and can see a tributary that is part of their watershed that goes into their Honey Creek that goes into their Walton River. [FN/10/12/10]

From my perspective, she had developed a classroom culture in which asking questions and asserting knowledge was both encouraged and expected – a classroom culture aligned with best practices based on educational theory.

Her status as a White female educator of mostly African American students placed her in a unique position – one in which she experienced minority status and was distrusted by her students and the community. As a child of the rural South, she had never personally experienced minority status, though remembered vividly experiences of some African American friends during desegregation. Growing up in a community that accepted difference, she was shocked when she arrived for her first day of teaching at the urban school and was immediately faced with the prospect of outright rejection based on race. She related:

It never dawned on me that they would find me offensive. I remember this one kid, he said, "How come you White teaching us?" I said, "Are you offended by that?" "Well, we wanted a Black woman. We ran the last teacher off." I'm like, "Well I'm not surprised. Some people would be really offended by that." He said, "Well, we're going to run you out, too." The next day a couple of them were missing because their parents didn't approve of a White woman teaching them. [I1/20/10/2009]

In this situation, students had more cultural capital than she, yet despite their initial resistance to her presence, they were willing to teach her their norms so as to help her gain acceptance in the community. Emily described how she reached a critical turning point with some of her students:

By the third day, they said, “Ms. Hobson, we're going to create you a language book. You're teaching us English. We're going to teach you our English.” So they made me a book of words like ‘crib’ and their lingo and translated it into White lady language. You know, it was just regular pieces of paper and cardboard and they all signed the back. I still have that book. [11/20/10/2009]

In the anecdotes above, Emily was confronted with her whiteness, yet was able to forge personal connections with her students. Her experiences with students in these urban settings were distal to her own upbringing, and because of this she learned important lessons. As a newly minted teacher, she quickly realized that she had neither professional expertise nor appropriate interpersonal skills to teach this population, yet displayed perseverance in her efforts as an educator and a willingness to be open to learning from her students.

Developing her praxis: coming into her own as a science educator

Similar to her early educational experiences, Emily also credits relationships with others as critical to her success as a science educator. Owing to the disparity between her life history and her experiences teaching in an urban school, it’s not surprising that after three years of teaching in urban schools, Emily took a position as middle school science teacher in a rural community. In

this rural school, she found the veteran teachers with whom she worked on an advisory team essential to her transition in the school:

I taught seventh grade science that year. I had not only one mentor; I had three mentors, my advisory team. Two of them had been teaching five or six years longer than I had and another guy who had been teaching like twenty years longer. He was amazing and the team was phenomenal. We made the kids accountable. We didn't have discipline problems then and if we did we took care of them as a team. [12/29/10/2009]

Emily contended that teaching in a rural school had a distinct set of advantages and disadvantages. For instance, she stated that a small town community affords teachers with the ability to establish reputations of competence, which in turn facilitated their efforts in the classroom:

Reputation precedes you here, so if you can get your foot in the door and establish some ground rules, you don't have to play the game every single year. They know what to expect from you. You make one phone call and somebody will know somebody who can help you. It will come back around to you; if you request something, you'll have it. You call a parent and the chances are they've had you in class or you've had their kids in class. There is a connectedness and a comfort level within that connectedness that would never have happened in the [urban] school. [12/29/10/2009]

I witnessed this sense of connection in my observations of Emily's classroom. Emily's attempts to foster an interactive, student-centered classroom became evident as I watched her lead class discussions. Students seemed quite comfortable with this arrangement, as evidenced by their enthusiastic participation. Rarely did Emily lecture to students. Often she provided them with opportunities to encounter science concepts, and then held debriefings with the whole class to check their understanding and to help them redirect their thinking when they had misconceptions. During a review of concepts related to stars and planets, Emily checked in with students, but the discussion was quickly redirected by students' queries:

Emily: Edwin Hubble. What did he do? Can someone tell me because I forgot?

Christopher?

Christopher: well, he proved there were other galaxies besides ours.

Ben: How many galaxies has NASA discovered?

Emily: Wow! I'm not sure since the Hubble telescope sends back pictures each day. Does someone want to see if they can find out by doing some Internet research? [before a student responds] Yes, Dennis?

Dennis: So, if we're in the Milky Way galaxy, how can we see it?

Katy: Telescopes.

Dennis: No, but it doesn't make sense if you think about it. Like if you're in the building, how do you see the outside of the building?

Emily: How do we see the outside of the building? [pause]

Annie: We send something outside of it.

Dennis: Wait, so what would you call the place that's not in any galaxies?

[Emily remains silent, puts her hand out to the class as an offering for students to respond.]

Mike: Space!

Katy: Stars.

Joey: Interstellar.

Emily: Okay, so the place between galaxies is interstellar medium? Then what might an intergalactic void be?... [FN/30/11/09]

Although Emily led class discussions, I noticed she did not dominate them or establish herself as sole authority. Instead, she gave students ample space to articulate their ideas and wonderings, as evidenced by students' willingness to pose and answer questions rather than rely on Emily as the source of knowledge. In doing so, Emily fostered a relational classroom in which students could trust what they knew and felt connected enough to others to publicly share their knowledge. Raider-Roth (2005) suggested that creating a connected, relational classroom in which a culture of truth prevails is difficult but important if students are expected to bring to bear their knowledge and diverse experiences on their learning. Emily created such a classroom, in part, by providing students with ample time to share their thoughts, connections and associations with the science concepts they encountered in her classroom. Moreover, Emily leveraged responsive practices that allowed students to respectfully disagree with one another and to solve problems in different ways.

This is not to say that teaching science in a rural school was not without its challenges. In fact, Emily described the effects of shifting demographics and the economic downturn on the community's cohesiveness:

The economy hit bottom four years ago. We lost our advisory teams and now all of us split teach grade levels. And the town is socioeconomically ruined. We've lost 75% of our industry and when that happens the people who can move out of town do, and the ones that are left move in with their relatives. We had a mass exodus of Latinos last year with the loss of industry. We've almost have no middle class anymore. It's a real interesting challenge to teach because you often have a mix of [rich and poor] and they're very snooty against each other. [I2/29/10/09]

However, she has viewed social and political challenges as a means to grow as an educator:

These [experiences] become integrated into your learning to teach and how you evolve.

While we understand the dire straits that a lot of these kids are in, it's not an excuse. Don't use it as a crutch. We expect a lot and we're going to turn out the best we can regardless of what [state administrators] tell us. [I2/29/10/09]

Feeling a sense of belonging and connectedness to the community helped Emily develop into the science practitioner she had longed to become as a young girl. Thus, Emily's science teaching beliefs and practices are firmly rooted in her relationships with others – her former teachers, her students, and her mentors. It is within these relationships that she gave the most credit to learning to teach. To her, development of her praxis came about through practical experiences in which others guided her in the important lessons. Teacher education was on-the-

job training, not in the theory from college textbooks. When I asked her about professional development, she replied pragmatically:

We think about how to teach better every day. I'm always making myself notes. And well, some of my lesson plans are, well, they're disasters. If anybody ever wanted to look at them, they'd have to look at all my scratches...Do this first instead, do this, do that, oh this was horrible, but this worked, or maybe try again. I mean every hour I teach things differently because every class is different. [12/29/10/09]

Discussion

We sought to achieve several goals through our use of portraiture; specifically, to demonstrate the richness and complexity of narrative portraits and to illuminate the value of portraiture as a method in science education research. In the discussion below, we examine the use of portraiture in two science education contexts and then explain the affordances and constraints of portraiture as a method of inquiry in educational research. In both portraits, important characteristics of the educational context emerge.

In the first portrait, as [Author 1Cassie](#) walked through the building and looked at the classroom doors and walls, we got a glimpse of learning there. McCullough was a unique place – an urban elementary school where all of its students are girls and the majority (99%) of the girls are African American. In addition, most of the girls live in public housing. It is a science/math-focused academy that exceeds state standards despite political, social and economic challenges. In this respect, there was great power and promise this school contributed to study of place as context. We assert that if we had reduced school context to a list of descriptors based on race,

socioeconomic status and standardized test scores, the complexity of the school and the care with which Ms. E approached her practice would have been lost.

In the second portrait, ~~Author 2~~[Amy](#) came to know a dynamic woman whose professional identity was the result of a complex combination of childhood inquiry, mentorship, and practical experience as an early induction teacher. Emily's portrait makes clear the influence of caring and relationships in the development of professional identity. If we had distilled Emily's professional identity into a list of descriptors or only attended to instrumental connections between her identity and her classroom practices, we would have lost the dynamic, storied nature of her perceptions of herself as a science educator.

Insights and contributions of authentic portraits of science education

The narratives interwoven into each portrait tell the stories of teachers, students, and places where science education occurs. In both portraits, important characteristics of the educational context emerge. Ms. E understood the contextual political structures at work in her school and how these structures affected the girls. Part of understanding the political structures in place at this school was confronting the rule-enforced pedagogy pervasive in many urban schools, which is focused on normative behaviors rather than active and meaningful engagement in learning (Solis, Kattan, & Baquedano-López, 2009). Unlike rule-enforced pedagogy imposed without explanation, Ms. E provided reasoning for her rules so the girls understood the rationale behind them. Part of being a successful teacher in this school involved orienting students to school norms. But instead of loud demands and harsh commands, Ms. E used kind words, sought out girls who were following the rules, and drew attention to them. The result was that the girls knew how to act when she is not around, which was a marker for success in this school. In this way,

Ms. E distanced herself from the political and cultural structure of this school and created an environment in which the girls felt comfortable participating and following the rules this place required.

Professional identity is complex, dynamic, constantly formed and re-formed throughout the life of a teacher (Beijaard, Meijer, & Verloop, 2004). Elbaz-Luwish (2007) and others have argued teacher's professional identities are constituted through retrospective reflection upon and interpretation of their stories of experience. This seemed to be the case with Emily; her storytelling provided not so much of an opportunity to constitute her professional identity as it did to reinforce and solidify this identity. More than once during this study, Emily noted after interviews that she had not thought about some of her experiences in quite some time. Bringing together these stories to narrate the development of her professional practice afforded her with opportunity to reflect and to draw connections between personal experience and classroom practice. In addition, Emily's narratives allow readers to understand the types of critical events that formatively shape the development of her professional identity, and subsequently how this identity was enacted in her classroom practice.

Emily revealed the dynamic aspects of her professional identity as she compared her early classroom experiences in urban settings to her more recent experiences in a rural school. Like other forms of identity, professional identity is socially constructed in that it requires recognition of self and recognition by others as a certain kind of person based on social interaction (Gee, 2001; Luehmann, 2007). It requires not only the influence of other people and social context, but also what individuals themselves find to be important in their professional lives, which is based on both personal and professional experience (Beijaard, et al., 2004). In addition, professional identity is multifarious in that there are numerous interrelated ways to be

recognized as a particular type of teacher based on one's participation within a community (Dillabough, 1999). Emily's narratives revealed the complexity and dynamism of her professional identity. She held a strong identification with the rural community in which she worked, and this grounded all aspects of her teaching, including the curricula and assessment methods she employed. Furthermore, the portrait framed the multifaceted nature of her professional identity in which she presented herself as a teacher who engaged student through relevant, connected science; fostered caring and intimate relations with students as a necessary component of the teaching-learning contract (Gergen, 2009) and presented herself as both tenacious and courageous in the face of adverse sociopolitical structures embedded in schooling – structures she viewed as diminishing the process of educating students about science in ways directly connected to their lived experience (Sidorkin, 2000).

Narratives of professional identity provide insight into the conditions of teachers' work, the dilemmas they face, and the ways in which they cope (or not) with educational change (Beijaard, et al., 2004). Furthermore, professional identity reflects the landscape of which the teacher is part; this is manifested in classroom praxis. Thus, attention to professional identity is necessary for understanding tensions that arise between educational structures and the ability of teacher to be agents in their classrooms (Coldron & Smith, 1999). Knowledge of teachers' narratives of professional identity may be useful for helping them to adapt to inevitable, and often volatile, institutional and policy-based changes to the settings in which they work. Finally, sharing personal insights regarding one's own professional identity can foster opportunities for cooperation among teachers and teacher educators as they make explicit what they share in common and how they can work together to improve learning.

The value of portraiture as a methodology in science education research

Portraiture is an under-utilized methodology in science education research. These portraits illustrate the unfolding interactions of teachers and students during science lessons and the definition and refinement of professional identity for science teaching. The rich, holistic detail of portraiture exposes the visual imagery and emotive responses of participants, and this affords clarity in understanding specific aspects of educational settings that shape science teaching and learning as a human endeavor. Through the aesthetic whole, the reader sees the portrait as a unified narrative of events and experiences. Narrative details are often lost in other forms of qualitative inquiry such as constant comparative analysis (Strauss & Corbin, 2007) or analytic induction (Bogdan & Biklen, 1998) in which data are reduced to increasingly smaller segments and become disconnected from the context in which it arises. Additionally, by employing the five essential features of portraiture (i.e., context, voice, relationship, emergent themes and aesthetic whole), the final narrative portraits embody both empirical and aesthetic features that would otherwise not emerge during qualitative data analysis and interpretation. Attending to these five features allowed us to illuminate of the most powerful characteristics of classrooms and the deep-seated ontological bases for teachers' ways of orienting themselves in science teaching.

Beyond the academy

A critical piece of portraiture is that it speaks beyond the academy to deepen the conversation about education through more direct conduits. Gaztambide-Fernández, Cairns, Kawashima, and VanderDusen (2011) suggested portraiture is more than qualitative methodology; it is a pedagogical tool for interrogating context, relationships and representations. Conducting

portraiture research provides a conduit through which researchers can frame and interpret stories that move the conversation from the realm of theory (i.e., academy) back into policy (i.e., teacher education) and practice (i.e., classrooms and the communities in which they are located).

First, we intentionally structured these portraits to speak our participants. The teachers who were a part of this study were integral to the analysis and construction of the final narrative portraits. But beyond member checking, reflection on the narrative portraits sometimes generated insights by the teacher-participants whereby after reading the story, they gained a new understanding of experiences and episodes in their classrooms. When researchers take individual's stories and place them into a larger narrative, they are imposing meaning on participants' lived experiences. Although good practice demands researchers share their ongoing narrative constructions, participants can never be quite free of the researcher's interpretation of their lives. During [Author 1Cassie](#)'s discussions with Ms. E in the analysis phase, we discussed the findings, and the majority of the time she felt that her story was being told authentically. However, there were moments of the story that she did not always recognize, particularly the subtleties between the girls and the effects of the quiet interactions she had with the girls. She remarked, "I believe that it happened but I did not notice it at the time." Lawrence-Lightfoot (1983) described a similar experience with her participants in *The Good High School* as they affirmed some parts of the portrait without doubt, while other parts they did not. Bell (2002) reiterated the importance of narrative inquiry that highlights moments that participants do not recognize, "Narrative lets researchers get at information that people do not consciously know themselves. Analysis of people's stories allows deeply hidden assumptions to surface" (p. 109).

Our teacher-participants nonetheless benefitted from reflecting on this painting of their experiences as educators, their classrooms and their interactions with students. Emily described to [Author 2 Amy](#) the benefit of reading and reflecting on an early version of her portrait:

The way you wrote about my experiences makes me aware of how my early experiences really shaped the teacher I am today. Some of these stories I had forgotten about until you asked me to share my memories of teaching. This experience helped me to connect how my experiences shaped my beliefs as a teacher.

Similar to the way Josselson (1996) describes narrative inquiry, Ms. E also found the effects of this imposed storytelling powerful. She told [Author 4 Cassie](#) that reading the stories allowed her to witness her classroom experiences in a new light and made her cognizant of classroom interactions, “[Reading the portraits] allowed me to pay closer attention to the interactions between the girls and see the girls working together in different ways. I learned about my teaching and the girls by reading the stories.” In this way, the portrait moved beyond the academy to inform Ms. E’s teaching practices.

Lawrence-Lightfoot (2005) suggested that because portraiture deeply examines the specific, it informs the general. This is the second way in which portraiture can move beyond the confines of the academy. Through the context-rich descriptions, we anticipate that educators at all levels and degrees of experience could learn from portraits of teaching by recognizing the setting, the experiences of participants and the pedagogical techniques they use in classrooms. After educators see resonance between classrooms portrayed in portraits and their own classroom, they will be able to practically extrapolate to their own practices (Miranda, Robbins, & Stauffer,

2007). For example, Emily spoke specifically about her own experiences as a rural science teacher. Presently, [Author 1Cassie](#) works in a rural teacher education program and uses Emily's portrait in her classes to help provide examples of how teachers form their identity based on the context in which they teach. Similarly, [Author 2Amy](#) works in an urban teacher education program in which she regularly requires preservice teachers to write a story about a critical event in their educational history and then reflect on the ways in which this event shaped their ideas about effective science teaching and learning.

Finally, we see these portraits moving beyond the academy as a means for teachers to solve problems of practice and to advocate for their students. Both Ms. E and Emily are advocates for their students and our portraits demonstrate their advocacy. Ms. E's demands that the students have a science lab to support their learning, and Emily's relational orientation pervaded her interactions with her students, which in turn led to their confidence in doing science. These two teachers' practices transcend normative views of science teaching and learning and the limiting contexts in which they teach. Advocacy moves the portraits beyond the academy into action – and begins to transform education. We assert portraiture can go well beyond deep investigation of one teacher or a single classroom, and Lawrence-Lightfoot (1983) demonstrated this in her work in high schools. Portraiture could be used to examine the organizational culture of a school, a district, or an educational system by gathering perspectives from individuals within a system. By fashioning a portrait from these various perspectives, a composite representation would serve to illuminate individuals' beliefs regarding the organization, and through this illumination would bring the potential for change (Hackmann, 2002).

Conclusion

Portraiture and other forms of narrative inquiry are not suitable for all types of research. The time commitment required for thick, rich description makes it unsuitable for work with a large number of participants. It requires close collaboration with participants as their stories are analyzed and incorporated into a final portrait. By including our voices in the portraits, readers come to understand our influence, as researchers, on the portrait's structure and form. Yet, we suggest that through close collaboration with participants their actions and words are more carefully represented, thus the power remains with them. Perhaps the most constructive aspect of portraiture is the way in which it affords extension beyond traditional research methodologies. Lawrence-Lightfoot and Davis (1997) suggested portraiture's unique contribution is:

...in its explicit effort to combine empirical and aesthetic description, in its focus on the convergence of narrative and analysis, in its goal of speaking to broader audiences beyond the academy (thus linking inquiry to public discourse and social transformation), in its standard of authenticity rather than reliability and validity...and its explicit recognition of the use of the self as the primary research instrument... (p. 14)

We used portraiture with goal of speaking beyond the academy particularly in studying a culture different from our own. Portraiture's focus on goodness supplies educational researchers and policy makers with an approach for understanding how and why teachers are successful in specific contexts. It requires a collaborative effort in the research process and provides an opportunity for teachers, parents, and students to speak about education together in a combined movement towards social change that leads to more equitable forms of education. Although the

goal of this research was not to generalize findings, it is our hope that educators will learn from the pedagogical techniques *in vivo* through the use of this narrative format, recognizing the setting, and seeing the implications of this work. Once educators see familiarity in these portraits, it is our hope that they will be able to extrapolate the findings to reproduce powerful attitudes and behaviors in their own classrooms.

Notes on contributors

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