Transformed Science: Overcoming Barriers of Inequality and Mistrust to Pursue the Agenda of Underrepresented Communities

Reneé Lyons
Clemson University, reneel@g.clemson.edu

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TRANSFORMED SCIENCE: OVERCOMING BARRIERS OF INEQUALITY AND MISTRUST TO PURSUE THE AGENDA OF UNDERREPRESENTED COMMUNITIES

A Dissertation
Presented to
the Graduate School of
Clemson University

In Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy
Curriculum and Instruction

by
Reneé Lyons
May 2017

Accepted by:
Dr. Michelle Cook, Committee Chair
Dr. Cassie Quigley
Dr. Mindy Spearman
Dr. Victoria Corbin
ABSTRACT

Educational programs created to provide opportunities for all, in reality often reflect social inequalities. Such is the case for Public Participation in Scientific Research (PPSR) Projects. PPSR projects have been proposed as an effective way to engage more diverse audiences in science, yet the demographics of PPSR participants do not correspond with the demographic makeup of the United States. The field of PPSR as a whole has struggled to recruit low SES and underrepresented populations to participate in project research efforts. This research study explores factors, which may be affecting an underrepresented community’s willingness to engage in scientific research and provides advice from PPSR project leaders in the field, who have been able to engage underrepresented communities in scientific research, on how to overcome these barriers. Finally the study investigates the theoretical construct of a Third Space within a PPSR project. The research-based recommendations for PPSR projects desiring to initiate and sustain research partnerships with underrepresented communities well align with the theoretical construct of a Third Space. This study examines a specific scientific research partnership between an underrepresented community and scientific researchers to examine if and to what extent a Third Space was created.

Using qualitative methods to understand interactions and processes involved in initiating and sustaining a scientific research partnership, this study provides advice on how PPSR research partnerships can engage underrepresented communities in scientific research. Study results show inequality and mistrust of powerful institutions stood as participation barriers for underrepresented community members. Despite these barriers PPSR project leaders recommend barriers can be confronted by open dialogue with communities about the abuse and alienation they have faced, by signaling respect for the community, and by entering the community through
someone the community already trusts. Finally although many of the principles of a Third Space well align with the larger level of activity, which existed in the PPSR project examined in this study, study findings challenge others to critically examine assumptions behind the idea of a Third Space in PPSR and urge other PPSR project leaders towards a transformed view of science.
DEDICATION

I would like to dedicate this dissertation to my amazing family. To Grandma Peace for always encouraging me to pursue knowledge and to stand for equality. To Grandma Lyons for your constant strength and unwavering love for your family. To my parents for all the support, sacrifices and love, which made this possible. To Bjorn for always supporting and loving me, and for challenging me to see things from new perspectives. And to Trisha, Jeremy, Sarah, and all the awesome editions you have brought to our family, for your love, patience, and wisdom.
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I would like to acknowledge my committee members. You all are wonderful professors, women, and friends. Thank you for your support and for challenging and pushing my research to become better. I would also like to acknowledge Dr. Steve Wing. The world lost a good man when it lost you. In the short time I knew you, you inspired me to be the change I want to see in science. Thank you for your example and for your wisdom. And finally I would like to acknowledge Gary Grant. You are passionate, brave, and tireless. Thank you for your honesty, for your time, and for allowing me to tell your story.
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CHAPTER 1: INTRODUCTION

Background

With science and engineering occupations one of the fastest growing and highest paying occupational sectors in the United States’ economy, now more than ever science skills enhance an individual’s competitiveness in the job market (Merolla & Serpe, 2013). Yet, these fields do not recruit a diverse group of participants. By 2045 the US Census Bureau predicts Black and Latino Americans will comprise over 40% of the US population (U.S. Census Bureau, 2012), but Black and Latino students only earn 7.6% of all doctoral degrees in STEM disciplines (U.S. Census Bureau, 2013). Racial disparities in STEM participation and achievement start before college and are largely associated with unequal access to educational opportunities and beliefs about one’s ability to succeed in science (M. Chang, Sharkness, Hurtado, & Newman, 2014). Even in early grades, Black and Latino students lag behind Whites and achieve less than Whites in STEM subjects (Bali & Alvarez, 2004). The persistent underrepresentation of students of color in STEM fields make broadening the participation in STEM and related activities an issue of national debate (Syed & Chemers, 2011). These discrepancies in achievement and pursuit of higher-level degrees stand as a stark reminder that rather than addressing the opportunity gap, educational programs often reflect societal inequalities (Syed & Chemers, 2011).

According to Hand (2006), to explain the existent gap in participation and achievement, early literature on culture, race, and learning focused on the deficits and the “culture of poverty,” which researchers assumed many underrepresented students come
The Deficit Model locates the problem within the students, their communities, and their cultures, often assuming families of these children do not value education (H. Chang, 1994). The Cultural Deficit Model, because it views the problem as originating outside of the school, results in research and remedies, which often do not address problems existent within educational programs. Instead research and reform efforts focus on the rehabilitation of students and their families, which are assumed to be culturally deprived (Rocha-Schmid, 2010).

Currently, many researchers and educators have moved beyond blaming students, their families, or their cultures for low performance and interest in school (Gutiérrez, Baquedano-López, & Tejeda, 1999). These researchers recognize inequalities within the school, such as school practices, which reinforce negative stereotypes about students of color, and a school culture in conflict with the practices in a child’s home can result in lack of engagement and resultant underachievement (Barton, 2001). Educational programs and institutions often have deeply rooted practices and cultural norms, which result in inequitable opportunities for students of color (Bali & Álvarez, 2004).

Western Modern Science (WMS) has been described as “empirically testable explanations, which exclude “spiritual, emotional, economic, aesthetic, and social aspects of human experience” (Cobern & Loving, p. 58, 2000). Certain institutional practices, norms, and values of WMS may lead students from underrepresented groups to believe they do not belong in the field of science (Carlone & Johnson, 2007). Despite claims stating WMS is a body of knowledge “governed by a single set of rules that is culture free” (McKinley & Gan, 2014, p. 287), science is not a body of knowledge void of values
and biases (Roth & Lee, 2002) but is rather a social practice (Roth & McGinn, 1998). Studies show science is not the culturally free space some present it as, and other aspects of peoples’ lives such as their home communities are highly related to their decision to participate in science (Elmesky & Seiler, 2007). Some researchers suggest the culture and practices of WMS align better with the social practices of White students than with the social practices of underrepresented student groups. This misalignment of cultures and practices results in members of marginalized groups feeling as if they need to deny part of who they are in order to participate in science (Hughes, 2001). Early experiences with school science activities often results in underrepresented students believing they are not capable of excelling in science (Martin, 2000); thus, they see no overlap between science and what they hope to accomplish in their lives (Martin, 2006). When an individual does not see how science connects to who they are or who they want to become, they will likely lose motivation to participate in science-related activities (Basu & Barton, 2007).

Although many science-related activities are constructed specifically to be opportunities for underrepresented communities to engage in science, Bianchini (2007) found social patterns determine what a person will do with opportunities they are given. Making the decision to participate in science or pursue a career in science is not a simple decision. Students may not feel comfortable or have a desire to participate in science-related activities if they perceive science to be a space where their personal history, culture, and knowledge are not valued (C. Brandt, 2008). When a person chooses to participate in science, the decision to participate may threaten other aspects of who they are (Aikenhead, 2002; Gilbert & Yerrick, 2001).
Studies in the educational setting show when students view a subject or educational program as oppositional to their home culture or other aspects of who they are, they will likely choose to disengage or not to participate at all (Nasir, 2004). Such resistance may lead to non-participation identities, cycles of non-participation, and low achievement in marginalized groups (Ogbu, 1987). Feelings of not belonging are then seemingly confirmed for some students of color when they see no one like them in a science honors class, science programs, or science careers. This racial isolation further impacts the likelihood of whether students of color will persist in STEM fields (Seymour & Hewitt, 1994).

Despite existent boundaries between school science and community practices of many marginalized student groups, several educational approaches demonstrate the ability to transgress these boundaries and connect scientific and community practices (Roth & Lee, 2004). Such educational approaches find ways to integrate community ways of knowing with scientific ways of knowing and successfully impact student achievement in underrepresented groups (Mehan, Hubbard & Villanueva, 1994). When students learn science in a context they know and understand-- a context blending their social world and the world of science-- student motivation to engage in science increases (Barton & Tan 2010). According to Licona (2013), student engagement strategies need to focus on creating synergy between WMS and cultural ways of knowing and communicating.

Some researchers apply the concept of a Third Space to describe the environment created when one blends WMS with the community’s values and ways of knowing. A
Third Space is a place where students have a voice in what they learn (Emdin, 2009) and are encouraged to bring the understandings they gain from outside of the classroom into this Third Space, which functions as a place for their outside experiences to meet their school experiences (Barton & Tan, 2009). A Third Space in science is created by combining a person’s social world (first space) with the world of science (second space) into a hybrid Third Space, which merges the discourse, practices, goals, and values of the world of science with the world a person experiences outside of science (Barton & Tan, 2009; Gutiérrez, 2008; Licona, 2013; Moll, Amanti, Neff, & Gonzalez, 1992a; Yosso, 2005). The goal of creating a Third Space is to value everyone’s knowledge and together form more comprehensive understandings of the world (Licona, 2013; Moll, Amanti, Neff & Gonzalez, 1992b; Yosso, 2005). This merging of worlds in theory provides new forms of participation and enables diverse community members to see and find a place for themselves within the scientific community (Hull & Greeno, 2006).

Another approach, which has demonstrated the ability to increase underrepresented students’ persistence in pursuing science-related careers is engaging students in authentic scientific research. Studies show underrepresented students are more likely to pursue a career in science when they have opportunities to engage directly in scientific research and when they are able to bring their own perspectives and values into the scientific research. Being a part of authentic scientific research helps students develop their competencies to do science and helps them see themselves as scientists (Seymour, Hunter, Laursen, & DeAntoni, 2004). Students begin to view science-related activities as something they can and want to do (Harnik & Ross, 2003a). Hill, Pettus, & Hedin (1990)
identified working alongside a scientist and developing relationships with scientists as the most significant factor to improving underrepresented students’ attitudes toward science careers. Participating in a real scientific research study aids in the development of students’ beliefs about their own ability to do science (Hunter, Laursen, & Seymour, 2007) and this belief in their own ability is vital for a student to persist in science (Seymour et al., 2004). However, if the scientific research study lacks relevancy to the goals and values of the underrepresented community, members of the community will show lower levels of engagement with the research. When scientists create projects, which directly link to the improvement of quality of life for underrepresented communities, members of the community show increased participation and engagement (Uriarte, Ewing, Eviner, & Weathers, 2007).

Environmental projects such as Public Participation in Scientific Research (PPSR) have been proposed as an effective way to engage more students and communities of color in science and provide them with opportunities to connect scientific practices with community practices (Jones, Childers, Stevens, & Whitley, 2012). A PPSR project asks individuals with little to no formal science training to gather research data for scientists (Bonney, Ballard, Jordan, McCallie, Phillips, Shirk, & Wilderman, 2009). The volunteer-based efforts of PPSR help scientists collect valid data across large geographic areas (Delaney, Sperling, Adams, & Leung, 2008), and at the same time provide citizens the opportunity to learn and understand better how the scientific process works in practice (Cohn, 2008; Laval, 2012). PPSR projects have been proposed as an effective way to provide opportunities for diverse communities to build their confidence in science and to
improve how they view themselves in relation to science (Dirks & Cunningham, 2006). Partnering with local communities to conduct scientific research studies on issues of concern for their communities can provide underrepresented populations with opportunities to connect WMS practices with community practices (G. Jones et al., 2012).

Despite the need to engage underrepresented communities in PPSR projects, efforts by scientists to recruit underrepresented communities to PPSR projects often fail. The typical PPSR participant is affluent, has a high educational attainment, and is White (Brossard, Lewenstein, & Bonney, 2005; Campbell & Smith, 2005; Evans, Abrams, Reitsma, Roux, Salmons, & Marra, 2005; Purcell, Garibay, Dickinson J.L., Dickinson, J., Bonney, R., 2012). This lack of participation in PPSR projects by communities of color raises serious questions about the relevancy of these projects to the goals and values of underrepresented communities and may compound the disparity of interest in science in the formal educational settings (Pandya, 2012). In response, this study sought PPSR project leaders who have successfully engaged underrepresented communities in scientific research for advice on the engagement process. Then, by examining a particular research partnership between an underrepresented group and a university, this study examined barriers, which may have affected the community’s willingness to engage in the project and how to overcome these barriers. Finally, within the context of a particular research partnership, the author of this study examined how and to what extent a particular engagement strategy, Third Space, was created in this project.
Theoretical Framework

Post-structuralist theorizations of identity frame this research study. Researchers recognize identity as an important analytical tool for understanding human behavior and learning (Wenger, 2003; Shanahan, 2009; & Brickhouse, 2001). People make decisions regarding whether or not they will engage in a PPSR project. Decisions to participate or not participate are based upon identities people hold for themselves and whether or not their participation aligns with or threatens these identities (Cohen & Garcia, 2008). For this reason, the author of this study chose identity as the theoretical framework. The construct of identity, although a useful framework, is somewhat ubiquitous with varying disciplines defining the meaning and theoretical role of identity differently. Identity has been used to refer to the culture of a group, the identification a person has with a particular social group, or how a person perceives the roles they occupy in society (Stryker & Burke, 2000). For this study, the author used Wenger’s (2003) conceptualization of identity. Wenger (2003) presents identity in terms of engagement with a community of practice. Learning, which involves a person’s motivation to participate or not participate in a community of practice, is an experience of identity transformation.

A person’s motivation to learn is linked to the social interactions they have in the world. Lave and Wenger (1991) describe the social interactions inherent in the process of learning in their model of situated learning. In this model they propose learning is a process and involves engaging in a community of practice. Communities of practice are like mini-cultures with agreed upon meanings and a shared history of learning, resulting
in boundaries, which define the community. This view of learning emphasizes the social nature of knowledge. Members of a community of practice, informally bound by the value they find in their social interactions, overtime develop common practices, shared knowledge, and approaches. Communities of practice have definitions regarding what knowledge and perspectives count, what ways of communication are appropriate, and what criteria a person must meet for membership in the community (Wenger, 2003). A community of practice is a simple social system, which sets the rules for what it means to be a successful participant, unsuccessful participant, or somewhere in between. Learning involves a person becoming a participant in the distinct activities of a community of practice. Learning is a production of practice and a negotiation as the individual makes sense of new knowledge and experiences in relation to communities of practice (Wenger, 2000).

Linking learning to identity, Wenger explains when people learn something, they also become something with that knowledge. As Wenger (2003) notes:

Because learning transforms who we are and what we can do, it is an experience of identity. It is not just an accumulation of skills and information but a process of becoming -- to become a certain person or, conversely, to avoid becoming a certain person. Even the learning that we do entirely by ourselves eventually contributes to making us into a specific kind of person. We accumulate skills and information, not in the abstract as ends in themselves, but in the service of an identity. (p. 215)
Learning is a process of identity transformation, transforming oneself into the person he or she wants to be (Shanahan, 2009). How an individual decides to engage with a community of practice relates to how one sees himself/herself in relation to others in a community of practice, and how participation in the community aligns with broader purposes he/she envisions for himself/herself. Wenger (2003) explains identity as a trajectory influenced by a person’s imagined relation to a community of practice and how membership in the community will impact broader goals and other community memberships he or she has. An individual’s imagination, or how he/she sees himself/herself fitting in a community will influence aspirations, directions, and plans for future participation within that community.

For this study, the author views engagement in science activities as the process of one negotiating their relationship with the community of practice known as science (Cobb, 1994). The subject of science is a community of practice with terms and ways of talking unique to the discipline of scientific study. Scientific communities decide what counts as scientific knowledge, what facts matter, and what theories are valid (Wenger, McDermott, & Snyder, 2002). Thus, learning science involves a gradual induction into these new perspectives on the world and new ways of using language to represent the world (Mercer, 2008). As people learn science, they acquire the skills and knowledge necessary to engage in conversations about science (Oakeshott, 1933). Learning can be viewed as an initiation into the well-defined discourse of the scientific community of practice. Science has a unique discourse distinguished by communication-mediating tools and meta-rules, which define communication within the community of science (Sfard,
2001). In this way, science is a community of practice; as individuals learn science they negotiate their position in the scientific community by making claims to competence (Wenger, 2000).

Communities of practice are everywhere, and a person will typically become involved in several of them. People form their identities as they make sense of their position within a larger system of communities of practice. Identities are people’s reflections about their relationships with various communities of practice. The multiple identities of a person are interwoven, constantly changing as these identities interact with the identities and voices of others (Hand, 2006). To create educational programs more equitable to all, Irizarry (2007) suggests educators need to be cognizant of the many identities people hold and how these identities interact within a given context. Complex and powerful forces such as race, class relations, and how others interact with a person all contribute to a person’s formation of science identity. Crucial to understanding a person’s science identity is an understanding of how a person engages in other communities of practice (Brickhouse et al., 2000).

With identity as a conceptual framework, this study focuses on the type of person one becomes by participating in a science-related activity. Brickhouse, Lowery, and Schultz (2000) describe science identity as the “kind of people who would want to understand the world scientifically” (p.443). Researchers using identity as a conceptual framework attempt to understand how a person identifies or does not identify with the scientific community of practice and the extent to which a person sees science as being “for me.” According to Brickhouse and Potter (2001):
In order to understand learning in science, we need to know much more than whether students have acquired particular scientific understandings. We need to know how students engage in science and how this is related to who they are and who they want to be. (p. 286)

There are varying levels of identification. Some people strongly identify with a community of practice and fully participate, while others may have low levels of identification, participate in a more peripheral manner, or not participate at all. Wenger (2000) conceptualizes identity as a product of both individual agency and of social practices. People construct their identity as they make choices about how they will participate in a community of practice, but the decision is not simply an individual one. A person may chose to identify with a community of practice and make claims of competence within the community, but a community of practice may reject a person’s bids to be recognized as a competent member of the community. This aspect of identity highlights Wenger’s (2000) conclusion that identity is something a person chooses, but identity is also chosen for a person.

Science identity involves how a person makes sense of their experiences related to science, and also how society structures possibilities for a person within the science arena (Carlone & Johnson, 2007). A person forms a science identity as they make sense of their position within the scientific community of practice and in relation to other communities of practice to which they belong. Davies and Harré (1990) discuss the concept of “positionality,” explaining a person forms their identity with a practice based
on the positions available for them to take up in that practice (p.43). A person’s science identity results in part from what options a person sees available within science and how participating in science aligns with broader goals and purposes envisioned for oneself. How a person is able to imagine oneself fitting in science may reflect histories of participation with science, other community memberships one holds, one’s ability to negotiate with the tools symbols, and signs of science (Holland, 2001), as well as how the community of science responds to one’s bids for recognition (Gee, 2000). All these factors will influence a person’s aspirations, directions, and plans for future participation within science (Wenger, 2003).

The notion of identity is useful when considering a person’s decision to participate in science learning activities such as PPSR projects. If project leaders hope to motivate a more diverse demographic to participate in science projects, leaders need to be conscious of the identities people hold and create for themselves (Steele, 2011). Whereas race, class, and gender are static categories, identity can serve as a more contextually specific lens for viewing the way people act (Gee, 2000). Identity attempts to capture a more holistic picture of a person within a given context. Studies using identity as a theoretical lens deepen our understanding of how and why people engage (or do not engage) in science-related activities (Aikenhead, 1996; Brickhouse et al., 2000; Kozoll & Osborne, 2004; Tan & Barton, 2008a). The construct of identity is useful because it accounts for “individual agency as well as societal structures that constrain individual possibilities” (Brickhouse, 2000, p. 286). Using identity as an analytical lens helps avoid the tendency to promote stereotypical notions of group characteristics and instead focuses
on individuals’ experiences (Gee, 2000).

The general problem addressed in this study is the lack of engagement of underrepresented groups in the STEM fields. Other researchers have also used theories of identity to investigate problems of engagement. Cohen and Garcia (2008) use the Identity Engagement Model to explain a person’s motivation to participate in a community of practice. According to this model, when a person enters a new social environment (or decides whether to enter) they often start by asking, “Is this a situation where my identity as ______ (African American, girl, etc.) could be associated with a negative outcome?” If yes, this person will be especially vulnerable and sensitive to perceived biases or negativity. As a person sees threats to their social identity, they may choose to dis-identify with the new environment to protect their already established social identity (Cohen & Garcia, 2008; Purdie-Vaughns, Steele, Davies, Ditlmann, & Crosby, 2008). Walton and Cohen (2007) describe this phenomenon in terms of “belonging uncertainty,” which occurs when a person doubts their genuine acceptance in a social environment. Belonging uncertainty results in a person being less motivated to participate, and feeling disconnected to an environment. When a person considers starting, continuing, or stopping the pursuit of something, one of the most important questions leading to this decision is “Do I belong here?” (Walton & Cohen, 2007, p.82). Feelings of not belonging in an environment, such as the scientific community of practice, could result in a person seeing few options for positive participation within the environment.

A person’s attitude toward science and motivation to learn it relates to social and cultural options, and what a person deems an acceptable identity to be (Costa, 1995;
Lemke, 2001). Even if underrepresented community members have initial interest in a science project, they may feel the activity is not something a member of their community would participate in (Robinson, 2005). Social psychologist Claude Steel (2011) points out that a person will be less motivated to participate and achieve in an environment they have assessed as threatening to their social identity. A threat to a person’s social identity arises when clues in a context undermine a person’s sense of belonging, competence, and aspirations. For example, if a person looks at an environment and sees there are few other people similar to one’s self, or if an environment devalues aspects of a person’s social identity, a person will perceive these as threats (Steele, 2011; Steele, Spencer, & Aronson, 2002).

Many underrepresented community members view themselves as outsiders to science, or to the academic community as a whole, believing that science is for the rich, while they live in neighborhoods literally separated from rich neighborhoods by bridges and roads, which serve to keep people like them at a distance (Barton, 2001). Underrepresented populations may feel like outsiders to the scientific community because of differing worldviews and a distrust for the scientific community (Hassel, 2004). Many underrepresented community members have memories of being made to feel like outsiders to the community of science. Past experiences of being made to feel like an outsider will impact a person’s willingness to participate in similar activities (Ogbu & Simons, 1998). If a person believes he or she is an outsider to an activity, this belief greatly impacts their motivation to pursue that activity (R. Miller, Brickman, & Bolen,
At times declarations of disinterest are in reality reactions to perceptions about a role being for a person like me (Rosenthal & Crisp, 2006).

Markus and Nurius (1986) use the concept of “possible selves” to explain why a person engages or fails to engage in a certain activity (p.954). A possible self is a personification of the self in the future and what roles a person sees being available in the future. What possible selves a person has to choose from is influenced by a person’s sociocultural background, history, and models that person has had presented to them. The point Markus and Nurius make is motivation is not a disposition of a person; a person’s motivation, behavior and course of action are guided by the self-knowledge one has for their potential future self (Markus & Nurius, 1986). This self-defining will affect goals one sets as well as activities one will take part in. The “possible self” serves as a regulator for human behavior (Markus & Wurf, 1987). From a very young age people develop a perception of what a scientist looks like and what type of people do science (D. Chambers, 1983). Thus, solutions aimed at changing a behavior, such as participation in science-related activities, need to change the scientific self-concept. One of the most important regulators of behavior is a person’s knowledge of themselves in relation to that behavior (Carver & Scheier, 1982).

In order for PPSR projects to truly connect scientific knowledge to the greater community, then projects cannot be separate from the identities citizens are creating for themselves in other arenas of their lives (Mueller & Tippins, 2012a). To create positive, trusting environments welcoming to all social identities, Cohen and Garcia (2008) recommend implementing strategies to increase people’s sense of belonging. A more
effective approach for increasing diversity in science projects is to consider how to transform the environment of science projects into a space, in which all communities and social identities feel they belong (Uriarte et al., 2007). Science practitioners can support science for all by creating learning experiences, which encompass the identities of all learners (Lemke, 2001).

As Wenger (2003) explains, a person’s aspirations, directions, and plans for future participation within a community of practice is dependent upon the alignment between that community and other communities of practice to which they belong. At times, science participation presents people with conundrums, in which they must choose between cherished parts of their already existing identities and the requirements one must meet to author a legitimate science identity (A. Johnson, J. Brown, Carlone, & Cuevas, 2011). The goals, values, language, and practices of science may serve as perceived threats to underrepresented community members’ sense of belonging within a science project and often result in the loss of meaningful learning and engagement (Aikenhead & Jegede, 1999; Brickhouse & Potter, 2001). The author used theories of identity in response to the Center for Advancement of Informal Science Education’s (CAISE) study report on PPSR, which calls for more research into the ways underrepresented community members develop science identities, and how these identities affect the community’s motivation to participate in PPSR projects (Bonney et al., 2009). Applying these theories of identity to the need for PPSR projects to engage underrepresented communities in scientific research, this researcher formulated the research questions, which guide the current study.
Research Problem

This study investigates how to engage underrepresented communities in scientific research partnerships. Research on science identity demonstrates how people’s identities impact their learning and motivation to participate in science. These studies clearly show when members of marginalized communities are positioned as creators of scientific knowledge rather than consumers, motivation to participate in science increases (Brickhouse, 1994). Likewise, the amount of overlap between social and scientific goals, practices and values impacts a person’s decision to participate in science-related activities (LeCompte & Dworkin, 1991). Additionally, these studies reveal scientific discourse practices and the values of science may conflict with other social communities to which underrepresented community members belong and can result in a person forming a “disrupted science identity.” These disrupted science identities lead underrepresented groups to view themselves as outsiders to the scientific community of practice (Carlone & Johnson, 2007, p.1187). Science learning experiences and programs incorporating other social communities of practices to which underrepresented groups belong result in higher engagement and participation levels (Elmesky & Seiler, 2007). The discourse of science and discourse of the underrepresented community should be equally prioritized and valued, otherwise a person may perceive a science identity as being un-attainable, or see no attractive options for authoring a science identity (A. Johnson et al., 2011). Scientific ways of knowing should not be in competition with community ways of knowing (Quigley, 2011). A person should not have to put their social identity aside in order to participate in science (Irizarry & Antrop-González, 2008; Lemke, 2001).
Similarly, PPSR projects aiming to engage underrepresented populations in scientific research should create projects in which community ways of knowing and community values are not in competition with project goals. PPSR projects designed as community partnerships to meet specific community needs have motivated involvement from participants outside the demographic of the typical PPSR participant (Bonney et al., 2009). When projects have research questions linked to common issues existing within underrepresented communities, community members are better able to see a place for themselves within the scientific community (Gregerman, 2009). Previous research has called for PPSR project leaders to form partnerships with underrepresented communities to allow for project goals to be built upon the foundation of community needs and values (Miller & Hafner, 2008; Scott, 1999). Participatory approaches for developing a project’s research questions have been especially useful in identifying the needs and priorities of underrepresented communities (Israel, Krieger, Vlahov, Ciske, Foley, Fortin, …Palmero, 2006; Minkler, Vasquez, Warner, Steussey, & Facente, 2006; Patten, Mitton, & Donaldson, 2005). By having members of the public answer their own questions instead of learning someone else’s knowledge and answering someone else’s questions (Warren, 1989), participatory PPSR projects provide a space of collaboration for the underrepresented community and scientists to co-construct knowledge (McCormick, 2007).

Yet, it is vital to understand the dynamics involved in a scientific investigation partnering with an underrepresented community, as not all partnerships result in successful long-term relationships. Berlin and Berlin (2004) document the failed
relationship in a partnership between anthropologists and Mayan community members as they collectively researched the development of viable substitutes for chemical pesticides. Their research posits that even with collaborative efforts, community members may feel marginalized by the scientific community of practice. Thus, the STEM field needs more research into approaches, which avoid marginalization (Nasir, 2004). Clearly, PPSR projects need to merge and equally value the discourse and values of science with those of the community, but the field needs more examples of what this process looks like in actual practice. How can a PPSR project equally prioritize the values, practices, and discourse of science with those of an underrepresented community, and are there any barriers to this process? With the many challenges to forming community-based research partnerships, it is necessary to document best practices and effective partnerships, and examine what makes them effective (Schensul, Nastasi, & Verma, 2006).

Researchers within the field of PPSR call for more studies exploring collaborative and co-created approaches to PPSR, in order to better understand how projects might reach new and more diverse audiences (Bonney et al., 2009). There are many guidelines and principles set forth for PPSR recruitment efforts, however, many academic researchers struggle to operationalize principles and put theory into practice (Cargo & Mercer, 2008), perhaps due to the scant research on the process and outcomes of PPSR projects (Fernandez-Gimenez, Ballard, & Sturtevant, 2008). For example, in theory, the field recognizes projects creating space for broader values in science will foster diversity, yet there is little practical advice on how to actually create an inclusive science culture.
with a PPSR project. Context dependent evaluations are needed to understand what the broadening of scientific value systems would look like in a particular context such as a PPSR project (Uriarte et al., 2007).

The research-based recommendations for PPSR projects desiring to initiate and sustain research partnerships with underrepresented communities well align with the theoretical construct of a Third Space, which has been described as an area between different discourses, or communities of practice, which has the potential to be productive for a person’s identity development (Bhabha, 1994). Yet, to the knowledge of this researcher, no study has explored what a Third Space would look like in a PPSR project, or if it would even be possible to create.

According to Pandya (2012), the field of PPSR requires more in-depth knowledge about how science projects can address the “historical and ongoing disconnect between established scientific research agendas and the priorities and needs of many diverse communities” (p. 317). This study addresses the current gap in the literature by seeking the advice of PPSR project leaders who have engaged underrepresented communities in scientific research, and have attempted to merge the goals and values of science with the goals and values of underrepresented communities. It is also unclear what a partnership, which truly merges the goals and values of underrepresented communities with the goals and values of science looks like in actual practice. Equitable practices are often an ideal rather than a clearly defined goal (R. Gutierréz, 2002). According to Pandya (2012), while community-based PPSR projects do exist, it is difficult to find “research based recommendations for these participatory approaches to citizen science” (p. 315).
Researchers call for more studies exploring obstacles inhibiting the engagement of underrepresented groups in science (Hurtado, Cabrera, Lin, Arellano, & Espinosa, 2009), and for more studies examining ways in which science educators are working to overcome these obstacles and create projects where people do not have to experience identity competition in order to participate (Brotman & Moore, 2008; A. Johnson et al., 2011). This current study is divided into two parts. Part 1 of the study, by examining advice from 7 project leaders who have established successful research partnerships with underrepresented communities, investigates best approaches for engaging underrepresented groups in PPSR projects. Part 2 of this study examines factors hindering a particular underrepresented community from participating in a PPSR project, and aims to illustrate the process of how PPSR project leaders partnered with the community to overcome these barriers. Finally, within the context of this particular underrepresented community, this study then investigates the theoretical construct of a Third Space, as a specific engagement strategy, which attempts to merge the goals and values of the underrepresented community with the goals and values of the scientific community of practice.

**Purpose of the Study**

The broad concern with the existent racial disparities in STEM participation and achievement for all students is that educational programs, which are set up to provide opportunities for all, in reality reflect social inequalities (Syed & Chemers, 2011). Even science curriculums and programs advertising under the slogan “science for all,” may “undermine” the identities of underrepresented groups (Aikenhead, 2002, p. 288).
Researchers believe girls, First Nations, and other underrepresented groups at times do not pursue careers in science because the fundamental structure of traditional science is alienating to them (Aikenhead, 2002; Hammrich, 2002). Often the dialogue on scientific literacy for all students stays rhetoric, and in reality the science being taught and practiced is highly resistant to change (Eisenhart, Finkel, & Marion, 1996).

Science programs and courses often push members of underrepresented groups into the world of science, rather than demonstrating how science actually connects to their lived experience (Fourez, 1997). Eisenhart et al. (1996) attributes the lack of interest and low achievement of underrepresented communities in science to the fact that science excludes these groups by not addressing their needs. In response, Aikenhead (1996) calls for breaking the boundary between science as a subject taught in schools, and science related activities in the community. Members of underrepresented communities need opportunities to see how science and technology coincide with their everyday experiences (Hodson, 1999), and how science supports solutions to problems arising in the daily life of their communities (Roth & Lee, 2004).

A more just world necessitates science programs, such as PPSR, be constructed in a manner, which will include, empower, and transform all people (Barton, 2001). Roth and Lee (2001) argue if the goal is to set “people up for life-long participation…and learning” of science, then rather than “coax individuals” into participating, program leaders need to “set up” projects, which “allow a variety of participatory modes, more consistent with a democratic approach in which people make decisions about their own lives and interests” (p. 1). The inability of PPSR projects to recruit diverse audiences is
more than an advertising problem (Bonney et al., 2009). Even within participatory PPSR projects, underrepresented groups at times feel disenfranchised and alienated from science (Roth & Lee, 2004). As project leaders attempt to recruit and sustain involvement from a more diverse demographic, it is useful to consider the motivations involved in a person’s decision to participate, or not participate in an activity. Many social psychologists agree motivation to participate in an endeavor is linked to a person’s sense of social identity, and if a person has a feeling of belonging in relation to that endeavor (Cohen & Garcia, 2008; MacDonald & Leary, 2005). Whether or not a person participates in a science activity is not simply a matter of whether they possess the opportunities and capabilities to learn science. Factors unrelated to the intellect, factors of identity, and a sense of belonging affect a person’s motivation and willingness to actively participate in a given context (Zigler & Butterfield, 1968). Some researchers suggest marginalized communities may be discouraged from studying or participating in science because it privileges White middle-class values (Eisenhart et al., 1996; Tobin, Seiler, & Walls, 1999). Thus, a primary purpose of this study is to investigate factors, which may have discouraged one underrepresented community from participating in a PPSR project.

Science alone gives very narrow practices and outcomes, leading many groups to view science as being irrelevant to their lives (Harding, 1991). If science hopes to engage a broader demographic, this must be done in a space welcoming a broad range of questions, a wider set of values, inclusive discussions (Uriarte et al., 2007), and a democratic set of outcomes (Lave & Wenger, 1991). Science learning is enhanced when it is viewed as a continuing narrative of a person’s life as opposed to an institutionalized
subject confined to science classrooms or laboratories (Ruby, Kenner, Jessel, Gregory, & Arju, 2007). Perhaps part of the reason so few people identify with science is because of the narrow definition of what a mature science identity looks like. People simply do not see themselves fitting into this narrow definition. Lave and Wenger (1991) recommend considering broader goals and more possibilities of identities within science. Hughes (2001) makes a similar argument, saying, “Dominant discourses of science as abstract and inflexible are open to reformulation and reinterpretation, offering possibilities for widening the range of scientist subjectivities available and creating new identity positions for those often excluded from science” (p. 278–279).

Past research shows approaches aiming to make science a space where the knowledge of underrepresented groups is valued (C. Brandt, 2008) and approaches finding ways to integrate community ways of knowing with scientific ways of knowing (Mehan et al., 1994) have been successful at engaging underrepresented communities in science. In this current study, the researcher applies Gutiérrez’s (2008) description of a “Third Space” to propose more attractive options for science identities are available to participants when PPSR projects become hybrid spaces, incorporating the multiple social identities of a person with an individual’s science identity. A Third Space in a PPSR project is created by combining a person’s existing social communities of practice (first space) with the scientific community of practice (second space) into a hybrid Third Space, which merges the discourse, practices, goals, and values of the world of science with the world a person experiences outside of science (Barton & Tan, 2009; Gutiérrez, 2008; Licona, 2013; Moll et al., 1992a; Yosso, 2005). This merging of worlds provides
new forms of participation and allows diverse community members to reposition themselves, developing a sense of their own place in the scientific community and strengthening their personal science identity (Hull & Greeno, 2006). Kimmerer (2013) uses the metaphor of a garden to explain this concept. A garden is created when WMS and community ways of knowing can keep their own qualities but support each other’s growth. This concept of generating a Third Space in PPSR projects—a hybrid space where the scientific community of practice, and the social communities of practice to which a person belongs blend—is illustrated in Figure 1.1.

![Figure 1.1. Generation of a Third Space in PPSR. This figure illustrates the overlap of community and scientific goals to create a Third Space.](image)

Barton, Tan, and O’Neill (2015) refer to Third Spaces in science as spaces for participation. By providing space for the discourses and identities people bring with them from other communities of practice, these hybrid Third Spaces provide participants with a vision of how participating in science fits in the larger context of their lives.
Imagination, as described by Wenger (2000), is the reinvention of oneself, an exploration of perceptions of a community of practice and discovery of one’s place in it. The more people envision themselves as part of the larger scientific community of practice, the more positive their identity with science will be (Lave & Wenger, 1991).

A Third Space is a place in which any person sees space to author an identity because they belong in that space and see options of participation running parallel to what they envision their life to be (A. Johnson et al., 2011). Yes, science is a community of practice with defined ways of knowing and describing the world, but it is at the boundaries where growth in a community of practice occurs. New experiences can pull a community of practice along; embracing new experiences can give new insight to a community (Wenger, 2000). The scientific community of practice needs to redefine what it means to work together, if the goal is to better embrace diversity. Working together should mean the ability of a diverse group to “work effectively and creatively in spite of differences in background or viewpoint” (Uriarte et al., 2007, p. 72). Yet the question still remains, what does it look like and what does it take to work together in a space, in which underrepresented community members see options of participation running parallel to their own life goals and ambitions?

Studies of community-based participatory research within the field of the social sciences offer some insight into this question. These studies reveal if a PPSR project is to be the type of space described in Gutierrez’s conceptualization of a Third Space, the project needs to address problems the underrepresented community deems critical, involve community participants as full participants, be scientifically rigorous but locally
appropriate, and give a central role to residents in all parts of the study from start to dissemination of results (J. Schensul, 2002). To a large extent this can be accomplished by building project goals upon the foundation of the community’s needs and values (Miller & Hafner, 2008; Scott, 1999). By having members of the public answer their own questions instead of learning someone else’s knowledge and answering someone else’s questions (Warren, 1989), participatory PPSR projects provide a space of collaboration for the underrepresented community and scientists to co-construct knowledge (McCormick, 2007). Full participatory research, however, is in reality difficult to achieve; quite often the field of science is uninterested in questions of concern to the local issues of the underrepresented community. As J. Schensul (2002) notes, “Economically marginalized and informationally disenfranchised communities” are often left out of the debate on where money should go and which research questions should be asked in scientific studies (p. 194). Schensul goes on to point out many underrepresented communities do not possess the power to “define their own positions” in relation to the questions, problems and solutions generated in scientific studies (p. 195). Baldwin (2000) reports a similar finding in a study on community-based participatory research, conceding after partnering with underrepresented communities, researchers did not find the concerns of the community to be interesting to their own goals and interests. Likewise, researchers have found community-based research is very time consuming, and it fails to bring as many publications as their institutions demand because the scientific community is not necessarily interested in the local issues underrepresented communities are facing (J. Schensul, 2002). Fuller (2000) explains science is a form of inquiry used to explain and
legitimatize “socially significant phenomena” (p.1) but what is socially significant seems somewhat arbitrary. Politics are involved in what studies are funded and how results of such studies are framed. Not all inquiries are open to explore, with many hypotheses never being given serious consideration.

Some underrepresented community members report even when they engaged in participatory research for their community, the research ended up hurting them and not advancing their cause (J. Schensul, 2002). J. Schensul attributes this to the “tenuous or non-existent” links between discipline-based theory and community practice (p. 192). Gutson (2004) points out that all communities have equal access to power, therefore “public priorities are…easily hijacked by disciplinary priorities” (p. 26). Even the methods used in scientific inquiry for the community are at times deemed to be “exploitative and oppressive” and result in products “not geared to changing the social structures that create disadvantage” (Baldwin, 2000, p.190). For this reason Baldwin (2000) calls for more research on what approaches to community-based research work well and what approaches do not work well, as well as examples on how specific problems, which arise in the process of creating a research study benefiting the local community were resolved. Baldwin advises publishing on the process in order to make this discussion public, “so that we can learn from each others’ mistakes” (Baldwin, 2000, p. 189).

Equity is a process, not an abstract goal (Rodriguez, 1998) and for this reason, the aim of this research study is to illustrate the process of how PPSR project leaders can create projects, which will engage members of marginalized communities. This study
explores factors, which may be affecting an underrepresented community’s willingness to participate in a PPSR project and provides advice from PPSR project leaders in the field, who have been able to engage underrepresented communities in scientific research, on how to overcome these barriers.

**Research Questions**

This study seeks to provide insight into how PPSR projects can engage underrepresented communities in scientific research, and it explores the various factors, which mediated an underrepresented community’s engagement in a PPSR project. The study will do so by examining the following questions:

1. What advice do PPSR project leaders have regarding how to engage underrepresented communities in scientific research?
2. What are the barriers, if any, affecting an underrepresented community’s willingness to engage in a PPSR project, and how can PPSR project leaders overcome these barriers?
3. How, and to what extent, can PPSR project leaders create projects that are Third Spaces, which merge the discourse, practices, goals, and values of science with the discourse, practices, goals, and values of an underrepresented community?

**Significance of the Study**

All citizens, regardless of their field of work, economic status, social or other group membership should be involved in making decisions regarding the environment and the earth’s natural resources. One of the main societal benefits of engaging more diverse audiences in science through PPSR is the creation of an environmental
democracy, in which the public is able to be a part of generating information and to participate meaningfully in conversations concerning environmental impact (Conrad & Hilchey, 2011). Environmental justice is achieved when all people have equitable access to healthy living environments, and access to decision-making processes, which affect their health (Marouli, 2002). Involving all social communities in scientific research is a form of empowerment. Scientific knowledge is used by governmental agencies to make decisions, which will impact all citizens, and thus those with expert knowledge have power over those without expert knowledge (Habermas, 1971). According to Freire (2000), dialogue is the vehicle through which men achieve significance. Through dialogue we name our world, and it is the human right of everyone to participate jointly in this privilege of naming the world. Dialogue must not be a situation where “some men name on the behalf of others” (Freire, 2000, p.147). The democratization of scientific research provides all citizens with influence by involving them in the production of scientific knowledge. To avoid subjecting the public to a “theme of silence” (Freire, 2000, p.150) PPSR projects need to provide a space of collaboration for all people, those trained as scientists and those not trained as scientists, to co-construct knowledge (McCormick, 2007).

PPSR projects need participation from underrepresented communities. Project leaders should purposefully and intentionally invite people who will challenge and expose scientific projects to different perspectives (Gay, 2010; Gurin, Nagda, & Lopez, 2004). Embracing the multiple realities of all people will promote creativity and provide a better picture of the total reality (Freire, 2000; Jickling, 2003). A combination of
ideological persuasions working collaboratively can offer more than any one ideology working alone (Scott, 1999). According to the North American Association for Environmental Education, increased diversity makes environmental projects better, more creative, and more informed (Diversity, Equity, & Inclusion, 2014). Real-world problems are complex, so scientists must rely on collaboration with many various types of expertise to derive viable solutions (Hara, Solomon, Kim, & Sonnenwald, 2003). Science exists in a historical, sociopolitical, cultural, and economic context (Nasir, Rosebery, Warren, & Lee, 2006). As such, science is better explored and better understood in a hybrid forum, where many diverse groups and forms of knowledge come together and mediate understandings (Callon, Lascoumes, & Barthe, 2009; Norgaard, Kallis, & Kiparsky, 2009). A truly educational investigation gains a better picture of the total reality, instead of capturing only a small sliver of it (Freire, 2000). True dialogue does not occur when reality has been decided upon by a select few, but rather when all people, both scientific and non-scientific, attempt to learn together things they do not know.

The democratization of scientific research also provides citizens a voice by involving them in the production of scientific knowledge (Freire, 2000; Janosky, Sun, Laird, & Kostura, 2008; McCormick, 2007). Engaging diverse groups of people in science forms an empowered citizenry who can make informed decisions concerning scientific issues (Sinatra, Kienhues, & Hofer, 2014). Thus, science should be welcoming underrepresented community members’ funds of knowledge, values, and practices into science, not only because this empowers communities with scientific knowledge but also because science will be better (Bianchini, 2007). Science needs to encounter otherness in
order to open the scientific community up to new viewpoints and understandings. As Latour (1998) advises the thinking of citizens at times provides a more complete picture of reality than scientific thinking alone, offering a better basis for action. Latour (1998) points out that citizen thinking takes place in the highly variable and intricate patterns of community life, whereas science works in isolation from these complexities.

Looking for common ground with underrepresented communities requires one to be fluent in the scientific way of doing things, and asks citizens to cross the border into the scientific community of practice, so things can get done according to the established scientific way of doing things. Yet, transformation will not occur until science as a community encounters radical differences. Instead of trying to reach underrepresented communities with science, as if the scientific community holds truth, scientific project leaders should be learning alongside diverse communities, attempting to better understand the world together (Deetz & Simpson, 2004).

Bandura (1982) describes vicarious experiences as those experiences where someone else models the skill in question. Vicarious experiences can increase others’ confidence in their own capabilities to accomplish desired outcomes. If the model performs well, and people identify with this model, then their own efficacy beliefs go up. PPSR project leaders need more vicarious experiences of what it means to partner with underrepresented communities in scientific research. Project leaders’ efficacy to work with underrepresented communities will grow as they examine other projects effectively partnering with these communities. The goal of this study is to provide a vicarious experience of a PPSR project, which engaged an underrepresented community in
scientific research. The researcher of this study hopes the study will draw out key approaches, attitudes, lessons learned, and ideas, which will be transferable to other projects and other contexts. If the field of PPSR is to advance and reach its full potential, the field needs partnerships with underrepresented communities, which will embrace local and traditional knowledge sources in projects, allowing for both a scientific and social component to the project. Until the field is able to this, it will not reach its full potential (Bonney, Shirk, Phillips, Wiggins, Ballard, Miller-Rushing, & Parish, 2014).

Assumptions

This study is guided by several theoretical assumptions, which the researcher used to formulate the research questions for this study and to situate the advice from the project leaders on the process of engaging underrepresented community members in scientific research. The first assumption guiding this study is that knowledge is constructed. Science educators hope by exposing people to scientific knowledge, ideas, and processes people will internalize this knowledge and make it their own. Yet, the question of how one acquires knowledge is not an easy one to answer. Scholars and theorists have debated the issue for years. This study is guided by a constructivist view of knowledge. According to the constructivist approach, a person is not a blank slate or an empty jar to be filled up with knowledge. Learning is a dynamic process, not a discrete achievement (Koschmann, 1999). Knowledge is something that is built upon, and building that knowledge base takes time (John-Steiner & Mahn, 1996). Cognitive change is a continual process affected by the context, the individual’s interests and abilities, past
experiences, and interactions with other individual’s in society (Barnes, 1992; Roth & Radford, 2010).

The second theoretical assumption guiding this study is knowledge is socially constructed. According to Vygotsky’s (1978, 2002) sociocultural theory of knowledge, the intellectual development of the individual cannot be understood without reference to the social and cultural context surrounding it. All cognitive functions are believed to originate in and are explained as products of social interactions (Mercer, 2007). Humans are not born with knowledge, and learning is not a passive, individual endeavor shaped by external forces (McMahon & Raphael, 1997). Social interactions are the vehicle for developing knowledge and all higher forms of cognition (Petrová, 2013). Learning starts on the social plane (between people) before it ever reaches the individual plane (internalized within) (Davydov & Kerr, 1995). According to Vygotsky, development occurs when socially shared activities are transformed into internalized processes (Hausfather, 1996; John-Steiner & Mahn, 1996). This view of knowledge acquisition decenters learning and locates it in social interaction, rather than in the head of any one learner (Koschmann, 1999).

**Organization of the Study**

This study is a two-part study. Part 1 of the study examined practical advice on the process of how PPSR project leaders can engage underrepresented communities in scientific research. Part 1 served as an initial screening to find the critical case, which was the focus of the larger study-- Part 2. Part 2 examined the critical case of a PPSR project, which has completed a scientific partnership and research with an
underrepresented community.

The study is organized into five chapters.

**Chapter 1**: This chapter presents an introduction, theoretical framework, statement of the research problem and research questions, purpose of the study, significance of the study, research questions and assumptions of the study.

**Chapter 2**: This chapter contains an extensive review of the research and related literature.

**Chapter 3**: This chapter describes the methods and research design used in conducting both Part 1 and Part 2 of the study.

**Chapter 4**: This chapter presents the analysis of the data obtained in Part 1 of the study.

**Chapter 5**: This chapter presents the analysis of the data obtained in Part 2 of the study.

**Chapter 6**: This chapter presents a summary of the study, conclusions, and recommendations for further study.
CHAPTER 2: REVIEW OF RELATED LITERATURE

Overview

This literature review begins with an overall description of the theoretical construct of identity along with empirical studies demonstrating how identity impacts learning and motivation to participate in a particular community of practice. The discussion then moves on to programs and approaches, which have demonstrated the ability to build more positive science identities in populations typically underrepresented in science. With the purpose of this study being to examine to what extent PPSR projects can become Third Spaces—creating options for all to author positive science identities—the focus then turns to examining PPSR projects, their impact, and the struggle the PPSR field as a whole has in recruiting diverse participants. Finally the review examines what the field knows in principle and theory on how to engage underrepresented communities in scientific research. It is these principles and theoretical constructs, which are at times difficult to put into practice. One of these theories—the idea of constructing a Third Space—will be examined closely, as one of the goals of this study is to examine if, and to what extent a PPSR project engaging underrepresented communities in scientific research becomes a Third Space.

Identity

With identity as the framework through which to evaluate this study, this portion of the literature review has been organized around four themes found throughout the literature on identity. The four themes are as follows: 1) identity as a trajectory, 2) the social nature of identity, 3) discourse as a mediator of identity and 4) the multiplicity of
identity. This section concludes with a brief discussion of practices and science programs, which have demonstrated the ability to build more positive science identities in populations typically underrepresented in science fields.

**Identity as a Trajectory**

Identity is a particular path influenced by forces—a path, which reflects a person’s participation in and transitions across communities of practices. A person’s current identity is a trajectory shaped by forces in the past as well as future directions a person has for themselves (Wenger, 2003). The history a person has with science activities affects their current attitudes and willingness to participate in activities related to science (Delpit, 1988). Martin (2000) describes a person’s identity as one’s beliefs about ability. Researching the development of Black youth’s mathematics identity, Martin defines identity as the deeply held beliefs people have about their ability to perform in mathematical contexts. A person’s math identity is one’s self-understanding within the context of doing math (Martin, 2006). Black youth often hear themselves as part of a storyline told in educational reform and policies. They hear about their deficits and their underachievement in math and science. Martin’s study concludes when people hear their competencies framed in a detrimental way, with their underachievement and failure being emphasized, they begin to see themselves as outsiders to the community of math (or science).

These negative storylines can serve to reinforce low achievement, lower self-efficacy beliefs, and dis-identification with a subject (Martin, 2000). Who a person believes one’s self to be significantly impacts that person’s motivation to achieve. R.
Miller, Brickman, and Bolen (1975) found improving a person’s academic self-concept, may lead to improved academic performance. In a control group comparison study, researchers found attributing positive math achievement characteristics to a group improved their achievement in math. These improvements in achievement were compared to both a control group and to a group motivated to achieve by teachers persuading them to do better. Study findings revealed when people believe themselves to be the kind of people to do a certain activity, they are motivated by the improved self-concept. In contrast, researchers found when teachers attempted to persuade a student to achieve more, this created a negative self-concept, sending the message to the student that he or she is not the type of person to achieve and that is why the teacher has to persuade them to try harder. The attempts of persuasion did not improve student achievement. This study provides empirical support for the idea that improving a person’s academic self-concept, or identity can improve performance in a given context.

If a group historically has been treated as outsiders to the community of science, this history will impact their current participation (Delpit, 1988). According to Brickhouse (1994) women and underrepresented groups have historically been treated as outsiders to the community of science, and this history is impacting their current participation. If a person identifies with a group typically excluded from science, then he or she may feel alienated from the community of practice and believe he or she will not be able to perform well. This low efficacy belief will inhibit attempts at future participation (Bandura, 1982). Brickhouse (1994) purports part of the solution is to present science as what it is—a product of historical and social conditions—which gave
rise to one possible way of interpreting the world. She proposes rather than explaining low representation in science by looking for deficits in underrepresented communities or inequitable practices in schools, the answer may lie in a reconceptualization of what it means to participate in the scientific community of practice. Rather than subjecting students to a position of consumer, in which they must make sense of someone else’s knowledge, students should be encouraged to bring their own ideas, forms of knowledge and ways of interpreting the world. The key is to show students how their own interests are connected to science (NGSS Lead States, 2013). For example, studies have shown girls’ interest in science is connected to concerns for people and living things. Conceptualizing science in terms of these felt concerns may help prevent students from feeling alienated from science (Harlen, 1989). Students should be engaged in answering their own questions instead of learning someone else’s knowledge (Warren, 1989). Without a reconceptualization of science many students will continue to exist outside the community of science, learning about science but never becoming part of the scientific community (Brickhouse, 1994).

Martin (2006) concludes the quest for educational success in math and science is not evenly paved for all groups of learners. Martin found decisions made by teachers early on in a student’s academic career affected what potential roles within the mathematics community of practice were available to that student and what math identity the student was able to create. For example, early experiences of being placed in low achieving math groups led students to feel alienated from math. Participants from a young age noticed higher track classes were occupied mostly by White students and
understood from this young age that math was not for Blacks. At the high school level, some teachers even verbally told the students math was not for them, and discouraged them from enrolling in any high-level math courses. Historical lack of exposure and lack of opportunities in math and science create a vicious cycle of lower achievement, stereotypes and presumptions about who can do and who cannot do math and science, resulting in a low subject identity for many underrepresented students. Participants in this study came to believe math and science were “someone else’s” and not “ours” (Martin, 2006, p.214).

The path a person is paving for one’s life shapes that person’s current identity. When people see a subject as valuable to an identity they are attempting to author, they will be more motivated to learn that subject (Bishop, 2012). Eisenhart et al. (1996) present the concept of “mature self”—explaining whether a person has motivation to pursue a certain identity depends on if they see the promise of a mature identity within that community of practice. Learning needs to be aligned with a future envisioned self. A person must be able to see a mature context of science knowledge and see a personal place within this mature context. If people cannot envision how an activity, such as science, will help them achieve their goals, they will put little effort into that activity (LeCompte & Dworkin, 1991). Often even high achieving science students reject the opportunity to pursue careers in science because they do not see science aligning with the person they hope to become (Costa, 1995). Learning and memory are tied to goals. People learn things for a particular purpose (Schank, 1983). People identify with a community of practice based on broader goals they have and if those goals align with
activities of that community (Lave & Wenger, 1991).

In a qualitative case study of urban, high poverty students of color, Basu and Barton (2007) found when science was connected to who students were and who they wanted to become, their interest in science grew. Youth in the study had very strong conceptions of who they wanted to be, in both their personal and professional lives. When science assisted them and moved them towards personal and professional goals, their motivation to participate in science increased. Polman (2013) explored the identity trajectories of history learners in two after school history clubs, highlighting the interplay between identity and learning. The study found students were more likely to take tools and perform actions related to a subject (in this case history) if they saw the subject had potential to create possibilities for the type of person they would like to be in the future. The study concludes with a call for educators to show students how acquiring knowledge will help them move along a trajectory of identity students already see value in pursuing. In addition Polman (2013) found simply connecting the curriculum to students’ interests will not necessarily promote student learning. For example, allowing the student to use rap when constructing the history project may hold the student’s attention better but will not necessarily show a student how history intertwines with the identity trajectory the student is attempting to create. Educators must deeply know the cultural norms of a group in order to consider how existing identity trajectories may be used to motivate engagement.

Social Nature of Identity
All knowledge is historically and culturally situated. External forces of social life affect the way a person thinks, feels, and acts and will affect a person’s desire to learn a certain type of knowledge (Eisenhart et al., 1996). Wiley and Alexander (1987) describe identity as the role an individual takes on within a given social relationship. People live under the influence of societal roles, rules for these roles and what roles they believe are available for them (Eisenhart et al., 1996). At the root of all identities is the concept of recognition. Any identity, whether that identity is biologically part of a person (I am a female) or whether the identity is chosen by an individual (I choose to be a runner), only exists as a category or an identity because people recognize it as such. People learn whom they are based on how others interact with them (Erickson, 1987). The way a person acts, dresses, speaks or believes will all cause that person to be recognized in a certain way. A person can be a social producer authoring oneself, but a person is also a social product, authored by the acts of others and in the way others recognize that person (Holland, 2001). From a very young age students are recognized and ascribed certain identities by school and social grouping practices. Students can accept these identities or resist them. People author their own identities, but they cannot author anything without recognition from others (Gee, 2000). As a person makes bids of recognition, in attempt to author an identity, these bids can be recognized, ignored, or rejected. A person makes a performance related to the identity they are seeking to author and receives feedback from others regarding their performance. Not only may a person’s bid for recognition be rejected, but a person may also be ascribed an identity other than the one they were trying to create (Gee, 2000). Identity is the type of person an individual is perceived to be in a
given context, is socially constructed, and influences the types of behaviors a person conceives as being appropriate for themselves (Gee, 2015).

In an ethnographic case study Carlone and Johnson (2007) interviewed successful women in science, following them through their experience in undergraduate science courses and continuing on with them through their careers in science. Findings of this six-year study highlight the importance of recognition in the formation of a person’s identity. When the women in the study sought recognition but did not receive it, this resulted in “disrupted science identities” and presented the women with difficulties as they worked toward achieving their science related goals (p. 1188). When a person is outside the status quo, if her way of talking, looking, or acting does not align with stereotypical visions of a person who does science, then that person will face barriers to their bids to be recognized as a scientist. A main factor contributing to the participants’ science career pathways was recognition by others. Participants needed to be recognized as being capable, and this recognition often provided needed access to science activities. Findings of the study also highlight how a person’s formation of their science identity is influenced by gender, race and ethnic identities.

In a two-year ethnographic study, Gilbert and Yerrick (2001) examined the impact of tracking on student identity. Researchers found for participants in this study, being placed in a lower track class resulted in students feeling like outsiders to school definitions of success. Students disengaged all together from the identity of good student and developed their own micro-culture within the school. Being placed in lower track classes, which were predominately students of color, was an identity ascribed to the
student by social others. If students performed well in classes and were moved to upper track classes (predominately White), other Black students viewed these students as traitors who had abandoned their own cultural identity. This conflict of identity contributed to the difficulty of ever escaping the cycle of being placed in lower track classes. Gilbert and Yerrick (2001) caution educators to carefully consider the identities being ascribed to students through tracking practices and other policies, which attempt to make up for perceived cultural deficiencies of students.

B. Brown (2004) conducted an ethnographic study on science language development among underrepresented students. For students in this study, social pressures from other students resulted in a lack of science language development. The cultural practices of science created intrapersonal conflict for students. The patterns of language used in science are very different from the patterns used in the cultural and ethnic groups of students. Brown found students in the study demonstrated the capability to use the discourse of science but were at times stigmatized by peers for using it. After being laughed at or receiving other negative feedback, some students reverted to a refusal to use the scientific discourse. Brown concluded there are social and political implications involved in using the language of science, implications a student may not want to risk, for fear of losing part of their cultural identity. Participation in the scientific community of practice may cause conflict for underrepresented student groups as they try to balance academic and personal identities (Brickhouse, 1994; Eisenhart et al., 1996; A. Gilbert & Yerrick, 2001; Lee & Fradd, 1998).

Identity and Discourse
Another theme recurring throughout the literature was the role of discourse in the formation of identity. In order to understand how people engage in science and why they do or do not participate in scientific activities, one needs to understand how and why people use specific discourses when engaging with science (Tan & Barton, 2008a). In Gee’s (2015) “Social Linguistics and Literacies,” discourse is defined as a:

社 socially accepted association among ways of using language, of thinking, feeling, believing, valuing, and of acting that can be used to identify oneself as a member of a socially meaningful group or ‘social network’ or to signal (that one is playing) a socially meaningful role. (pp. 42–43)

The language spoken in a community of practice (such as science) becomes a tool a person and others around them use to author their identities (Reveles, Cordova, & Kelly, 2004). An individual’s identity is created through discourse with others so that one comes to be recognized in a certain way. As Gee (2000) notes “discourses are ways of being certain kinds of people” (p. 110). According to Vygotsky’s (1978) dialectical theory of learning, individuals are kept in a dynamic relationship with their environment through dialogue with other human beings. Each community of practice, including the scientific community, has its own discourse, or institutionalized way of talking (Davies & Harré, 1990). People learn as they develop the capabilities to talk using this language and are able to take part in scientific conversations (de Mello, 2012). People know things in terms of discourse, and identity arises as a result of the discourses people take part in. Through conversations people position themselves and other people in relation to a particular community. Dialogue is the vehicle by which people work out their identities
In a year long ethnographic case study Tan and Barton (2008b) examined the transformation in science identity of a 6th grade student, Melanie, who began the study as a marginalized member of her 6th grade science community (as evidenced by a failing grade and lack of participation in classroom activities). Later in the year Melanie became actively engaged in the conversations of her science classroom. Findings of the study revealed discourse played a major role in repositioning Melanie within the classroom scientific community of practice. The use of unconventional discourse practices provided Melanie a space of comfort and helped her find a position within the community. In order to transition Melanie out of the role of a quiet student, never participating in the discourse of the class, the teacher began giving Melanie opportunities to talk about issues not directly related to science content. This action by the teacher supported Melanie’s development of science talk, as she slowly but surely gained confidence to take part in the science discourse of the classroom as well. The opinions, stories and funds of knowledge Melanie contributed to the class discourse presented no risk of rejection from the teacher and helped Melanie bridge the gap between being a silent participant in the class to being a contributing participant. The classroom became a hybrid space in which Melanie felt comfortable and safe to develop her own science identity.

In an ethnographic study of students in rural India, Sharma (2008) explored how students negotiate their role in order to participate in the school science discourse. Students in the study often played more passive roles in the classroom, limiting their contribution to answering teacher-generated questions and participating in activities.
designed by the teacher. However, when the teacher opened up the conversation to topics outside of school, the students’ roles changed to a more active participant in the classroom, with students influencing the nature and direction of the classroom science dialogue. The resultant dialogues were a blending of the school science discourse with out of school discourses and experiential knowledge of the students. Out of school discourses and experiences are tools students can use to find a space within the classroom discourse. Students were able and willing to use school science discourses if they saw it relevant to concerns they had for their lives.

A case study examining discourse and learning of 28 high school students enrolled in an active learning Biology Program used discursive analysis to examine how discourse patterns functioned to create projected identities for students. Researchers compared students’ use of science discourse with gains in student learning, measured by scores on a pre/post assessment on scientific content. Researchers found the nature of students’ participation in the classroom discourse was related to overall assessment gains. Students who took up scientific discourse and a position of leadership within those conversations showed more learning gains (Cross, Taasoobshirazi, Hendricks, & Hickey, 2008). Another study examining student perceptions of science revealed similar findings, showing when students see themselves as knowledge makers within the scientific community they have more positive perceptions of science (Costa, 1995).

In an ethnographic study on discourse patterns in a third grade science class, Reveles et al. (2004) explored the relationship between student discourse and the development of students’ identities as scientists. Findings of the study revealed specific
teaching practices, which support the formation of positive science identities for students. The teacher in the study used discourse as a tool for students to construct their own relevant, conceptual understandings of scientific knowledge. The more the students engaged in classroom discourse, the more they saw themselves as capable learners of science. Their active participation in the discourse of the class served as a tool to insert themselves into the community of practice (science classroom). The teacher served as a key supporter in the identity formation process by welcoming and teaching multiple options for communicating scientific knowledge.

Bishop (2012), while examining the enactment and development of students’ math identities, identified discourse as the primary means students have to shape an image of themselves in relation to math and to convey that image to others. Words themselves, along with the structural patterns of discourse, convey positions and identities of people within a math classroom. Who has opportunity to speak, how long they speak and whose ideas are recognized as important, all re-enforce identities, both positive and negative. Positioning acts and repeated discursive patterns, over time, may accumulate in advantaging some students to develop more positive subject related identities while disadvantaging others. Boaler and Greeno (2000) had similar findings in a study on the formation of mathematics identities. They found the math identity of a student is strongly influenced by their positioning within the classroom discourse. When the mathematical authority was presented as being external to students (found in textbooks, teachers etc.), students were positioned as receivers of knowledge and reported experiencing a conflict between the identities they were creating for themselves outside
of class and their math identity. When a class used a different pedagogical approach, in which students were engaged in math discussions, researchers found this repositioning resulted in students forming relationships with math, which were not perceived to conflict with the identities they were forming in other parts of their lives. The discussion-oriented class required a different form of participation requiring more contribution from students and resulted in students describing their relationship with math in active terms consistent with the type of person they saw themselves as now and the person they hoped to become.

In a separate study, Boaler and Greeno (2000) highlight the important relationship between knowledge, pedagogical practice, and identity formation. Researchers conducted interviews with 600 students enrolled in either a traditional math class, or a reform oriented math class. In the traditional classroom, students were encouraged to be actively involved in the class, but the actions were defined by standard procedures of the math discipline. In the reform class, students had the capacity to act using their own ideas and methods, with class time dedicated to bridging standard methods to fit new situations and the students’ own ideas. Students in the reform class developed a more positive and active relationship with math than students in the traditional math class. Researchers conclude the manner in which one participates with a community of practice (math) will result in different types of disciplinary relationships (identities). These disciplinary identities affect the willingness of a student to attempt further math endeavors and apply math knowledge and practices to new situations.

Olitsky (2006) conducted a study in a diverse, urban 8th grade classroom
examining the role of school discourse on the positioning of students within a community of practice. The study focused on school discourse about science as opposed to the discourse of science and specifically looked at what messages discourses communicated to students about possibilities for participation within science and how these possible roles contributed to students’ emerging science identities. Findings of the study revealed teachers often communicated an elitist picture of science when they talked about how difficult science is for some people. In addition school practices such as tracking and placing students in science classes based on their abilities communicated to students only certain (special and smart) people could understand science. These findings are similar to other studies conducted, in which tracking of students into lower level science classes resulted in negative perceptions of science and students feeling alienated from science (Costa, 1995). Students in Olitsky’s (2006) study held beliefs consistent with their school’s discourse about science, beliefs about knowledge coming in different levels, and only college bound students needing to learn science. The discourse about science at this school resulted in the creation of two inflexible positions—college goer and non-college goer. Because certain students did not see college as an option, this negatively impacted their science identity. Students who did not see attainable positions within science did not see the point in participation. Authors conclude if science educators want to make science accessible to all students, then they need to make a wider variety of possible positions to assume within science. Science educators should also be cautioned certain statements may convey the message that science is a subject for elites, and with such statements communicate a message of exclusion to some (Olitsky, 2006).
Houseal, Abd-El-Khalick and Destefano (2014) examined the impact of a program engaging students in authentic scientific research, thus repositioning students to active roles in the scientific discourse. Students in the program worked alongside scientists of the National Park System to conduct student generated scientific investigations, which were also of interest to scientists. Using control-group comparisons to evaluate educational impact of the program, researchers demonstrated students who engaged in this authentic research experience not only showed significant gains in content knowledge but also showed improved attitudes towards science. In addition students in the program increased knowledge gains on scientific content unrelated to the scientific investigation of the program, which led researchers to believe students engaged in independent science learning as a result of program participation.

In an ethnographic study examining the science identity formation of three Navajo women, C. Brandt (2008) focused on the women’s experience with scientific discourse. The study concluded discourse played a major role in the development of science identity. The development of the students’ science identities was dependent on the availability of a discursive place, which C. Brandt describes as a “location of possibility” (p. 726). A discursive place is a neutral location, in which a student’s personal history, culture and knowledge are valued. This place of safety is egalitarian and collaborative, allowing students opportunities to try out their scientific language and develop alternative identities free from authorities or scientific experts. C. Brandt concludes discursive places are needed to provide students a neutral place to work out their science identities, bringing their own experiences and dialogues to construct what it
means for them to practice science.

Barton and Tan (2010) conducted a critical ethnography investigating the development of science identities in 20 low-income, urban youth, taking part in a summer science program. The five-week unit on the urban heat island effect (UHI) engaged students in the making of scientific documentaries to investigate the potential effects of UHI on their own communities. With a focus on how youth are positioned within the scientific community of practice and how they negotiate positions and identities within this world, Barton and Tan identified two powerful mechanisms participants used to assert themselves in science—authoring an investigation and taking up an expert stance. Analysis from video-recordings of activities and interviews with the participants revealed these mechanisms allowed youth to “blend what they know and can do with who they are and desire to be” (Barton & Tan, 2010, p. 212). Allowing youth to question the normative practices of science, and produce new science ideas and practices, gave students a place in the scientific discourse and allowed youth to construct an identity for themselves within the scientific community. Positioned socially within the community of science, the youth gained the confidence to engage in authentic dialogue and were empowered to place scientific ideas in a context they knew and understood. This process made the students producers instead of just recipients of the information. Researchers conclude giving opportunities to blend the social world of students, who they are and who they want to be with the world of science allowed students to develop a positive science identity.
As these studies illustrate, discourse plays an important role in the formation of a person’s identity. If people do not possess the tools to participate in the discourse of a particular community of practice, such as science, they may not take the risk of participating in conversations of that community. Educators can encourage student participation in scientific discourse by providing students opportunities to talk about things unrelated to science, welcoming out of school discourses, or by providing opportunities for students to construct scientific knowledge. By giving students the platform to talk, even if the talk may be unrelated to science, educators provide students a position within the classroom discourse. Students are able to see themselves as vital to the conversation. Instead of science being a subject they are positioned outside of and are tasked with the challenge of learning about, students are able to see their own lives and social identities as part of the conversation of science. The overall finding from the literature on discourse and identity is that by giving students a position to be producers of scientific knowledge instead of consumers, educators allow space for students to author more positive science identities.

**Multiplicity of Identity**

Gee (2000) explains a person’s identity is multiple and can be thought of as the type of person one is in a given context. A person’s identity cannot be homogenized. A social person cannot be explained by reducing that person to simple categories. Identity has many layers and must be considered within each unique context (Crenshaw, 1991). One aspect of a person’s identity does not exist in complete isolation from other aspects of his or her identity. Promoting the development of a positive science identity begins
with understanding the multiple identities of a person and how these identities influence and operate dialogically in relation to a person’s science identity (Wertsch, 1991).

Irizarry (2007) suggests in order to create equality within science education programs, educators need to be cognizant of the multiple identities a person has. People make choices about what learning activities to engage in based on their multiple identities. Learning is not simply about taking in new knowledge; learning is about who a person becomes when he or she takes in that new knowledge (V.M. Hand, 2006). If people perceive the trajectories of two identities to be in conflict, then they may abandon activities associated with one identity in favor of activities of their leading or core identity (Eisenhart et al., 1996). How people decide to engage with a community of practice relates to how participation in the community aligns with broader purposes they envision for themselves (Lave & Wenger, 1998). It is vital to consider how science aligns or does not align with other identities people have and how this alignment or lack thereof creates positions for people within science (Gee, 2000).

Certain groups will face more barriers in their attempt to succeed in school definitions of success because of conflicts between identities. In an ethnographic study, which looked at the experiences of Black community members striving for mathematics literacy, Martin (2006) describes the struggle many Blacks feel as they attempt to form their own identity in a subject, which claims to be culturally free. For many Blacks their racial identity plays a central role in constructing meanings of math experiences. The study concludes a student’s racial identity plays a major role in the development of their math identity. Many school practices may lead to Black parents and students feeling
judged and devalued because their cultural ways of caring or doing things are different from the mainstream way of doing things. This leads to inequitable learning opportunities for these communities. Additional studies show Black students’ success in school science may require them to abandon characteristics of their own culture because of conflicts between scientific views and their traditional views of nature (Ogawa, 1986; Ogunniyi, 1988).

Elmesky and Seiler (2007) conducted a longitudinal critical ethnography of Black students and found students’ science identity can be strengthened if schools embrace other aspects of students’ identity, even if these aspects are seemingly unrelated to science. As evidenced by the persistence of these forms of expression across different fields of participation (school, home, community), the researcher found music and expression through movement and sound were part of the core identity of students in the study. Incorporating this vital aspect of students’ identity into the classroom provided students opportunities to create a hybrid identity, aligning science with other parts of who they are. Use of music, rhythm, beats, and movement in the science classroom helped students feel an increased sense of belonging within the scientific community of practice. Elmesky encourages educators to blend the community culture of students and the culture of science in order to create spaces where participation in science will also strengthen students’ community identities. This finding connects to the Polman’s (2013) study, which also found when science was used to strengthen identities, which students were constructing outside of science activities (rap identities), students’ participation in science increased. Elmesky and Seiler (2007) also found when practices vital to a youth’s identity
were prohibited, this resulted in a weakening identity with science. Students’ engagement with science was hindered when movement expression was not valued (and at times prohibited) in the science classroom. Elmesky and Seiler call for educators to reshape definitions of school science to include other aspects of students’ identities, including non-verbal ways of expression.

Brickhouse and Potter (2001) found school science practices favor some personal identities of students over others, resulting in difficulties for certain students to succeed in school science. Specifically examining the scientific identity formation of two high school students of color, researchers found school science practices devaluing students’ personal identities may lead to early disengagement with school and construction of identities, which are in opposition to school. This study emphasized the importance of finding ways to help students retain identities, which are socially desirable to them as members of their communities but at the same time help students acquire valuable and practical skills. Authors conclude educational programs should not be designed in a way, which requires students to adopt the identity of a White, middle class male in order to succeed in science.

Oppositional identities may be formed when students purposely reject the mainstream goals and values in favor of community identities, which are perceived to be in conflict to school identities (Bowles & Gintis, 2002; McLean & Behringer, 2008; Ogbu, 1987). This phenomena of dis-identifying occurs when certain schooling conditions and practices lead underrepresented student groups to adopt the overarching goal of failure in school in attempts to preserve other more important aspects of their
identity (Fordham & Ogbu, 1986; J. Osborne, 1997).

In a case study of four middle school, Black girls, Brickhouse et al. (2000) found these students’ participation in science was related to other aspects of the students’ identities (good student, athlete, girl etc.), as well as future communities of practice the girls hoped to one day participate in (ex. mother). Researchers concluded the choice for a girl to engages in science was connected to how she viewed what kind of girl she was. Some identities of participants overlapped with science and had positive impacts on science achievement, whereas other identities may have served to impede the participants’ success in school science achievement. In this particular case, the identity of Black girls being loud, which may have served them well in other communities to which they belonged, worked against their success in classroom science. Researchers found the Black girls who did well and succeeded in science class were typically the ones who took on a White girl identity of quiet. Research elsewhere has demonstrated the most potent aspect of underrepresented children’s lack of classroom success lies in the conflicting features of their communication—both words used and patterns of discourse—with those valued by the teacher and educational institutions (Gee, 2000). Brickhouse et al. (2000) call for broadened definitions of science to form a community of practice compatible with and relevant to the lives of diverse students.

Gilbert and Calvert (2003) explored the process of how women with successful careers in science established their science identity. Specifically looking at the science narratives of these women and what they said about themselves in relation to science, Gilbert found study participants pursued a career in science because they saw a position
within science offering them a path leading to who they wanted to be. However, most participants admitted after working in science they found science to be masculine, referencing aspects of science such as the analytical and deductive ways of thinking. The girls in this study attributed their success in science to their ability to successfully maintain two personas. Although they considered themselves successful, this maintenance of two distinct personas created high levels of internal conflict, which resulted in some leaving the field of science even after being successful. Participants who left the field of science cited reasons such as the isolated environment or feeling different from everyone else. They felt they had to change who they were, or at least put aside who they were, in order to be allowed in the field of science. Conclusions of the study were that science is not inherently “a neutral, apolitical and gender-free” knowledge, and that if science practitioners hope to diversify science, attempts will need to involve more than recruiting more numbers of underrepresented groups in science (Gilbert & Calvert, 2003, p.875).

Managing dual identities may become problematic if two identities are seen to conflict with each other, leading people to feel they have to live dual lives (Giroux, 1992). Hughes (2001) argues the dominant discourse and practices of science are more congruent with some personal identities than others, resulting in some people facing difficulties in constructing positive science identities. Through observations and interviews with 60 students studying science, Hughes found certain student participants rejected the identity of a scientist because it was incompatible with their identity of being female. The students believed taking a science identity meant taking up a masculine
position. The conventional nature of science did not provide students with opportunities to reconstruct the discourse of science to make it relevant to their own identity. The science identity positions made available to the female students were uncomfortable positions, which they would rather not occupy. Hughes makes the case for re-conceptualizing science and making space within science for positions comfortable for female science identities. Some students did not have identities compatible with science and thus were unable to find comfortable positions within science. Findings of the study reveal new positions within science are made available when student knowledge is legitimized and they are provided opportunities to reconstruct the discourse of science. This capability to reconfigure the discourse of science enables students to create positions within science, which are consistent with their other identities.

A person’s social identities greatly impact how they encounter science and construct a science identity. When a person’s social identities conflict with the culture of science, authoring a positive science identity may not seem to be a possibility for that person. Educational programs can overcome this conflict by embracing and incorporating other aspects of students’ identities into science programs. Reflecting back on Polman’s (2013) study of incorporating rap into a history class, if educators take the time to get to know and deeply understand the identity trajectories their students are authoring outside of the classroom (such as identifying as part of the rap community), they can strive to demonstrate to students how the scientific community of practice may have positions available, which will strengthen these outside social identities as well as their academic identity. As the literature shows, a science welcoming to all values, cultural ways of
expression, and cultural ways of knowing, allows students to reconfigure the discourse of science, recognizes ways of talking, looking or acting outside of the stereotypical vision of science and strives to show mature contexts of science, which fit with the multiple identities people hold.

**Building Positive Science Identities**

**Approaches within Science Classrooms**

Educational programs, which have found ways to simultaneously affirm a person’s social and academic identities, have successfully impacted student achievement (Mehan et al., 1994). Rather than require suspension of students’ ways of knowing and communicating in order to participate in the scientific discourse, educational programs should provide opportunities for students to integrate existing cultural and personal identities into their science identities (Bianchini, 2007; Bouillion & Gomez, 2001; Cajete, 1999; Emdin, 2009; Lee & Buxton, 2011; Wertsch, Minick & Arns, 1984). One approach with potential to positively impact the science identities of learners is the Funds of Knowledge (FoK) approach. In this approach the educator becomes a learner, seeking to glean information from the funds of knowledge diverse students bring from their cultural experiences (Licona, 2013). The focus is not on making up for perceived deficiencies of a student but is instead on creating synergy as the knowledge of Western Modern Science (WMS) and the diverse knowledge of the student come together to provide a more holistic view of the world (Bianchini, 2007). The FoK approach not only recognizes alternative ways of knowing but values and embraces them. Educators acknowledge certain aspects of academic institutions, such as science, may negatively impact diverse
student groups whose cultural ways of communicating and knowing are in opposition to the institutional norms. Educators attempt to make their classrooms Third Spaces, which are places where students have a voice in what they learn (Emdin, 2009). Students are encouraged to bring the understandings they gain from outside of the classroom into this Third Space, which functions as a place for their outside experiences to meet their school experiences (Barton & Tan, 2009). The goal is to value everyone’s knowledge and use it to create more comprehensive understandings of the world (Licona, 2013; Moll et al., 1992b; Yosso, 2005).

**Research Experience for Undergraduates**

Another effective approach found to positively impact the science identities of underrepresented students is Research Experience for Undergraduates (REU). In an effort to increase representation of students of color in STEM fields, many undergraduate programs offer REU programs, which engage underrepresented students in authentic scientific research. Many of these programs pay students to work alongside university professors on scientific investigations. REU programs have risen in number based on research demonstrating the underrepresentation of diverse groups in STEM fields may not be the result of a lack of interest. Often underrepresented students are attracted to a career in science but do not persist in completing the degree. Sharkness, DeAngelo, and Pryor (2010) conducted a study examining a national sample of undergraduate STEM majors, specifically looking at how many complete their degree within 5 years of beginning the degree. This study found 33% of White students and 42% of Asian American students completed their degree, whereas only 18% of Blacks and 22% Latino
students completed their degree within 5 years of beginning. In a longitudinal study examining factors contributing to underrepresented undergraduates persisting in STEM fields, M. Chang et al. (2014) sampled 3,670 students from over 217 institutions. The goal of study was to identify institutional and individual factors positively or negatively affecting the likelihood of underrepresented students continuing and completing STEM majors. Conclusions of this study were racial disparities in STEM achievement start way before college and a person’s belief in their ability to do science is a major factor contributing to their persistence in STEM majors. Merolla and Serpe (2013) found people’s science identities have implications for their success in STEM fields, in particular if they will matriculate into graduate school. Students who perceived themselves as being capable and interested in science and who saw science as being for people like them were more likely to act on these perceptions and pursue graduate degrees in STEM. Researchers concluded giving historically underrepresented groups opportunities to do scientific research provides these students with access to the social networks conducive to persistence in STEM education and builds their beliefs about their capabilities to do science.

Studies show not only do students’ cognitive understandings of science grow as a result of participation in REUs, but students also more strongly identify as scientists or members of the scientific community after participation (Hunter et al., 2007; Kardash, 2000; Lopatto, 2004; Russell, Hancock, & McCullough, 2006; Thiry, Laursen, & Hunter, 2011; Ward, Bennett, & Bauer, 2002). Students involved in these authentic research experiences showed an increased understanding of the professional practice of science
and saw a potential place for themselves within it (Thiry et al., 2011). When students engaged in scientific research, they benefited from the authentic scientific experience (Harnik & Ross, 2003a) and were able to demonstrate a better understanding of the scientific research process (Evans, Abrams, Rock, & Spencer, 2001; Harnik & Ross, 2003a; Ross, Harnik, Allmon, Sherpa, Goldman, Nester, & Chiment, 2003; Wurstner, Herr, Andrews, & Alley, 2005). Students enrolled in REU programs are more likely to complete their science degree (Barlow & Villarejo, 2004; M. Chang et al., 2014; Hippel, Lerner, Gregerman, Nagda, & Jonides, 1998) and are also more likely to pursue graduate studies in STEM fields when compared to students with no research experience (Barlow & Villarejo, 2004; F. Carter, Mandell, & Maton, 2009; M. Jones, Barlow, & Villarejo, 2010; Schultz et al., 2011). Students who develop the ability to see themselves as science people are more likely to continue on in STEM majors (H. Chang, 1994; Espinosa, 2011).

Participating in REUs allows students to see a place for themselves within the scientific community of practice (Lopatto, 2007).

When students believe in their abilities to do science and develop the necessary skills to participate in science, they are more likely to have aspirations for research careers (Adedokun, Bessenbacher, Parker, Kirkham, & Burgess, 2013). In a study investigating the logical and sequential relationship between research skills, research self-efficacy, and aspirations for a scientific research career, Adedokun et al. (2013) found both research skills and research self-efficacy predict participants’ aspirations to have careers in science. In addition, the predictive effect of research skills is mediated through efficacy beliefs; as such, whether or not a student acquires skills and knowledge in
science is mediated by their beliefs and confidence in their ability to do so. This study provides further support demonstrating a person’s science identity influences their engagement with science. Social cognitive career theorists Lent and Brown (1996) explain the career a person chooses is not totally dependent on their personal interests. To a large extent, a person’s career choice is determined by self-efficacy beliefs and outcome expectations. For a person to choose a career in science, a person needs to believe in his or her abilities to do science and needs to see a possible outcome for one’s self within science. Students who feel they have skills necessary for scientific research are more likely to get involved in research. Interest is linked to self-efficacy. If one doubts one’s capabilities to do something, then that person will be less interested in pursuing a career in that subject.

REU’s are able to build a person’s science confidence by creating a position for the student as a generator of scientific knowledge. The student’s research efforts make actual contributions to the field of science (Hunter et al., 2007). When students see themselves working as co-equals with scientific experts who do not have all the right answers, this repositioning within the scientific community of practice results in an increased confidence in their ability to do science (Harrison, Dunbar, Ratmansky, Boyd, & Lopatto, 2011). When a person is able to directly engage in scientific research and bring his or her own perspectives and values to a science project, this positions a person as an insider to the scientific community of practice (Harnik & Ross, 2003b). Seeing practical applications of science helps a person identify more with STEM and his or her capabilities to do STEM (Carlone & Johnson, 2007).
With the large success of REUs in undergraduate programs, similar initiatives have arisen outside of the university. Citizen science projects, which involve research partnerships between scientists and members of the public, have been proposed as an effective way to provide opportunities for underrepresented communities to build their confidence in science and how they view themselves in relation to science (Dirks & Cunningham, 2006). Place based educational initiatives such as citizen science, in which knowledge of the local community is used as a starting point to build scientific knowledge, offer a great opportunity to overcome the alienation many people feel between science and their lived experience (Sobel, 2004). Research experiences are especially beneficial to underrepresented populations when research questions connect to issues existing within diverse communities and encourage social interaction (Gregerman, 2009). By having members of the public answer their own questions instead of learning someone else’s knowledge and answering someone else’s questions (Warren, 1989) citizen science projects provide a space of collaboration for the public and scientists to co-construct knowledge (McCormick, 2007). When a person is recognized as doing real science and sees the impact of their work on local communities with which they identify, this helps build their science identity (Carlone & Johnson, 2007). Being a part of authentic scientific research helps a person develop their competencies to do science and gives them a space within the scientific community of practice (M. Jones et al., 2010; Seymour et al., 2004).

**Public Participation in Scientific Research: Citizen Science**
Citizen Science, a term coined by Rick Bonney of the Cornell Lab of Ornithology, commonly refers to collaborative research efforts between scientists and members of the public to address real world problems. A citizen science project asks individuals with little to no formal science training to gather research data for scientists (Bonney et al., 2009). Without the need for specialized equipment, people can participate in science as a community studying their own urban ecology (Pandya, 2012). Citizen science falls under the umbrella term, Public Participation in Scientific Research (PPSR), which is a term used to encompass the many diverse forms and traditions of engaging members of the public in scientific research. All PPSR projects involve “intentional collaborations in which members of the public engage in the process of research to generate new science-based knowledge” (Shirk et al., 2012, p. 28). PPSR includes initiatives similar to citizen science, such as community-based monitoring (Danielsen et al., 2009), participatory monitoring (Bell et al., 2008), biological monitoring (Lawrence, 2006), community science (Wilderman, 2004), and participatory action research (Miller-Rushing, Primack, & Bonney, 2012). Many of the findings included in this literature review, regarding best practices for engaging diverse communities in scientific research, come from the field of participatory action research, a type of PPSR with the purpose of democratizing knowledge production (Israel, Schulz, Parker, Becker, Allen, & Guzman, 2003).

PPSR has been historically guided by two theoretical traditions: Public understanding of Science and Technology (PUST) and Public Engagement in Science (PES). PUST can be viewed more as an educational outreach, in which scientists engage the public in research with the assumption that if the public better understands science,
they will be more accepting of scientific results (Lewenstein, 1992). PES is seen as a bottom up approach and a two-way dialogue between citizens and scientists around scientific and community goals (Mejlgaard & Stares, 2010). The many types of PPSR projects, with their differing levels of citizen participation and measures of success, reflect project goals tied to these two traditions (Haywood & Besley, 2014). To avoid the confusion existing as a result of the many terms used to describe citizens engaging in scientific research, this literature review and subsequent study use the umbrella term PPSR (Shirk et al., 2012).

**PPSR project models.** The Center for Advancement of Informal Science Education (CAISE) established an inquiry group to describe the various models for PPSR, classifying models based on the degree and quality of participation from the public (Bonney et al., 2009). Which project model is used depends on project goals, community needs and the context of the research (Bonney et al., 2009; Danielsen et al., 2009). Shirk et al. (2012) defines *quality* of participation as the “extent to which a project’s goals and activities align with, respond to and are relevant to the needs and interest of public participants” and defines *degree* of participation as the “extent to which individuals are involved in the process of scientific research” (p. 29). The subsequent CAISE report classifies projects into three major categories, which are described below in Table 2.1, along with an example of each type of project.
### Table 2.1  
**Model Types for PPSR Projects**

<table>
<thead>
<tr>
<th>Who asks research questions</th>
<th>Contributory Projects</th>
<th>Collaborative Projects</th>
<th>Co-created Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientists</td>
<td>Scientists design all steps of project</td>
<td>Scientists design most steps of project, participants may help design protocols for data collection</td>
<td>Participants help inform and exert control in project design</td>
</tr>
<tr>
<td>Design of project</td>
<td>Data collection (and occasionally minor data analysis)</td>
<td>Data collection, data analysis, interpretation of data and presentation of results</td>
<td>Posing research questions, data collection, data analysis, interpretation of data and presentation of results</td>
</tr>
<tr>
<td>Stages of research process involving participants</td>
<td>ALLARM Acid Rain: Scientists interested in the effects of acid rain on local streams recruited the help of volunteers to test pH and alkalinity of stream waters across state of Pennsylvania</td>
<td>Salal Harvest Sustainability: Scientists interested in effects of harvesting intensity partnered with local salal harvesters on Washington’s Olympic Peninsula</td>
<td>Reclaim the Bay: In an attempt to restore shellfish to the Barnegat Bay in New Jersey, local citizens partnered with scientists to monitor and manage shellfish habitat</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source. Adapted from (Bonney et al., 2009)

Wilderman, Barron, and Imgrund (2004) describe the strengths and challenges associated with the use of each model. A summary of their findings shows the Co-created Project Model, with its local ties, makes recruitment and retention of citizen participants easier, however, the tendency of this model to involve many stakeholders presents challenges to successfully balancing the goals and priorities of all project participants.
The Contributory Model is the most efficient model and is often viewed by the scientific community as more scientifically rigorous than the other models. Yet, Co-created and Collaborative projects better build capacity within communities for collecting knowledge and collectively implementing action to address local concerns (Wilderman et al., 2004). Contributory projects most often result in peer-reviewed publications (Dickinson et al., 2012), yet Collaborative and Co-created projects offer greater potential for innovation because they bring together multiple abilities and different ways of knowing to work towards common goals (Woolley, Chabris, Pentland, Hashmi, & Malone, 2010). The CAISE study report found Collaborative and Co-created projects have the biggest impact on science learning and behavior change, whereas Contributory projects seem to have more clearly defined educational goals (Bonney et al., 2009). Overall, researchers conclude the more control the community has, the more benefits there will be for the community (Wilderman et al., 2004), thus more Collaborative and Co-created projects are needed, which involve community members in more steps of the scientific research process as well as in the project design (Bonney et al., 2009).

When choosing a project model, scientists need to balance scientific goals, educational goals, and motivational goals of participants (Jordan, Gray, Howe, Brooks, & Ehrenfeld, 2011). Projects may have the main goal of recruiting citizens to monitor natural resources (Ballard, Pilz, Jones, & Getz, 2005; Cooper, Dickinson, Phillips, & Bonney, 2007), or may have educational outreach as the overall goal, with the project’s purpose being to increase the public’s understanding of science (Osborn et al., 2005). Shirk et al. (2012) recommend project leaders begin with the end in mind by considering
and balancing project goals. Project leaders need to consider what scientific data citizens will collect but also consider what the public will do with the scientific knowledge. If the end goal is the public being involved in policy decisions, then project leaders need to consider how much scientific knowledge will be needed for a participant to make an informed decision (Jordan et al., 2011). If project goals are not balanced, then some of the potential usefulness of the project may be lost (Harnik & Ross, 2003b). For example, if educational goals are emphasized but there are no strong scientific goals, then the data will not be used, and the project will lose its potential as a tool for empowering citizens with scientific research (Kim, Robson, Zimmerman, Pierce, & Haber, 2011).

**Benefits for scientists.** Rick Bonney, Director of the Department of Program Development and Evaluation at Cornell’s Lab of Ornithology, describes PPSR as a valuable research tool for the scientific community because it allows for large-scale data collection over time and saves money through volunteer hours (Cohn, 2008). The volunteer-based efforts help scientists collect valid data across large geographic areas (Delaney et al., 2008; Nagy, Bardwell, Rockwell, Christie, & Weckel, 2012). Citizens can be especially useful in projects involving the monitoring of natural resources, as the monitoring process is expensive and time consuming (Danielsen et al., 2009; Dickinson, Zuckerberg, & Bonter, 2010). Involving citizens in scientific research can overcome challenges scientists face regarding insufficient time and computing power necessary for research projects (Holohan & Garg, 2005) and allows for a large amount of data to be collected at minimal cost (McCaffrey, 2005). Recent advances in technologies have provided significant opportunities for citizens to contribute directly to the expansion of
scientific knowledge (Howard, 2012). One virtual PPSR project, called Folding@home, involves citizens using their personal computers to do scientific calculations of proteins’ folding structures. Volunteers in this project have made significant contributions to scientific understanding of protein structures (Beberg, Ensign, Jayachandran, Khaliq, & Pande, 2009).

If PPSR is going to be accepted as a valuable research tool, then the data must be reliable (Bonter & Cooper, 2012; Harnik & Ross, 2003a). According to Brian Mitchell, an ecologist for the National Park Service, using well-developed protocols and guides for data collection helps ensure data collected by citizens are accurate, reliable, and useable (Cohn, 2008). Studies investigating the validity of citizen data reveal when scientist take the time to invest in training citizens upfront and establish certain criteria for collection methods, citizen data can be trusted according to scientific standards (Delaney et al., 2008; Gallo & Waitt, 2011; Mueller & Tippins, 2012b). Online data screening and validation tools create smart filters, allowing scientists to be more confident in the validity of participant data (Bonter & Cooper, 2012). Determining the skill level of the citizens and how their skills can best contribute to data needed for a scientific investigation is key. PPSR data sets may not give as much detailed information, but scientists are able to get large-scale patterns covering expansive areas, producing results with great statistical power (Devictor, Whittaker, & Beltrame, 2010). Data collected by citizen scientists have been used to inform states’ endangered species consultation process (Havens, Vitt, & Masi, 2012), create species distribution maps (McCaffrey, 2005), develop taxonomic systems to understand evolution of species (Miller-Rushing et
al., 2012), come to robust conclusions about polymorphism in organisms (Worthington et al., 2012), inform public health initiatives (Wing, Horton, Muhammad, Grant, Tajik, & Thu, 2008), form complete and accurate maps of breeding ranges of every North American bird, track disease in birds, and formulate guidelines for land management and habitat preservation (Cohn, 2008).

**Benefits for citizens.** PPSR projects provide citizens the opportunity to learn how the scientific process works in practice (Cohn, 2008; Jordan, Ballard, & Phillips, 2012; Laval, 2012) and may lead to gains in data collection skills (Wilderman, 2004), scientific knowledge (Brossard et al., 2005; Evans et al., 2005; Ruby et al., 2007) and improved attitudes towards science (Ross et al., 2003). Some projects result in independent investigations by citizens with results being published in peer-reviewed literature (Oberhauser & LeBuhn, 2012). Certain projects have educational goals and couple project data collection activities with explicit science instruction. Such projects have demonstrated increased scientific literacy scores for participants, including better understanding of scientific vocabulary, science process understandings, scientific methodology, and reasoning related to the monitoring of invasive species (Cronin & Messemer, 2013; Cronje, Rohlinger, Crall, & Newman, 2011; Wilderman, 2004). Qualitative analysis of unsolicited letters sent to project leaders of a PPSR project of the Cornell Lab of Ornithology, Seed Preference Test (SPT), revealed nearly 80% of participants who sent letters, engaged in thinking processes similar to scientific investigation (Trumbull, Bonney, Bascom, & Cabral, 2000).
PPSR projects offer meaningful opportunities for students to experience the scientific process (Kountoupes & Oberhauser, 2008) and demonstrate the relevancy of science to students’ lives (Mueller & Tippins, 2012a). Educators have used projects as extended lab experiences because the projects fit well within many science curriculums and provide an opportunity to expand science from beyond the classroom into the homes of students (G. Jones et al., 2012). In a qualitative study consisting of interviews with students involved in Operation Magpie—a project involving parents and school groups in scientific research—Alexander and Russo (2010) found the project improved students’ perceptions of science. Researchers concluded because PPSR projects often involve sensory activities, experiential learning, and being outdoors in students’ communities, more schools should incorporate such projects into their science curriculums.

PPSR projects are not always educationally valuable to citizens, with some project results revealing no change in participants’ scientific knowledge or conservation behaviors (Druschke & Seltzer, 2012). In fact, very few PPSR projects are able to demonstrate people’s attitudes toward science have changed as a result of project participation (Brossard et al., 2005). Research has demonstrated for citizens to benefit from the project, the research effort needs to be truly collaborative (Druschke & Seltzer, 2012). When participants are not involved in much of the research process and instead function only in data collection, they may not understand project goals, scientific processes involved, or how the data will be used. In the interest of participant learning, it is best to have personal and sustained communication between participants and researchers and to involve citizens in the collection and analysis of project data (Evans et
Long-term projects involving sustained participant engagement have the greatest potential to benefit the citizen and promote behavior change (Bonney et al., 2009). The CAISE study report on PPSR revealed different models of PPSR projects have demonstrated varying results in terms of learning outcomes. Table 2.2 summarizes the findings on educational impact of different PPSR model types (Bonney et al., 2009).

Table 2.2

<table>
<thead>
<tr>
<th>Understanding of scientific concepts related to study at hand</th>
<th>Contributory Projects</th>
<th>Collaborative Projects</th>
<th>Co-Created Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge about scientific process</td>
<td>X</td>
<td>To a significant degree</td>
<td>To a significant degree</td>
</tr>
<tr>
<td>Knowledge of community structure and environmental regulation</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Community building</td>
<td>Large scale projects have demonstrated ability to build virtual communities</td>
<td>Effective at building real world communities</td>
<td>Effective at building real world communities</td>
</tr>
</tbody>
</table>

PPSR projects can be instrumental in raising awareness of local environmental issues (Bonney et al., 2009; Cohn, 2008; Evans et al, 2005). Well-designed projects become powerful tools when the people involved in data collection are the people whose actions have the potential to affect change (Dickinson et al., 2012). As urbanization
increases, what it looks like to be involved in conservation efforts is changing—with the growing need to preserve residential ecosystems (Cooper et al., 2007). PPSR provides an opportunity for citizens to manage their own resources instead of leaving decisions in the hands of a few informed policy makers. The actions needed to preserve lands depend on local citizens. In theory, involving local citizens in every step of the research process will result in better buy-in with outcomes and recommendations resulting from the research (R. Chambers, 1994; Lemieux-Charles, McGuire, & Blidner, 2002).

An investigation into a Contributory project involving citizens using a mobile app to collect information on noise pollution revealed the more citizens were involved in generating the data about noise pollution (measured by the frequency of contributions), the more the app users rated noisy environments as hectic and less loveable. This project accomplished one of the main goals of PPSR projects, which is having citizens generate their own information, will lead to more public involvement and behavior change (Becker et al., 2013). Other projects have led to changed behavior in citizens as well. After data for the project had been collected and analyzed, members of a Co-created project—Sherman’s Creek Conservation Association—took action by developing a conservation plan for their community (Wilderman, 2004). Community Health Effects of Industrial Hog Operations (CHEIHO)—a Collaborative project researching health effects on residents by pollution from industrial hog operations—raised environmental awareness and resulted in community action policies (Wing et al., 2008). Community volunteers in an Earthwatch program—Grevy’s Zebra Conservation—now serve as ambassadors between their local communities, NGOs and governmental agencies. Data
collected during the project serves to inform management plans and conservation strategies, giving citizens a voice in land management policies (Chandler et al., 2012).

PPSR projects provide an opportunity for people to get involved in preservation efforts. Matthew Stevens, monitoring coordinator for Appalachian Trail Conservancy PPSR project reflects, “The environment belongs to all of us...We want to give people a chance to get involved in its preservation in a whole new way” (Cohn, 2008, p. 197). Data collected by citizens helps everyone understand long-term changes in ecosystems and has been used to inform policy and management decisions (Miller-Rushing et al., 2012). Knowledge of, and experience with, the impacts of urbanization are key factors determining one’s adoption of sustainability practices (Devictor et al., 2010). Earthwatch, an international agency supporting PPSR projects in more than 30 countries, partnered with Starbucks and local Costa Rican farmers in a scientific inquiry investigating the decline of coffee bean crops. Local citizens, who had an economic interest in the project, dedicated over three years and hundreds of hours of their time collecting data for the project. Results of the study have led farmers to reduce synthetic inputs into their fields and to adopt other more sustainable farming practices. Follow up after the study revealed key stakeholders in the investigation, both farmers and Starbucks agronomists, had behavioral changes after participation in the project, becoming vocal proponents of sustainable coffee production (Chandler et al., 2012).

One of the main societal benefits of PPSR is the creation of an environmental democracy, in which the public is able to become a part of generating information and participate meaningfully in conversations concerning environmental impact (Conrad &
Hilchey, 2011). Environmental justice is achieved when all people have access to healthy living environments and access to decision-making processes affecting their health (Marouli, 2002). Involving the public in scientific research is a form of empowerment. Scientific knowledge is used by governmental agencies to make decisions, which will impact all citizens, and thus those with expert knowledge have power over those without expert knowledge (Habermas, 1971). According to Freire, dialogue is the vehicle through which men achieve significance. Through dialogue we name our world, and it is the human right of everyone to participate jointly in this privilege of naming the world (Freire, 2000). Dialogue must not be a situation where “some men name on the behalf of others” (Freire, 2000, p.147). The democratization of scientific research provides all citizens influence by involving them in the production of scientific knowledge. To avoid subjecting the public to a “theme of silence” (Freire, 2000, p.150) PPSR projects provide a space of collaboration for the public and scientists to co-construct knowledge (McCormick, 2007).

**Demographics of PPSR participants.** The demographics of citizens engaging in PPSR projects do not reflect the demographics of the United States. Blacks, Latinos, Native Americans and all lower socioeconomic statuses are underrepresented in PPSR projects (Evans et al., 2005; Pandya, 2012). In fact, projects tend to attract an environmentally aware citizenry (Brossard et al., 2005) who already actively demonstrate care for the environment and have at least some awareness of scientific processes. Often these volunteers are scientists, science teachers or outdoor enthusiasts (Cohn, 2008). Despite efforts by scientists to recruit a diverse group of citizen scientists, the typical
participant is older, well educated and White (Campbell & Smith, 2005). A summative evaluation of Cornell University’s Birdhouse Network—a project asking citizens to help scientists monitor bird species—found 98% of their participants were White, 65% were age 30-60 years old, and 79% had a college degree or higher (Brossard et al., 2005). More than 80% of participants in Smithsonian’s Neighborhood Nestwatch Program had at least a bachelor’s degree and there were very few participants living in urban settings (Evans et al., 2005). Cornell’s Lab of Ornithology Seed Preference Test (SPT) project also attracts a homogeneous crowd with participants being older, more educated than the general public and already interested in science. 70% of project participants had at least a bachelor’s and 63% read science on a regular basis (Trumbull et al., 2000).

Volunteers in Florida Fish and Wildlife Conservation Commission (FWC)—a project surveying Florida beaches for turtle nests—found the majority of participants were older, well-educated, White females who participated because they wanted to protect sea turtles (Bradford & Israel, 2004). Volunteers in another project—started by the Nature Conservancy in Ohio, involving members of the public in the monitoring of birds’ nests—found most participants were middle aged, well-educated and fairly affluent White males. 63% indicated they participated because they wanted to do something for nature (King & Lynch, 1998). As these results indicate, a major challenge facing the field of PPSR is how to interest a broader spectrum of people to engage in these research efforts (Alexander & Russo, 2010; Bonney et al., 2009).

Many PPSR project leaders recognize the importance of broadening the impact of PPSR projects to include underrepresented populations. Engaging underrepresented
participants in scientific research not only promotes scientific literacy across all cultures but also provides a wider sampling of data (McCaffrey, 2005; Purcell et al., 2012) and multiple perspectives to provide enriched interpretations of the data (Mohatt, Hazel, Allen, Stachelrodt, Hensel, & Faith, 2004; Ribisl et al., 2004; Teufel-Shone, Siyuja, Watahomigie, & Irwin, 2006). Conservation issues involve many stakeholders, including underrepresented groups; thus, research efforts also need to involve more people and more sociopolitical, economic, and ecological interests (K. Brown, 2003; Nagy et al., 2012). Conservation goals and policies are not scientific decisions alone because they involve values. The decision of which goals are prioritized and funded needs to be a societal decision reflecting the values of more than just a small sector of society (Hobbes, Davis, Slobodkin, Lackey, Halvorson, & Throop, 2004). All communities, especially those vulnerable to environmental justice, need access to scientific information and a voice in the decision-making processes (Higgins, 1993).

**Strategies for Engaging Underrepresented Communities**

Being inclusive is strategic; it will not happen on its own. Research on the varying PPSR project models shows Contributory projects tend to engage a homogeneous group of participants already knowledgeable about science and the environment, whereas Co-created and Collaborative projects designed to meet specific community needs have motivated involvement from participants outside the demographic of the typical PPSR participant (Bonney et al., 2009). The participatory approaches involved in the Co-created and Collaborative project models have been especially helpful in identifying the needs and priorities of underrepresented communities (Israel et al., 2006; Minkler et al.,
2006; Patten et al., 2005). The remainder of this literature review provides research-based recommendations for PPSR projects desiring to initiate and sustain research partnerships with underrepresented communities. Several themes emerged from the literature regarding the process of how effective partnerships are forged with underrepresented communities. These themes overlap to some extent but taken together provide a comprehensive overview on effective approaches for engaging underrepresented communities in scientific research. The overall themes for this final portion of the literature review are: establishing community partnerships involves respecting communities, building trust, and working together. Much of the literature covers the experiences, insights and advice from PPSR project leaders currently engaging underrepresented communities in scientific research. Throughout the literature, PPSR project leaders’ overall description of how to design projects, which engage underrepresented audiences in scientific research, well aligns with the theoretical construct of a Third Space. In fact, it was the review of the project leaders’ advice, which led this researcher to propose more attractive options for science identities are available to participants when PPSR projects become hybrid Third Spaces. This literature review is organized according to these themes and examines how these themes parallel the theoretical construct of a Third Space.

Third Space

Homi Bhabha, a postcolonial theorist, first described the concept of a dialogic Third Space as an area between different discourses, or communities of practice, which has the potential to be productive for a person’s identity development (Bhabha, 1994). A
Third Space is a place recognizing people draw upon multiple resources and discourses to make sense of the world. It is a place not only recognizing these other resources and discourses a person brings with them to a learning environment or project, but also merging the multiple discourses together to form new discourses. In a PPSR project, a Third Space is a place where the discourse of the community and the discourse of science are not in competition with one another but rather blend together. According to Bhabha (1994), this merging allows individuals to find a strong sense of themselves within a space. A Third Space is a bridge between two communities of practice (Gutiérrez, Baquedano- López, & Tejeda 1999) and a place offering opportunities to express and validate a person’s multiple identities (Whitchurch, 2008). A Third Space is a zone of proximal development, which provides a person with navigational tools to cross boundaries between communities of practice but also creates a social environment where a person can reconceive who they are in relation to an academic community of practice such as science (Gutiérrez, 2008). As the following discussion will show, PPSR projects, which become Third Spaces, have great potential for engaging diverse audiences in scientific research.

**Respecting communities.** The theme of respect is defined as giving the proper dignity to and recognizing the value in a community’s culture and perspectives on knowledge. Wallace (2004) explains Bhabha’s Third Space allows for the co-construction of new hybrid meanings. In a Third Space, neither party in the conversation holds the correct meaning, rather there is cooperation and compromise in the construction of new meanings. A Third Space is a place where neither party’s understanding is
privileged (Wallace, 2004). It is a weaving together of multiple discourses in a way, which does not dismiss community ways of knowing and experiencing. As Gutiérrez et al. (1999) explains, a Third Space is a zone of collaboration between the “official” script and the script of the community (p. 292).

PPSR project leaders advise respect should guide the way project leaders enter a community and how they interact with community members throughout the project (Mueller & Tippins, 2012a; 2012b; Kuznetsov, 2006). Science has a unique culture and values certain ways of knowing. Uriarte et al. (2007) defines the scientific culture as “scientists’ shared values, norms, attitudes, customs, goals, and practices” (p. 71). The culture of science “sets the ground rules for success and participation in science” (Uriarte et al., 2007, p. 71). Research has shown certain aspects of the scientific culture may be alienating to underrepresented communities and serve as a barrier to truly collaborative projects (Brickhouse & Potter, 2001; Jegede & Aikenhead, 1999; Jolly, 2002; Lee & Buxton, 2011). These alienating aspects include the positivistic nature of science (Barton, 2001), mentality of intense competition (Epstein, 2006), hierarchical structure rewarding competitive behavior (Uriarte et al., 2007), analytical ways (Lee & Buxton, 2011), communication patterns used to construct scientific knowledge (Bianchini, Johnston, Oram, & Cavazos, 2003; Gay, 2002; Parsons, 2008) and White, masculine values and norms (Brickhouse et al., 2000), values which may be fundamentally different and at times contrary to values of diverse groups (Barton, 2001; Seymour & Hewitt, 1994).

Moreover, scientists are often untrusting about what unscientific people have to say about science because of the intense training involved in becoming a scientist (Latour
& Woolgar, 2013). However, project leaders successfully engaging underrepresented communities in research recommend truly participatory approaches in which community members and scientists co-generate knowledge by combining local knowledge with scientific based knowledge (Kincheloe, Steinberg, & Tippins, 2008; Kountoupes & Oberhauser, 2008; Mueller & Tippins, 2012a; Pandya, 2012). Likewise, a Third Space merges different disciplinary of knowledge (Moje, Ciechanowski, Kramer, Eillis, Carrillo, & Collazo, 2004). Disciplinary boundaries break down and interdisciplinary forms of knowledge are produced (Whitchurch, 2008). A Third Space focuses on horizontal forms of expertise and learning (Gutiérrez, 2008). Project leaders also recommend forming multilateral partnerships allowing for a blending of community knowledge and western ways of knowing (Barnhardt, 2005). Top down PPSR projects, in which citizens do not ask their own questions but rather serve as tools to collect data for scientists, may convey the message that scientific knowledge is superior to community ways of knowing (Mejlgaard & Stares, 2010; Mueller & Tippins, 2012a; Wilderman et al., 2004).

Part of respecting community knowledge means being humble about scientific knowledge. When project leaders enter a community with pre-determined project parameters, the terminology to be used, and pre-determined definitions of how one can participate, they may send the message that science scientific knowledge is more valuable than other forms of knowledge and only elite people, those trained as scientists, have the right to describe and name the world. As Freire asks, “How can I dialogue if I regard myself as a case apart from other men—mere its in whom I cannot recognize other “I’s”
Participatory approaches have the ability to empower people and communicate to them a respect for their knowledge (Fawcett et al., 1995; Ribisl et al., 2004).

A Third Space is a zone for new interpretations of meaning where hegemonic interpretations are not assumed to be the correct or true interpretation (Bhabha, 1994). In a Third Space other ways of knowing, expressing, and communicating are welcomed as “ethos and official knowledge” (Gutiérrez et al., 1999, p. 295). Similarly, PPSR project leaders engaging underrepresented communities in scientific research advise scientific knowledge is not the only vital knowledge (Bianchini, 2007; Nieto, 2005); other ways of knowing, such as geographic knowledge, are vital to true understandings of the issues (Burbank & Hunter, 2008; Mueller & Tippins, 2012b) and open up scientific projects to the possibilities for growth (Barnhardt, 2005; Popkewitz & Brennan, 1998). A Third Space celebrates local and cultural ways of knowing. It is transformative, allowing new knowledge to be developed (Gutiérrez, 2008). PPSR projects have found success in creating “transnational” spaces where local knowledge and Western Modern Science (WMS) function together rather than always translating or changing local knowledge to the universal discourse of WMS (Gough, 2013; Lowan, 2013). Many programs suffer from what Freire (2000) calls “narrator sickness” where project leaders do all the talking and creation of knowledge, and community members play passive roles. Freire says true education occurs when everyone’s knowledge is valued and both researchers and community members together attempt to solve real problems of humans in their relations to the world (Freire, 2000). Transnational spaces are best created in an environment of
collective community learning, in which scientists and community members have equal status and seek to learn together (Ardoin, Clark, & Kelsey, 2013). A true dialogue is not one dominant worldview explaining the way things are to a lesser worldview. A true dialogue is horizontal and leads to a partnership in naming the world (Freire, 2000).

A Third Space is a space of cultural, social, and epistemological change, a place of conversation between different types of knowledge and discourses characterized by the building of communicative relationships (Moje et al., 2004). A Third Space is a strategic integration of various ways of knowing and experiencing the world. Accordingly, constructing a Third Space requires more information regarding the funds of knowledge and discourses community members draw on (Gutiérrez et al., 1999; Moje et al., 2004). People construct knowledge through their prior experiences, interaction with the world and others, and through their culture (Bianchini et al., 2003). Educators cannot truly acknowledge the diverse experiences, traditions, voices, and histories of underrepresented groups unless they spend time in local communities. Project leaders need to be immersed in the language, practices and thoughts of a community with whom they are dialoging (Freire, 2000). In this way they can understand the cultural practices of the group, use everyday language, and communicate through modes culturally accepted by the group (Jolly, 2002; Nisbet & Scheufele, 2009). Handa and Tippins (2012) recommend a practice they refer to as cultural memory banking, in which science educators spend time in the community prior to any initiation of a project in order to come to an understanding of where community life intersects with science learning. It is vital to understand the issues and lived experiences of community members along with challenges they face.
Spending time in the community can help project leaders understand a community’s perspectives on knowledge (Duggan-Haas, Smith & Miller, 1999) and ways of communicating and collaborating (Carr, 2002; H. Chang, 1994; Jolly 2002), so project leaders can negotiate the boundaries between the community’s culture and the culture of WMS (Lee & Buxton, 2011). Even small cultural differences in communicating such as hand gestures may have a huge impact on how a project will be received in a community (Jolly, 2002).

A Third Space does not privilege the language of science over the language of the community. Instead, cultural ways of communicating are used as tools for meaning making (Gutiérrez et al., 1999). A Third Space creates a collective identity through the use of a hybrid language. Community members participate and build their own meaning, situating their own lived experiences, trajectories, and challenges within the scientific community of practice (Gutiérrez, 2008). The language shared in a Third Space is a language of possibility, attempting to build shared understanding and an “interactional matrix” (Gutiérrez, 2008, p.153). A Third Space is characterized by developing appropriate language, which speaks to both communities (Whitchurch, 2008). In accordance with the language of a Third Space, PPSR Project leaders recommend developing a common language for collaboration and building trust between partners (Barnhardt, 2005; Duggan-Hass et al., 1999; Jegede & Aikenhead, 1999). Not all community members will feel comfortable with scientific ways of communicating their data. Project leaders have found it is important to find other ways for participants to express what they are observing, ways of presenting data viewed as legitimate in the eyes
of community (Fernandez-Gimenez et al., 2008). Some examples project leaders give are
the use of stories, music, personal accounts (Caldiero, 2007; Purcell et al., 2012), and art
to promote conversations with underrepresented communities and nurture a sense of
place (Jacobson, Mcduff, & Monroe, 2007; Sobel, 1996). Likewise, a Third Space
welcomes various forms of participation and alternative ways of sharing expertise
(Gutiérrez et al., 1999) and integrates other vital parts of a person’s identity into the
discourse and values of the project (Moje et al., 2004).

**Building trust.** The theme of trust highlights the relational aspect of partnering
with underrepresented communities to conduct scientific research. When attempting to
form a Third Space between two diverse communities of practice, it is vital to understand
a group’s historical participation with a practice or activity (Gutiérrez & Rogoff, 2003).
A Third Space privileges the socio-historical lives of community members (Gutiérrez,
2008) and develops mutual respect between two communities of practice (Gutiérrez,
Baquedano-López, & Tejeda, 1999). In order to develop trusting relationships with
community members, project leaders recommend an attitude of humility (Porter & Baker,
2005), as well as a reflective view on status and privilege (Chavez, Duran, Baker, Avila,
&Wallerstein, 2003; Israel, Eng, Schulz, & Parker, 2005; Minkler, 2005). Therefore,
PPSR projects aiming to engage underrepresented communities need to take time to
develop mutual respect and trust between the scientific and local communities (Metzler et
al., 2003; Wallerstein, Duran, Minkler, & Foley, 2005).

The conversations project leaders have with community members cannot be
separated from the context, history, and place in which they occur. There is no such thing
as a neutral project, event, or action. Many underrepresented communities might be skeptical of working with a researcher because they have had bad experiences with researchers financially exploiting their lands or writing negative descriptions of their communities, referring to them as deprived, deficient and inferior (Chandler et al., 2012; Delpit, 1988; Delpit, 2006a; 2006b; Delpit & Dowdy, 2008; Gearheard & Shirley, 2007). In light of the negative pasts many communities have with researchers, building trust is essential (Chandler et al., 2012; H. Chang, 1994). A Third Space does not deny the past but rather uses it as a resource to critically examine and engage in dialogue about oppression and possibilities for future action. Instead of letting oppression leave a community defeated, a Third Space involves a conscious effort to find hope and the tools, which enable a community to author their own history of the future (Gutiérrez, 2008).

Likewise, PPSR project leaders recommend acknowledging the existence of sociocultural and ecological oppression in North America. Even environmental research questions asked in PPSR projects are all situated in a politically controversial environment (Kulnieks, Longboat, & Young, 2013). To establish trust within the community, project leaders need to be honest about intentions and be cognizant of the values guiding projects (Jickling, 2003). Even the language project leaders use to discuss issues, as well as the research questions they pose, have both knowledge and value claims, which function differently in various contexts (Stevenson, Brody, Dillon, & Wals, 2014). Project leaders should be cautious and honest, critically considering whose economic interests are being served by environmental language, policies and research questions (Jickling, 2003; E. Johnson & Mappin, 2005).
Spending time engaged in the informal activities of a community can be vital to the development of a Third Space because it can help science practitioners understand the community’s values, funds of knowledge, and social purposes (Moje et al., 2004). Similarly, Fernandez-Gimenez (2008) in a review of 18 community-based monitoring projects, found not all participatory PPSR projects studied had equally positive results. Overall, researchers found trust was enhanced when there was repeated interaction between all stakeholders in a project and when there were multiple opportunities to demonstrate respect, reliability and transparency. To build trust and create synergy between scientists and community members, researchers need to be actively involved in community activities (Chu, Leonard, & Stevenson, 2012; Gearheard & Shirley, 2007), spend face-to-face time developing personal relationships (Chu et al., 2012), find more frequent and creative ways of engaging and communicating with community members (Gearheard & Shirley, 2007), and recognize volunteer contributions (Rotman et al., 2012). Mutual trust is established through open, honest, and ongoing dialogue (Ammerman et al., 2003; Minkler, 2004; Wallerstein et al., 2005). Finally, to establish trust with underrepresented communities, project leaders should demonstrate a commitment to continue working with a community over time. Gearheard and Shirley (2007) explain many Inuit communities—indigenous peoples inhabiting the Arctic regions of Greenland, Canada, and Alaska—refer to researchers as “Siksiks” or “ground squirrels” because researchers come in the summer, they scurry around collecting what they need and then are gone. This picture, although used playfully at times, also is used to convey community members’ feelings of mistrust for researchers (Gearheard & Shirley,
In order to overcome these feelings of mistrust and build positive relations with communities, project leaders need to be flexible and demonstrate long-term commitment to the needs of the community (Israel et al., 2006).

**Working together.** The final theme of working together—identified as key to engaging underrepresented communities in scientific research—emphasizes the importance of give and take in relationships with local communities. Project leaders will have certain research goals to accomplish but should not forget about the community’s goals for the project. Building community action projects, which meet the needs of very distinct communities of practice, when each group has its own goals and ways of knowing, is no easy task and requires a deep knowledge of the community (Moje et al., 2004). A Third Space sees community goals and scientific goals as standing side by side and reorganizes activity so multiple voices and even tensions are purposely used as building blocks to form new types of activity (Gutiérrez et al., 1999). One strategy PPSR project leaders recommend to help ensure the community’s voice and values are reflected in the research agenda is to partner with third party agencies or state and local community agencies already working in the community (Chu et al., 2012). Community organizations are a great place to start because they already know and reflect the goals and values of the community (Purcell et al., 2012), and the community is familiar with these agencies (H. Chang, 1994; Delpit, 1988). In addition, if a project is associated with a cause people already take pride in, this can lead to increased motivation to participate (Chu et al., 2012). Community organizations are often the key to successful partnerships because
they serve as bridge builders, which have command of both cultures (Carr, 2002; Chu et al., 2012; Israel et al., 2006).

Project leaders also recommend supporting leadership from within the community, to give the community’s values a voice (Diversity, Equity, & Inclusion, 2014). Yet, having leaders from the community is not enough; project leaders must also respond to what the community leaders are saying and lead research projects directed by community values (Scott, 1999). To inspire trust with the community, words need to coincide with actions. Freire believed many educational plans fail because they are designed according to the author’s own view of reality. Project leaders can say to the community members, “Your voice matters!” However, saying one thing and doing another does not inspire trust. A dialogue in which dialoguers expect nothing of their efforts is “empty, sterile, bureaucratic, and tedious” (Freire, 2000, p.149).

Third Spaces are intentionally designed to bridge the underrepresented community’s every day goals and values with the goals and values of science. Gutiérrez et al. (1999) describes the intentional design of a Third Space as a conscious bridging. A Third Space will not naturally arise but rather requires careful listening and attentive construction, which grapples with the conflicts between two discourses and reframes the activities and understandings accordingly (Moje et al., 2004). Some researchers attribute the lack of underrepresented groups’ participation in PPSR projects to a fundamental disconnect between the pressing needs of underrepresented community members and the priorities and values of science (Pandya, 2012). When recruiting underrepresented populations for PPSR projects, it is vital to align project goals with community values.
and goals (Crowston & Fagnot, 2008). Inclusive projects are intentionally designed and work best if project leaders partner with small, target populations to formulate project goals based on feedback from the community (Dickinson et al., 2012). Project leaders need to engage communities in conversations to discover community values and goals and then mold projects responsive to community needs (C. Johnson, Bowker, & Cordell, 2004). True dialogue responds when it encounters and hears the voice of another (Bakhtin, 1981; Bakhtin, 1986b). A research study is not a true partnership if project leaders ask community members to work on outcomes only relevant to the needs of the scientific community. Co-generative dialogues are necessary to create a space where all voices are valued (Emdin, 2009).

The goal of a Third Space is to create a new community with new roles and activities, which participants use to build a collective identity and shared vision (Gutiérrez, 2008). Instead of each separate community of practice working on their own level of activities, a collective activity system is formed—a system with a larger level of activity. As such, a sense of belonging to the Third Space, or hybrid community, is created (Whitchurch, 2008). Likewise, working towards a common goal can be a powerful motivator for contributing to a PPSR project because of the sense of belonging and community it builds (Kuznetsov, 2006). Yet, even the outcomes of community-based projects can be severely limited by power dynamics. Science is not an objective, neutral space. Science, by focusing on some issues, will exclude others (E. Johnson & Mappin, 2005). The agendas of the partner with more power may compromise the agenda of those with less power (Hogan, 2002). Project leaders need to go beyond creating a space for
community ways of knowing. A truly productive dialogue asks who is benefiting from this knowledge and whose interests are being served (Agrawal, 1995). Differing ontologies will result in valuing different data. Project leaders should carefully consider implications involved in asking a community to share data about their lands. For true collaboration to occur between two communities of practice, the process involves going beyond finding a common language and involves resolving equity issues regarding who benefits from the data (Bowker, 2000). A fully democratic model, with equal participation from all partners is highly desirable, one in which academic and non-academic partners both direct each phase of the research (Wallerstein, 1999; Wallerstein & Duran, 2006). When scientists invite community members to help form what questions will be asked and how to analyze data, community members are more likely to feel equal footing with the scientists (Pandya, 2012). PPSR presents an opportunity to bridge the gap between the pressing needs of diverse communities and the priorities and values of science best when projects create an environment of co-learning and equal footing of scientists and participants (Pandya, 2012).

Likewise, a Third Space involves an active interpretation of roles as opposed to authority coming from one community (Whitchurch, 2008). A Third Space breaks down power structures of society and gives a new structure, one in which community members have a voice (Gutiérrez et al., 1999). In moments of tension between two communities, instead of shifting focus back to the academic way of doing things, a Third Space reorganizes activities to form a bridge with new forms of participation (Gutiérrez et al., 1999). Community members take the role of expert in the official space and are given the
identity of “knowing contributor.” Instead of outside helpers they are seen as a valued resource (Gutiérrez et al., p. 300).

The most effective model for PPSR is a model in which citizens and scientists co-manage natural resources (Rotman et al., 2012), and community members are given equal say in how investigations are structured and run and how results are communicated (Gearheard & Shirley, 2007). Project leaders also recommend community members decide when and how they want to participate. When a project has multiple points of entry, people can participate within their comfort zone and express themselves as they see fit (Purcell et al., 2012). Project leaders can break tasks that need to be done into smaller building blocks in order to provide more community members with options for participation, which can more directly appeal to their interests (Green & Mercer, 2001; Rotman et al., 2012) and in order to provide opportunities for participants to make the projects their own (Chu et al., 2012). In conclusion, project leaders recommend to successfully engage underrepresented communities in scientific research, projects should form partnerships built on pressing community needs (P. Miller & Hafner, 2008), have co-generative dialogues engaging and responding to voices in the community (Bakhtin, 1986a; Freire, 2000), and create spaces where both scientific and community voices, ways of knowing and agendas are valued (Emdin, 2009).
CHAPTER 3: RESEARCH METHODS

Overview

The purpose of this study is to offer practical advice to PPSR project leaders aiming to engage underrepresented communities in scientific research. Specifically, the intent was to uncover what factors, if any, affect underrepresented communities’ willingness to engage in scientific research and to understand how and to what extent PPSR projects can become Third Spaces, which merge the discourses, practices, goals and values of underrepresented communities with those of the scientific community. This chapter begins with a description of the research paradigm, including the worldview of the researcher, which frames this study. The second section provides a rationale for using qualitative methods for this study, a justification for selecting the single, exploratory case study approach, and also a brief explanation of the evolution of this study. The third section provides a description and explanation regarding data collection and data analysis for Part 1 of the study. The fourth section provides a description and explanation regarding data collection and data analysis for the larger case study. The chapter concludes with a discussion on trustworthiness and credibility as well as ethical considerations of this case study research.

Researcher’s Views

Merriam (1988) recommends researchers begin a study by asking themselves about their view of reality and knowledge. The type of method one chooses for a study depends on the type of questions asked in the study and the type of knowledge one hopes the study will generate. With this in mind, this study begins with a short discussion of the
researcher’s view on reality and knowledge. Ontology concerns one’s philosophical assumptions about the nature of social reality (Dillon & Wals, 2006; Ramey & Grubb, 2009). This researcher views the world through a relativist ontology and believes truth is constructed and dependent on the historical context and social interactions taking place at a given moment. Thus one piece of data may have multiple meanings depending on the unique context (Collins, 1983). The researcher’s epistemology is that of a constructivist. Epistemology concerns one’s assumptions about the best way to investigate the nature of the world or how knowledge is established (Dillon & Wals, 2006). The researcher views all knowledge as being socially constructed and value laden (Gordon, 2009), although she does not deny the possibility of a reality external to the social construction and description of that reality. A constructivist lens emphasizes the social construction of reality, however, this view does not exclude the potential of a reality external to humanity’s social construction of it (Bradbury & Reason, 2006; Cheek & Gough, 2005; Sayer, 1997). What constructionism does is challenge the positivist assumption and “characterisations of people, practices, institutions and other social phenomena as having fixed identities which deterministically produce fixed, uniform outcomes” (Sayer, 1997, p. 454). This study is framed and interpreted through a relativist, constructivist view of reality and knowledge.

**Research Problem**

The goal of this study was to understand best practices for engaging underrepresented communities in PPSR projects. For this reason, the researcher interviewed project leaders actively engaging underrepresented communities in scientific
research. The researcher was not interested in the number of community members involved in each project or even the specific scientific knowledge gained through participation in such activities. Rather, the researcher hoped to understand the meanings behind project leaders’ ability to engage underrepresented communities in scientific research. The intent was to understand the history, the culture, and the power struggles, which may be affecting the way two distinct communities of practice (the scientific community and the underrepresented community) are interacting with each other. The researcher also investigated project leaders’ perceptions on the theoretical construct of a Third Space within a PPSR project and explored how and to what extent a PPSR project was able to merge the discourse, practices, goals, and values of science with the discourse, practices, goals, and values of an underrepresented community.

**Research Methods**

**Qualitative Approach**

A qualitative approach, because it involves “learning how individuals experience and interact with their social world and the meaning it has for them” (Merriam, 2002, p. 4), is the preferred approach to answer the research questions posed in this study. This study explores a social problem—the inability of many PPSR projects (and science as a whole) to engage underrepresented communities in scientific research. The researcher also used qualitative methods in this study because qualitative research explores “the meaning individuals or groups ascribe to a social or human problem” (Creswell, 2007, p. 37). This study investigates the perceptions from two distinct social communities—the scientific and the underrepresented community—on what factors promote, or dissuade a
research partnership from forming between the two distinct communities of practice. Merriam (2002) explains qualitative research seeks to understand how people describe and understand their experiences. In this study the researcher examined the experiences of one underrepresented community and their university research partner. Through the thick description provided in this study, readers are able to see how two unique communities of practice describe this PPSR partnership.

The case study method is ideal when studying a complex, social issue with many interacting variables and operational links needing to be traced over time (Yin, 2013). The current study sought to understand the interactions and processes involved in initiating and sustaining a scientific research partnership between two unique communities of practice- the scientific community and the underrepresented community. The interactions between two communities of practice are complex as many cultures, histories and understandings of the world interact to make such a partnership possible. For this reason the researcher used the case study method as the research approach for this study.

Merriam (1988) explains case study research is ideal for applied fields such as education. Case study knowledge is valuable because it is contextual and concrete and is rooted in the experiences and descriptions of every day life. The case study method allows the researcher to investigate a process, problem, or project and offer practical advice on how to improve it. Likewise, Uriarte et al. (2007) suggest the use of case studies for an examination into how science projects can be more inclusive because case studies will reveal underlying assumptions and will open up more dialogue. Reichardt
and Cook (1979) describe the case study research design as a “causal explanation: discovering or confirming the process by which the treatment had the effect that it did” (p.21). The problem this study investigated was that most PPSR projects are not recruiting and sustaining involvement from members of underrepresented communities. Thus, the goal was to offer practical advice to PPSR project leaders on how to overcome this problem and engage all groups of people in scientific research studies. The researcher was also interested in exploring the process of engagement and any barriers, which may make members of the underrepresented community feel as if they do not belong in the scientific community of practice. Merriam (1988) explains a researcher uses a case study when the interest is in “process rather than outcomes, in context rather than a specific set of variables, in discovery rather than confirmation” (p. 10). Hence, the focus of this study is on the process of how PPSR project leaders can approach and engage underrepresented communities in scientific research studies.

Merriam (1998) explains qualitative case studies can be particularistic, descriptive and heuristic. This study is particularistic because the case is a critical case, which can reveal something about the phenomenon being investigated. Merriam (1998) further details a particularistic case study as “problem-centered,” because it considers how a particular group of people examined or confronted a specific problem (p. 31). This study examined a common problem and looked at how a particular group of people confronted that problem. The general problem addressed in this study was the historical inability of many PPSR projects to engage members of underrepresented communities in scientific research. The researcher examined how a particular group (formed through a partnership
between a scientific researcher and an underrepresented community) was able to
overcome this problem and establish a research collaboration, which lasted over a decade.
Likewise, a particularistic case study looks at a specific instance but illuminates general
problems and can suggest “what to do or not do in a similar situation” (Merriam, 1998, p.
31). The goal of this study was to make recommendations for PPSR project leaders
concerning best practices for engaging underrepresented community members in
scientific research studies and to gain insight into the existent barriers, which need to be
confronted before a partnership with underrepresented communities can be formed.
Another goal of this study was to examine a specific engagement strategy—a Third
Space. The construct of a Third Space, which began as a sociolinguistic theory, has been
applied to educational settings as a method for organizing learning activities to create a
culture of collaboration (Gutiérrez et al., 1999). This study aimed to evaluate if and how a
PPSR project engaging an underrepresented community in scientific research aligned
with, or did not align with the theoretical construct of a Third Space. The case study
approach is appropriate when the researcher hopes to uncover the “thoughts, feelings, and
desires” of a person or group of people (Bromley, 1986, p. 23). In this study the
researcher examined the thoughts, feelings, and desires of a particular underrepresented
community and how these thoughts, feelings, and desires impacted their willingness to
participate in scientific research.

Case studies are also classified based on their purpose. Based on the intended
purpose of the research, this study is an interpretive case study. Interpretive case studies
use detailed descriptions to “illustrate, support, or challenge theoretical assumptions held
prior to the data gathering” (Merriam, 1998, p. 38). The researcher of this study assumed two communities of practice were involved in a PPSR project—the scientific community and the underrepresented community. The goal of the study was to explore how these two communities of practice, who historically do not often collaborate in scientific research, were able to come together and partner in a scientific study. The theoretical construct guiding this study offers insight into the relationship between a community’s social identity and their motivation to participate in an activity. This study examined a particular aspect of identity—barriers to belonging—and to what extent it influences an underrepresented community’s willingness to participate in a PPSR project. Additionally, the theoretical framework of this study discussed the construct of Third Space, which was developed in the educational setting to propose more attractive options for science identities are available to participants when these settings become hybrid spaces, incorporating the multiple social identities of a person with a person’s science identity. The goal of this study was to examine the theoretical construct of a Third Space and look at a concrete example of a research partnership to see how and to what extent a Third Space was created. In this way the researcher hoped the study would illustrate, support, and/or challenge the theoretical assumption that a Third Space can be created in a PPSR project.

The four basic types of case study are—holistic single case, embedded single case, holistic multiple case, and embedded multiple case design (Yin, 2009). The researcher of this study employed a single-case (holistic) design. She chose a holistic design because the study investigated the global nature of a process—engaging
underrepresented communities in scientific research. Although a multiple-case study method is considered more robust (Herriott & Firestone, 1983) and allows the researcher to explore differences within and between cases and investigate similar findings across cases (Yin, 2013), the decision to conduct a single case study was made based on the evolution of the study, discussed next. Additionally, the decision to conduct a single case study relates to the theoretical construct guiding this study.

**Evolution of The Study**

Originally, the researcher planned to conduct a multiple-case study, hoping to uncover differences and similarities in how several PPSR project leaders have approached and engaged underrepresented communities in scientific research. However, upon conducting the initial interviews of PPSR project leaders (Part 1), for the larger study (Part 2), the researcher found many projects leaders could offer advice to answer Research Question 1, regarding advice on how to engage underrepresented communities in a PPSR project, but they were unable to answer Research Questions 2 and 3. In some cases this was because the project leaders were still in the relationship-building phase (some projects spend ten years building relationships before ever collecting scientific data with their partnering communities), and in other cases this was because the PPSR project had educational goals but was still trying to determine what, if any, scientific goals the project would have. Thus, based on initial conversations with the project leaders, the researcher concluded it would be difficult for these project leaders to comment on the second and third research questions of this study, regarding the factors
affecting a community’s willingness to participate and the merging of the local community of practice with the scientific community of practice.

Additionally, as the researcher began collecting data from the different PPSR projects, she was sensitive to the information being gathered and listened to what was being said and what was being implied (Merriam, 1998). In this listening, the researcher concluded if she examined multiple cases, the study would not be investigating a single unit. Each of the PPSR projects was so unique; the researcher would not be able to replicate the same experiment multiple times (which is necessary for a multiple case study). For each PPSR project examined in Part 1 of this study, it was not only the context that was different. Each PPRS project also varies on major factors such as the educational training of each project leader (some were trained as scientists and others were not), goals of the project (some projects had only scientific goals, others had only educational), the stage of the engagement process each PPSR project was in (two projects were not yet at the point of developing research questions). Case study research is about peeling back layers of an onion. The researcher collects data, analyzes the data, and then goes back to the data again, collecting more data to really uncover the layers of what is occurring. After Part 1 of the study was complete, the researcher determined a multi-case study would be comparing an onion to another type of vegetable because each PPSR project and community interaction is completely different.

Thus, the decision to use a single case study design related to the strong theoretical construct guiding this study. As Easton (2010) notes, “We can know a great deal about the general if we know where to look and the general can be hidden in the vast
number of cases if we don’t” (p.1). The theoretical framework of this study showed the researcher where to look. The theories of identity alerted the researcher that several of the original cases were not yet at a point to answer the research questions this study asked. The researcher believed including multiple projects would lose some of the underlying mechanisms on the process of how to engage underrepresented communities in scientific research. The interview questions used to explore this case were based in theories of identity and the well-constructed theoretical construct of a Third Space. These well-developed theories showed the researcher where to look and what questions to ask.

The researcher chose a particular instance to study in depth (Merriam, 1998). Explanations can be deep or wide, and there are trade-offs with choosing either. When there is little relationship to existing theory, then one case is enough because understanding that one instance in depth will reveal more general truth and understanding than many diverse cases (Easton, 2010). This principle stands true for this research investigation. Although the theory on Third Space and theories of identity are extensive, there is minimal work exploring the relationship between these theories and the case of engaging underrepresented communities in scientific research. Thus, more will be gained by examining one case in depth.

**Case Study Design**

The remainder of this chapter provides a description of the methods used to conduct this research. The researcher begins with a brief overview of her role in the study and then moves into a description of the methods used for Part 1 and Part 2 of this study. For both parts of the study the researcher presents a thorough description of the context,
discusses the selection of participants, various phases of the data collection process, and an overview of the data analysis stage.

**Researcher’s Role**

The researcher comments on her own biography as it relates to the study because as Kilbourn (2006) notes, personal history will result in a researcher’s insight and interpretation of the study’s data being different from that of another individual. As the human instrument in this study, the researcher responded to the data and situations in order to maximize research opportunities. The downside of this is the personal biases the researcher brings to the study (Merriam, 1988). There is no such thing as value free human research; therefore, it is key to admit your biases (Lincoln & Guba, 1985).

The role a researcher takes in a study can range from complete membership in the group, to the researcher having no membership in the group. Insider research occurs when the researcher is studying a group he or she belongs to (P. Adler & P. Adler, 1987). The researcher of this study was both an insider and an outsider. When conducting a study, it is vital for the researcher to search out the multiple “I’s” in their study (Peshkin, 1988). The researcher has past experiences and identities she brought with her to this study. The researcher had multiple roles in this study based on these identities and experiences. The first role relates to the role the researcher has as a PPSR project leader. The researcher is an insider to the community of PPSR, or citizen science. Since 2013, she has been an active participant and leader in a PPSR project associated with the university where she is enrolled in graduate school. This PPSR project is in the process of attempting to establish a community partnership with a local, underrepresented
community. As such, the researcher travels to speaking engagements and conferences representing the PPSR project to which she belongs. She met the project leaders, who became the participants in this study, at a conference for PPSR leaders across the world. All of these past experiences contribute to the researcher’s role as an insider to the community of PPSR. However, the researcher of this study was an outsider to the PPSR projects examined in this study. The researcher chose to study other PPSR projects engaging underrepresented communities because the PPSR project to which the researcher belongs has been unsuccessful in engaging underrepresented communities in scientific research. For this reason, she chose to study projects with well-established, working relationships with underrepresented communities, in order to gain insight from projects modeling the skill.

The researcher’s role as a PPSR project leader and researcher had the potential to influence her interpretation of the data. The researcher is currently involved in a separate project with many similarities to the PPSR projects examined in this study. The researcher’s project is in the process of attempting to engage underrepresented communities in scientific research. There have been certain frustrations as this project has faced barriers to engaging underrepresented communities. The emotions from the researcher’s own attempts to establish working relations have the potential to affect her interpretation of the data. Hewitt-Taylor (2002) suggests keeping a field journal as a way to help researchers keep their bias from obscuring the findings of the study. Throughout the duration of this study the researcher kept a journal and recorded personal feelings and reflections about the data being collected. Throughout the study, the researcher returned
to these journal entries and reflected on her feelings and what she was hearing in an attempt to separate herself out from the words of the project leaders.

The economic background and race of the researcher, as well as the PhD she now pursues also influenced her positioning within this research study, and has impacted her understanding and interpretation of this study’s findings. Having grown up in poverty, the researcher had certain preconceived notions of privilege. Her background resulted in an unawareness of the privilege she benefits from as a white female. However, throughout this study, the researcher has come to realize the impact of race on her lived experiences. To illustrate the development of this researcher’s racial identity, she now provides a short excerpt from her researcher journal, as suggested by Hewitt-Taylor (2002).

I grew up poor. My mom and dad were still in high school when my mom gave birth to my older sister. So when I came along a year later, my dad had taken a job as a trash collector. We lived on food stamps, the generosity of others, and things my dad found in the trash—garbage to others, but cherished possessions for us. I don’t feel sorry for myself. I have a loving and brave family. I learned from a young age the value of hard work. Yet, my experiences led me to be blind to my own privilege. I watched my parents work hard and sacrifice to pave a new life for me. So I honestly thought that everyone who worked hard could do the same. I didn’t know the color of my skin had influenced the outcome of all my family’s hard work. I was unaware that there are many who, no matter how hard they work, feel they cannot pave the new path I was able to achieve. (Researcher Journal entry, May 16, 2016)
The researcher of this study is also pursuing a PhD from a powerful institution. The white color of her skin and the PhD she pursues influenced her interactions with underrepresented community members, because as the findings of this study reveal, they serve as symbols of status and privilege the underrepresented community members have been denied. Thus, the researcher was an outsider to the underrepresented community examined in Part 2 of this study. This outsider status presented challenges but also provided opportunities. As an outsider, the researcher of this study faced many of the same challenges to engagement other white researchers face as they seek to establish partnerships with underrepresented communities. The researcher, as an insider to a powerful institution, faced many of the same institutional constraints other researchers face as they attempt to forge research partnerships with underrepresented communities, while still operating under the constraints and priorities of institutions. Thus, this researcher had the unique opportunity to apply the findings of this study as she learned them and used the findings to guide her interactions with community members both during and following the conclusion of this research study.

**Part 1: Interviews with Project Leaders**

Part 1 of this study examined Research Question 1—What overall advice do PPSR project leaders give on the process of how to engage underrepresented communities in scientific research? All project leaders interviewed for Part 1 have led PPSR projects engaging underrepresented communities in scientific research, and thus are able to give advice on this research question. Part 1 also served as an initial screening to find the critical case, which was the larger part of this study.
Case study research involves the deliberate selection of “particular settings, persons, or activities” (Maxwell, 2012, p.88) aimed at obtaining the best information for the research questions at hand. Part 1 of this study offers insights and reflections from seven PPSR project leaders who have already established scientific research partnerships with underrepresented communities. In Part 1 the researcher examines advice these project leaders have for other PPSR projects seeking to establish partnerships with underrepresented communities. These project leaders offer insight into the crucial elements and approach a project must have in order to establish research partnerships with underrepresented communities.

**Methods of Data Collection**

**Participants**

The researcher used a purposive sampling technique to select members who were currently engaging underrepresented communities in scientific research. The goal of this sampling technique is to examine participants who are likely to provide rich information (Stake & Savolainen, 1995). Creswell (2007) suggests purposeful sampling as a useful technique for case study research because it provides the ability to most specifically target the information a researcher is looking for. Criterion sampling was used to select participants according to the following two preselected criteria relevant to the research questions of this study: 1) the participant must be the leader of a PPSR project, and 2) the project must be engaging, or within the last ten years have actively engaged an underrepresented community in scientific research. Maxwell (2012) explains one rationale for choosing participants for a qualitative research study is if they are
representative of a phenomena or theory. All project leaders chosen for this study conducted PPSR projects known for their successful engagement of underrepresented communities in scientific research. For the purpose of this study, a partnership with an underrepresented community is defined as an underrepresented community, as a whole, associating with and collecting data for a PPSR project.

The researcher contacted seven project leaders who had been invited to present on various aspects of their established community partnerships at the Citizen Science 2015 Inaugural Conference in San Jose, California. In an email sent several weeks prior to the conference, the researcher outlined the nature of the research study and the contributions these individuals could make. The final sample of participants was comprised of five project leaders who responded to the initial email and agreed to meet and be interviewed at the Citizen Science 2015 Conference. Additionally, two projects were added to this initial sample based on recommendations from the initial five PPSR project leaders. In order to protect the confidentiality of the study participants and communities they collaborate with, the names of the project leaders and the exact locations of the projects have not been included, with the exception of the PPSR project, which served as the case study. Originally the researcher had not planned to reveal the identity of the participants in the case study or what information was collected about their project in particular. However, after conducting initial interviews, the researcher realized the nature of the study and research questions necessitated understanding the historical context of a specific community. The details of this history alone reveal the identity of the community. In addition, the nature of the questions being asked in no way presents
potential harm to the participants. For these reasons the researcher included the identity of the project leaders engaged in the case study, along with the community with whom they partnered in scientific research.

**Context**

Part 1 of this study occurred within the context of two PPSR project leaders—the researcher and the seven project leaders—sitting down and having a guided conversation about a general problem facing the field of PPSR—the inability of many PPSR projects to engage underrepresented audiences in scientific research studies. The researcher went to each participant for general advice and insight because these project leaders have been able to accomplish what the field, as a whole, has not—engaging an underrepresented community in a PPSR project. To situate the advice from each project leader, the researcher provides a brief description about each project and the nature of its collaboration with the underrepresented community.

**PPSR Project One.** This PPSR project, which has been in operation since 2012, is associated with a public university in the Northeastern Unites States. The project began as a neighborhood initiative of the university to be better neighbors to the communities surrounding the university. Scientists, faculty, and community members took part in the neighborhood planning process for a particular underrepresented neighborhood. The planning process resulted in the establishment of an urban extension center, in which university faculty and students work with local residents on solving problems of the community, combining academic expertise with community knowledge.
PPSR Project Two. This PPSR project, which has been in operation since 2007, is associated with a public university in the Northeastern United States. The project began with the purpose of engaging non-typical participants in citizen science—diverse urban audiences. In the ten years of their operation this project has partnered with over 12,000 community-based organizations—94% of which are underserved audiences. With scientist driven research questions, participants are asked to watch a specific creature and record which species of this creature are observed, and the conditions for the sighting in order to help scientists better understand the value of urban green areas for the creature.

PPSR Project Three. This PPSR project is associated with a public university in the Northeastern United States, which has been in operation since 2000. The project began when university researchers partnered with local 4-H programs to begin monitoring an insect of interest to university scientists. University entomologists initiated this North American Citizen Science Project, with the project purpose being to search for rare species of a particular family of insects and report findings back to scientists. The scientific question the project seeks to understand is why native species of this insect are in decline. The basic activities of the project include citizens and scientists going out and looking for this insect, taking pictures and then uploading pictures onto the project’s website. The project also has the educational goal of helping children become confident and competent participants in science. This project has formed community partnerships with various tribal nations in the area of the university and also across the United States. Their partnerships with underrepresented communities began local and have expanded.
**PPSR Project Four.** This PPSR project is associated with a non-profit organization in Asia. Scientists from a regional university desired to monitor a local organism suspected to be endangered. This organism is found on local lands, and rather than turn the lands into a national park, the local community of livestock herders voiced their desire to monitor the organism. The partnership is framed as a community co-management and a new approach to conservation within the protected area system. This project has been in operation since 2000. The scientific goal of this study is monitoring and conservation of an endangered species. The basic activities of the project include citizens and scientists looking for this organism, keeping detailed records of sightings, and participating in conservation efforts.

**PPSR Project Five.** This PPSR project is associated with a public university in the Northeastern United States and is also registered as a non-governmental organization (NGO). The project has the scientific goal of analyzing animal remains from sites in the Caribbean, as well as an educational goal of engaging local communities in archeological research. With cross-disciplinary research of archaeology and paleoecology, researchers examine the locals’ interaction with the environment—necessitating participation of local communities in the research process. Educational goals of the project include providing participants opportunities to find a sense of place in their local environment and to raise awareness of human impact on environmental changes. This PPSR project has been engaged with local communities for six years.

**PPSR Project Six.** This PPSR project is associated with a public university in Northeastern Asia. The project, which has been in operation for three years, is a citizen
science program of the Open & Collaborative Science in Development Network (OCSD Net). Project leaders work closely with rural communities who typically have been denied access to scientific tools and knowledge. They mainly work with community activists and teachers to train and develop environmental monitoring. The local leaders of each community decide what data will be useful to monitor and together with PPSR project leaders, they develop a scientific study. The PPSR project leaders provide the scientific tools necessary for the study. At the time of the interviews, conducted as part of this study, this project was still in the developmental stages and had not yet collected data. Additionally, the project leader acknowledged the project had not decided what scientific data would come out of the research.

PPSR Project Seven. This PPSR project is associated with a public university in the Southeastern United States. The project began when a university researcher was attending a community meeting about pollution in the community. The researcher and a community leader decided to apply for a grant together in order to conduct a scientific study, which would document the effects of the pollution on the community’s health. This collaboration lasted over 15 years. With community-driven research questions, the university researcher collaborated with this underrepresented community to collect data and used the data for political action to protect the health of the community. The PPSR project co-led by Project Leader 7 was selected for the larger case study (See Chapter 5).

Table 3.1 provides a general description of each participant’s PPSR project, its location, the nature of the community engagement in scientific research and the approximate duration of the engagement.
### Table 3.1
*Project Leaders Interviewed in Part 1*

<table>
<thead>
<tr>
<th>Project Leader</th>
<th>Institutional Association of Project</th>
<th>Type of Underrepresented Community</th>
<th>Duration of Partnership with Community</th>
<th>Nature of Partnership</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leader 1</td>
<td>University &amp; Federally Designated Promise Zone</td>
<td>Low-income and working-class Black community members</td>
<td>5 years</td>
<td>Collaborative Project</td>
</tr>
<tr>
<td>Leader 2</td>
<td>University</td>
<td>Underrepresented, urban audiences across the US</td>
<td>10 years</td>
<td>Collaborative Project</td>
</tr>
<tr>
<td>Leader 3</td>
<td>University</td>
<td>Tribal nations across the United States</td>
<td>17 years</td>
<td>Collaborative Project</td>
</tr>
<tr>
<td>Leader 4</td>
<td>NGO and University</td>
<td>Local community of livestock herders in Northeast Asia</td>
<td>17 years</td>
<td>Co-created Project</td>
</tr>
<tr>
<td>Leader 5</td>
<td>NGO and University</td>
<td>Local community of Caribbean islanders</td>
<td>6 years</td>
<td>Collaborative Project</td>
</tr>
<tr>
<td>Leader 6</td>
<td>OCSDNet and University</td>
<td>Rural communities in Northeast Asia</td>
<td>3 year</td>
<td>Co-created Project</td>
</tr>
<tr>
<td>Leader 7</td>
<td>University</td>
<td>Rural community in North Carolina</td>
<td>Over 15 years</td>
<td>Co-created project</td>
</tr>
</tbody>
</table>

**Data Sources**

This study received ethical approval from the university’s Institutional Review Board prior to commencing. The researcher chose to conduct individual in-depth, semi-structured interviews with each of the participants in order to better understand the...
unique nature of the partnerships these leaders have with their communities. Yin (2009) explains interviews are useful for qualitative research when the researcher hopes to explore experiences of participants. The researcher used semi-structured interviews to allow questions to emerge as the interview progressed (Glesne & Peshkin, 1992). The researcher was given clearance to conduct the interviews at the Citizen Science Conference in San Jose, California and Project Leaders 1-5 pre-arranged to meet and interview with the researcher during scheduled conference breaks. Project Leaders 6 and 7 were introduced to the researcher through connections made during this first interview session in San Antonio. Due to the distance of each project leader to the researcher’s university, their interviews were conducted via Skype.

Upon arrival to the scheduled interview, the researcher introduced herself to the participant and explained the goal of the study was to gain a better understanding of the kinds of partnerships PPSR projects are forming with local underrepresented communities. Project leaders were informed the intended purpose of the study was to learn how community partnerships are established, the type of dialogue they allow, the lessons they can teach the field of PPSR, any barriers to establishing them, and any impact they have on the project and community. Each project leader was interviewed using a semi-structured interview format (See Appendix A). The duration of the interviews ranged from 25 to 60 minutes. While the structure of these interviews did vary somewhat according to the direction and advice of the PPSR project leaders, generally these interviews focused on the following questions:
Additionally, the researcher found it necessary to conduct follow-up interviews with Project Leader 1 and Project Leader 6. The purpose of these follow-up interviews was to clarify topics covered during the first interview, which needed further explanation. These follow-up interviews lasted approximately 20 to 30 minutes.

Data Analysis

The researcher used thematic analysis as the overall analytical approach for interpreting the data. This inductive approach allows the data itself to drive the structure of the analysis (Strauss & Corbin, 1990). The data collected from the interviews was transcribed by a professional transcription service. Upon receiving the transcripts, the researcher used the process of repeated reading to immerse herself in the data, reading through each transcript verbatim several times making notes in the margin of words, theories, or short phrases summarizing key concepts (Braun & Clarke, 2006). The researcher then employed Saldaña’s (2015) method of thematic coding to categorize the data into more specific codes before examining the data for themes and larger concepts. In the following paragraphs, the researcher attempts to lay out the analysis procedures, which were adapted from Quigley, Che, Achieng, and Liaram (2016). The researcher includes the analysis pathways, which led to the themes of this study in order to increase the trustworthiness of the analyses.
The first round of data analysis consisted of open coding. Using the research questions of the study, the researcher formed an initial coding framework by analyzing the data for any notion of practical advice regarding the process of how PPSR project leaders can engage underrepresented communities in scientific research projects (Riessman, 1993). The researcher read through the interview transcripts verbatim making notes in the margin of words, theories, or short phrases summing up what had been said. This produced the initial coding framework. At this point in the analysis, there were 41 codes: respect, listen, know your community partner, respond, compromise, flexibility, sensitivity, community goals, community benefit, scientific goals, scientific benefit, leadership, project parameters, study methods, study results, possibilities of participation, views on science, culture of community, culture of science, marginalization, government, history, language, barriers to communication, misunderstanding, funding agency, money, politics, institutional constraints, definitions of science, definitions of expertise, time, trust, relationship, friendships, community functions, third party, champion in community, community agencies, and community perspectives on knowledge.

The second round of data analysis consisted of combining redundant codes and reexamining the data for any new codes. During this stage, the researcher noted some of the codes should be merged. For example, the researcher observed the code “misunderstanding” and the code “barriers to communication” could be merged to the more encompassing code of “language barriers.” The researcher also merged codes such as “culture of community” and “culture of science” into the more inclusive code of
“cultural context.” In addition, the researcher noticed certain codes such as “project parameters” and “leadership” were redundant as they both described the projects blending of community and scientific goals, so the researcher merged these codes into the code “blending community and scientific.” At this point, the researcher re-read through each of the interview transcripts and noticed two new codes emerged: “acknowledging mistakes” and “community resources.” After this round of analysis, there were 23 codes: acknowledging mistakes, respect, listen, respond, compromise, sensitivity, community goals, scientific goals, blending of community and scientific, views on science, cultural context, marginalization, historical context, language, language barriers, funding, institutional constraints, positioning of science, time, trust, relationships, community resources, and community perspectives on knowledge. To ensure the rigor of the study, a fellow researcher independently coded 25% of the study data and the 23 codes of the final coding system were discussed until an agreement was reached concerning the meaning of each code. Table 3.2 provides a summary of the final coding framework along with samples from the data illustrating each code. Upon finalizing the final coding framework, the researcher worked through each interview transcript again and marked data according to these codes.

Table 3.2
Final Coding Framework

<table>
<thead>
<tr>
<th>Sample From Interview Transcript</th>
<th>Final Coding Framework</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Then the big gap is really just presenting yourself as a scientist that’s got human attributes that’s not a genius.”</td>
<td>Positioning of Science</td>
</tr>
<tr>
<td>“We don’t have a requirement as to how people use all our materials and our science project.”</td>
<td>Blending of Scientific and Community Goals</td>
</tr>
<tr>
<td>“There's a high respect for specialist knowledge and people feel that we know it, they're a bunch of bumpkins, quote, unquote.”</td>
<td>Views on Science</td>
</tr>
<tr>
<td>“Time and listening and taking tea together is all part of it.”</td>
<td>Time</td>
</tr>
<tr>
<td>“Even a research project is relational....”</td>
<td>Relationships</td>
</tr>
<tr>
<td>“The listening is the flip side of the relational aspect, time and listen.”</td>
<td>Listening</td>
</tr>
<tr>
<td>“Funding schemes and our time frames in universities are quite limiting. It's hard to find a way around that.”</td>
<td>Funding</td>
</tr>
<tr>
<td>“Our main barriers were language and culture on the one hand and political on the other because of the global politics of working in certain areas.”</td>
<td>Institutional Constraints</td>
</tr>
<tr>
<td>“Let's say if the government in the past has constrained you in your practice and now your research project is the research project of that government agency that maybe put limits on your community...”</td>
<td>Historical Context</td>
</tr>
<tr>
<td>“So as a university, we have to tread really carefully in terms of neighborhood relationships and I mentioned in the talk about sort of how we historically have earned a lot of distrust...”</td>
<td>Sensitivity</td>
</tr>
<tr>
<td>“It's actually using the appropriate language for the purpose that you're trying to, you know, the goal that you're trying to achieve.”</td>
<td>Language</td>
</tr>
<tr>
<td>“Either they have to convert over and speak science so that the policy makers and the national scientific institutions who advise policy makers can understand them or there needs to be some translation somewhere.”</td>
<td>Language Barriers</td>
</tr>
<tr>
<td>“Trust needed to be developed with our government partners at multiple levels, not only with the community.”</td>
<td>Trust</td>
</tr>
<tr>
<td>“You have to get a mutual respect.”</td>
<td>Respect</td>
</tr>
<tr>
<td>“I think a lot again is doing your homework and understanding ‘some cultural differences’ even traditional”</td>
<td>Cultural Context</td>
</tr>
</tbody>
</table>
“There's lots of things that go along the way and I think that as long as you stay open and learn from your mistakes, and other people see you learning from your mistakes, I think that's the best.”  

“Mistakes”

“There's lots of things that go along the way and I think that as long as you stay open and learn from your mistakes, and other people see you learning from your mistakes, I think that's the best.”  

“Mistakes”

“That's how we approach it, we are saying to our neighborhood stakeholders, 'Tell us what you want, tell us what you're interested in, tell us what you need.' As we respond to that, it strengthens the relationship each time.”  

“Respond”

“We don't see it as any kind of compromise. We're kind of adding value and offering a way to ... a sort of a way for those researchers to irrigate their efforts and have an impact on a single community. That's actually really attractive to them. The dynamic of giving up doesn't seem like it's happening at all.”  

“Compromise”

“We gathered all the science teachers and we presented the project...and they gave inputs on what challenges they see for their village that is linked to these topics.”  

“Community Goals”

“The voices of scientists... like the science isn't a objective pursuit even what they want to believe. Scientist bring their own political agenda to their work and their own cultural assumptions.”  

“Scientific Goals”

“As we know, when we think about, to go back to time of the history of how university's have operated in North America they've put up barriers, especially to low income neighbors.”  

“Marginalization”

“We found a local community organization that worked on water monitoring and used these kind of sticks that measure the depth of the water...They gave us one of these for each school.”  

“Community Resources”

“It’s a bit more difficult to find really local knowledge on water since we work with teachers.”  

“Community Perspectives on Knowledge”
During the third stage of data analysis the researcher returned to the data to look for patterns, which would provide insight into the interpretation of the codes. Saldaña (2015) explains patterns occur when a researcher sees many instances of comparable data. The patterns found were: the need to merge community and scientific goals, the need to acknowledge past and present abuse and mistakes of researchers and research institutions, the need to share ownership of the project, the need to avoid privileging scientific knowledge over community knowledge, the need to spend time getting to know the community and building trusting and respectful relationships, the need to listen, value, and respond to voices in the community, the need to translate community perspectives and scientific, and the need to respond to community voices by blending scientific and community goals.

During the fourth, and final round of analysis, the researcher found there were still broader categories, which described the patterns. The overall categories encompassing the patterns were: humility, listen and respond, positioning of science, project ownership, value community, contentious history, translation, powerful institutions, long-term relationships to build trust, and definitions of science and expertise. At this point in the analysis, the researcher returned to the research question: “What advice do PPSR project leaders have regarding how to engage underrepresented communities in scientific research?” The researcher then re-analyzed the data by searching for themes, which naturally arose from the organized patterns and categories. The researcher reduced the codes and patterns into themes based on the research questions of the study. Throughout the entire analysis process, the researcher used the
method of constant comparison, reading and re-reading the data to identify emerging themes found within the data. All codes from the final coding system were incorporated into a theme. After generating the themes the researcher once again re-read through the entire data set to ensure the themes reflected the content of the data set as a whole. Themes, which could not be qualified with enough data to support them, were discarded. Mindful the goal of the study was to discover general guidelines and advice for leaders of other PPSR projects hoping to engage diverse communities in scientific research, the final stage of analysis involved summarizing practical findings for each theme and choosing examples from the transcripts to illustrate these findings. In this way, there were three primary themes, which encompassed the overall advice from project leaders.

Table 3.3, adapted from Quigley et al. (2016), summarizes the overarching themes, patterns, categories, and codes described previously. The first column, Overarching Theme, provides the theme, which were derived from the categories, patterns, and codes listed in the columns to the right of the question. For example, the theme “Respect the Community,” includes the categories titled humility, listen and respond, positioning of science, project ownership, value community, contentious history, translation, and powerful institutions; the patterns titled acknowledge past and present abuses and mistakes of researchers and research institutions; avoid privileging scientific knowledge over community knowledge; listen, value and respond to voices in community; and codes acknowledge mistakes, community perspectives on knowledge, listen, views on science, and respect.
Table 3.3  
*Thematic Analyses of Study Research Questions*

<table>
<thead>
<tr>
<th>Overarching Theme</th>
<th>Categories</th>
<th>Patterns</th>
<th>Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respect the Community</td>
<td>Humility, Listen and Respond, Positioning of Science, Project Ownership, Value community, Contentious history, Translation, Powerful Institutions</td>
<td>Acknowledge past and present abuses and mistakes of researchers and research institutions; Avoid privileging scientific knowledge over community knowledge; Spend time getting to know the community and building trusting and respectful relationships; Listen, value, and respond to voices in community</td>
<td>Acknowledge mistakes; Listen; respond; Views on science; Community perspectives on knowledge; Respect; Cultural context; Marginalization; Historical context; Language; Compromise; Sensitivity; Institutional constraints; Trust</td>
</tr>
<tr>
<td>True Dialogue</td>
<td>Listen and respond, Humility, Long-term relationships to build trust, Powerful institutions, Project ownership</td>
<td>Merge community and scientific goals; Acknowledge past and present abuses and mistakes of researchers and research institutions; Share ownership of the project; Spend time getting to know the community and building trusting and respectful relationships; Listen, value, and respond to voices in community; Respond to community voices by blending scientific and</td>
<td>Time; Trust; Listen; Respond; Sensitivity; Community goals; Scientific goals; Blending goals; Language; Language barriers; Relationships</td>
</tr>
</tbody>
</table>

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In an attempt to add credibility and confirmability to the data collected, the researcher conducted member checks with participants by providing each with a copy of the key themes and findings of the study and soliciting feedback to ensure they believed the themes accurately reflect the advice they wanted to give other project leaders (Lincoln & Guba, 1985). Chapter 4 details each theme, explains the findings for each theme, and provides evidence in the form of quotations to illustrate each finding.

**Part 2: The Case Study**

For Part 2 of this study the researcher selected a single PPSR research partnership from Part 1 and examined this partnership as a critical case. As described earlier, Part 2 is a case study classified in the following manner:

- Particularistic because it examined a specific problem: the underrepresentation of communities of color and low socioeconomic status in PPSR projects.
- Interpretive because the researcher hoped to illustrate, support, or challenge the theoretical assumptions of this study’s theoretical framework.
- Single because the researcher hoped to study a particular instance in depth.
• Holistic because the researcher investigated the global nature of a process: engaging underrepresented communities in scientific research

One PPSR project from Part 1, the partnership represented by Project Leader 7, was selected to serve as the larger case study and to offer further insight and advice regarding the process of partnering with an underrepresented community in scientific research. The author of this study chose this particular case because of the mature stage of this research partnership, which was established over ten years ago and had completed several scientific studies together. The research partnership also led to several publications and to community action. The community and university project leaders of this partnership were thus well positioned to answer the second and third research questions of this study. This case study explored the context of a particular underrepresented community and examined how this community’s unique history and context affected their willingness to participate in a PPSR research partnership. The researcher chose to examine one particular PPSR research partnership closely as the case for this study in order to provide the reader with details on the context in which this partnership in scientific research was formed.

The research partnership examined as the case for this study was between a rural and predominately African American community in Tillery, North Carolina and a group of public health researchers from University of North Carolina Chapel Hill. The focus of this case study is on the partnership between these two communities of practice. For this reason, although there were several smaller PPSR projects between Tillery and UNC researchers, this study reports on the overall nature of their collaboration, not the specific
research questions of each smaller project. Therefore, the interview questions focused on exploring how the research partnership was first formed, any barriers to the initiation of their partnership, and how these barriers were overcome.

The partnership examined in this study was initiated based on a community concern. The community of Tillery North Carolina, represented by a community group named the Concerned Citizens of Tillery, believed their community and other poor communities of color like them were being targeted for the placement of industrial hog operations. Governmental officials told the community these industrial hog operations would bring economic development to their community, however, community members soon began to feel sick and believed the hog farms were polluting their air and water. The research partnership formed between Tillery and UNC was initiated to investigate these community concerns. In this case study, Gary Grant, a long time citizen of Tillery, represents the voice of the underrepresented community. Gary Grant is a community activist who grew up in Tillery and leads the Concerned Citizens of Tillery. Dr. Steve Wing represents the voice of the scientific researcher in this study. Steve teaches epidemiology and conducts research on occupational and environmental health. Steve and Gary connected at a community meeting and later co-authored a grant, which established the scientific research partnership investigated in this case study.

**Research Questions**

The research questions for Part 2 of this study are:
2. What are the barriers, if any, affecting an underrepresented community’s willingness to engage in a PPSR project, and how can PPSR project leaders overcome these barriers?

3. How, and to what extent, can PPSR project leaders create projects that are Third Spaces, which merge the discourse, practices, goals, and values of science with the discourse, practices, goals, and values of underrepresented communities?

**Study Propositions**

Yin (2009) explains a case study benefits from prior development of theoretical propositions. This study used theories of identity for a theoretical framework; these theories serve as a hypothetical story to explain why something happens. The theoretical propositions of a Third Space guided this study. The researcher examined the critical case to confirm, challenge, or extend the theoretical propositions of a Third Space. This study sheds empirical light on the conceptualization of a Third Space within a PPSR project.

**Unit of Analysis**

A case study approach involves exploring an issue through “one or more cases within a bounded system” (Creswell, 2007, p. 73). Miles and Huberman (1994) define the case as a “phenomenon of some sort occurring in a bounded context” (p. 25). The case involved in this study was a PPSR research partnership between an underrepresented community and university researchers. Stake and Savolainen (1995) explain a case is “specific, a complex functioning thing” (p.2). The researcher chose a specific PPSR research partnership to study in relation to the process of engaging underrepresented
communities in scientific research. Stake and Savolainen (1995) suggest binding the case to avoid a common pitfall in case study research, which is attempting to answer a question too broad for one study. Merriam (1998) explains when researchers bind the case, they are essentially “fencing in” what they are going to study (p.27). The researcher of this study bound the case by both definition and by focus, as suggested by Miles and Huberman (1994). Based upon the work of The Center for Advancement of Informal Science Education (CAISE) report on PPSR projects and related literature, the researcher operationalized a definition for a PPSR project engaging diverse participants in a scientific investigation (Bonney et al., 2009).

**Definition of PPSR project.** The CAISE report describes three basic model types for PPSR projects. PPSR projects investigated in this study will be classified according to these three types, which assume scientists are involved in all steps of the scientific investigation. Projects vary based on degree of public involvement in the steps of the scientific investigation. Table 3.4 describes the three types of PPSR projects described by the CAISE report.

<table>
<thead>
<tr>
<th>Project Type</th>
<th>Role of Scientist</th>
<th>Role of Community Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contributory</td>
<td>Determining research questions and project design; collecting and analyzing data</td>
<td>Collect data</td>
</tr>
<tr>
<td>Collaborative</td>
<td>Determining research questions and project design; collecting and analyzing data</td>
<td>Collect data; contribute to any one of the other processes of the scientific investigation: refine project design, analyze data, or distribute findings</td>
</tr>
</tbody>
</table>
Determine research questions and design project; may contribute to varying degrees in data collection, data analysis, or findings distribution.

Source: (Bonney et al., 2009)

**Definition of engagement.** According to the CAISE report, engaging the public in a scientific investigation includes involving the public in any one of the following processes, steps, or activities: deciding research questions, designing the scientific study, collecting data, analyzing data, interpreting results, distributing conclusions, and generating new research questions based on results (Bonney et al., 2009).

**Definition of underrepresented community.** The researcher defines an underrepresented community as a community of non-typical participants to PPSR projects. Summative evaluations of who is participating in PPSR projects reveal Blacks, Latinos, American Indians, and most lower socioeconomic statuses are underrepresented in PPSR projects (Evans et al., 2005; Pandya, 2012). The typical PPSR participant is affluent, well educated, and White (Brossard et al., 2005; Campbell & Smith, 2005; Evans et al., 2005). Because the researcher did not have access to the specific ages and educational attainments of participating members of the projects involved in this study, she chose to define underrepresented community as a non-White, low socioeconomic community of participants. The researcher acknowledges gender is also part of a person’s social identity but did not include this demographic factor in the current study because PPSR projects do not as a whole exclude one gender over the other (Bonney et al., 2009). Additionally, the researcher did not have access to specific genders of community.
members involved in this PPSR project. The distinguishing factor of this case study was the community of Tillery is a community of color with low socioeconomic status who engaged in a scientific research study with a university researcher.

The author chose the term underrepresented group, instead of historically disenfranchised because this study addresses a general problem facing the field of PPSR—the lack of engagement by communities of color. The term disenfranchised refers to depriving someone of a right or privilege. Engagement in PPSR, on the other hand, involves a choice a person makes to participate or not to participate. Even when PPSR project leaders try to engage communities of color, they often are unable. Thus, the author selected the term underrepresented communities to refer to the non-typical participants in PPSR projects.

The case was further bound by the focus of the study. The unit of analysis was the project leaders’ perceptions regarding the process of engaging an underrepresented community in scientific research—perceptions of both a university project leader and a leader from within the underrepresented community. The researcher focused on key historical factors contributing to the process of engaging the community in scientific research, barriers affecting the process, practical ways to increase the sense of belonging for community members within a scientific study, and how, and to what the PPSR project became a Third Space, which merged the discourse, goals and values of science with those of the underrepresented community. The study examined attitudes, events, or relations, which project leaders have experienced to be part of the engagement process. The researcher did not include details of the scientific investigation of particular PPSR
projects within the larger partnership, or on individual citizen participants unless these details related to the overall questions of the study.

**Methods of Data Collection**

The goal of this study was to find general ideas, which will be transferable to other projects and contexts. In the following sections the author details the design of the case study, providing the reader with the “logical sequence that connects the data to the studies research questions” (Yin, 2009, p. 29). The goal is to illustrate to the reader how the data collected allowed the researcher to answer the research questions of the study and come to the study’s findings, which will be the topic of Chapter 5.

**Case selection.** In order to conduct a study yielding the most detailed information and impact the development of knowledge, the researcher chose a critical case to examine the research questions of this study (Patton, 1991). As Yin (2009) explains, when selecting a critical case, the researcher needs to identify the dimensions making a case critical. The case chosen to be the focus of this study was selected because it involved an underrepresented community actively engaging in scientific research. Additionally, the case also stood out among the other PPSR projects examined in Part 1 of this study as a good context to explore the relationship between the proposed theories and the research questions of this study.

The first significant factor making this case ideal was the fact this PPSR research partnership had already completed several PPSR projects--meaning all steps to the research process were experienced by the participating members of the project. Several other PPSR projects examined in Part 1 were still in the relationship-building phase. In
order to answer the research questions of this study—particularly Research Question 3, which examined the merging of scientific and community goals, the research needed to be complete. Research Question 3 could be partially explored in a project, which had begun the process of merging goals, but as noted in Chapter 1, because not all communities have equal access to power, even when a project merges the university and community goals, “public priorities are…easily hijacked by disciplinary priorities” (Guston, 2004, p. 26). Thus, the researcher believed it was necessary to examine a project in which the research process had been completed, to determine if the end result of the project benefited both communities of practice.

The second key aspect of the PPSR project selected for this study was the nature of the partnership with the underrepresented community. In order to answer both Research Questions 2 and 3, the project needed to have explicit scientific goals. Take for example Project 6 in Part 1, which had only educational goals and was still trying to determine what the scientific goals of the study would be. Project 6 would have been a difficult context in which to determine if there were barriers to belonging for an underrepresented community in a scientific study because one could argue the project was not representative of the scientific community, since it had no scientific goals. Additionally, Research Question 3 could not be answered in this scenario either because without the scientific goals, the process of merging community and scientific goals could not be explored.

Finally, the researcher wanted the PPSR project selected as the case for this study to be led by a professional scientist who had scientific career goals. In at least two of the
projects selected for Part 1, the PPSR project was led by a social scientist. Although these projects hope to one day connect with university scientists at their associated institutions, at this point the express goal of the project leader is to build relationships with underrepresented community neighbors. Again, one could argue there were no explicit scientific goals in such a PPSR project.

**Participants.** The researcher used purposive sampling to select representative members from both communities of practice—the scientific and the underrepresented community. The goal of using this sampling technique was to find members of each community of practice who could provide the information necessary to answer the research questions of this study (Creswell, 2007). Criterion sampling was used to select participants according to a preselected criterion relevant to the research questions of this study. The pre-selected criteria related to membership in a social community of practice. To be considered a participant in this study, a person either was 1) a member of the underrepresented community for over five years or 2) a member of the scientific community of practice based on training and employment in the field of science. A second criterion the researcher considered having, but decided to not to include, was engaging in the scientific research of the PPSR project. Initially, the author planned to select only participants who had been engaged in the PPSR research partnership, which served as the case for this study. However, upon reflection, the author decided to leave this criterion out. This decision was made because the purpose of this study was to examine the process, which occurred during the merging of these two communities of practice, but also to investigate barriers to that process. Thus, the voices of non-
participating community members were vital as they offered additional insight into barriers inhibiting participation in a PPSR research partnership.

The sampling process began with an introductory email to the university scientist, Steve Wing, who co-led this PPSR project. In the email the author explained the nature of the research questions and asked him if he would be willing to be interviewed for the Part 1. Steve also introduced the researcher of this study to Gary Grant, the community leader of the underrepresented community, who with Steve co-authored the grant, which initiated the PPSR partnership examined in this study. These two participants were present for the entirety of the PPSR research partnership—witnessing the initiation, formation of project goals, research process, and the aftermath of each research project. For this reason, the researcher relied heavily upon their insight and reflections to answer the research questions of this study. The researcher also included voices from the underrepresented community, which provide information pertinent to the research questions of this study.

**Data Sources**

A qualitative case study approach explores a phenomenon using a variety of data sources in order to better understand the multiple facets of the issue being explored (Baxter & Jack, 2008). To gain a thorough understanding of the complex issue being considered, it is vital to use multiple sources of evidence, triangulating the data to corroborate each study finding (Yin, 2013). The selection of data sources for a case should not be left to chance. The researcher should carefully find the sources leading to the greatest discovery and understanding of the case being considered (Stake &
Savolainen, 1995). After careful consideration of the available data sources, and in order to triangulate study data, the researcher chose to use documentation, archival records, observation, and interviews. With the focus of this study being project leaders’ perceptions on key attitudes, events, and/or relations affecting the engagement process, the author used interviews with the community and university project leaders as primary data sources. As an outsider to the underrepresented community, the author of this study did not have a trusting relationship with individual underrepresented community members. After several conversations with Steve Wing, during which he sought out the purpose of this study, Steve agreed to introduce the researcher to Gary. Steve served as a mediator between this researcher and Gary, vouching for this researcher’s intent. As the findings of this study reveal, a mediator was necessary because of the hurt relationship between researchers and underrepresented communities. Individual community voices, however, do appear throughout the study as secondary data sources. The researcher had access to these voices through documentation, archival records, and participant observation. Table 3.5 provides a summary of data sources collected for this study. The analysis of all four data types allowed the researcher to answer both research questions for Part 2 of this study.
<table>
<thead>
<tr>
<th>Sources of Evidence</th>
<th>Description</th>
<th>Tools and Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Documentation regarding the research collaboration</td>
<td>PPSR project websites, published works and news articles associated with both the PPSR project and the underrepresented community</td>
<td>Throughout the study the researcher searched for current news, interviews, and scholarly articles involving either the underrepresented community or the PPSR project and resultant scientific data produced from these collaborations</td>
</tr>
<tr>
<td>Documentation describing the underrepresented community</td>
<td>Documentation that would provide information on who this underrepresented community is, what their goals and values are, and what their experience with science and research has been in the past</td>
<td>The researcher searched the internet to gather background information on the underrepresented community and also was directed to past documentation the community had stored in the community center</td>
</tr>
<tr>
<td>Skype and face-to-face interviews</td>
<td>Two semi-structured Skype interviews were conducted with the university researcher. One extended face-to-face interview was conducted with the community leader</td>
<td>An interview protocol was used to guide the interviews</td>
</tr>
<tr>
<td>Email interviews</td>
<td>Two interview protocols were emailed to each project leader for them to respond to on their own time</td>
<td>Interview Protocol was used</td>
</tr>
<tr>
<td>Participant observation</td>
<td>The researcher travelled to the underrepresented community to conduct the interview with the community project leader; after the interview, the researcher spent the afternoon in Tillery, N.C.</td>
<td>The researcher interacted with several community members while touring the community and travelling through the community</td>
</tr>
<tr>
<td>Analytic memos</td>
<td>Analytic memos were typically recorded in columns next to the data they reflect. A few analytic memos were recorded in the researcher’s journal</td>
<td>Throughout the study the researcher recorded analytic memos, which were mini analyses of lessons being learned throughout data collection</td>
</tr>
</tbody>
</table>
**Data Collection**

**Documentation.** The main use of documentary evidence is to corroborate information from other sources. The researcher monitored project websites associated with the research partnership examined in this study. The researcher also collected any news clippings associated with the PPSR research partnership and the community partner. A document can serve as a substitution for an observation (Stake & Savolainen, 1995). Because the research for this PPSR partnership was complete, the researcher of this study was not present for the events associated with the individual PPSR projects between Tillery and UNC. Searching the news and recorded documentation for relevant happenings thus served as a way to illustrate the partnership’s activities and corroborate the project leaders’ reflections on project events. Throughout the duration of this study, the researcher conducted internet searches for any relevant project and community happenings. The researcher also searched library databases for any scholarly articles published on the project events. Table 3.6 provides a detailed list of the exact articles, websites, and publications, which provided evidence about the PPSR research partnership examined in this study.
<table>
<thead>
<tr>
<th>Data Source</th>
<th>Chapter 5 Citation</th>
<th>Reference URL or Citation</th>
</tr>
</thead>
</table>
| Websites of university researcher       | (UNC website)      | [http://sph.unc.edu/adv_profile/steve-wing-phd/](http://sph.unc.edu/adv_profile/steve-wing-phd/)  
[http://sph.unc.edu/](http://sph.unc.edu/) |
| Environmental Heroes Documentary 2009   | (EH Documentary, 2009) | [https://www.youtube.com/watch?v=4I5SP-Y9SCE](https://www.youtube.com/watch?v=4I5SP-Y9SCE) |
| Community health impacts of factory farms: Steve Wing at TEDxManhattan 2013 | (TEDx, 2013) | [https://www.youtube.com/watch?v=7ZW8-LQfinY](https://www.youtube.com/watch?v=7ZW8-LQfinY) |
| Lecture at University of Wisconsin     | (Siesinger, 2011)  | [https://www.youtube.com/watch?v=UKjr-IHeebY](https://www.youtube.com/watch?v=UKjr-IHeebY) |
To gain a more complete understanding of the study context, the researcher also relied on documentation regarding the history and happenings of the underrepresented community. The findings of Part 1 revealed the necessity to understand the historical context of each underrepresented community. Thus, the researcher used documentation to investigate who this community is, what their goals and values are, and what their experience with science and research has been in the past. When the university researcher or community leader referenced past or present events, which affect the community’s current engagement in science, the researcher investigated details of these events using the internet and library database to gather background information. Each source of data can serve as a piece to the puzzle, allowing for a more holistic view of the case (Baxter & Jack, 2008). By adding documentation to the sources of data for this study, the researcher gained a more complete picture of the sociocultural and historical backdrop of the underrepresented community. The qualitative case researcher observes with the purpose of understanding the overall story; historical events are a part of the story this researcher sought to record (Stake & Savolainen, 1995). Table 3.7 describes the documentation collected in order to understand the sociocultural and historical context of the underrepresented community, which was the focus of this study.
<table>
<thead>
<tr>
<th>Documentation</th>
<th>Reference in Findings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concerned Citizens of Tillery website</td>
<td>(CCT website)</td>
<td>The CCT maintains a website detailing community events, the history of the community, news, and CCT projects.</td>
</tr>
<tr>
<td>Concerned Citizens of Tillery (CCT) News Notes. October-December, 2015; Volume VII Issue 6</td>
<td>(CCT news, 2015)</td>
<td>The CCT puts out four newsletters per year. This edition of the newsletter details several community initiatives and also highlights a special day to recognize the university researcher, Steve Wing.</td>
</tr>
<tr>
<td>We Shall Not Be Moved. <em>The Story of the Tillery Resettlement Community</em>. 2007</td>
<td>(Tillery Documentary, 2007)</td>
<td>Documentary film produced by the CCT and directed by Charles Thompson and Chris Potter with support from the National Endowment for the Arts and the Center for Documentary Studies at Duke University. Tillery members tell their own history in this film.</td>
</tr>
<tr>
<td>Record and Notes for the Premiere of Tillery’s Documentary Film, Labor Day Weekend, September 1, 2007 Tillery Community Center</td>
<td>(Documentary Premiere, 2007)</td>
<td>The CCT collected letters, speeches, and details of the premiere of Tillery’s documentary film in a 41 page book</td>
</tr>
<tr>
<td>The Concerned Citizens of Tillery 35 year anniversary book, January 2015</td>
<td>(CCT Anniversary Book)</td>
<td>Published by the Concerned Citizens of Tillery, this 142 page book provides an introduction to the CCT, a historical account of the community’s political action, and summary of the last ten years of fellowship and celebrations of the community</td>
</tr>
</tbody>
</table>
**Interviews.** Interviews are guided conversations, which serve as the primary data source for case studies (Yin, 2013). The purpose of conducting interviews is to learn other people’s interpretations of what they have experienced and observed (Stake & Savolainen, 1995). In a case study, the researcher is trying to uncover “the interaction of significant factors characteristic of a phenomenon” (Merriam, 1998, p. 29). The process of how and why two distinct communities of practice were able to successfully collaborate in a scientific research study involved many conversations, events, attitudes and actions, which have already occurred in the past. In this particular study, the researcher did not have access to situations leading up to the successful research partnership, rather she relied on the observations of others who have seen and experienced project activities and events. The researcher’s goal was to capture the lived experiences of project leaders who were there for the conversations, events, and actions and who witnessed the feelings, motivations to participate, and perceptions of the community members. The researcher relied on the words of the community and university project leaders to understand key factors contributing to the process of building positive science identities for community members, barriers affecting the process, and best practices of the process. An interview seeks to find what is on and in someone else’s mind (Patton, 1991). The project leaders interviewed for this study spent years building their relationship and understand the barriers and successes of merging the goals, values, and discourse of an underrepresented community with those of science. It is vital to learn what is on their minds and learn from their years of experience and expertise (Merriam,
1988). In this particular study the individual project leader’s perceptions are the material to be understood (Yin, 2013).

Both observations and interviews have the purpose of discovering what happened, but the interview has the capability of being much more targeted and influenced by the researcher (Stake & Savolainen, 1995). Part of being a good interviewer is being sensitive to the data being collected. The researcher needs to know when to be quiet and listen and when to speak up and steer the questioning back in the direction of the research topic (Merriam, 1988). The interviewer needs to have a plan, or else the conversation can very easily get away from the research questions of interest. It is useful to have guiding questions developed ahead of time and even to give a copy of these questions to the interviewee before the interview (Stake & Savolainen, 1995). For this reason, the researcher developed interview protocols prior to conducting each interview. The analysis of data collected in Part 1 of this study led the researcher to develop the research questions and interview protocols for the larger case study. Several rounds of interviews were conducted to gain a deeper understanding of the research questions through the eyes of project leaders who have spent years engaged in a scientific research collaboration between a university research group and an underrepresented community. An initial interview was sent to both project leaders (university and local community) via email. This initial interview intended to collect necessary background information on the nature of the PPSR partnership, the type of research involved, the extent of community involvement, and basic information on the diverse community partnering in the scientific research (See Appendix B). Both community leaders opted to discuss the answers for the
emailed interview in person. During the semi-structured interviews with both project leaders, the first 15-20 minutes began with a discussion of the email interview protocol. Despite the distance between the PPSR project leaders and the researcher of this study, the researcher desired to conduct face-to-face interviews in order to have the opportunity to hear beyond what the project leaders explicitly stated. Much can be learned through being sensitive to the implicit messages of facial expressions, pauses, and silences in an interview (Stake & Savolainen, 1995). The university project leader was interviewed via Skype in two separate semi-structured interviews (See Appendix C); the first interview lasted 60 minutes (Wing, interview, October 14, 2015) and the second lasted 66 minutes (Wing, interview, January 5, 2016). The community leader was interviewed face to face as he expressed the need to meet the researcher; this interview lasted 99 minutes and also included a two-hour tour of the community along with further conversation (Grant, interview, February 17, 2016). Due to the travel required to have this in person meeting with the community project leader, the researcher conducted one extensive semi-structured interview instead of two shorter interviews (See Appendix D). Both interview protocols included questions based on the conceptual framework of the study and the Part 1 findings, but also allowed for freedom to explore questions, which arose during the interview (Glesne & Peshkin, 1992). In email correspondence prior to the interviews, Steve Wing expressed interest in the theoretical construct of a Third Space and requested additional information on the theory. For this reason, the interview protocol used to interview Steve includes some rhetoric from the theoretical constructs guiding this study. The researcher had the opportunity to interview Steve first and through these interviews,
she learned more about the community leader, Gary Grant. Based on advice gleaned through these interviews the researcher did not include rhetoric or theories in the interview with Gary. Both protocols contain questions, which are searching and open-ended as a means to elicit participant’s reflection and recall of personal experiences (Polkinghorne, 1988; Webster & Mertova, 2007), however, the researcher of this study was careful to remove any questions associated with science education jargon and theories from Gary’s interview protocol. Gary’s interview was audio-recorded using a handheld recorder and was later transcribed verbatim using a professional transcription service. The interviews with Steve were audio-recorded using the MP3 Skype Recorder and later transcribed verbatim using a professional transcription service. Due to a technical error, the recording from the second Skype interview was lost (Wing, interview January 5, 2016). The researcher realized the error moments after the interview had concluded and was able to jot down as much of the conversation as she was able to remember. Steve was gracious enough to read over this researcher’s summary of the interview and provide additional comments and a few quotations to support the summaries of the interview. The point of data saturation was reached by constantly analyzing the data throughout the study. By thoroughly researching other published interviews Gary and Steve had participated in, along with using the initial data analysis to develop the final interview protocol(s), the researcher reached a point of data saturation and concluded the interview process.

**Participant observation.** During her time in the community, several interactions with Gary and a few community members provided powerful illustrations of the overall
findings of this study. For this reason, the researcher includes a description of these incidents, as participant observations, in Chapter 5.

**Data Analysis**

The researcher employed thematic analysis as the overall analytical approach for interpreting the data. This inductive approach allows the data itself to drive the structure of the analysis (Strauss & Corbin, 1990). The data collected from the interviews conducted in Part 1 was transcribed by a professional transcription service. Thus, upon receiving the transcripts, the researcher used the process of repeated reading to immerse herself in the data, reading through each transcript verbatim several times making notes in the margins of words, theories, or short phrases summarizing key concepts (Braun & Clarke, 2006). Using the broad research questions of the study, the researcher identified features of the data pertinent to these questions and formed an initial coding framework (Riessman, 1993). The first round of data analysis consisted of open coding. Using the research questions of the study, the researcher formed an initial coding framework by analyzing the data for any notion of factors affecting a community’s sense of belonging to science and for any aspects of the project related to the theoretical construct of a Third Space (Riessman, 1993). The researcher read through the interview transcripts verbatim making notes in the margin of words, theories, or short phrases summing up what had been said. This produced the initial coding framework for Part 2. At this point in the analysis, there were 32 codes: unequal power, exploitation, political power, racism, institutions of power, discrimination from social and political institutions, community history with science and institutions of education, White privilege, symbols of wealth,
symbols of power, funding, decisions in project, project goals, community made to feel less than, mistrust, norms of science, critical perspectives on science, definitions of science, third space science, overcoming communication barriers, third space community, agendas and goals, historical abuse/discrimination, community champion, sensitivity to past, respect, relationships, trust, time, openness, honesty, respond to community, and alienation.

The second round of data analysis consisted of combining redundant codes and reexamining the data for any new codes. During this stage, the researcher noted some of the codes should be merged. For example, the researcher noticed the codes “unequal power,” “exploitation,” and the code “political power” could be merged to the more encompassing code of “colonialism.” The researcher also merged codes such as “racism,” “institutions of power,” and “discrimination from social and political institutions” into the more inclusive code of “institutional racism.” In addition, the researcher noticed certain codes such as, “symbols of wealth” and “symbols of power” were redundant as they both (in context) described “privilege.” The researcher merged all three of these codes into “symbols of privilege and status.” At this point, the researcher re-read through each of the interview transcripts and noticed a new code emerged, which the researcher described as “leadership in project.” After this round of analysis, there were 22 codes: colonialism, institutional racism, racial discrimination and abuse, community history with science and institutions of education, symbols of privilege and status, funding, whose research project is it, community made to feel less than, mistrust, challenging science, third space science, conceptualization of science,
overcoming communication barriers, third space community, agendas and goals, acknowledging abuse, community champion, sensitivity to past, respect, time building trusting relationships, true dialogue, and alienation.

To ensure the rigor of the study, a fellow researcher independently coded 25% of the study data and the 22 codes of the final coding system were discussed until an agreement was reached concerning the meanings of each code. Upon finalizing the final coding framework, the researcher worked through each interview transcript again and marked data according to these codes (See Appendix D for codebook used to organize the data in this study). The codebook includes descriptions, inclusion and exclusion criteria, and examples to provide the audit trail, detailing how this researcher came to the study’s conclusions.

During the third stage of data analysis, the researcher returned to the data to look for patterns, which would provide insight into the interpretation of the codes. The patterns found were: science alienates but the issue is bigger; modern day display of colonialism; exploitation by those with power; history of working for Whites; history of blatant racial inequality; history of lack of power; inequalities alienate; “help” often hurts; White privilege viewed as potential exploiter; inequalities affect decision to participate; science has described African Americans as inferior; science typically has no benefit to the African American community; strong mistrust for powerful institutions; hear, acknowledge and respond to community’s experiences of exploitation; talk openly and honestly; trust is built by joining fight for equality; respect community knowledge and cultural traditions; project structure can convey respect; be sensitive to convey
respect; find someone community respects; forge relationships to overcome trust; be conscious and sensitive about language; study results need to be in form community can understand; community has clear goals; researcher has clear goals; working together results in benefits for both communities; community and researcher worked together throughout entire project; both communities should equally own project; project needs to result in benefits for both communities; inequalities surfaced through funding restrictions; funding can be difficult to find; science is viewed as more legitimate; science is not unbiased; concept of science needs to be challenged; everyone has the right to speak in science; motivations matter; true empathy is needed; and what matters is whose agenda is served.

During the fourth, and final round of analysis, the researcher found there were still broader categories, which described the patterns. The overall categories encompassing the patterns were: historical inequality; present day inequality; inequality in research; science belongs to larger system; mistrust; approach to community; respect community; dialogue about abuse; merge community and scientific discourse; merge community and scientific values/agendas; project ownership; challenges of funding; science as dominant paradigm; and superficial Third Space. At this point in the analysis, the researcher returned to the research questions: 1) What are the barriers, if any, affecting an underrepresented community’s willingness to engage in a PPSR project and how can PPSR project leaders overcome these barriers? 2) How, and to what extent, can PPSR project leaders create projects that are Third Spaces, which merge the discourse, practices, goals, and values of science with the discourse, practices, goals, and values of
an underrepresented community? Based on these research questions, the researcher then used the patterns to reanalyze all transcripts and organize the patterns and categories into themes. Throughout the entire analysis process the researcher used the method of constant comparison, reading and re-reading the data to identify emerging themes found within the data. All codes from the final coding system were incorporated into a theme. After generating the themes the researcher once again re-read through the entire data set to ensure the themes reflected the content of the data set as a whole. The final stage of analysis involved summarizing practical findings for each theme and choosing examples from data to illustrate these findings. There were 5 primary themes, which encompassed the findings from the data analysis: 1) Inequality is a barrier to belonging, 2) Overcoming barriers to belonging, 3) Conscious bridging, 4) Equal footing, and 5) Challenges to Third Space. Chapter 5 details each theme along with evidence from the data.

Tables 3.8 and 3.9, adapted from Quigley et al. (2016), summarize the organization of patterns, categories, and codes used to determine the overarching themes for Research Question 2 and 3, respectively. In the first column, titled **Overarching Theme** is the theme derived from the categories, patterns, and codes listed in the columns to the right of the question. For example, the theme “Inequality is a barrier to belonging,” includes the categories titled historical inequality, present day inequality, inequality in research, science belongs to larger system, and mistrust; the patterns such as science alienates but the issue is bigger and modern day display of colonialism; and codes such as “colonialism,” “institutional racism,” and “racial discrimination and abuse.”
<table>
<thead>
<tr>
<th>Overarching theme</th>
<th>Categories</th>
<th>Patterns</th>
<th>Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inequality is a barrier to belonging</td>
<td>Historical inequality; Present day inequality; inequality in research; Science belongs to larger system; mistrust</td>
<td>Science alienates, but the issue is bigger; modern day display of colonialism; exploitation by those with power; history of working for Whites; history of blatant racial inequality; history of lack of power; inequalities alienate; “help” often hurts; White privilege viewed as potential exploiter; inequalities affect decision to participate; science has described African Americans as inferior; science typically has no benefit to African American community; Strong mistrust for powerful institutions;</td>
<td>Colonialism, institutional racism, racial discrimination and abuse, community history with science and institutions of education, symbols of privilege and status, community made to feel less than, mistrust, alienation</td>
</tr>
<tr>
<td>Overcoming barriers to belonging</td>
<td>Approach to community; Respect community; Dialogue about abuse</td>
<td>Hear, acknowledge and respond to community’s experiences of exploitation; talk openly and honestly; trust is built by joining fight for equality; respect community knowledge and cultural traditions; project structure can convey respect; be sensitive to convey respect; Find someone community respects; forge relationships to overcome trust</td>
<td>Colonialism, institutional racism; racial discrimination &amp; abuse, community history with science and institutions of education, symbols of privilege and status, community made to feel less than, mistrust, acknowledging abuse, community champion, sensitivity to past, respect, time building trusting relationships, true dialogue, alienation</td>
</tr>
</tbody>
</table>
Table 3.9

Summary of Themes from Research Question 3

<table>
<thead>
<tr>
<th>Theme</th>
<th>Categories</th>
<th>Patterns</th>
<th>Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conscious Bridging</td>
<td>Merge community and scientific discourse; merge community and scientific values/agendas</td>
<td>Be conscious and sensitive about language; study results need to be in form community can understand; community has clear goals; researcher has clear goals; working together results in benefits for both communities; community and researcher worked together throughout entire project</td>
<td>Funding, whose research project is it, challenging science, third space science, conceptualization of science, overcoming communication barriers, third space community, agendas and goals, sensitivity to past</td>
</tr>
<tr>
<td>Equal Footing</td>
<td>Project Ownership; Challenges of Funding</td>
<td>Both communities should equally own project; project needs to result in benefits for both communities; inequalities surfaced through funding restrictions; funding can be difficult to find</td>
<td>Colonialism, community history with science and institutions of education, funding, whose research project is it, community made to feel less than, agendas and goals, respect</td>
</tr>
<tr>
<td>Challenges to Third Space</td>
<td>Science as Dominant paradigm; Superficial Third Space</td>
<td>Science is viewed as more legitimate; science is not unbiased; concept of science needs to be challenged; right to speak in science; motivations matter; true empathy needed; whose agenda is being served</td>
<td>Colonialism, whose project is it, challenging science, third space science, concepts of science, third space community, agendas and goals, alienation,</td>
</tr>
</tbody>
</table>

**Trustworthiness and Rigor**

To ensure the trustworthiness and rigor of this case study the researcher attended to the credibility, dependability, confirmability, and transferability of the research (Kyburz-Graber, 2004). To make certain the study was credible, the researcher selected project leaders who have prolonged experience engaging in a community-based scientific research study (Lincoln & Guba, 1985). The prolonged engagement in the field allowed project leaders to provide a picture of what is occurring when an underrepresented community is motivated to participate and engage in a PPSR project. The collaboration
between Tillery and UNC researchers has lasted for over 15 years. The persistent efforts and experiences of these project leaders helped ensure their advice was representative of the typical case. After hearing the perceptions and advice from project leaders the researcher took another step to ensure the credibility of the study. The researcher consulted with a fellow researcher not involved in the study to be a peer collaborator who verified the interpretations of the data were true to the data being collected. This process of peer debriefing helps a researcher stay focused on the research questions and can help crystallize the findings emerging from the data (Lincoln & Guba, 1985).

Another step the researcher took to increase the credibility of the study was to conduct member checks with study participants. Participants were asked to review the transcripts, analysis, and conclusions of the study to ensure the findings of the study accurately portrayed the experiences of the project leaders. Gary Grant was able to provide the researcher feedback and approval of the study findings. Unfortunately, Steve Wing passed away prior to the conclusion of data analysis. He was able to approve the quotations used in the study, but did not read the final findings and conclusions of the study. The final step to ensure credibility is triangulation of the data. The researcher did not rely on only one source of data to draw the conclusions of the study. Instead, the researcher collected documentation of both present day happenings and happenings of the past along with several interviews and document analysis to corroborate the study’s findings.

The dependability of a study refers to the consistency of the study’s findings. If someone else were to repeat the study would they find the same thing (Lincoln & Guba,
1985)? Although the unique context and time of the interactions examined in this study would prevent someone from exactly replicating the study, the researcher clearly communicated the exact methods of this study. The researcher kept a clear chain of evidence and was explicit in the write up of the study. A third aspect of trustworthiness is confirmability. Confirmability relates to how much the findings of the study are the result of the data and not researcher bias (Lincoln & Guba, 1985). The first step the researcher took to ensure the study had confirmability was to be reflexive. The researcher made every attempt to explicitly admit bias at every step of the research, recording biases in the researcher’s study journal. In addition, the researcher kept an “audit trail” so any other researcher could trace the steps of how the study started and how the data led her to the findings of the study. This audit trail included how the data was reduced and themes generated. Finally, the before mentioned triangulation of the data, also helped ensure the confirmability of this study.

The last aspect of trustworthiness is transferability. Transferability relates to how the findings of a study apply to situations outside of the case being considered (Lincoln & Guba, 1985). In order to increase the transferability of this case study the researcher provided thick description and extensive details of the case and context of the study. The goal of this study was to provide a vicarious experience of how PPSR projects can engage underrepresented communities in scientific research. This study hoped to draw out key approaches, attitudes, lessons learned and ideas transferable to other projects and contexts. By providing rich description, the researcher provided the reader with enough context to determine what parts of the case apply to his or her situation. It is the reader
who decides if the findings can be generalized to their situation or not.

**Ethical Issues**

The author does not know of any risks or discomforts to participants in this research study. IRB approval for Part 1 was obtained prior to collecting any data for this study. All participants received a letter of consent informing them they did not have to be in the study and may choose to stop taking part at any time, with no questions asked and no repercussions. There were no visual recordings involved in this research. All audio-recordings were stored on the researcher’s password protected laptop, along with all transcribed data. Originally the researcher planned to keep the identity of the underrepresented community, university research and community leader confidential. However, after conducting initial interviews the researcher realized the nature of the study and research questions necessitated understanding the historical context of a specific community. The details of this history alone reveal the identity of the community. In addition, the nature of the questions being asked in no way presented potential harm to the community. Because some community members have expressed fear of reprisal for being associated with this PPSR project’s political action, the names of any individual community members, aside from the community project leader, were kept confidential. Both project leaders, Gary Grant and Steve Wing, agreed to the revelation of their identities in the final report of this study. They were told however, that, they would be contacted for consent before their identity was revealed and could refuse to grant the researcher permission to use their name. The researcher will retain the audio files until the completion of the study, which will be no later than June 2017. The
researcher does not know of any way the researchers, or any participants, will benefit directly from taking part in this study. However, this research may help the field of PPSR better understand ways to engage underrepresented communities in scientific research.

**Limitations and Strengths**

This study had several limitations. The first limitation of this study relates to a general limitation of case study research. Case study research can have the tendency to produce a product that is too lengthy for readers to sort through all of the data and find applicable lessons. Merriam (1998) notes the “amount of description, analysis, or summary…is up to the investigator” (p.42). Since the purpose of this study was to provide other PPSR project leaders advice for their own projects to understand an effective approach to engaging underrepresented communities in scientific research, the researcher organized the study findings according to general themes and pragmatic advice other PPSR project leaders can apply to their own project.

The second limitation was the reliance on a single case study to draw study conclusion. The knowledge claims of a single case study are at times attacked on the basis of lack of generalizability. However, Yin (2013) explains case study research strives for analytical generalization. It was this analytical generalization the researcher in this study strove to find. Yin (2013) explains the causal relationships in one case, may be used to develop theory beyond that case. The structures at work in this case exist outside the context of this particular case, revealing patterns of interactions and historical relationships affecting the engagement of underrepresented communities in scientific
research. As such, this one case might contribute to further theory development regarding a useful approaches and engagement strategies.

The final limitation of this study was a weakness of interviews and that is participants could not possibly recount every past event that went into shaping their PPSR research partnership with local diverse communities. The experiences and narratives they recalled were resultant of values they have as well as their past experiences and perceptions. Interviews are imagined reproductions of events (Huberman, 1995) not “true” or accurate descriptions of reality (Polkinghorne, 1988). Yet, the researcher believes this weakness would be true of any method of data collection, including direct observations. If the researcher had observed the PPSR project, the observations would also be imagined interpretations and perceptions of events. The researcher has biases that would cause her to see certain things and not attend to others. The researcher believed the PPSR project leaders were the best available option to relay the events that went into shaping these successful research partnerships with underrepresented communities. Interviews with these project leaders thus strengthened the results of this study because the purpose of the study was to focus on the process of establishing a research partnership with underrepresented communities and to discover how other PPSR projects can become spaces allowing scientific and community goals, values, and traditions to be merged. These successful projects did not occur overnight; they took many years, conversations and events. The project leaders were present for each step of the way. They were able to observe what researcher was not.
CHAPTER 4: FINDINGS PART 1

Overview

Part 1 of this study served as an initial screening identifying the larger case study, which Chapter 5 will detail. For Part 1 of this study the researcher examined experiences, insights, and advice from seven project leaders who have demonstrated the ability to engage underrepresented communities in PPSR projects. The guidance from these project leaders provides the field of citizen science with critical lessons, both theoretical and practical. Practically their words show specific steps project leaders can take to build partnerships and engage underrepresented communities in scientific research. Theoretically they provide a holistic description of an overall approach to establishing partnerships with underrepresented communities. Data presented in Chapter 4 relates to the first research question of this study, “What advice do PPSR project leaders have regarding how to engage underrepresented communities in scientific research?”

A general qualitative approach was employed for Part 1 of this study (Merriam, 1998). Chapter 4 presents key findings, which emerged from the data collected through semi-structured interviews with the seven project leaders. Throughout this chapter, project leaders are identified as Project Leader 1-7 in order to protect the privacy and identity of the underrepresented community with whom the project leaders partnered with. Individual project leaders enacted a variety of approaches based on the unique context of their community partner and the overall goals of the PPSR project, however, the thematic analysis elicited key concepts evident in the data. As project leaders relayed their stories regarding the partnerships they formed with underrepresented communities,
several themes emerged regarding the process of how these partnerships were forged and maintained. These themes overlap to some extent but taken together provide a comprehensive overview of the advice these project leaders had to offer other PPSR projects seeking to establish partnerships with underrepresented communities. In the following sections, the author provides exemplars of each theme and related findings. Since the overarching goal of this study is to understand from a comprehensive perspective and to provide general advice for other project leaders seeking to establish community partnerships with underrepresented populations, the author purposely did not seek to quantify the specific number of times each theme or finding was mentioned. The three themes for Part 1 of this study are respect, true dialogue, and overcoming the barriers to a true dialogue. Table 4.1 summarizes the overarching themes and provides the findings for each theme.
<table>
<thead>
<tr>
<th>Theme</th>
<th>Findings</th>
</tr>
</thead>
</table>
| **Respect**                | • It is vital to understand and respect a community’s culture and perspectives on knowledge  
• It is vital to understand and respect the painful histories of many underrepresented communities |
| **True Dialogue**          | • True dialogue requires long-term relationships to build trust with underrepresented communities  
• True dialogue requires intentionally building in listening opportunities before project parameters have been decided on  
• True dialogue responds to conversations with underrepresented communities and results in transformed PPSR project |
| **Overcoming Barriers**    | • Definitions of science and expertise may be a barrier to a true dialogue  
• Funding may be a barrier to a true dialogue |

**Theme 1: Respect**

This theme is defined as giving dignity to, and recognizing, the value in a community’s culture, perspectives on knowledge, and history. As PPSR project leaders shared their reflections, personal accounts, and advice, an overall theme of respect emerged from the data. Respect, as defined by Webster’s dictionary, means a “feeling or understanding that someone or something is important, serious and should be treated in an appropriate way” (Merriam-Webster, n.d.). Project leaders emphasized the importance of consciously and proactively respecting a community’s history, culture, and
perspectives on knowledge. They recommend respect should guide the way project leaders enter a community and how they interact with community members throughout the project. The following section illuminates the importance respect plays in a PPSR project aiming to engage underrepresented communities in scientific research.

Finding: It Is Vital to Understand and Respect a Community’s Culture and Perspectives on Knowledge

Knowing and respecting the unique culture of the community is vital. Project leaders advise communication with the community will be hindered if community members sense a lack of respect for their culture and perspectives on knowledge. Project leaders will not be able to respect the unique culture and knowledge of a community, if they do not take the time to learn about it. According to Project Leader 2, “Learning about the specific cultural heritage of a community is huge because that can help you avoid issues that you may totally not be aware of when you start out” (Interview, February 12, 2015). Part of this cultural heritage involves cultural norms project leaders should understand and respect. For example, Project Leader 2 notes in the community she partners with it is rude to look a person directly in the eye when having a conversation. Learning this aspect of the community’s culture was crucial for her to effectively communicate with community members. She also had to learn a very soft, barely touching handshake is what is considered polite. She recommends spending time researching a community’s cultural norms. Not being aware of cultural norms may communicate to the community one does not respect the community’s way of doing
things. Project Leader 5 recognizes the lack of participation from underrepresented communities in scientific research and advises:

If you want to change that, you have to think about your community and how you can approach it, being very mindful and sensitive with who you’re trying to represent and what their culture is. And then, do what you need to do, but cultural sensitivity is important, because not everybody works on the same protocols.

(Interview, February 12, 2015)

Avoiding disrespectful behavior is not the same as showing respect to a community's culture. Project Leader 5 stresses, “Your membership into a privileged group (whether by race or class) can automatically make a community suspicious of how you view their culture.” Project leaders advise always keeping in the forefront of your mind the fact that marginalized communities are attempting to preserve their culture or rebuild a culture, which has been and is being stolen from them by members of the dominant group. Project Leader 3 advises other project leaders to always carry with them the understanding that community members may feel they are “basically …collaborating with the enemy” when they work with a university researcher. She recommends project leaders proactively show support for the culture of the underrepresented community. She advises project leaders to find ways to “attend cultural events” and “take part with the culture.” Overall, it is imperative to “signal to the community that you support their cultural identity” (Interview, February 11, 2015). Participating in cultural holidays and celebrations, sponsoring local athletes, and attending local events are specific ways to signal respect to a community.
Project leaders need to convey a deep respect for the community’s knowledge and be humble about their own knowledge. Not everyone uses the same language, and the language of science or other institutions is not better than the community’s vernacular. If project leaders enter a community using the same language they use with their research partners or institutions, they will likely push community members away. The cultural practices and speech of science may alienate the underrepresented community. Project leaders advise carefully choosing the appropriate language for each community. Project Leader 5 notes:

When we’re working with local community members, it is important to have an all-inclusive language, that everybody understands each other. It is not about showing anybody how much somebody knows. That is one language. The language that affects the way that we are within a community is also based on cultural norms and things that are accepted in the local community. (Interview, February 12, 2015)

Project leaders advise part of respecting a community’s knowledge may involve providing translation. The community has a way of talking about the environment, wildlife, and how they hope to conserve the environment. Project Leader 4 notes:

They (the underrepresented community) don’t use the language of science but their language is a valid language… just a different language. This is a cultural language. There are two options. Either they have to convert over and speak science so that the policy makers and the national scientific institutions who
advise policy makers can understand them, or there needs to be some translation somewhere. (Interview, February 11, 2015)

He believes the researcher’s role is to listen to the language of the community and provide the necessary translation between the local community and the scientific community. The burden is on the researcher to receive the traditional knowledge and to figure out ways to translate and when possible integrate scientific and indigenous knowledge. Project Leader 3 agrees noting, “It is up to us to creatively find ways to document it (knowledge of community) and integrate it into our systems” (Interview, February 11, 2015).

Project Leader 4 recommends starting by humbly seeking to understand how a local community views a given situation. He notes, “It is important to have a relational receptivity and true dialogue… making sure that I have a good understanding of the community’s language.” He warns fellow project leaders to make sure they are not reinterpreting what the community is saying to serve their own agenda. Rather, project leaders need to stay true to the meaning and form of what the community has said. He warns against the “danger” of losing the meaning of the community’s words in an attempt to convert everything into the language of science. There may not be a direct translation (Interview, February 11, 2015).

Respect is built by approaching every new person and new situation with humility. An inflated view of one’s institution, oneself, or the good that a person is trying to do for the community can make the community feel their knowledge is not respected and they are viewed as inferior. According to Project Leader 2, when project leaders have
an inflated view of their own training or how they are going to help the community, this prideful attitude dissuades community members from participating in a PPSR project. Project Leader 2 notes when she meets new community members she does not introduce herself with titles denoting her degree. She has found it much wiser to introduce herself by her first name (February 12, 2015). Likewise, Project Leader 4 notes:

A lot is going to be dependent on the integrity of or the expression of the individual, to recognize the past, to not come in as what I can call an arrogant scientist approach saying, ‘I know everything.’ If that can be removed, if respect for the local community, the local citizen and, where appropriate, that person's cultural background and cultural perceptions and way of interpreting the environment or expressing it… if that respect is there, it would go a long ways. If you don’t sense respect, it’s a barrier to communication. (Interview, February 11, 2015)

For this reason, some project leaders prefer to refer to community members as “colleagues” rather than “partners” or “participants.” Project Leader 1 recommends making projects “fully participatory” and argues that “expertise is more than that sort of university trained, certified expertise” (Interview, October 10, 2015).

It is vital to understand and not just give lip service to the idea of a project being a space to learn together with the community. The community’s perspective on knowledge can add value to the PPSR project, and it is the responsibility of project leaders to find ways to demonstrate to the community how much they value the community’s knowledge and perspectives. Project Leader 5 notes “mutual respect” is vital. She says:
We’re learning from each other, and knowledge is learned and gained in various ways. I am disciplined in one way to gather information and to see the world and understand and break apart and synthesize the world, in the culture that I came from. It’s understanding and being receptive to other ways, understanding the other’s knowledge and then valuing it. (Interview, February 12, 2015)

If project leaders have an inflated view of their own way of understanding the world, community members will often recognize this and have no desire to work with them. Project Leader 2 notes when project leaders act as if they are going to “help” the community “know how to operate their lives in a better way,” this will likely push community members away from participating in the PPSR project. Instead she recommends project leaders come with the approach of, “we're learning together and developing ways of mutually working together” (Interview, February 12, 2012). Several project leaders mentioned approaching the project as a co-management of community resources. When project leaders approach the community with a deficit view or with the view that they are going to do something big for they community, these approaches may communicate a lack of respect for the community. Several project leaders caution other project leaders against over directing the community and against the tendency to “partner” with a community simply to get a certain demographic included in the researcher’s own study. Research should not be viewed as something that is done on the community; rather research should be conducted with the community. Project Leader 3 notes:
Again, rather than saying, oh, we have all these things to offer, we want to give these to you or any kind of reflection on them being ‘underserved,’ we really try to keep it much more as a ‘can you help us with this and this is what we’re doing and this is what we could bring. Would you like to meet and talk about what we could develop’? (Interview, February 11, 2015)

Project leaders recommend being cautious about who is generating the research questions and what pre-determined project parameters signal to the community. Project Leader 2 recommends respect for a community’s culture and perspectives on knowledge can be conveyed by “sitting back and letting community members make decisions about research questions and also how their community will participate” (Interview, February 12, 2015). When community members help researchers better understand the community’s issues and problems, science gains a more complete understanding of nature.

Knowing and respecting that not every culture and community views knowledge in the same way will also be vital to successfully establishing a partnership with underrepresented communities. A PPSR project’s values and goals may be contrary to how some communities view knowledge. Project Leader 3 explains how her project had to adapt project goals and let go of the drive to always get data. She did this in response to a community member who expressed to her why the PPSR project’s emphasis on data collection was not appropriate for individuals in the local community. She recalls a conversation in which one of her community partners said:
We don’t put a big premium on everybody knowing everything about everything. Because in our spiritual approach to nature, if you go very specifically into learning a lot about a particular being, then you’re taking on a spiritual responsibility to that being. We’re not necessarily going to really want or it’s not necessarily appropriate for all our kids or our community members to do that.

(Interview, February 11, 2015)

This project leader went on to express the need to take feedback, such as this, from the community and respond to it. If a project leader truly respects a person’s view, then they may have to put certain scientific goals on the back burner. She concedes this particular PPSR project did not collect large quantities of data, but respecting the community’s request to take part in the PPSR project in their own way strengthened her institution’s relationship with the community.

Finding: It is Vital to Understand and Respect the Painful Histories of Many Underrepresented Communities

There is no such thing as a neutral project, event, or action. A person’s perceived choices of what they can do and how they can do it are all constrained by history. The project leaders interviewed in this study consistently noted significant hesitation of many underrepresented communities to associate with PPSR projects. They advise even science activities are situated in a broader group of related activities, and these activities are influenced by culture, politics, and a person’s history of participation with these activities. In many cases issues of racism and inequality in the past and present can lead to a general mistrust of researchers entering communities of color. Project leaders stress
denying or ignoring the past will not inspire trust in the community. Project leaders should deal with painful histories head on and work to heal them. According to Project Leader 1, knowledge of history is vital to a PPSR project’s success, and project leaders ignore it at their “own peril.” She recommends dedicating time up front to conversations with community members surrounding their histories and the history they have had with science and powerful institutions. She notes:

I just think that we couldn’t be successful without kind of learning our history and in fact one of the things that we are working on launching is a teach-in… in which we kind of officially have community residents tell us about their history. We’re working on getting our neighbor partners to just be real clear with us their history so we don’t make assumptions…We are acknowledging it, embracing it, and then using it to build what we are doing. Racism and inequality need to be dealt with head on. (Interview, February 12, 2015)

Project Leader 4 advises “history is perceptions of individuals,” and thus it is important to hear the history from the community’s perspective (Interview, February 11, 2015). The conversations project leaders have with people cannot be separated from the community, history, and place in which they occur. It is vital to enter a community with humility and willingness to learn, instead of entering with a dismissive attitude toward the hurt many communities of color have and are still experiencing. Project leaders need to listen and learn about the community’s history because it is a living history for them. When project leaders deny or refuse to dwell on uncomfortable issues of inequality and
abuse, this may communicate to people that project leaders do not see the importance of the hurt that group of people has experienced.

The hurt of community members is often deep. Project leaders need to be prepared to hear an uncomfortable truth about how many communities have lost at the hands of powerful institutions. For some communities, this painful history involves the loss of their culture. Project Leader 3, who works with tribal nations across the United States, reflects on the painful history of the communities with whom she partners. She says:

We’re interacting as European-based scientists with people who are rebuilding their culture after having their culture annihilated or at least stolen or at best downplayed, but usually forbidden. That isn’t even 100 years ago. This happened all across the country. We just don’t know about all of that, and we don’t know the depth of wounding that has occurred there. (Interview, February 11, 2015)

She goes on to describe how the Native American communities with whom she works are being forced to live in two realities. They are trying to rebuild the culture stolen from them, on the one hand and are forced to live in the culture of capitalism—a culture very much opposite of their own. The community members have memories of grandparents and parents being brutalized and forced from their lands—lands that the project leader’s university now sits on. She stresses the need to always be conscious of a community’s painful history and focus on healing. Project Leader 5 warns other project leaders to “be cognizant of the history of colonialism,” which continues to affect marginalized communities on “one level or another” (Interview, February 12, 2015).
It is vital to understand the name researcher may be associated with the community’s painful history. Not everyone looks at universities or governmental agencies as a positive influence in the community. Project leaders in this study warn university researchers to be careful about proudly bearing the university’s name. Many underrepresented communities may want to distance themselves from a project bearing a powerful institution’s name, and many will likely not want the “help” being offered. Project Leader 4 warns, even if the community perceives a project to be associated with the government or an agency with whom they have had a negative history, the community may shut down immediately and not want to work with such a project. He notes:

There’s a lot of suffering, a lot of constraints. If it’s someone who seems to be part of that system who comes in and says, ‘We are knowledgeable. We are the scientists and this is what you have to do,’ the message won’t be accepted. That history does affect communication and language, and it sets up barriers.

(Interview, February 11, 2015)

Project Leader 1 notes as she has spent time in the neighborhood and talked with community members, she has realized the community has a longer history with her institution than she does. These community members have memories of the university taking away their family’s homes to build dorms. They have felt used by the university and consider them to be horrible neighbors. She notes:

There is so much contentious history around what we're doing, and we would fail if we didn't have that in mind… We have to be really kind of humble about what
we say to neighbors about what we are all about because in a lot of cases they know it better than we do. (Interview, February 12, 2015)

She cautions other project leaders to “tread lightly” and work hard to avoid being the “ignorant giant” in the neighborhood. She advises project leaders to acknowledge the community’s hesitation to work with them comes from a place of real hurt and then to work towards healing these offended relationships. Decisions made by various governments, land developers, and university representatives have excluded the underrepresented community and made them outsiders to the university, its knowledge, and its resources (Interview, February 12, 2015). Project Leader 1 goes on to say:

So many of American universities have an expanding footprint through eminent domain, while at the same time have sort of closed off the university to neighbors. Some universities do it with actual walls. Others have metaphorical walls that make residents in the neighboring community feel distinctly unwelcome.

(Interview, February 12, 2015)

She believes it is wise to “walk really carefully” and be very sensitive (Interview, February 12, 2015). For some communities, the negative history with a project leader’s associated institution may be very recent or even on going. A project leader’s institution is larger than the department he or she represents. For example, if a project leader works for a university’s science outreach unit, the community may have had bad experiences with another outreach unit. These negative experiences with other branches can result in underrepresented communities not wanting to work with anyone from the institution.

Project Leader 2 advises:
You've got to respect that they've gotten burned. They've been put on grants without permission. They've been used for getting the grant, received no funds, and in a way feel very, very used for having gotten the grant and having gotten nothing back for the community from that grant. (Interview, February 12, 2015)

Many of the project leaders, after forming friendships with underrepresented community members, found community members often feel they have been researched to death. They have no desire to fill out another survey. They do not appreciate feeling as if they are objects being studied, as if they are guinea pigs. Thus project leader recommend respecting the community’s sentiments regarding research. Project leaders cannot change the historical relationship between researchers and underrepresented communities nor can they control what other researchers are doing, but they can be cognizant and acknowledge the abuse.

Not only does a PPSR project carry the name of its associated institution, but it also carries the association with science. Project leaders warn communities of color have a history of being exploited in the name of science, which may further dissuade them from participating in PPSR projects. Project Leader 7 notes the community with whom he partners is very hesitant to participate in any type of scientific research because they have an overwhelming experience of exploitation by the authorities, powerful institutions, and science. He recommends other PPSR project leaders read critical discussions of the Tuskegee experiment. The Tuskegee experiment was a 40 year biomedical research study, ending in 1972, in which African Americans were denied information about what disease they had and treatments for the disease, so medical researchers could observe the
full effects of the disease once it had claimed the lives of participants. He also recommends PPSR project leaders read about lynching as a phenomenon and the “forced sterilization that was practiced under a eugenics program for decades in many states” (Interview, October 14, 2015). He notes, “Wherever science has done work that has involved community research, it has had a history of abuse of human subjects.” He urges other project leaders to realize this historical mistreatment of underrepresented communities in the name of science is “really relevant” to scientific studies today (Interview, October 14, 2015). Similarly, Project Leader 2 notes earlier in her career she would proudly announce her university’s name and use scientific terminology to explain what the project hoped to accomplish with the community. She found, “There's immediately a setback of, ‘Whoa, whoa, whoa, whoa. No, I don't see any kind of commonalities here.” Over the years she has learned to be “very, very cautious about how science is positioned” (Interview, February 12, 2015).

Project leaders do not have the ability to undo the suffering experienced by many underrepresented communities, but they do have the ability to respect it. A lack of respect for a community’s suffering will be a barrier to communication. Project Leader 1 warns asking community members to partner with a researcher is a “very complicated thing.” She advises other project leaders to recognize community members may feel “threatened” by the presence of a researcher in their neighborhood, thus the researcher will need to “navigate a lot of suspicion.” In order to work towards repairing these hurt relations, project leaders need to be ready to do “a lot of explaining” about how the project will benefit the community. She recommends project leaders can show respect for
community concerns by acknowledging research is often a “one way street” on which the researchers “take data from community members.” In her experience, when researchers tell community members they know how “crappy that may feel” and they want to do things differently, this acknowledgement of past abuse may be an effective way to work towards healing these hurtful relationships (Interview, February 12, 2015).

**Theme 2: True Dialogue**

As project leaders shared their insight into establishing research partnerships with underrepresented communities, an overall theme of true dialogue emerged from the data. A true dialogue, as defined by Paulo Freire (2000), a Brazilian educator and leading advocate of critical pedagogy, occurs when humans encounter each other and together name the world. A true dialogue is not one dominant worldview explaining the way things are to a lesser worldview. A true dialogue is horizontal and leads to a partnership in naming the world. The following section illuminates the importance of engaging underrepresented community members in a true dialogue, which will ultimately transform the PPSR project into a space where both the scientific and local community can name the world together.

**Finding: True Dialogue Requires Long-term Relationships to Build Trust with Underrepresented Communities**

A true dialogue pre-supposes equity among the people speaking—each participant in the conversation must have mutual respect and trust for each other (Freire, 2000). Before project leaders can engage underrepresented communities in a true dialogue, they must build trusting relationships with the community. Many project leaders interviewed
in this study noted the painful histories between marginalized communities and powerful institutions, such as universities, have created a “lack of trust” that must be “overcome.” Trust, as defined by Webster’s dictionary means, “The assured reliance on the character, ability, strength, or truth of someone or something” (Merriam Webster, n.d.). Entering a community respectfully is vital but so is assuring the community a project leader is there to work with them and not to use them to complete their own agenda. Project Leader 1 notes the “major reservations” community members may have about working with researchers require project leaders to “take a step back” and start “relationship-building” (Interview, October 10, 2015). As Project Leader 4 notes, “They (community members) are not just tools for us to gather more data.” Partnerships are needed and a “partnership must have such relationships at its core” (Interview, February 11, 2015).

Relationships are built by spending face-to-face time getting to know community members. Project Leader 2 admits, at times, she has been tempted with her busy schedule to “save time” by picking up a phone and calling a community member but has found in person contact is essential to overcoming mistrust. She explains “face-to-face contact” has helped her “really learn” about who the community members are, where they are coming from, and what they are dealing with on a daily basis. She notes these personal connections have helped her to “stay open” and “avoid assumptions” (Interview, February 12, 2015). She reflects:

They are nervous about working with us, for example, and just don't know what it's going to look like. That makes them nervous, makes them pause. I’ve found
they would much rather meet in person than via email or phone call, and if I’m not willing to put the time into doing that, they drop it. They don't want to do it. (Interview, February 12, 2015)

Project leaders have found it is vital to first demonstrate to the community members they care about them, and only then ask community members to care about the scientific research. When project leaders enter a community and want to talk about science right away—with the project’s scientific goals already decided upon—this can reinforce negative perceptions about researchers and cause community members to doubt the project will in any way be beneficial to their community. Project Leader 3 remarks, “I think it is being willing to step back as a scientist, and step forward as a person” (Interview, February 11, 2015). Project Leader 1 explains she has spent four years building relationships with her community partner and is still not ready to decide on the scientific research questions for the project. She explains, “We don't want to jump into the (research) question identification yet, until everybody feels more familiar with each other.” She goes on to say, “When you're talking about a university's relationship with the community next to it that has been historically really not so great, you can't move really quickly on something like that” (Interview, October 10, 2015). Project Leader 2 notes, she spends a lot of time doing tasks totally unrelated to science, things some may question as a poor use of time, but she has found them to be absolutely essential for a successful partnership. She remarks:

I'm really cautious about using science in the beginning in any kind of way. I want to work on that relationship building… Again, the key to everything that
we've done has been to listen and to go into the communities we wanted to work with, to be on their turf, to do a lot of socializing, a lot of eating lunches, a lot of talking face-to-face, a lot of learning about their kids and learning about the projects that they're doing. (Interview, February 12, 2015)

This finding highlights the relational aspect of partnering with underrepresented communities to conduct scientific research. Project leaders consistently advise the best partnerships occur when community members see the project leader as a person, a friend, and someone who cares about what their community is facing and striving to do. Project Leader 3 notes much of the necessary healing from past strained relationships can occur through personal acts of “kindness, compassion and humor” (Interview, February 11, 2015). She recommends project leaders build trust by taking the time to listen and by showing community members they are genuinely interested in the community. Project Leader 4 advises, “You need to take the time to listen. The listening is the flip side of the relational aspect—time and listening. We're willing to learn from them, learn people's interests, needs, focus, desires, and priorities” (Interview, February 11, 2015).

Project leaders recommend being a collaborator and a colleague and warn not to underestimate the value of friendships in building a partnership. PPSR projects are better built upon the foundation of friendships. Thus, project leaders advise sharing meals together, chatting, and getting to know community members on a personal level. If project leaders know community members on a personal level, then when it comes time to do research, they will already possess a deeper understanding of what drives the community and will have friends within the community who they can contact and find
out if the community would be interested in collaborating. Project Leader 2 reflects on her friendship with community members, noting when a project leader has a friendship with the community, people are “happy to work” with the project leader because they know the project leader on a personal level (Interview, February 12, 2015).

Trusting relationships will not be built overnight. Project leaders advise trusting relationships are based on deep friendships and longer-term connections. Project Leader 5 cautions, “Be humble. Gain acceptance…You have to get a mutual respect. Trust is important. It is important to have mature collaborations, and then get to know your collaborators a lot better, and that is where the trust comes in” (Interview, February 12, 2015). It will take time to develop these relationships, but this time is well spent. Project Leader 4 reflects on the amount of time he has spent getting to know his community partner and building “mature collaborations”:

This is why it took us 15 years of living there to get to where we are. It's the commitment needed. It's not a two month or two-year project. Funding schemes and our time frames in universities are quite limiting ... I would say it's a matter of spending the time to drink tea… you sit down, you listen, you observe. It's a longer-term project. The best projects, I think, will be embedded in these longer, well-established relationships. (Interview, February 11, 2015)

When trust has been broken, relationships may not be easy to form. It may take more than a few in-person meetings to demonstrate sincerity to community members. Project Leader 2 notes, “It took three years of relationship building. We did a lot of talking, a lot of almost testing” (Interview, February 12, 2015). She recalls several
instances of community members “trying to really see whether I'd done my research, whether I knew who they were, whether I cared who they were, whether I knew what their goals were” (Interview, February 12, 2015). Trust is the assured reliance in the character of another. Community members may test project leaders to see if they are there to work with them and for them, but the result of this relationship building work will be long lasting collaborations. Project Leader 2 notes:

> Once you develop those relationships they become part of you that will stick with you for the rest of your work. It develops lots of other relationships. You can't rush through that. You can't start selling them stuff and start telling them what they need to do and start telling them that you're the greatest. (Interview, February 12, 2015)

Project leaders can build trust with a community when they show the community they are committed to working with the community for the long term. Project Leader 2 reflects back on a conversation she had with a community leader. The community leader, now a good friend of hers, was very concerned about many of the outreach programs coming to “help” the community. He told her his community was very accustomed to “White people coming in, they're there temporarily then they're gone, then life goes on.” In the view of his community, researchers come in with promises of how they are going to help the community, but in reality, they get what they need and then leave the community without staying long enough to make any real change in the community. This same community leader once told her:
You know how many organizations come to us and say … because they've got a grant or because they want to get a grant, want to work with us on a one-shot basis after they get the grant and then they never come back again? I'm sick of it. I don't want to do this anymore. If you really have interest and really care about what it is that we're doing and want to help us accomplish those goals, that's a different story. (Interview, February 12, 2015)

If a community believes the research project will extract the information from the community and then leave, they will be apprehensive to work with such a research project. It is imperative for a project to overcome this stigma and demonstrate to the community a commitment to stay and work towards community goals. Project Leader 5 notes, “In terms of the community awareness and participation…trust, again, I think is very important. Come through on what you have communicated you will do and demonstrate a commitment to continue on” (Interview, February 12, 2015).

Finding: True Dialogue Requires Intentionally Building in Listening Opportunities Before Project Parameters Have Been Decided on

Freire (2000) believed many educational plans fail because they are designed according to the author’s own view of reality. PPSR project leaders can say to the community members, “Your voice matters!” But to say one thing and do another does not inspire trust. A dialogue in which dialoguers expect nothing of their efforts is “empty, sterile, bureaucratic, and tedious” (p.149). Project leaders interviewed in this study consistently advised true dialogue will not occur if project leaders enter the community
with well-defined research projects. Conversations with community members become meaningless if the project goals have already been determined. Project Leader 4 notes:

> Relationships are important and when westerners come in they break relationships at the very outset by saying, ‘Here's my project. Here are the parameters. This is what we'll do. This is when we'll do it.’ If you want to participate it's all so boxed in that often you can't have genuine partnerships. (Interview, February 11, 2015)

The project leaders in this study have found it is wise to schedule in listening opportunities with the community before project goals have been decided on. Project Leader 2 advises:

> You may love science and be excited about your project but, take a step back and get out of your own skin. Realize that your project as is, is just that… your project. If the community is unable to see any overlap with their own visions and goals, then they may not want to participate. (Interview, February 12, 2015)

Conversations with community members are vital when a project is first being conceptualized. Project Leader 1 notes, “Dialogue has to be allocated to that process” (Interview, October 10, 2015). She advises sitting down with community members and getting to know what is on their minds, what their pressing needs are, and what they would want from a PPSR project. As Project Leader 2 recommends, “Do it on their turf and really take the time to listen to what it is that they need.” She cautions against making assumptions about what community goals are. She goes on to say, it is vital to listen and “take an analysis of each community because each one is quite different” (Interview, February 12, 2015). Likewise, Project Leader 5 challenges fellow project leaders to be
careful about who is generating the questions in the study. If the questions are decided upon before having a conversation with the community, it will not be a true dialogue. She notes, “You need to understand the cultural background of your community and understand what drives them” (Interview, February 12, 2015).

Project Leader 1 describes a metaphor of making soup with the community partner. She advises it is not a partnership if the recipe for the soup has been decided on before the project leader enters the community. She stresses the importance of creating space for each partner to add to the recipe. One way she has done this is by “really sitting carefully at community meetings…and really doing homework on other projects going on in the community” (Interview, October 10, 2015). Another way to schedule in time for dialogue is through the formation of community advisory boards. Depending on the context and goals of the project, one may decide to invite different members of the community to this board. Project Leader 6, working on a project with primarily educational goals, went to science educators in the community to open up the dialogue. She notes:

We started by inviting teachers to a meeting where they got more information on the project and they had some working groups where they could work on their issues and give their inputs. This was really like with the teachers and after that, we went to each community again and talked first to the teachers and then, they also brought in some other people… like activists who could be interested.

(Interview, October 20, 2015)
By starting conversations with community members who already had a vested interest in science education, this project leader was able to meet more members of the community and also gain deeper insight into what the community was passionate about and how these passions overlapped with the educational goals of the PPSR project. She goes on to say, “Let them decide what is most important for them” (Interview, October 20, 2015).

If project leaders want to understand the goals of a community, they will need to dedicate serious time to listening. Project Leader 2 notes sometimes this listening will take “years and years.” She reflects on her own experience of “partner development” in order to “understand what their goals are and how they perceive us.” She notes:

That meant we needed to go out into the community, someone needed to talk to folks and to organizations and learn about what they wanted, learn about what they were doing and how we could blend what we were doing so we could work together. (Interview, February 12, 2015)

Project Leader 2 cautions other project leaders to dedicate enough time to go into the community as listeners and learners. The focus needs to be on “finding areas of convergence, of common interest” rather than viewing it as “them working for us.” She notes:

In my view, you can't have good projects if you don't have your ears open and you're not learning from the community. You can create a project that sounds great and you can spin your wheels and congratulate yourself on what you've got if you're thinking about it academically, but if you're thinking of it practically and what people get out of it and how people use it, unless you involve the community
and unless you get those perspectives from the community, you're going to really not get very far in my opinion. (Interview, February 12, 2015)

Community advisory boards allow project leaders to hear from various community members regarding what their pressing needs are. Project Leader 1 notes, “We formed this board because we don’t want to make assumptions about what this neighborhood is all about… sometimes, assumptions really miss the mark.” The community advisory board, which consists of residents of the community including young adults, students, senior citizens, people who work with non-profit agencies in the area, and employees who work at community recreational centers and libraries, meets monthly to “build the project.” She has found not only do community members appreciate these meetings, but also it is during these meetings that “trust is happening.” She advises it is more about “being at the table with our neighbors instead of setting the table.” She approaches the project as a “peer organizations, being careful to not seem to be driving neighborhood development for the neighborhood.” She notes this has been a major “strength” of their project, and it represents a “delicate diplomacy” (Interview, October 10, 2015).

Project Leader 3 went to the environmental division of her community partner and found out what projects they were working on. She advises project leaders to distinguish themselves from “other parts of the mainstream community offering or giving things out left and right” (Interview, February 11, 2015). She notes knowing the community’s history will be vital to these conversations as well, so one does not come into conversations without the necessary context. It takes time to figure out what a community
values or what would be interesting or helpful to them. She cautions others to have these conversations every time they enter a new community. She notes:

It's going to be different for every organization, for every community, for every part of the community. Unless you stay open and keep these conversations going, keep talking and listening, you never become an expert because every community is different. Every location is different. Every person is different. (Interview, February 11, 2015)

A true dialogue consists of both reflection and action (Freire, 2000). Yet, project leaders warn it may be difficult to respond to the voice and needs of the community, if conversations take place after the grant has been written and project parameters have been decided upon. Realistically, a scientist or researcher will likely have certain questions they would like to investigate, but project leaders stress the importance of finding commonalities with the community before the formation of the research questions. Project Leader 2 reflects:

We had to start from scratch. That meant we needed to go out into the community… someone needed to talk to folks and to organizations and learn about what they wanted… learn about what they were doing and how we could blend what we were doing so we could work together. (Interview, February 12, 2015)

PPSR project leaders will have certain research goals to accomplish and funding agencies to which they must report. Thus, project leaders recommend working towards institutional agendas but taking extra care to build flexibility into the project and to
accomplish community goals for the project as well. Many community members report feeling used when projects come to their community to extract the information they need and then leave doing little good for the community. Project Leader 3 notes, “We had to back it up, broadened it, and also connected to what we found were things that parents could relate to as things that they wanted for their children…then we could start” (Interview, February 11, 2015). A project leader will likely have some variables they believe will come out of their discussions with the community, but it is wise to avoid making assumptions. Project Leader 4 cautions:

> We need to spend the time with the community and focus in on those areas that they also value and not overly direct them. Out of that, we'll find areas of convergence… of common interest. Out of that you can have genuine partnership participation… not just them working for us. (Interview, February 11, 2015)

In a true dialogue, both parties name the world together. Project Leader 6 warns if project leaders fail to take time for conversations upfront, community members will not be able to shape the project, or even have their goals reflected in the project “because they won’t really know what type of things you are talking about.” She recommends coming in with ideas, hearing the community’s ideas, and then discussing with them and “working together on defining project activities and tools” (Interview, October 20, 2015). In her experience, this discussion will take place over many conversations. Even after conversations, project leaders may realize they have misinterpreted a community’s vision for the project. She has found it vital to be flexible and willing to let the voice of the community impact project decisions at every step of the process. This flexibility may
require a major shift in thinking for project leaders. Many project leaders work for universities or other institutions with deadlines and pressures to accomplish project goals quickly. Project Leader 4 reflects on how he had to change and adapt his way of thinking:

> It’s really a matter of time and communication. I used to be more strictly contractual based as opposed to relational. Time was measured in minutes and hours, and you want to have time. Now, I go a lot more with the flow, and I become a bridge between the community and other researchers that come in that want to know from now to three weeks from now, day to day, exactly what's going to happen. I did that. I've changed my way of dealing with time and lack of predictability or the flexibility needed. I've adapted… maybe not in terms of language or the actual content of what you observe. I can still take detailed notes of the wildlife I've seen, where, when, and GPS location. That's all very rigorous, but as a person, I've changed a lot and become, in a sense, more aligned to the slower time frame on the one hand or the greater flexibility needed. (Interview, February 11, 2015)

Project leaders agree forming a collaborative research project with underrepresented communities begins with both the community and researchers getting to know each other and their capacities, identifying research questions overlapping both partners concerns, identifying funding to support the study, and then beginning to work on data collection. Project Leader 4 notes their PPSR project has still not reached the data collection phase:
We have not started the monitoring. We have worked to understand the community context over the last year. Now, next month we're going to start to work with them to develop what specific variables they are interested in, variables that could affect their use of land, how they use the pastures, when they irrigate their crops. What do they find valuable and interesting? Then, we'll work with them to monitor that. This is just the foundation for a long-term, social ecological monitoring system that we're trying to put into place. (Interview February 11, 2015)

Finding: True Dialogue Responds to Conversations with Underrepresented Communities and Results in Transformed PPSR Projects

According to Freire (2000), in a true dialogue, every word consists of a reflection, an action, and a transformation. All seven project leaders emphasized the need to engage in conversations with the community, and to let those conversations transform PPSR projects. They recommend hearing what the community is saying about their needs and goals and taking actions based on those needs. Once project leaders have had conversations with community members and other agencies to find out what the needs of a community are, these conversations should change the PPSR project. The words and feedback from the community become powerful tools to build projects, which are relevant to the community. Overall, projects should strive to provide opportunities for the community to voice their broader interests and then work with the community according to their interests. When project leaders are able to modify a project or create a project based on the community’s needs, it brings a whole new level of significance to the work.
Overall project leaders advise community members may see a disconnect between their needs and the goals of the PPSR project, if project goals do not address the major issues their community is facing. Project leaders interviewed in this study have found being responsive to community needs may involve addressing concerns unrelated to science or the specific research questions they believe to be top priority. Several project leaders noted their community partner saw no overlap between the scientific goals of the PPSR study and the pressing needs of their community. However, they did see ways the researchers could give back to the community. Project leaders advise responding in any way possible. Project Leader 1 reflects:

We are imperfect at it sometimes…necessarily limited by staffing and resources, but in some really key areas, we've been able to follow through asking the neighborhood, ‘What do you want? What do you need?’ They tell us, and we do it. In the way that we're sort of bringing in programming that might not have anything to do with the institution’s research mission, we are just showing that this university is being responsive. (Interview, October 10, 2015)

Project Leader 1 challenges others to “think differently about how you’re doing research.” She has found community members are tired of university researchers making empty claims about how a particular study will “help your neighborhood in the future.” Community members may feel it will be “ultimately meaningless to their everyday lives” (Interview, October 10, 2015). Even if project leaders believe the study will benefit the community in the long run, they must realize that when the community provides the
researcher with data, the community is helping the researcher. Thus, the researcher needs
to find ways to reciprocate and meet the community’s needs in return.

Project Leader 1 recalls her community partner expressed wanting better access to
the resources of the university. Community members told her, “We want better access to
your knowledge resources. You're a university. You're not sharing any of that”
(Interview, October 10, 2015). She reflects on how she responded:

We were able to respond to the community by making our knowledge resources
available to our neighbors. Part of the way we do that is through doing just
straight up education. Inviting neighbors to do education with us. We have a
community based learning format… the university works side by side with our
neighbors and opens up university classes to community partners. We invite
community members to sit in as a student in a university course. (Interview,
October 10, 2015)

Project Leader 1 partners with an African American community that runs about “double
the unemployment level” (Interview, February 12, 2015). During meetings with the
community advisory boards, community members expressed to her they have grave
concerns about university students moving into their area and the gentrification and
economic changes these students are bringing with them. The community gave the
researchers specific ways to address their fears and negative perceptions about the
university. For example, community leaders asked for the university to “hire local union
members on your many construction projects” (Interview, October 10, 2015). Although
some of the community’s requests were out of the researcher’s control, she was able to
respond to this particular concern by adding on to the PPSR project a dimension of career counseling and a workforce development program. In addition, she hired a community member as a full-time employee to manage project activities. This same project holds poetry nights, law clinics to offer legal advice and council to seniors in the community desiring to write their wills, youth programming, and dance fitness classes. These activities may have “nothing to do” with project data being collected but are a direct response to the voice of the community. This well illustrates the give and take in a true partnership (Interview, October 10, 2015).

Project Leader 6, who partners with poor, rural communities who lack access to funding and equipment, shares how she was able to meet the community’s expressed need for science equipment and tools in their schools. She notes:

One thing they really highlight is, that they are also interested in getting the tools and equipment itself. This is something they need to position themselves within their system and with the educational system. So this was something that we didn’t plan to put too much emphasis on but for them it is really important.

(Interview, October 20, 2015)

This project was able to respond to the community by providing tablets used for entering data, microscopes, and basic chemical analysis sets. Project Leader 5 notes, when project leaders are able to respond to specific requests the community has, they show the community they “take them seriously” (Interview, February 12, 2015).

In some cases, a partnership involves helping the community on separate, non-scientific projects they are working on. Project Leader 1 recalls how the community came
to her about a “local design project where a group of neighbors were looking at grant resources to design a park” (Interview, October 10, 2015). Designing the park had nothing to do with the research data needed in the PPSR project, but she recognized that in a partnership there is give and take. She responded by co-authoring the grant with the community and notes the university’s name on the grant “strengthened” the grant proposal and demonstrated to the community her commitment to work towards community goals (Interview, October 10, 2015).

**Theme 3: Overcoming Barriers**

Engaging in a true dialogue will not always be easy. In fact, the PPSR project leaders interviewed in this study report there will likely be many barriers along the way. Project Leader 2 cautions the “road will be bumpy,” and it will “take time,” but together project leaders and communities can find ways to overcome barriers to a true dialogue. She notes:

> There are lots of barriers. There are lots of things that go wrong along the way, and I think that as long as you stay open and learn from your mistakes, and other people see you learning from your mistakes, I think that's the best … that's sort of the best approach. At least what's worked for us. (Interview, February 12, 2015)

**Finding: Definitions of Science and Expertise May Be a Barrier to a True Dialogue**

Project leaders report some of the existent barriers to a true dialogue in a PPSR project stem from definitions of science and expertise. They note many scientific researchers at their institutions do not want or feel the need to begin a dialogue with underrepresented communities. As Project Leader 1 notes, scientific studies, as defined
by institutions and scientific bodies, lead some researchers to believe it would be a “stretch to see how there can be a fit” between community goals and scientific agendas (Interview, October 10, 2015). This belief limits the type of studies attempted and carried out with underrepresented communities. Many PPSR leaders interviewed in this study, a few of whom are not trained as scientists themselves, have struggled to find scientists who believe a community partnership would benefit their research in any way. Project Leader 1 reflects on a particular professor at her university who wishes he could participate more in the community partnership. She recalls:

He has said, there's a lot of stuff he'd like to do, but he doesn't feel he can while he's still constrained (by trying to get tenure)… by that grant raising narrative and the idea that going too heavily towards community participatory research could sort of, damage isn't the right word… would not contribute as effectively to his research agenda, I guess, as the sort of more traditional ways of looking at how his expertise would and how that would constrain the type of research projects he was proposing. (Interview, October 10, 2015)

She goes on to say certain fields, such as the social sciences are more open to participatory methods, whereas science and engineering “have more anxiety along those lines” (Interview, February 12, 2015). She notes the culture of science may be a bit contrary to participatory research because “the hypothesis driven positivism of science tends to have well-defined notions of what expertise is all about” (Interview, February 12, 2015).

At times, scientists participate in conversations with underrepresented
communities; however, the conversations are not true dialogues because of beliefs about
expertise. When scientific knowledge is viewed as superior to community knowledge and
expertise, community members are viewed more as participants in an educational
outreach as opposed to contributors to better understandings of the world. Project Leader
6 concedes this barrier has resulted in their project having more educational goals and
less scientific goals. She notes she has not been able to find scientists who think the data
is “useful,” “accurate,” or “interesting” (Interview, January 13, 2016). She recalls:

The perception that science has to be done by scientists is really strong. Now, we
managed to find some people, but it was actually really difficult to find people
who think like, ‘Wow. It's a great project’ but still, among them, it's more in terms
of educational potential and not really, ‘Oh, this is going to produce really useful
data.’ (Interview, January 13, 2016)

She notes thus far scientists have not been “taking the data seriously.” Her hope is the
data will be “used on the local level…used for giving the community a voice and for
advocating some problems they have to influence higher levels.” Nevertheless, at this
point, the project has been unable to achieve this goal because the higher levels do not
perceive the project as a “scientific analysis” (Interview, January 13, 2016). Project
Leader 4 has run into similar issues. He reports:

Part of the issue is working with my colleagues. There's a high respect for
specialist knowledge and people feel that we know it… they (community
participants) are a ‘bunch of bumpkins.’ There are some challenges to shift our
research in [researcher’s university] towards a genuine, full partnership. We’re developing that. (Interview, February 11, 2015)

At times community members also hold views of science, which are a barrier to a true dialogue in a PPSR project. Perceptions that science is something only scientists do dissuade members of the community from participating in project activities. Project leaders note community members have a history of experiences with science, and that history at times leads to a belief that science is not something someone like them does. Project Leader 6 reports members of her community partner often see science as something “bigger and higher,” and they do not see how their community traditions have any place in science (Interview, October 20, 2015). Community members have expressed to her they “don't have the knowledge for doing it” and believe they need to have “specialized training” before they can contribute in a meaningful way to the PPSR project activities (Interview, January 13, 2016). In her experience members of the community view science as “huge theoretical constructs that you do not use in real life” leading them to believe “science is not something they can contribute to” (Interview, October 20, 2015). Additionally, Project Leader 6 has found many community members do not believe any scientist would actually use the data they are collecting on their small community, reporting to her “no one is interested” in their community. She concedes the community’s fear has proved true (referring to the fact that no scientists are currently interested in the community’s data) but is “hopeful” scientists will use the data collected in their PPRS project, and if not, the data will empower community members for “some kind of civic action” (Interview, January 13, 2016).
Despite the finding that definitions of science and expertise may be a barrier to true dialogue in a PPSR project, several solutions emerged from the conversations with PPSR project leaders interviewed in this study. Project Leader 1 is hopeful broadening perceptions of science both in the scientific community and in the underrepresented community will result in a science where more people see a space for themselves to participate. She notes the importance of recognizing “science isn’t an objective pursuit” and “scientists bring their own political agenda and their own cultural assumptions” to their work (Interview, February 12, 2015). She advises:

When science is limited to middle class, White people who can afford to have gone to a university, then the perspectives of science are limited. When we bring more and more different kinds of diverse people and voices into the scientific process, it also means that science careers become something that is attainable for the kids in our neighborhood. We're trying to get kids together with our astronomer to do star gazing and talk to them about. You think this is really cool right now; you could do this for a living. (Interview, February 12, 2015)

She believes being open and honest about the values driving science and striving to have more people’s values represented in science will create a science in which more people see a place to participate.

Another proposed solution is to have a PPSR project collect data, which will be valuable to the community. Project Leader 6 notes one of the villages she partners with has a drinking water system detrimental to the health of the community. The river they take water from in the winter comes from a goldmine, which results in members of the
community “getting sick from that water” (Interview, October 20, 2015). She is hopeful the data, which will “not necessarily be useful to big scientists” will be a “tool” the community can use to “pressure people to get them another source of water” (Interview, October 20, 2015). Similarly, Project Leader 3 notes if a PPSR project really wants to engage members of underrepresented groups in a true dialogue, then the project’s research questions should start with environmental issues facing the lands and home of the community (Interview, February 11, 2015). PPSR project leaders need to find out what the community’s concerns about the environment are and use these concerns as a springboard to find commonalities between the scientific and community agenda. Project Leader 5 also has found great value in connecting a PPSR’s research questions to the “sense of place” a person has towards their home and community. She notes “a sense of history, a sense of protection or affectation toward a place” will result in an “emotional connection” to a project and a more meaningful and more engaged form of participation (Interview, February 12, 2015).

A final solution to overcome the barrier definitions of science and expertise can present to a true dialogue is to broaden the methods used in scientific studies and to see the value added in bringing in community methods. Project Leader 2 advises this will allow for “possibilities of participation” and create a space within a scientific study for members of the underrepresented community (Interview, February 12, 2015). Project leaders caution traditional methods of scientific data collection may be alienating to community members and stand in the way of people seeing any place for themselves within a scientific study. At times, it is the methods of science themselves, which result in
community members feeling science is not something they do, or something they are interested in doing. Project Leader 5 remarks, “In the West we're very much into surveys, into forms, into this, into that. That is the most mind-numbingly boring and wholly disinteresting approach to people that are not part of that cultural background.” She recommends being open to new approaches and forms of participation, specifically noting “art and technology” have been vital to her project’s success (Interview, February 12, 2015). A community’s background and driving values may lead them to engage in the PPSR project in ways other than simply collecting traditional forms of data. Project leaders recommend seeing the value in other forms of engagement and not placing a superior value on the scientific data. Project Leader 3 advises:

   We try to approach the partnership posing our scientific question; we describe what our basic activity is, describe the other educational materials that we have and other possibilities for participation to try to just open up dialogue with each collaboration as to what are their needs and how do they see this benefiting them. (Interview, February 11, 2015)

Project leaders advise reconsidering what is relevant. Project Leader 4 warns, “Partnerships die when we try and contractualize everything which may or may not be relevant directly to your query” (Interview, February 11, 2015). When researchers enter a community and consider only scientific data pertinent to their research questions as relevant and any other form of expression to be less important, they are communicating a message to community members that scientists are the creators of a superior form of knowledge, rather than a different form of knowledge. Project leaders have found great
success engaging community members when members are repositioned as creators of knowledge. When given opportunities to generate knowledge, community members demonstrate a greater belief in their ability to participate in project activities. Project Leader 5 notes community members show maximum engagement when they “totally get into it and start teaching you about what they know” (Interview, February 12, 2015). Project leaders recommend thinking outside of the box and providing opportunities for community members to create and express their relationship and feelings about the data being collected. These forms of expression are not less valuable than scientific data; rather project leaders have found them to be vital to engaging underrepresented communities and to creating better science. Project Leader 1 notes including non-typical methods of research for a scientific study is not “any kind of compromise,” but rather it “adds value” to scientific studies. She advises when science projects involve underrepresented communities in projects, this “changes how science gets done.” There are basic requirements for knowledge to be considered scientific, but including a “broader set of voices” and representing more agendas in scientific studies is “going to make science more resilient and better” (Interview, October 10, 2015).

**Finding: Funding May Be a Barrier to a True, Responsive Dialogue**

Project leaders interviewed in this study consistently report funding as a challenge to a true dialogue within a PPSR project. As Project Leader 1 recognizes, participatory, community based research “bucks the traditions,” and until they have tenure researchers tend to “worry” about pursuing such research projects (Interview, October 10, 2015). Researchers instead tend to seek grants with more traditional notions of scientific
expertise. She notes, “The importance for the scientists or engineer to rack up a certain size pile of outside funded proposals can trump their interest in coming and working and doing some participatory neighborhood research.” She goes on to say she feels pressured all the time to make the argument for why the community partnership is important and is not “taking away from the core academic mission” of her university (Interview, October 10, 2015). This has resulted in 95% of the project’s funding coming from outside of the university. Similarly, Project Leader 6 notes on the governmental level, “there are no funds for conducting science” in the communities in which her underrepresented community partner lives. Other project leaders have had similar experiences, and some projects currently “don’t get any money from the major science funding agencies” (Interview, October 20, 2015).

Another potential barrier regarding funding agencies is sometimes the goals and priorities of the funding agency are not the goals of the community partner. Project leader 1 has found she needs to be “very, very careful” about decisions she makes because her project has donors to “keep happy” (Interview, February 12, 2015). Project Leader 6 notes the success of the project must be “regarded as successful by the donor organization” and often she finds herself “fighting” to keep the project going and constantly has to seek out “new funding mechanisms, which are for longer term” because “donors always seem to be looking for new ideas” (Interview, January 13, 2016).

Although funding presents these barriers to a true dialogue, project leaders offer some advice on how they have been able to overcome these barriers. One solution project leaders offer is to partner with a third party agency already working within the
community. Project leaders acknowledge busy schedules and limited funding schemes may make long-term relationships harder to develop. Project Leader 2 advises short-term grants may require partnering with someone the community already trusts. Project leaders have found it beneficial to reach out to other agencies already working and building trust in the community. These agencies may be able to give a project leader insight into the values and goals of the community (Interview, February 12, 2015). Project leaders may benefit from seeking out agencies, which are already giving, listening, and working within the community. Project Leader 3 notes:

> A lot of it is forming relationships and then growing those with introductions maybe to other people. It might be reaching out to someone else who has already done some work with that community and then getting introduced maybe to the people in that environmental division or you contacting people at the Nation’s (referring to First Nation communities) school or the environmental division.

(Interview, February 11, 2015)

Project leaders need to grow those initial introductions into working relationships, but the third party organization may be a helpful starting point. Partnering with a third party agency may also be beneficial if project leaders are having difficulties finding ways their research agenda overlaps with the goals of the community. Realistically project leaders may not have as much time as they would like to spend on relationship building and getting to know community goals. If they are able to find other agencies, which have spent years in the community building relationships, they can learn from these agencies.

Although project leaders recommend forming research questions with the
community, they acknowledge not all research projects have the flexibility to start from scratch, and researchers may have specific scientific questions they need to be answered because of the goals of funding agencies. Partnering with a third party agency can be a way to overcome this limitation as well. Project Leader 1 found partnering with other agencies and individuals, which were not “scientifically research project driven” provided a way to help her find a balance between the scientific and community goals (Interview, October 10, 2015). Project Leader 4 reflects on limitations he faced when he was unable to develop into the conservation organization his community partner needed. He notes:

If a research individual or research team can't make itself into a development or conservation organization per se then perhaps find partnerships who will in the area. Become a tripartite partner. I think that would be much more effective if all three partners—the community, those other agents or agencies involved in conservation and development, and the research community—can all understand the value of each other and how they reinforce each other… you have a good system. You have the give and take and a greater genuineness of mutual benefit. (Interview, February 11, 2015)

By finding a third party agency who was able to fill the community’s expressed need, this project leader was able to find a way to benefit the community, reinforce the goals of a conservation agency, and work on the necessary research questions for his academic work.
A second solution to overcome barriers of funding agencies is to seek out donors who understand the importance of community partnerships. Project Leader 5 encourages other project leaders to become a part of the “larger system and network” of people who understand the importance of engaging underserved communities in scientific research. She acknowledges project leaders will always have “certain objectives in order to obtain grant funds,” but they can “tweak things in such ways that are meaningful” and “find opportunities” that will support the underrepresented community’s broader goals. She notes:

The reality is that, unless you have funding and people you cannot do it. You can have all the interesting questions in the world, but there is a disconnect between a great idea and an idea that can be implemented. Part of the reason why we registered as a local NGO was because it gave us access to local funding that was elusive of our university background. Also, funding that would go straight into feeding local communities…So, my advice is to think outside of the box and also bring the projects to a number of people, foundations, and private individuals. It requires a lot of sharing and public relations to build awareness. (Interview, February 12, 2015)

She goes on to say there are a lot of individuals who are willing to help, but people cannot help if they do not know about the project. For this reason, she recommends spending the necessary time spreading the word about the importance and need of the project. Then, project leaders can use whatever funds they obtain to “establish doable, smaller goals.” She continues:
You do not always go from here to there… but build the building blocks. It's like, how can I get there? What can I do with what I have at hand right now, and where would I like it to be in six months, in a year, in two years? It is important not to go into paralysis where it's like…there's no way we can actually make that happen. But actually going to, ‘That's really cool. Eventually, we want to approach this, but what can we do in order to get there? What do we need in order to get there?’ (Interview, February 12, 2015)

Project Leader 1 reiterates there are funders out there who “immediately understand what we’re doing with these neighborhood relationships” and are willing to fund the PPSR project. She has found even from “inside the university, there has been a really, really interesting shift that has been happening in terms of participatory methodologies” (Interview, October 10, 2015). In the 12 years she has spent with the university she has watched more and more junior faculty integrate participatory methods in their work and has seen these methods “snowball.” She has seen undergraduate students who are “dynamic kids who really want to get engaged with their surroundings…and who look for ways to more meaningfully connect with the neighbors” (Interview, October 10, 2015). Additionally, the new president of her university “completely supports civic engagement,” and he has made the “amoeba-like movement towards local engagement official and codified” (Interview, October 10, 2015). She is very encouraged that within academia, civic engagement is becoming more valued, and thus more funding opportunities are available. Her own university has designated her, as a social scientist with a research agenda well aligned with participatory action research,
the coordinator of a Joints Arts community center. As the leader at this community center part of her role is to find university researchers whose research agendas overlap community concerns. Community members benefit from university resources, form friendships with researchers, and have through these relationships volunteered to participate in focus groups and other studies the university researchers are conducting. For example, the community with whom she partners places a high value on dance. She has responded by connecting the community to a dance professor, with a research agenda in participatory research. The joint arts center now offers dance classes to community members. The same joint arts center has been the home base for scientific researchers of her school to conduct citizen-based monitoring for water control research. The scientific researcher benefits by getting community data, and the community members benefit as well. Not only do community members see a scientific study in motion, but they also have access to free dance classes, which is something they place high value on. (Interview, October 10, 2015).

Overall, project leaders advise being honest with community partners about the constraints funding agencies place on a PPSR project. Project Leader 2 notes, “For me the best approach has been to be as transparent as I possibly can and to be as honest as I possibly can and to try to work together to find solutions” (Interview, February 12, 2015). She has found the community members “are more creative” in ways to get stuff done than people from the university have ever been. She notes:

As long as I've done things well in terms of developing those relationships in terms of listening to what their (community’s) goals are when I say, ‘My hands
are tied on this one, but I want to make it work. Let's figure this out together,’ it tends to work. There's a lot of experience, and there's a lot of ways around things.

(Interview, February 12, 2015)

She goes on to say sometimes navigating funding barriers may not involve “your typical protocols,” but “as long as you stay within some parameters and as long as you are transparent on all ends about what it is that we're doing, it tends to work out” (Interview, February 12, 2015). Similarly, Project Leader 5 recalls a time when their PPSR project lost funding. She had made a commitment to the community and all of a sudden found herself without the necessary funds to follow through on that commitment. She notes, “I was devastated…I didn’t want to go back on my promise” (Interview, February 12, 2015). She went to the community and told them what had happened with the funding. To her delight the community responded in a major way. With the generosity of community volunteers and personal donations from individuals on the research team and in the community, the project went from having zero dollars to building two museums. She notes:

There will be setbacks, and that is where some of your partnership is going to be tested. But if you have gained acceptance, you are a collaborator, you are a colleague, but you also become a friend. I think that should not be underestimated, the personal friendship and connections that you establish in a community. (Interview, February 12, 2015)

Summary of Chapter 4

The findings from Part 1 answered the first research question of this study—What
advice do PPSR project leaders have regarding how to engage underrepresented communities in scientific research? Throughout the themes explored in Chapter 4, PPSR project leaders interviewed in the study advised other project leaders to respect the culture and history of underrepresented communities and carry with them the reality of inequality and marginalization these communities have been and are being forced to endure. PPSR project leaders also describe the type of dialogue necessary to engage underrepresented communities in a PPSR project. The type of dialogue described paralleled Paulo Freire’s (2000) conceptualization of a true dialogue, and for this reason the theoretical description of a true dialogue guided discussions of this theme. Finally PPSR project leaders openly discussed several barriers, which may stand in the way of a true dialogue with underrepresented communities. Project leaders acknowledged limited funding opportunities to support community partnerships, definitions of science and expertise, and institutional pressure to obtain publications and grants may present challenges to a true dialogue. Despite these barriers, project leaders remain optimistic and offer advice on how to overcome such roadblocks to engaging underrepresented communities in PPSR projects.
CHAPTER 5: FINDINGS PART 2

Overview

The purpose of Part Two of this study was to examine in detail a particular PPSR project in which an underrepresented community engaged in a scientific research study. By interviewing both community and university project leaders, reviewing community documents, and reviewing documents resulting from the PPSR study, the goal was two-fold. First the researcher of this study hoped to identify potential factors, which may have affected this underrepresented community’s sense of belonging to the scientific community of practice. Secondly, by zooming in on a particular PPRS project, the researcher of this study examined if and how the conceptualization of a Third Space was created in this community research partnership. The community perspectives and insight from the community and university project leaders provide the field of PPSR with critical lessons and push the theoretical concept of a Third Space to a transformed view of the scientific community. Data presented in Chapter 5 relate to the second and third research questions of this study, which are bounded by the same case and thus grouped together:

1. What are the barriers, if any, affecting an underrepresented community’s willingness to engage in a PPSR project, and how can PPSR project leaders overcome these barriers?

2. How, and to what extent, can PPSR project leaders create projects that are Third Spaces, which merge the discourse, practices, goals, and values of science with the discourse, practices, goals, and values of underrepresented communities?
A case study approach was used for Part 2 of this study. This chapter begins by presenting a background of the case followed by key findings emerging from the data. As Chapter 3 detailed, the findings were collected through semi-structured interviews, field notes, and document review and analyses. The case, a PPSR project in which an underrepresented community and university researcher partnered to conduct scientific research, provided a bounded unit—bound by definition and by focus.

**Background of the Case**

The case for this study was a PPSR project in which an underrepresented community and group of university researchers partnered to conduct scientific research. The following section describes the underrepresented community, the lead university researcher and the nature of their collaboration. Many members from the community and several university researchers joined together in this scientific study, but one community member and one researcher co-led the project, later publishing works together reporting the findings of the study. It is these two project leaders who will be the representative voice of the underrepresented community and the community of science. The community project leader, Gary Grant, and the university project leader, Steve Wing have both been very vocal about their partnership and the legal battle following their work together on this PPSR partnership. For this reason, and with their permission, the researcher of this study named them as well as the name of the community—Tillery, North Carolina. The identities of individual community members will not be revealed, in order to protect their privacy and confidentiality.
The community partner in this PPSR partnership was participating members of a small farming community in Tillery, North Carolina. Located in Halifax County, Tillery is a predominantly African American, rural community. The community is not large enough to obtain US Census data demographic information on; consequently, this researcher gathered demographics on Halifax County, which is the larger county of which Tillery is a part. Halifax County is a “Black Belt” county with few educational resources, poor housing conditions, and low paying jobs (Wing et al., 1996). The term “Black Belt” originally referred to a layer of rich, dark cotton-growing dirt, but is now used to describe regions, which are predominately African American. Halifax County is located in Northeastern/North-central North Carolina and is approximately eight miles from the Virginia border. Halifax is one of the largest geographical counties in North Carolina, encompassing an area of approximately 722 square miles. Figure 5.1 shows a map of Halifax County. This map shows the exact location of Tillery, NC within Halifax County.

![Figure 5.1. Map of Tillery, N.C. This figure shows the location of Tillery, N.C. in reference to the larger Halifax County. (North Carolina Gazetteer, 2017)
The main industries in Halifax County are tourism and agriculture. Table 5.1 shows a summary of key demographic variables for Halifax County according to the 2014 US Census projections. The far-right column contains the national average of these demographic variables for comparison sake. As can be seen, Halifax County, as a whole, is 53.2% African American, compared to the overall population of the United States, which is 13.2% African American. Halifax County is also a low socioeconomic community with 23.5% of the community being in poverty, compared to the national average of 14.8%.

Table 5.1
**Key Demographic Characteristics of Halifax County**

<table>
<thead>
<tr>
<th>Demographic Variable</th>
<th>Halifax County</th>
<th>United States</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>52,456</td>
<td>321,418,820</td>
</tr>
<tr>
<td>Population % Change</td>
<td>-4.1%</td>
<td>4.1%</td>
</tr>
<tr>
<td>White alone, not Hispanic</td>
<td>39.1%</td>
<td>62.1%</td>
</tr>
<tr>
<td>Hispanic or Latino</td>
<td>2.7%</td>
<td>17.4%</td>
</tr>
<tr>
<td>Black or African American alone</td>
<td>53.2%</td>
<td>13.2%</td>
</tr>
<tr>
<td>High school graduate or higher, percent of persons age 25 years +</td>
<td>76.5%</td>
<td>86.3%</td>
</tr>
<tr>
<td>Bachelor’s degree or higher, percent of persons age 25 yrs +</td>
<td>11.9%</td>
<td>29.3%</td>
</tr>
<tr>
<td>Median household income (in 2014 dollars)</td>
<td>$32,834</td>
<td>$53,482</td>
</tr>
<tr>
<td>Persons in poverty</td>
<td>23.5%</td>
<td>14.8%</td>
</tr>
</tbody>
</table>

Note: Projections of Demographic data from (USA Census, 2015).

A portion of the community of Tillery was formed during the 1930s and 1940s as part of the New Deal Resettlement under President Franklin Roosevelt’s New Deal.
Tillery was “one of the largest Resettlement Projects in North Carolina and one of only 15 African American projects in the Unites States” (CCT Anniversary Book, p. 6). With a spread of 18,000 acres, the Resettlement farm was called Roanoke Farms. The farm was segregated, with 150 African American families assigned to the Roanoke River Flood Plain and 110 White families assigned to West Halifax. The Tillery section of the farm is located in Southeast Halifax County. Families were loaned land, livestock, and tools and were given three years to learn the basics of farming. They had strict guidelines to follow and paid monthly installments towards the debt of their farm. If after three years they demonstrated enough “interest and potential,” they obtained the title for the farm and had 40 years to pay off the rest of the debt (CCT Anniversary Book, p. 7). Tillery’s CCT Anniversary Book serves as a community documentary, detailing the story of Tillery’s founding, listing all family names in the “colored section” of Roanoke Farms and the unit numbers both before the historic flood of 1940 and after the flood. This major flood destroyed many of Tillery’s original farms, and although some descendants of those original farms remain in Tillery, in the late 1940s a new group of African American farmers came and purchased farms through Farmer’s Home Administration (FmHA) loans (CCT Anniversary Book, p. 8).

In this case study Gary Grant, long-time citizen of Tillery, represents the voice of the underrepresented community. Gary Grant is a community activist who grew up in Tillery. After college, and over 15 arrests participating in the civil rights movement, Gary returned to Tillery where he taught school for 11 years as a English teacher (CCT Anniversary Book). Gary is now the executive director of the Concerned Citizens of
Tillery (CCT), president of the Black Farmers and Agriculturalist Association (BFAA), and co-director of The North Carolina Environmental Justice Network. Figure 5.2 shows a picture of Gary to help the reader put a face with one of the voices represented in this study.

![Gary Grant](image)

Figure 5.2. Photo of Gary Grant. This photo shows the leader of the CCT, Gary Grant (CCT Anniversary Book, p. 4).

Dr. Steve Wing represents the voice of the scientific researcher in this study.

Steve Wing, who prefers not to use honorary titles, is professor of epidemiology at UNC Chapel Hill (Wing, interview, October 14, 2015). Steve teaches epidemiology and conducts research on occupational and environmental health. His academic website notes his recent studies focus on the health impacts of ionizing radiation, industrial animal production, sewage sludge and solid waste disposal (UNC website). Figure 5.3 shows a picture of Steve to help the reader put a face with the second voice represented in this study.
Through the years, Tillery community members have been strong activists fighting for equality and positive social change. Originating in 1978, in protest to a local governmental decision to close a local Tillery school, the community of Tillery formed a group called the Concerned Citizens of Tillery (CCT Anniversary Book). This group, founded by Gary Grant’s father and other Tillery community members has been working for social change for over 37 years. CCT was formed to “promote and improve the social, economic, and educational welfare of the citizens of Tillery and the surrounding community area through the self-development of its members” (CCT website). Tillery’s fight for environmental justice serves as the problem addressed in the PPSR partnership examined in this case study. Figure 5.4 pictures the CCT’s logo, photographed by the
researcher during the participant observation of this study.

Figure 5.4. CCT Logo. This logo was designed by a local Tillery high school student and photographed with permission from Gary (Participant Observation).

The *CCT’s Anniversary Book* details Tillery’s fight for environmental justice. A summary of this fight is provided here to give the reader the necessary context to understand the PPSR project examined in this study. In the early 1990s, Tillery community members were told (in a local newspaper article) that “economic development” was coming to Halifax County, in the form of hog farms (CCT
Being a farming community, this did not raise immediate alarm for Tillery community members. They were farmers and many of them already had hogs on their farms. However, once construction started on these new facilities, members of the community knew these were no ordinary hog farms—they were intensive hog production facilities, also known as confined animal feeding operations (CAFOs).

Gary recalls after he heard about this “economic development” he visited the construction site and saw huge holes being dug for the waste repositories. After seeing the construction sites of these hog operations Tillery community members to realized this was not the type of economic development they wanted for their community (Grant, interview, February 17, 2016). Gary notes Tillery community members had no vote or choice in the decision to bring hog operations to their community and soon discovered this development was detrimental to the health of their community (EH Documentary, 2009).

Intensive hog operations are hog farms with at least 740 hogs and up to tens of thousands of hogs (Wing et al., 1996). Steve explains:

The ventilation systems put in place for the pigs in the factory, result in air pollution for communities in which the factories are placed….Liquid and solid waste are flushed into open lagoons and the waste is then sprayed out on nearby fields (TEDx, 2013).

According to Steve, a particular problem with CAFOs being placed in Tillery was the fact Tillery sits in a flood zone. He notes, “lagoons are often breached by heavy rains…Pigs are flooded out of confinements” (TEDx, 2013). Likewise, during heavy
rains when the low-lying grounds, in communities such as Tillery, flood, not only do pigs flood out of the industry’s buildings, but also the lagoons containing the pig’s waste flood and enter the community’s ground water (TEDx, 2013). Now, years after the construction of these facilities, the community of Tillery knows well the effects of industrial hog operations. The Concerned Citizens of Tillery state:

- Intensive livestock operations are huge factories housing thousands of hogs or chickens in a confined area. These operations have a history of polluting the land, water, and air with uncontrolled, untreated waste from thousands of animals.
- Excrement pours from the buildings in which the animals are housed into unlined, uncovered pits measuring as large as eight acres. There have been countless incidents of lagoons either bursting, polluting rivers and waterways, or letting large amounts of waste slowly seep into the water table, polluting drinking water in areas with a large number of shallow wells. (CCT website)

Figure 5.5 shows a picture of one of the CAFOs in Tillery, NC.
As more CAFOs were placed in rural communities across North Carolina, Tillery community members realized they were not alone, many other primarily African American and poor communities were being targeted for these industrial hog operations (CCT website). Together, with other communities, they formed a group called the Hog Roundtable to protect the health of their community and lands. Gary notes, “Basically we were trying to protect water, surface water and ground water of our communities” (Grant, interview, February 17, 2016). It was at one of these Hog Roundtable meetings, Gary met Steve and they, along with others, formed the North Carolina Environmental Justice Network in 1998. Shortly after, Gary and Steve co-wrote a grant to the National Institute of Environmental Health Sciences called Southeast Halifax Environmental Reawakening (SHER), and thus began the PPSR partnership, which serves as the case in this study.
Gary concedes past experiences with researchers led both he and other Tillery community members to be skeptical of researchers, but he soon realized “Steve Wing was different.” Steve, through his approach, words, and actions, helped the community “change” their “mentality towards researchers.” This PPSR project helped the community see even a university researcher can “fight community battles against the government as well as industries that want to pollute in the communities” (Grant, interview, February 17, 2016). This case study examines the nature of Tillery’s and UNC researchers’ collaboration in scientific research and how the partnership changed one underrepresented community’s beliefs about scientific research.

**PPSR Project Description**

The Center for Advancement of Informal Science Education (CAISE) established an inquiry group to describe the various models for Public Participating in Scientific Research (PPSR), classifying models based on the degree of participation from the public (Bonney et al., 2009). Based on this classification scheme, the PPSR project between the community of Tillery and UNC was a Co-created Project model. Co-created Projects are defined by three main qualities: 1) members of the public initiate research questions of concern to their community, 2) scientists and public participants work together to answer these questions, and 3) participants are encouraged to take part in all stages of research process.

Tillery community members began to feel sickness and discomfort and suspected the hog operations were polluting their water supplies and air (EH Documentary, 2009). The community of Tillery was concerned their community had been purposely selected
as a location for the construction of several industrial hog operations and viewed this situation as an example of environmental racism (Wing et al., 1996). They also believed the distribution of hog operations was disproportionate, with the majority of CAFOs located in poor, non-White communities. They complained to local officials and media but soon became “frustrated” when they were met with the response that these discriminatory patterns were “anecdotal and did not prove any consistent pattern” (Wing, Commentary, 2002). Public officials demanded research documenting the problems, so the community members needed quantifiable evidence of pollution levels along with health related outcomes caused by the industrial operations, in order for their voices to be heard. Most community members did not have experience conducting research, so a partnership was formed with the university researcher, Steve Wing. Steve recalls the formation of the PPSR project:

All they knew was that the air pollution was terrible and it affected their daily lives, and that their water pollution affected their drinking water, or they were concerned that it would in the future. And when there was flooding, these facilities affected their neighborhoods and these weren’t research questions or hypotheses, those were daily life. They were also concerned that their property values were impacted and that their county government was run by people trying to promote the industry’s practices. (Wing, interview, October 14, 2015)

Gary and Steve—under the assumption that taking measurements, answering research questions, and documenting specific health effects of the pollution might get the attention of political leaders—sat down and developed research questions together. They talked
about how existing research methods in public health research could be used to identify hypotheses and design scientific studies to address them. The identification of research questions was done collaboratively. The formation of the research partnership between Tillery and Steve stands in contrast to the formation of the other PPSR projects in Part 1; the PPSR projects in Part 1 were initiated by a university researcher or scientist who hoped to connect and partner with an underrepresented community. The partnership between Tillery and Steve, however, was initiated by the community and founded upon community needs.

Together UNC’s School of Public Health researchers and the community of Tillery applied for a grant funded by the National Institute of Environmental Health Sciences, which was calling for proposals that “promoted community-based education and research” (CCT, website). Their co-authored grant titled Southeast Halifax Environmental Reawakening (SHER) was funded in September, 1996. SHER had a multi-faceted design including participatory community workshops, seminars for medical care providers, environmental health consultation and support, a community ground water festival, quantitative environmental justice analysis, a speakers’ bureau comprised of community members, and outreach to other Black Belt communities (CCT website; Wing et al., 1996). Steve describes the purpose of this PPSR research collaboration:

Along with environmental justice education and outreach to communities and medical providers, we were funded to conduct research that, using official records, could quantify systematically the extent to which hog CAFOs and their potential impacts on health and quality of life disproportionately affected communities of
low income and people of color (primarily African Americans) in the state. (Wing, Commentary, 2002)

The data collection for this PPSR project was also designed collaboratively because as Steve notes, “We from the university have ideas about how studies can be designed and the people there (in the community) know what is possible as far as knowing where to make measurements and getting people to participate in the process” (Wing, interview, October 14, 2015). Steve recalls, “In collaboration with our community partners, we made decisions about how to define the study population and data sources, how to choose and define variables for the analysis, and how to interpret results” (Wing, Commentary, 2002). By involving community members in data collection, the research team was able to collect real-time data. Steve recalls community members used a “diary and instruments to collect data on odor, mood, blood pressure, symptoms, and immune and lung function twice a day for two weeks” (Wing, interview, October 14, 2015). A training session with university researchers and community members was conducted at the beginning of the study. These training sessions were carried out in community homes, churches and other local venues, in order to provide a “natural and comfortable setting” (Wing et al., 2008, p. 1393).

UNC researchers used a portable trailer to bring research equipment to community members living within one and a half miles of industrial hog operations. These trailers downloaded measurements of hydrogen sulfide, a toxic gas produced by the decomposition of fecal waste and measured concentrations of particles small enough to enter the human lungs. A community member regularly checked the project equipment to
ensure it was functioning. Community members participated in a community health study at the same time, recording personal feelings and also taking measurements of lung function and blood pressure using monitors provided by the university (TEDx, 2013).

University researchers conducted most of the data analysis in this PPSR study because the community did not have the necessary equipment or capacity to analyze data (Wing, Commentary, 2002). However, Steve notes, “The analyses we did were influenced by the community members” (Wing, interview, October 14, 2015). The university research team also interpreted the data, but part of this interpretation process was done collaboratively with community members by interviewing community participants to provide the study with context for interpreting quantitative results. Soon after the data collection and analyses were completed, the university research team returned to the community with a preliminary report on environmental measurements. Averages and bar graphs were used to summarize environmental measurements. Together the university research team and community members discussed the results and worked together to attempt policy change (Wing, interview, October 14, 2015).

The findings of Chapter 5 are based on the complex and social interaction of a research partnership between two communities of practice—Tillery, NC and a team of researchers from UNC Chapel Hill’s School of Public Health. The PPSR partnership described in this study began as a partnership between UNC researchers and the Concerned Citizens of Tillery, but it grew to include other Tillery community members and other poor, underrepresented communities who shared Tillery’s plight. Thus Gary and Steve’s recollections and advice are based on all of their experiences fighting
environmental racism, those occurring within Tillery and those occurring in other communities. The thematic analysis process elicited key concepts evident in the data. As the researcher of this study examined documents, made observations and considered the perspectives of Gary, Steve, and other Tillery community members, several themes emerged regarding the process of how their partnership was forged and maintained. Five broad themes structure the findings of this chapter. In the following sections, the researcher provides exemplars of each theme and related findings. Table 5.2 summarizes the overarching themes and provides the findings for Research Question 2: What are the barriers, if any, affecting an underrepresented community’s willingness to engage in a PPSR project, and how can PPSR project leaders overcome these barriers? Table 5.3 summarizes the overarching themes and provides the findings for Research Question 3: How, and to what extent, can PPSR project leaders create projects that are Third Spaces, which merge the discourse, practices, goals, and values of science with the discourse, practices, goals, and values of underrepresented communities?
<table>
<thead>
<tr>
<th>Theme</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inequality and mistrust are barriers to</td>
<td>• The larger system which science represents has historically alienated African Americans through inequality</td>
</tr>
<tr>
<td>engagement</td>
<td>• The larger system which science represents currently alienates African Americans through inequalities</td>
</tr>
<tr>
<td></td>
<td>• Scientific and other research studies alienate the African community through inequalities</td>
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<tr>
<td></td>
<td>• Inequalities in past and present have created mistrust</td>
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<td></td>
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<tr>
<td>Overcoming the barriers of inequality and</td>
<td>• PPSR project leaders can confront the barrier of inequality by having an open dialogue with community members about the abuse and</td>
</tr>
<tr>
<td>mistrust</td>
<td>alienation they have faced.</td>
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<tr>
<td></td>
<td>• PPSR project leaders can confront the barrier of inequality by conveying respect to the community.</td>
</tr>
<tr>
<td></td>
<td>• PPSR project leaders can confront the barrier of mistrust by approaching the community through someone the community already trusts.</td>
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Table 5.3
Summary of Themes and Findings for Research Question 3

<table>
<thead>
<tr>
<th>Theme</th>
<th>Finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conscious bridging</td>
<td>• Conscious bridging was required to merge the discourse of Tillery, N.C. with the discourse of the university researchers</td>
</tr>
<tr>
<td></td>
<td>• Bridging the goals and values of Tillery with the goals and values of university scientists created a new, hybrid level of activity</td>
</tr>
<tr>
<td>Equal footing</td>
<td>• Joint project ownership allows for more equal footing between the university and community partner</td>
</tr>
<tr>
<td></td>
<td>• Funding may present challenges to equal footing</td>
</tr>
<tr>
<td>Challenges to Third Space</td>
<td>• The idea of a Third Space in a PPSR project may perpetuate the dominant paradigm’s view of science</td>
</tr>
<tr>
<td></td>
<td>• A Third Space could be superficially created without any read change to communities</td>
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</tbody>
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Overview of Themes for Research Question 2

The second research question of this study examined potential barriers, which may be affecting Tillery’s sense of belonging to the scientific community of practice, and how Gary and Steve were able to overcome these barriers. The themes of this research question are: 1) Inequality and mistrust are barriers to engagement and 2) Overcoming the barriers of inequality and mistrust. This research investigation revealed Tillery’s hesitation to participate in a scientific study was based on their past and present experiences of inequality within powerful institutions, such as science. These experiences
resulted in a general distrust of powerful institutions and their representative. Steve and Gary advise overcoming these barriers with open and honest dialogue about the abuse and alienation inequality brings. Additionally, they emphasize the need for PPSR project leaders to overcome the barriers of inequality and mistrust by actively conveying deep respect for the community and by approaching the community through someone the community already trusts.

Theme 1: Inequality and Mistrust Are Barriers to Engagement

Finding: The larger system, which science represents, has historically alienated African Americans through inequality. Science is part of a bigger system of institutions, which have historically alienated African Americans. When asked specifically about the factors affecting Tillery’s sense of belonging to the scientific community of practice, both Steve and Gary emphasized the issue is bigger than science. Gary advises, “It's not just science. It's actually who shows up…What America doesn't understand is we still don't trust you, your White skin. Because we've been the victims, no, we've been the survivors of your wherewithal” (Grant, interview, February 17, 2016). Likewise, Steve describes the issue as “more fundamental” (Wing, interview, October 14, 2015). He explains there is more to the alienation. Yes, science is a unique community of practice with terms and a language different from that of the underrepresented community, but he contends the real alienation has its roots in colonialism, which involves the dominant group in a society acquiring political control over a group of people with less power and exploiting them economically. When specifically asked his opinion on the difficulty some scientists have in motivating underrepresented
communities to engage in scientific research, he replied, “The African American community is a population with overwhelming experiences of exploitation by the authorities, and by powerful institutions” (Wing, interview, October 14, 2015). The African American community has long struggled with powerful governmental and educational institutions, the same institutions to which science belongs.

The influences of colonialism on the community of Tillery are seen throughout their history. Even the community’s name has its roots in colonialism. Tillery was a plantation owned by the Tillery family. The White Tillery family got a land grant from the King of England and had 150 slaves working 1,000 acres of land. The Tillery family founded their town, and to this day there are descendants of the slaves and descendants of slave owners living in Tillery. A Tillery community member recounts after the Civil War their “freedom was short lived,” due to powerful Whites and Jim Crow laws, which took away voting rights and imposed segregation (Tillery Documentary, 2007). Throughout Tillery’s community documentary, Tillery residents share stories of loved ones and family members terrorized by the KKK if they dared to “stand up” to Whites with power. Even governmental programs during the Reconstruction, such as sharecropping, kept landless Black farmers “locked in poverty.” Sharecropping, which continued in the community into the 1970s, is a personal memory for some Tillery community members. A community member recalls:

The landlord gave everything and you called it sharing. You do the work and they provided furnishing, but you were working for the White man…just making it.

When the crop was sold, the problem was you didn’t know how much the crop
sold for, so you didn’t really know what percentage you were getting. (Tillery Documentary, 2007)

The community members, with no political power and lack of access to information were forced to accept the word of powerful White men. Inequalities did not end when slavery was abolished. The African American community continued to live with inequalities sanctioned by the government and powerful institutions.

Gary, Steve, and Tillery community members emphasize the fact that powerful institutions have historically been full of inequalities, which alienated the African American community and made them feel that powerful institution are set up to favor Whites over Blacks. A Tillery community member interviewed in the documentary recalls the signing of FDR’s New Deal in 1934. She recalls believing the deal would be better than sharecropping because you were farming to own. She remarks:

People thought they had died and gone to heaven. Made you feel like you was somebody raising your own crop and being independent…what I meant by independent is you always felt underneath and down here you didn’t feel underneath, you felt like you were doing something for yourself. You owned the land. (Tillery Documentary, 2007)

Yet, community members soon learned even the governmental policies of the New Deal were full of blatant racial inequalities. Gary recalls the story of his own family coming to Tillery. His family moved to Tillery in 1947 as landowners, purchasing their own land, and excited about “the amount of independence that it gave” (Tillery Documentary, 2007). He describes the New Deal put forth by FDR, which made lands
available for farmers to develop. Gary recalls the New Deal farms were “basically plantations” full of more inequalities for African Americans. He remarks:

It was called the Resettlement Administration. Just to make it clear, no forty acres were given. We purchased and we recently, within the last few years, discovered that we actually paid more for the land than Whites paid for the land. What else is new under the sun? (Tillery Documentary, 2007)

Another community member, in a dedication speech delivered on the occasion of the Historic Marker Unveiling in 2007, recounts her “personal take” on Tillery’s history:

Whites settled thousands and thousands of acres of land…free…had slaves to work the land…free…years after slavery was over the federal government comes back and rescues plantation owners from financial ruin by paying huge sums of money to Whites for the land…only to sell the land back to the descendants of the slaves who worked it “free” in the first place. (Documentary Premiere, 2007, p. 16)

Community members in the documentary film recall some of the racial inequalities of the Resettlement Community. One community member, who grew up during the time, reports Blacks received smaller plots of land than Whites (Tillery Documentary, 2007). She adds Blacks had to lease the farm for three to five years to “prove” to governmental agencies they were able to do it, while White farmers did not have to lease the farms. She recalls in Tillery, the Resettlement Farms came to be known as “share-cropping for the government” because Black farmers couldn’t make their own decisions. A community member in the documentary film reports:
You had to go there (to governmental agency) and wait to get your money. You should be out planting your seeds and attending to your crop but instead you had to wait in lines. My understanding is that it didn’t happen with White farmers. (Tillery Documentary, 2007)

Community members believe these extra requirements put on Black farmers set them up for failure. Another community member recalls White men could go into the governmental agency early and get money in February, whereas Blacks had to wait until April and up to May. The community member raises an eyebrow and remarks, “Now that’s the part I saw” (Tillery Documentary, 2007).

Another inequality Tillery community members recall is when the government discovered Roanoke Farms was in a flood plain, White farmers were moved to higher ground and Black families were only sold low-lying farms. Hanging in the Tillery community center is a map depicting this inequality regarding how farms were sold to families. Figure 5.6 shows this map. When a flood came in 1940, most Black families lost their farms. White farms, which were on higher ground, were preserved from the flood-waters (Tillery Documentary, 2007).
Figure 5.6. Map of Tillery Farms. This figure shows a map depicting zoning of farms for White and Black Farmers (Remembering Tillery, 1997).

Upon hearing the history of Tillery, as told by Tillery community members, the researcher of this study found herself surprised. She wondered if these details of history had been purposely omitted from her own education. Below is an analytic memo, written shortly after the researcher’s visit to Tillery, North Carolina.

*Identity is chosen for a person. The way a history is told influences the moral of the story. When I learned about the years following the Civil War, I distinctly remember feeling relieved; a weight lifted off me as the conscience of my identity as a white person was eased. Yet, as I reflect on Tillery’s history, this is not the history I remember learning. I wonder... did my history teachers fail to teach the...*
blatant institutional inequalities African Americans faced after slavery? Or do I not remember? (Analytic memo, March 1, 2016)

With these questions in mind, the researcher found and read experts from the United States history book currently used to teach high school students in her own state. In addition, she consulted the high school history standards for the Reconstruction Era and years following. Below is an analytic memo regarding the publically recorded history she found.

It wasn’t that the history wasn’t accurate. No, the textbook mentioned the same inequalities Tillery community members shared. The difference was the moral of the story, the focus, and the lessons to be learned. The textbook examines the impact of the Reconstruction Era on democracy, not the impact this time had on African Americans. (Analytic memo, March 15, 2016)

For this reason, Tillery must record and tell the impact this history had on those facing the inequalities. As the CCT notes, “Until the lion has his own historian, the tale of the hunt will always go to the hunter” (Documentary Premiere, 2007, p. 9).

Many governmental programs claiming to help the African American community, in reality hurt them. Tillery community members have been told in the past that institutional policies will benefit their community, and then were forced to watch as they suffered and powerful Whites benefited from those policies. A community member in the documentary film tells the story of when the Caledonia State Prison came to Tillery. Community members were told they would see an “economic benefit” from the prison, however, one community member remarks, “of course we never saw any of it” (Tillery
Caledonia Prison serves as a state enterprise farm. The documentary contains a scene in which a White prison guard is interviewed. As the prison guard talks, one can observe Black inmates working in the background. The prison guard explains inmate’s request to do labor. The entire farm is run off inmate labor. He notes, “They don’t make a lot of money; it’s the opportunity to get out of the cell block and do something constructive all day” (Tillery Documentary, 2007). Gary, who was also interviewed in the documentary, notes this prison was not an economic development for Tillery. He explains only three Tillery community members work at the prison, “Yet we take all the risk” (Tillery Documentary, 2007).

For many Tillery community members these memories of inequality and lack of representation within powerful institutions are fresh in their minds. Community members in the documentary report local committees of the Farmer’s Home Administration (FHA) are made up “almost entirely of White land owners.” These committees have the “decision making ability on loans” and are “bias[ed] against Blacks.” Community members recall specific decisions made by these committees, which “brought trouble for Tillery” and resulted in community members losing their farms (Tillery Documentary, 2007). Tillery is accustomed to powerful institutions making decisions for them, and then watching as these decisions hurt the community and keep them struggling.

The documentary film contains an interview with a community member who recalls the foreclosures and “struggle for land” in 1976. She notes:

Banks (Farmer’s Home Administration) came and wanted all the money all at once. We were working people. We could have paid if off over time but didn’t
have all the money upfront. They wouldn’t let us set up a payment plan. I’ll never forget that day… how they talked down to daddy…Matthew this and Matthew that. The man at the FHA office told him, ‘you going to lose this land…I don’t care what you do. It’s over for you.’ Dad began to plead and I said, ‘Don’t you beg that son of a bitch for nothing.’ (Tillery Documentary, 2007)

Community members will “never forget” inequalities such as this (Tillery Documentary, 2007). A powerful institution, looking to serve its own agenda, set the community up for failure and took their land. This same community member, in a speech delivered on the occasion of a historic marker unveiling in 2007, attributes the inequalities her community has faced to “the White power structure” doing “everything possible” to “keep Blacks out” (Documentary Premiere, 2007, p. 17).

Gary shares a story about how painful memories of inequality do not go away. A few years ago he and Steve were attending a conference in the Durham area and taking a break after a long day of meetings. Steve invited Gary to go watch a movie with him but had not communicated to Gary where they would meet. Gary recalls:

So I'm ready to go see the movie… he just never told me where. When we got ready to go, we ended up at the Carolina Theater, in Durham. I became very… I guess one would say, haughty. He's going, ‘What's wrong with you?’… I'm saying, you didn't tell me this. I was arrested here for trying to sit here in the 1960s. That doesn't go away. That's a reality that still is. (Grant, interview, February 17, 2016)
Steve apologized, and they watched the movie, but as Gary recalls he can’t even remember what the movie was about because his mind was on other things for the rest of that evening. He advises, “If you (researchers) are sensitive enough to understand those kind of things, then we can move past them. I did not enjoy the movie, however” (Grant, interview, February 17, 2016).

**Finding: The larger system, which science represents currently alienates African Americans through inequalities.** Gary, Steve, and other Tillery community members firmly believe racial inequalities are not a thing of the past--they occur now in the form of discriminatory practices within powerful institutions. Black farmers are still being forced off their lands if the government decides they have a need for the land. Gary shares a story of a Black farmer near Tillery who was put off his farm this past January (2016). He recalls, “Fourteen armed federal marshals came to put a 73-year-old couple off their property. They were armed not just with a handgun but with rifles” (Grant, interview, February 17, 2016). He explains this African American couple was not put off the land because they couldn’t make their monthly mortgage payments but because they couldn’t pay their mortgage in full.

Not only do African Americans experience inequality, but also they do so in a culture, which denies these inequalities exist. In a recent edition of Tillery’s News Notes, the CCT describes the efforts of the Black Farmers & Agriculturalists (BFAA), which they note is a “group, which continues to work to bring reality to the loss of Black Farm land…(CCT News, p.11). The BFAA is a group of Black Farmers, led by Gary Grant, who work to fight inequalities Black Farmers are facing. As Gary explains, Black farmers
are denied loans to purchase farms and denied representation on committees, which make decisions regarding loans, presenting crippling obstacles in their fight to own land (Grant, interview, February 17, 2016). The author of this study includes an analytic memo made during the analysis of this data:

*The theories of cultural trauma seem relevant here. Black Farmers know what they are experiencing, and yet their work is focused on bringing their suffering to reality. Those in power continue to deny their suffering is real. And people like me, are unaware. Gary and other African Americans have for years been fighting for justice. And I’m just now aware of this. How can healing occur, if the perpetrators of the trauma and others do not even acknowledge the trauma has occurred?* (Analytic Memo, June 14, 2016)

Racial inequalities also occur today when African American votes are silenced. Gary recalls how powerful institutions through zoning of voting districts silence the voice of African Americans. He notes:

*We have two districts in North Carolina that they packed all the Black voters…and they say that it was not a racial issue. Well, Black folk are 90%, 95% Democrat. If you decide that you're going to put all the Democrats in one block, it means you've been a racist, because you didn't put the White folk in there, you put only Black folk in there.* (Grant, interview, February 17, 2016)

Steve too recognizes the racial inequalities in zoning practices and the resultant lack of access to power this practice creates for African Americans. Steve says:
That's another common problem in Black communities that have been excluded from city boundaries so that they can't vote in local elections. In areas to where there are a lot of Black people, that's been done a lot to keep White people in the mayor's office and city council, for example. That means they (African Americans) also don't get services. (Wing, interview, October 14, 2015)

This lack of political power results in poor, African American communities being unable to protect their communities from laws and practices, which have potential to harm them.

During a lecture delivered in 2011 at The University of Wisconsin, Steve gave a specific example of how an African American community was forced to watch as political leaders made decisions, which hurt their community’s health and well being. In 1978 a toxic management company decided to save money and dumped thousands of gallons of waste, containing cancer-causing chemicals, on roadsides in Central North Carolina. By 1982, the situation was recognized as a public health hazard and the government of North Carolina decided to take action. The government decided to place all the contaminated soil in one county—Warren County, which Steve notes is the county with the largest African American population in the state of North Carolina (65% African American). It was during this recent historical event, the people of Warren County invented the term “environmental racism.” With no political power, the people watched as a powerful institution (the state government) dumped contaminated, dangerous toxins into their community (Siesing, 2011).

Gary notes racial inequalities are not secluded to local governments but are also prevalent in the educational system. He believes these inequalities are a barrier to a
person’s sense of belonging within science. While commenting on the discrepancy in science achievement between Black and White students Gary notes:

Currently, I don't know whether you know it or not, but this county (Halifax) has three public school districts. Two of them, we have 115 districts in the state. One is 115, one is 114, and one is 72% from the top. So we've got three failing districts, and nobody wants to merge them. Well, the power structure doesn't want to merge them. White folk don't want to merge. Racists don't want to merge. (Grant, interview, February 17, 2016)

Community members in Tillery believe racial inequalities keep African Americans from succeeding. The Concerned Citizens of Tillery believe there is “no mystery in the fact that rural and predominantly people of color school systems remain at the bottom of the totem pole, insuring a sub-class to supply labor for America's most privileged” (CCT website). Gary elaborates on this same point:

If you have kept me in the ditch, you can't be so bright, because you have to stay there too. Because if you left, I was coming out. That's the piece that people don't understand. Why should science be of interest to me? (Grant, interview, February 17, 2016)

Even today, powerful institutions approach the African American community with programs, which promise to help their community, only for community members to discover the program brings harm to the community. Take for example the CAFOs, which led to the research partnership between Steve and Gary. Tillery community members were told “economic development” was coming to their community (Tillery
Documentary, 2007). Gary explains poor African American communities are known as “avenues of least resistance… Big giant corporations do their homework…they know whether or not people register to vote…they know the educational level” (EH Documentary, 2009). He recalls a scientist telling him, “What is coming (hog farms) is no worse than a deer running through the forest” (EH Documentary, 2009). After the hog operations had been built, Tillery knew they had been lied to; the odor and the physical health affects from the hog farms’ pollutants were undeniable. Another community member recalls, “People didn’t know what this could do to their health. The smell is overwhelming. You think you’ll go outside for fresh air, and you just have to go back in” (Tillery Documentary, 2007). Upon the researcher’s own visit to Tillery, she noticed the horrible and overwhelming smell produced by the hog factories. During the participant observation, the researcher drove to the hog farm to take a few pictures. Upon exiting the car to take the photo, the researcher became overwhelmed and felt dizzy. She snapped a quick photo and ran back to the car to escape the foul odor and feelings of malaise (Participant Observation). Below is an analytic memo recorded upon the conclusion of her visit to Tillery:

*I felt a little scared today. When I got out of my car to take the picture of the CAFO, I started to see tiny little flashes. I guess that’s what people mean when they say they saw stars. I didn’t expect the evidence of pollution to be so obvious.*

*Why did Tillery’s local government demand scientific evidence? If they cared even a little bit, they could have visited and seen for themselves.* (Analytic memo, February 17, 2016)
Tillery community members attribute the selection of their community, and others like theirs, to racism and exclusion from White power and privilege. Gary notes:

You start talking about White folk… who else you supposed to talk about? Black folk didn't have any power… we didn't do it to ourselves, and certainly we didn't go out and recruit the hog industry to come in and again, to poison our groundwater and the air that we were going to breathe. (Grant, interview, February 17, 2016)

Steve agrees, noting the “rapid rise of intensive hog operations in Black Belt counties in Eastern North Carolina is an example of environmental racism” (Wing, et al., 1996, p. 131). African Americans have been excluded from political bodies, such as the North Carolina General Assembly, which vote on decisions regarding the industries brought to communities.

Steve, who was called before the North Carolina General Assembly to produce the research resultant of the PPSR study examined in this case study, noticed the lack of representation of African Americans in this political body. Steve notes “after staff members (African American) finished setting up the slide projector and providing water for the committee members, the CCT members (who came to support he and Gary) were the only African Americans remaining in the room” (Wing, Commentary, 2002, p. 439).

During a lecture delivered at The University of Wisconsin, Steve relates how representatives of the North Carolina Government told Tillery community members the waste from the hogs and other waste facilities (sludge) was fertilizer and would help their land grow better, yet Tillery soon discovered these same representatives did not want this
fertilizer anywhere near their own lands (Siesinger Lecture, 2011). In 2007, Tillery community members led a protest against the hog waste polluting their community. Travelling to the North Carolina State Legislature in Raleigh, they constructed a mock hog operation and brought a 50-gallon drum of hog waste. As they were emptying the hog waste into the child pool (representing a waste lagoon), the capitol police told them they would be “subject to arrest if they spilled one drop because it would cost thousands of dollars for toxic waste cleanup” (Siesinger Lecture, 2011). Steve shares how Tillery community members saw the irony that the government told Tillery the waste was organic fertilizer when they were trying to convince Tillery the waste wouldn’t harm their community, but when it was brought to Raleigh, to governmental property, it was “toxic waste” (Siesinger Lecture, 2011).

Decisions by those with political powers have resulted in Tillery community members being unable to live healthily in their own community. Tillery community members are concerned about the long-term health impact of the CAFOs’ pollution, but they are also troubled community members cannot even enjoy daily life. They cannot go out for a walk to exercise, and children from Tillery are made fun of for smelling bad (TEDX, 2013). Steve shares the words of a Tillery community member:

They are blowing animal waste on us. So you really can’t stay out there long.

Your eyes start to water, you start coughing and gagging. You want to throw up.

They have taken every freedom that we have away from us and we’re just supposed to become complacent and say oh this is ok. This is just a normal way of living. But they’re not breathing it in. (TEDX, 2013)
Gary laments the fact Black Americans do not have the same privilege White Americans have. He is angered by the fact African American soldiers are “off fighting these wars so that we can have the freedoms that we have.” But from his perspective, “Black men being killed and maimed… come back home to a place where they still won't have the same freedom that you (referring to the researcher) have as a White person” (Grant, interview, February 17, 2016). The members of Tillery cannot even take a walk around their neighborhood or sit on their porch, without the pollution and stench forcing them back inside.

Steve explains when industrial hog operations are put in poor, African American communities this is a modern-day manifestation of colonialism—powerful industries are exploiting poor communities with no political power. He and Grant note, “Environmental racism is one aspect of a complex history of colonialism” (Wing et al., 1996, p. 129). He explains, “The elite don’t care about harmful effects because it is not their community being affected. It’s not their schools, their health or their neighborhoods” (Wing, interview, October 14, 2015). In a publication Steve, Gary, and several other researchers authored, they charge:

Hog operations have been placed in areas with large populations of poor Blacks who have been disenfranchised in a system that began during slavery and continues today in the form of racially segregated schools, housing and job opportunities. Industry chooses these locations because of the lack of local political power, and the acceptability in the dominant society of sacrificing poor Blacks, their communities and the value of their property. (Wing et al., 1996)
Not only do the elite (often government officials) not care, but they also protect large industries, which bring harm to poor, African American communities. A study cited on the CCT website (Environmental Justice Case study, 2004) found hog industries such as Murphy Farms and Carroll’s Foods, “Contribute tens of thousands of dollars to the coffers of state legislators in order to ensure that environmental regulations are not instated” (CCT website). This same study found laws were passed “protecting the industry from existing government regulation.” These laws were passed while Wendell Murphy of Murphy Farms was a member of the General Assembly. Murphy even sponsored a number of these bills. CCT also notes North Carolina Senator Faircloth and other government officials in North Carolina “own large numbers of hogs” (CCT website).

Steve advises institutional racism runs deep in the fabric of many societal practices and institutions. He notes many people working in these institutions are unaware of their own contribution to these practices. He challenges all people, those trained as scientists and those not, to be critical of their own choices and how choices affect the well-being of communities such as Tillery. He notes:

We all benefit every day from environmental racism. When we drive a car or consume something that was transported by a truck or train or plane. We are benefitting from the fact that we don’t live next to where the oil was extracted or where the asphalt plant was…or where the industrial farms were…We don’t have to deal with that stuff. We don’t live with that, but someone does. It’s a system of injustice where some people benefit from avoiding the negative consequences of
our daily activity; one population benefits at the expense of the other. (Siesinger Lecture, 2011)

He urges people to think about the expense of benefits they enjoy. He notes, “Many of us know more about the inhumane treatment of livestock than about inhumane treatment of people living nearby” (TEDx, 2013).

Steve stresses institutional racism is something felt by many communities of color. It is not secluded to the poor, African American communities of North Carolina. Steve also works with an African American community in Baton Rouge, Louisiana, which is nearly 100% African American. In this community people are daily exposed to pollutants known to be harmful to the human body and environment and are also daily injured in accidents from dangerous working conditions in the factories of ExxonMobil’s oil refinery. ExxonMobil, with established connections to the government of Louisiana and the Department of Environmental Quality, does their best to convince community members this economic development is helping the poor community, but community members know better (Siesinger Lecture, 2011). Community members have come to Steve in hopes of more effectively protesting the detrimental effects of ExxonMobil’s powerful hold on their community.

When communities are consistently exploited by those with power, they no longer want the help offered by powerful institutions. Gary notes:

We've always said to young folk (referring to university researchers) who come to us…first thing is, you don't come to help us. You've helped enough, or your
ancestors have, and you're still in those same institutions that taught them how to help us. (Grant, interview, February 17, 2016)

Steve acknowledges his own university, University of North Carolina, Chapel Hill for many years dumped its waste in an African American community on the outskirts of town (Siesinger Lecture, 2011). It is important to realize underrepresented communities have an experience of being abused and exploited by powerful institutions, sometimes the very same institution a researcher comes from.

The community of Tillery feels alienated from powerful institutions and sees themselves as “the fray” and “protesting” governmental agencies (CCT Anniversary Book, p. 65). The community of Tillery, recognizing the influence and power provided in political offices, has for years protested the lack of representation African Americans have in the government, specifically focusing on the lack of representation on the Halifax County Board of Commissioners. Gary comments on the reasoning behind their protests, “It is time that Blacks refuse to be the shadowy unofficial backbone of the Halifax County economy while being bartered like slaves to the racist totalitarian politics of some White power brokers who would be king” (CCT Anniversary Book, p. 63). Gary and the community of Tillery have participated in many non-violent protests and have been arrested several times for such protests (CCT Anniversary Book, p. 66). The citizens of Tillery have struggled and will “continue to struggle against racial oppression and regional underdevelopment from a position outside local, regional or national power structures” (Wing, Grant, Green &, Stewart, 1996).
A recurring theme throughout the analysis of this study’s data was these experiences of inequality with powerful institutions and lack of access to privilege stand as barriers to a person’s willingness to participate in science and related activities. These encounters the community has had with governmental agencies and other powerful institutions impact the way community members feel about researchers and university projects. Steve advises, “Anything related now to police violence and the Black Lives Matter movement” is “really relevant” to an African American’s willingness to participate in a scientific study (Wing, interview, October 14, 2015). Steve notes race and class play a big part in a person’s decision to participate. He believes, when researchers interact with a community, “it's not just the race of the scientist, it's the class position and the institution that we come from.” He continues:

On the one hand, very definitely people in the communities exposed to this pollution weren't comfortable with me, or my language, and I think a lot of that's race, not science; it does not really have to do with science. Any White privilege people that they knew from their interactions, or the majority of them, treated people disrespectfully…they were prejudiced. These are areas where…older people, they grew up with White and colored signs on the public facilities. Those facilities are still run by White people who grew up like that. There's a real alienation from White privilege. I think that's much bigger than just science. (Wing, interview, October 14, 2015)

Steve is sure much of Tillery’s initial hesitancy to collaborate with him involved his affiliation with UNC. He says:
My university would be perceived as a potential exploiter and benefiting from being able to enroll people in research and do what they want kind of stuff. Science was just part of that bigger picture, which includes medical services, and social services, and banking, and anything that involves daily life. (Wing, interview, October 14, 2015)

The findings of this study reveal underrepresented communities may not engage in science when they feel so disconnected from the system to which science belongs. Thus, institutional inequalities stood as a barrier to Tillery’s community members’ feelings of belonging within science.

**Finding: Scientific and other research institutions alienate the African American community through inequalities.** Although both Steve and Gary believe the issue of alienation from science is bigger than science, they also both note specific instances where science and other research institutions alienate the African American community. People with power and privilege, in the name of science, have treated African Americans as if they are inferior to Whites. There are specific scientific studies, which occurred in the United States’ history, which illustrate how science has exploited and abused African American communities. Steve notes:

I would say that these are general observations that apply in our country and maybe more in the South than other regions. We have our unique history. To read about it… you could read critical discussions of the Tuskegee experiment, the syphilis study. You could read about lynching as a phenomenon. You could read about forced sterilization that was practiced under a eugenics program for decades
in North Carolina and other states. There's definitely an academic literature about those things… I think that's really relevant. (Wing, interview, October 14, 2015)

These examples of scientific studies and public health practices, which abused African American communities, are a modern, current manifestation of the United States’ history of abuse. Steve recommends university researchers be aware of these historical events and realize they impact the way a community views a scientific study today.

Gary agrees certain aspects within science itself are alienating to the African American community. He notes “scientific studies” have described African Americans as being inferior to Whites. Gary advises, “We need to debunk the myths of what has been perpetuated about Black people. Our brains are smaller. We can't learn. All of those kinds of things” (Grant, interview, February 17, 2016). Instead of always describing the African American community as being inferior, Gary stresses the importance of reporting and conducting studies, which will lead to “proof that young people who sometimes may not even have had the same opportunity can overcome” (Grant, interview, February 17, 2016). He goes on to share a story of a Tillery community member who brought her three sons and a daughter to a recent meeting of the CCT this past February for Black History Month. Out of these four Tillery youth, one has now obtained a PhD and all four are college graduates. He notes, “The basic thing is, if I'm given the same opportunity, then I can achieve. If I'm not given the opportunity, then I won't be able to achieve.” He believes studies need to stop reporting that African American students “are nothing” and “never will be anything but nothing.” African American youth and the rest of America
need to hear stories that say, "You are somebody and you can be whatever you want to be" (Grant, interview, February 17, 2016).

In addition to scientific studies treating and describing the African American community as being inferior, scientific studies have historically benefited only communities who already have privilege and power. Steve notes:

When science only serves the interests of those with power, colonialism is perpetuated. What is needed are scientists and project leaders who are willing to challenge that status quo and lead science projects that do not serve the interests of one group over another. (Wing, interview, January 5, 2016)

Not only do many scientific studies have no benefit for the African American community, but these studies also have the potential to bring the community harm. Gary notes:

Studies that have been done either on us, or supposedly for us, always lost us somewhere in the process. There are groups within the community, or churches, that would be happy, ‘oh, we've got this White woman coming from Clemson (referring to the researcher of this study), let's do it. Never knowing that what she could produce could actually do us more harm than good. (Grant, interview, February 17, 2016)

Gary recognized the potential harm even this current study could bring to his community, noting during the interview he will “need to see this before it is published.” Gary is well accustomed to the potential that a researcher, acting friendly and nice, can leave and write detrimental things about the community.
Gary notes, at times, researchers have approached his community wanting to do a study on or about the community rather than for the community. He comments if a study has no real solutions the community can use, then the study is not for the community, regardless of what a researcher may claim. Gary recalls a researcher who recently approached him about a study to look at the pollution in community members’ wells. He notes, “Well, the first thing is, we don't want to go out and find something in somebody's well that we're not going to be able to help them correct” (Grant, interview, February 17, 2016). Without working towards a solution, the study is on the community and may produce more harm than good. Gary recalls a time during an earlier research project in which researchers tried to end the study with “a report that you have 90% diabetes, 98% hypertension, da-da-da.” He recalls researchers handed the community the report and said, “Here's your report, and we're going back to UNC and Duke.” His reply was, “Oh, no you're not! You can't do that.” He advises:

If we can't help with solutions, people have enough problems and worries to start out with. Let's don't come in and get them all riled up over something that they cannot do anything about. Someone would say, ‘Well, you're still killing them.’

Right. You may be still killing them, but they didn't have the extra stress of knowing it, and not being able to do anything about it. (Grant, interview, February 17, 2016)

Gary challenges other would be researchers to critically examine who their research is really for. If a study only reports problems existing within the African American community, in his view, the study is not for the community. The researcher
leaves with the necessary data to obtain publications, but the community is worse off than when the researcher came. This type of interaction with researchers coming, taking what they need from the community, and then leaving has left Gary and other Tillery community members skeptical of researchers entering their community. The author of this study includes an analytic memo from the analysis of this data:

_up until now, I have not considered how this research study will benefit Tillery. I’m so busy trying to collect data and meet one deadline after the next. I have not considered Gary and Tillery community members. They are taking the time to meet with me and share their story with me. I will have a dissertation in the end. What will I bring back to Tillery?_ (Analytic memo, June 12, 2016)

**Finding: Inequalities in the past and present have created mistrust.** Past and present inequalities leave a mark on the African American community and create a barrier to potential collaborations between research institutions and these exploited communities. During the researcher’s visit to Tillery, she had the privilege of watching a portion of Tillery’s documentary film, which plays on a small television screen in Tillery’s History House—a former Resettlement home displaying photographs, oral, and visual histories collected by the CCT. As Gary and the researcher listened to a community member recall her history of growing up in Tillery, Gary pointed out the fact the community member never looked the camera in the eye. Gary explained she did not look the camera in the eye because a White man was filming. He explained, “She doesn’t quite trust him” (Participant Observation). With Gary’s words still echoing in the researcher’s ear, the community member could be heard saying, “I come up in fear
because I thought my mom and dad would get hurt.” She shook her head slowly from side to side and sighed.

Both Steve and Gary recall the community of Tillery had an initial mistrust for Steve. Gary notes when he first met Steve “walls went up” because Steve was a researcher, and Gary recalls Steve had to “dismantle” those walls before they could work together (Grant, interview, February 17, 2016). Gary also reports when Steve first started coming to Tillery’s community meetings, the members were very suspicious of him because he was a White researcher from a powerful institution. He tells the story of when Steve first came to a meeting of the Open Minded Seniors (OMS), a group of “concerned, elderly, retired, and dedicated citizens of Tillery” who meet weekly to “organize a variety of educational and empowerment activities” (CCT website). The purpose of the meeting with Steve was to let the community members meet Steve and to share with him what they had already done towards fighting against the CFAO policy, which had been created in Halifax County. Gary recalls during this initial meeting Steve sat at a table, which put him approximately ten feet from a door opening to the outside of the building. The meeting seemed to be going well, and Steve seemed to be “thoroughly enjoying it.” Steve spoke with the community members about how a research partnership could assist them in their fight against industrial hog operations. Gary notes of Steve’s speech, “The applause was not thunderous. It was a nice applause, but it was not thunderous” (Grant, interview, February 17, 2016). Gary waited until the next Tuesday’s meeting in which Steve was not present, and community members discussed how the meeting went. He found Tillery community members were suspicious of Steve. One community member
said, "Why was he backing up toward the door the whole time he was talking to us?"

Gary protested, "He wasn't backing up." The community member retorted, "Yes, he was too. By the time he finished, he could have reached the door and walked on out of here."

Another community member chimed in, "And who does he think he is. We're down here talking about hogs and pigs, and he wants to talk about swine." Gary said, “Well, isn't swine pigs?” The community member said, "Yeah, they're pigs, but we were saying pigs. How come he couldn't say pigs?" Gary explains the community’s initial response to Steve was one of suspicion and mistrust because of their past experiences with researchers (Grant, interview, February 17, 2016).

Tillery community members are accustomed to people with privilege believing and treating them as if they are inferior, and their knowledge or way of talking about things is not the proper way to do it. Past experiences made them untrusting of Steve’s intentions (Grant, interview, February 17, 2016). Steve recounts similar experiences of mistrust when he first entered the community of Tillery. During the first few years of the partnership with Tillery, he and fellow researchers would start out community meetings with a skit, which they would “use as a basis for initiating discussions about environmental injustice.” In the skit, Steve played the part of Dr. Privy. He recounts,

Dr. Privy was arrogant and disrespectful and was trying to convince the community that something that he was responsible for bringing was going to be great for them, and was going to give them jobs, and economic development, and that they should welcome him to the community. (Wing, interview, October 14, 2015)
The other characters in the skit were community members who would question Dr. Privy on if the economic development would actually benefit the community. They would ask questions such as, “Well, how much are these jobs going to pay? and “Will there be any pollution?” The conclusion of the skit was always a realization that the “jobs would be minimum wage, the pollutants were going to be there, but it was all approved by the authorities… things like that.” Steve notes an important lesson he learned through these skits:

In a number of these meetings, community members thought that I really was Dr. Privy. They were so ready to believe that this arrogant, White guy was going to come in and try to pull the wool over their eyes. It just fit right into their whole template of what to expect. (Wing, interview, October 14, 2015)

Steve goes on to explain sometimes Gary and other community organizers had to step in when community members became upset with Steve and say, “Wait a minute, this isn’t real.” These experiences revealed to Steve just how community members viewed him and other researchers—as potential exploiters. Years later, Steve is able to say he has many close friendships with community members, but the existent mistrust had to be overcome before this could happen.

Steve recalls another example of Tillery’s initial mistrust of his White privilege. One time, Steve and a community organizer went to visit a Tillery family, who had agreed to participate in the PPSR study. As they stepped out of the car to approach the home, the community organizer said, “Oh look, people are closing their shades because there’s a White person approaching their home” (Wing, interview, October 14, 2015).
Steve explains part of the mistrust was because he is White and thus has privilege the community members have been denied. He also notes a Black researcher may have experienced the same thing if he or she were to drive up in a state car (which Steve did not drive because of “the meaning of that”). He explains a state car, with state plates on it would also communicate privilege and evoke mistrust from community members. Even the language and privilege of researchers can be enough reason for a community member to mistrust researchers and see them as “potential representative of White-power” (Wing, interview, October 14, 2015).

Mistrust for powerful institutions can result in community members fearing the outcome of their participation in a scientific or other research study. Gary notes he had difficulty getting some of the community members to participate in the study and protests against the hog industry, which followed the study because community members feared they would be penalized for their participation. He recalls many of the community members were afraid to participate because they rely on social security, and they feared the government would take away their social security if they chose to stand up and protest other decisions made by the government. He says:

They had a right to worry about that because of things that had happened in the past. You become too vocal… well, you can get it back, but you're going to have to go through a process, and you're going to be without your money for a little while. Being able to get them to understand… nobody can take your social security away… they became way more vocal than they normally would have. (Grant, interview, February 17, 2016)
Steve also recalls witnessing the hesitancy of community members to participate in the study due to fear of reprisal. He recalls a Tillery community member telling him if he wanted to do the study in her neighborhood, he better do it in one day. She insisted they (the government) would not let him come back. He paraphrases her warning, “The sheriff’s department is in with the hog operations; they protect them. If you break down on the road, don’t call the sheriff’s department” (Siesinger Lecture, 2011). This Tillery community member went on to warn Steve she carries a pistol in her pick-up truck because a friend of hers was murdered after resisting the hog industry. Other Tillery community members share her fears.

Steve recalls, “In some areas, community members have been fearful of participating in research because of the influence of the hog industry in local affairs” (Wing, Commentary, 2002, p. 443). In many Eastern North Carolinian counties, the pork industry is a “major employer and has political influence through county commissions, boards of health, sheriff’s departments, and other public institutions.” Additionally, community members may “rent homes or land from owners or operators, and fear reprisal if they participate in research into the health effects of the industry” (Wing et al., 2008, p. 1395). Another Tillery community member, who lives in close proximity to a spray field, told Steve and Gary he worried about the impact of the pollution on his young children, but he could not participate in the study “for fear of losing his job” (Wing et al., 2008, p. 1395). Several community members who have publicly opposed the industry told Steve they have been followed and threatened, and they now carry weapons for their own protection (Wing, Commentary, 2002, p. 443).
Gary notes even if community members have not experienced discriminatory practices themselves, then “they have grown up hearing stories about it from their parents and grandparents” (Grant, interview, February 17, 2016). He believes stories about institutional racism or experiences as subtle as walking into those institutions and noticing that very few other African Americans work there can communicate to African Americans they do not belong there. He notes, “It speaks to them (African Americans) when they go into offices and governmental agencies. Now we wouldn't say that there's no one that looks like them, but there are very few who look like them” (Grant, interview, February 17, 2016). Likewise, Steve remarks because institutional practices or scientific studies are typically conducted to serve the interests of those who already have privilege and power, “It communicates that certain people’s interests are deemed more important than their own. It creates a mistrust for the institution of science and it creates a mistrust for researchers associated with the institution of science” (Wing, interview, January 5, 2016).

**Theme 2: Overcoming Barriers of Inequality and Mistrust**

This study revealed before any research partnership could be established, PPSR project leaders needed to confront the barriers of inequality and mistrust. For a community such as Tillery, which has and continues to have painful experiences of inequality, researchers must convey great respect for the community’s culture, traditions, and knowledge; acknowledge inequality and abuse; and form long-term trust building relationships to overcome the mistrust inequality creates.
Finding: PPSR project leaders can confront the barrier of inequality by having an open dialogue with community members about the abuse and alienation they have faced. The community of Tillery has long been, and continues to be alienated from the larger system, which science represents. Gary and Steve recommend a first step to overcoming the barriers of inequality and mistrust is to listen and talk with community members about experiences of exploitation they have and are facing. Steve notes:

The more experience I have in the field the less I talk. I partner with community organizations… organizations who better know what is going on and what communities are experiencing, and I let leaders of these organizations talk and share their own experiences and frustrations and empathize with the community. I do more sitting back and listening these days. (Wing, interview, October 14, 2015)

The community of Tillery knows what they have experienced and are experiencing is part of who they are, and they recognize the importance of acknowledging this history—even if it is full of painful stories. A community member notes, “If you don’t know your history, you lost anyway” (Tillery Documentary, 2007). The community of Tillery strongly believes “knowledge about yourself and a feeling about yourself are vital (Tillery Documentary, 2007). This knowledge has lead Tillery to document and commemorate their history, even though it is a history full of exploitation. In Tillery, community members “welcome opportunities for change and a consciousness of ourselves, where prejudice, brutality, and the killing of Black males by police are no longer acceptable and inevitable treatment” (CCT website). If a PPSR project leader
enters the community and does not want to hear about the Tillery’s history and experiences, this will be a barrier to a true partnership forming.

Gary believes a conversation about racial discrimination is a precursor to any kind of research partnership forming. He notes, “Science has been used, not for communities, and in fact against Black communities, a lot…getting past the racial piece is the first thing that has to be done…They're (White people) using it (science) for their benefit and not ours” (Grant, interview, February 17, 2016). If a project leader cannot admit this point or empathize with the community of Tillery, it is unlikely they will be able to work together. In fact, there have been researchers who desired to work with the community of Tillery, but the research partnership failed because the researcher did not want to have an open dialogue with the community about the racial discrimination Tillery and other African American communities are facing.

Gary shared a specific situation, which occurred recently with a White researcher who wanted to work with the community of Tillery. The researcher was upset Gary was concerned about the institutional racism taking place within a particular situation. The man wrote Gary and said, “You are keeping us from being able to come together, because in your press release, you make this a racial issue” (Grant, interview, February 17, 2016). Gary had recently written a press release about the issue of the government taking lands from Black farmers because they could not pay their entire mortgages. Gary had made reference to the fact White men in Oregon had taken over the federal lands for four weeks, owed the government almost one million dollars, and had not lost any land. Gary pointed out at the same time a Black man near Tillery, who only owed a hundred
thousand dollars, was being escorted off his property by armed federal marshals. The community of Tillery views this as an example of institutional racism. Gary tried talking with the researcher but “couldn't get him to understand it” (Grant, interview, February 17, 2016). The researcher’s unwillingness to empathize with the experiences of Tillery resulted in Gary saying, “Okay, we aren't going to make any headway there. We thank you very much, we will keep you posted. Let's just move on” (Grant, interview, February 17, 2016). An unwillingness to acknowledge the community’s perspectives and hurt was a barrier to the formation of a research partnership. Gary advises, “It's the reality of what we live with every day…If you don't stop long enough to realize that ... You're not going to get very far” (Grant, interview, February 17, 2016). Likewise, Steve notes being unaware of racial inequalities and realities the community is facing makes the researcher look “aloof” and “does not promote trust” (Wing, interview, October 14, 2015).

Gary notes one important characteristic of Steve, which allowed the two to form a partnership—Steve’s willingness to have frank and honest conversations about uncomfortable topics. The community of Tillery has no question about why the hog industry was brought to their community. In their own words, “Why have hogs and other hazardous pollutants come into communities? Because there are Blacks and Latinos and Native Americans living in these communities” (CCT website). Steve was willing to talk about these issues. Gary notes, “People are still skittish on both sides about talking about it (racism). That's why it continues to be an issue, because no one wants to talk about it” (Grant, interview, February 17, 2016). He recalls people often get offended and shut down when racism is mentioned, but that was not the case with Steve. He remembers
back to early Hog Round Table meetings he had with Steve, and recalls, “Just listening to him (Steve)… he was very frank. He didn't get offended when I was frank” (Grant, interview, February 17, 2016). At one of the early meetings with Tillery community members, he remembers being in the meeting for 45 minutes discussing an issue and no one had yet said racist, or racism, yet they had “danced all around the subject” and “were saying it without saying it” (Grant, interview, February 17, 2016). Gary recalls:

Finally, I said to them, ‘Look, this is Steve, and he's here. Yeah, he's White. But he's been dealing with me for… whatever number of times it was.’ I said, ‘So he's quite accustomed to hearing the word racist… racism. I can say to you, he's not a racist, but he also understands that there are actions… there are racist actions and there are people who are racist, who try to prevent you from being able to …’ It was like a sigh of relief went over the room. (Grant, interview, February 17, 2016)

Gary acknowledges from that point on “we had an honest dialogue.” He advises, “If you're going to dance around it and not feel comfortable, then you don't make any headway” (Grant, interview, February 17, 2016). Likewise, Steve notes, “Talking about these issues (of racism), I think can only help” (Wing, interview, October 14, 2015).

Gary advises PPSR project leaders do not need to raise the issue of racism (or other painful histories) with the community. Instead he recommends, “You need to make that person comfortable enough to be able to raise it with you, who then can, and will, raise it with the community in the dialogue… discussion” (Grant, interview, February 17, 2016). Gary reflects in the past there have been discussions on race, but people like to
talk about it without including members of the African American community in those conversations. He says:

> See, America, we laugh in our community about… there was this dialogue on race during the Clinton years. I asked the seniors who are 80, 90 years old, how many of you were in on that conversation? They go, ‘No!’ We haven't had a dialogue on race, and until we do, it's not going to go anywhere. (Grant, interview, February 17, 2016)

Tillery community members describe racism as a “sickness that plagues all of White America” (CCT website). Gary believes issues of racism and a project leader’s acknowledgment and willingness to talk about racism will all “have an impact on how people are going to perceive and relate” to a PPSR project (Grant, interview, February 17, 2016). Gary attributes the successful research partnership with Steve to this fact:

> He understood that we had been a mistreated people. He wanted to produce what would be beneficial to the community as well as his being able to produce the papers that he needed in order to continue his career. We talked very openly and frankly about that. (Grant, interview, February 17, 2016)

Gary notes researchers need to be willing to “understand” what community members have been “been subjected to.” If they can acknowledge it “then we can have that discussion and then we'll be able to move on.” Gary advises talking openly will require thick skin. You will hear things, which may make you uncomfortable. He notes:

> I would say very much so for trust to be built, that discussion (on racism) is necessary. You have to have it. It does not have to be the first discussion, but at
some point it really has got to happen. You've got to be prepared for what you hear. You have to develop some thick skin. I have students that will tell me all the time, ‘You just say, y’all (referring to all White people as racist)... I'm not like that.’ Well, then you have to remove yourself from that, like I have to remove myself from it when they say niggers. I don't consider myself a nigger. You certainly aren't talking about me. Then, I can go on and prove to you that I don't fit that description. Now, you've proved that you don't fit it (racist), and everything's all right. (Grant, interview, February 17, 2016)

Gary also notes the need for researchers to be sensitive while having conversations about racism and inequality. Too many times those with privilege—who do not live in a reality of exclusion—will nod and say, “Oh, I’m sorry that happened, but let’s move on now” (Grant, interview, February 17, 2016). Gary says this is “anything but sensitive” and the community is “not fooled” by false pretenses of caring. If a person honestly cares, then that person will advocate for the underrepresented community. Gary says, “You will continue to be in denial, and I will continue to experience it (racism).” He stresses the importance of “listening to what the community has to say” and that people should “stop trying to tell me that I ought to forget 400 years of slavery... how many years of Jim Crow, and a presidential candidate out there now using code words to tell you that we're going to put them back in their place” (Grant, interview, February 17, 2016). Gary continues:

If we just admit it exists; the racism is institutionalized. But some White people don’t want to hear it. Until we can open our minds to hear it, and then not only
hear it, but say, okay, I may not be able to bring about the institutional change, but I can bring about the change within me. (Grant, interview, February 17, 2016)

In Gary’s experience, “unless you're willing to be honest and open, and take your criticism just as the community has to be open and be accepting of its criticism,” then researchers are “always going to have trouble” (Grant, interview, February 17, 2016). He recognizes many institutions will come in with a project that “doesn't have time” for such conversations but the community will “always have time for that.” He stresses the need to “understand that everybody doesn't see it in your light.” PPSR project leaders have not walked in the shoes of the community member. Gary questions, “You want an accurate study? You want to really get the community involved? Then you've got to stop and have those conversations.” He warns the “institutionalization of racism” tells project leaders “to get in there and get the data and come on back out,” but if project leaders really want a partnership and to get the community involved, then they need to make time for those conversations (Grant, interview, February 17, 2016).

The community of Tillery has, for many years, experienced environmental groups approaching their community offering to help, but then in reality Tillery has found these groups only want to serve their own agenda. Tillery has become “disillusioned by the refusal of the ‘environmental community’ and those affiliated with it to recognize environmental racism and environmental injustice issues” (CCT website). Tillery believes the “obvious absence of adequate representation of communities of color, as well as no mention of justice issues in mission statements” (CCT website) is evidence of their concerns. They are frustrated when groups want to distance themselves from any
issues other than their specific environmental concerns. In their own words, “CCT will not to be a part of any present or newly forming coalitions that refuses to address issues of justice” (CCT website).

Steve also recognizes the importance of acknowledging the painful experiences of the underrepresented communities. After an initial study was complete, which confirmed the hog farms were being disproportionately placed in low-income communities of color in eastern North Carolina, Steve and Gary started subsequent studies by displaying official data showing the disproportionate location of industrial hog operations in low-income communities of color in eastern North Carolina (Wing et al., 2008). Before getting to the health questions of the study Steve started with conversations on the topic of institutional racism. He says:

I do think it's really important to acknowledge that our institutions still benefit from that relationship (colonialism) now. It's not just in the past. One of the ways that I've often opened the discussion of science in communities is to put, right up front, most scientific research is conducted for clients in industry and government, or industry trade associations that are non-profits, or even foundations that are connected to philanthropists whose money comes from industry, or for government agencies which are closely tied and work very closely with industries; whether it's drug companies, or oil companies, or whatever. I start out by talking about that. (Wing, interview, October 14, 2015)
Steve has found these honest conversations are vital, even if a project leader’s hands are tied, and there is little he or she can do to change such practices. Steve calls for a true compassion for the oppression many underrepresented communities are facing. He says:

Underlying opposition to discriminatory practices and a science that promotes democratic values are vital to true empathy. A project leader can empathize with an underrepresented community all day long, but it takes true compassion and caring about discriminatory practices, even if they aren’t affecting you or those closest to you. (Wing, interview, January 5, 2016)

**Finding: PPSR project leaders can confront the barrier of inequality by conveying respect to the community.** Another way PPSR project leaders can confront the barrier of inequality and resultant mistrust is by conveying great respect to the community. Institutions with power have long treated the African American community as if they are less than Whites, and the community has continually felt disrespected. Thus, in order to overcome this barrier to belonging, PPSR project leaders need to convey great honor and respect for the community. To convey respect project leaders can value the community’s culture and perspectives on knowledge and be extra sensitive and attentive to the manner in which they approach and address community members throughout the project.

Steve emphasizes the importance of respecting a community in the way a researcher enters the community. He comments when he first enters the community, he does not “take a possie” with him. He goes alone “because of the message that can send to the community” (Wing, interview, October 14, 2015). He also does not introduce
himself as professor or Dr. Steve Wing. He rather introduces himself as Steve. If the community member insists on giving him an honorary title, then he also confers them an honorary title to “show the same respect back to them and reinforce that it’s not that I’m on one level and they are on another level” (Wing, interview, October 14, 2015). Steve notes he is also “careful about how” he talks. He “avoids the use of jargon.” He recommends fellow PPSR project leaders “spend some serious time thinking through what jargon you would typically use” to talk about the topics you plan to discuss with a community and then “reword that into common terms before you go in and talk” (Wing, interview, October 14, 2015). He does this because he recognizes not only will communication be impeded because community members likely have not been exposed to the jargon but also because jargon “makes them feel as if I believe they are lesser because I have this knowledge and they don’t” (Wing, interview, October 14, 2015). Gary also advises project leaders to pay close attention to the way a community talks about a topic, warning the researcher to “be cognizant of your language.” He says, “if the researcher is coming with a major piece, and is so highfalutin, and speaking in a language that we can't understand….the researcher won’t get very far” (Grant, interview, February 17, 2016).

Steve cautions against project leaders becoming arrogant about their knowledge. He recognizes “all academics, whether they're scientists or in the humanities or whatever, are trained to talk with each other in ways that nobody else can understand” (Wing, interview, October 14, 2015). He reflects on the purpose of subject specific jargon:
That's the way our professions keep other people out, but also it's useful because we need specific terminology. It has a function, it's important, but it also has side effects that are detrimental. I had to be trained to recognize my language and how that would be a put-off to community people, and not just language that's terminology, but body language, and non-verbal stuff too. (Wing, interview, October 14, 2015)

One specific example Steve recalls was his use of the word 'swine’. He recalls when he first began attending community meetings, he would talk about industrial swine operations, or the swine facilities. After being advised by Gary, "People around here don't use 'swine,' that's not the way they talk," he began to use the traditional term that was used on Tillery family farms, which is "hog parlors." He notes changing the term “didn't detract from anything” (Wing, interview, October 14, 2015). Community members knew what he meant when he said pig, but by switching to the local term, he was able to convey a respect for Tillery’s language and way of talking about an issue.

With these lessons fresh in her mind, the researcher of this study relied upon the wisdom of Gary when selecting words to be used in this study. For example, she noticed Gary used the term African Americans and the term Black to describe his community. She had read elsewhere, however, that some consider the term African American to be patronizing and condescending because the term suggests Black Americans are half American. In an effort to show respect to this specific community, she asked Gary what term he would prefer she use in this study. Gary’s response was:
Isn’t it interesting that AA people find the term African American offensive when the Irish do not find Irish American or German American or other nationalities offensive? At any rate, I use the terms interchangeably. I do capitalize Black so that it is equal to African American. Once again, Black people have and are still trying to satisfy a culture that will never be accepting of them no matter what they call themselves or what others determine they should be called. So use them both or either and I am fine. (Gary Grant, email, March 25, 2017)

Another way respect can be conveyed to the community is by being very attentive to who is talking and whose knowledge is valued. If the researcher is the only one speaking and the one whose knowledge is viewed as valuable, then this does not convey respect for the knowledge of the community. In the PPSR project between UNC and the community of Tillery, the knowledge of community members such as Gary was greatly valued. One way Steve showed how highly he valued the community’s knowledge was by creating a class at UNC on environmental justice and enlisting Gary’s help to teach it. Together he and Gary “educate young people who are either getting their masters or their PhDs.” Gary reflects on these classes and notes, “They (students) have a different perspective than they would have had, had not the class been established” (Grant, interview, February 17, 2016). Gary and Steve also partnered to form the North Carolina Environmental Justice Network. Within this PPSR partnership Tillery and UNC researchers came together and used each of their unique perspectives on knowledge to work for positive social change.
Another way to convey respect to the community is by showing respect and when appropriate participating in the cultural traditions of the community. Part of respecting a community’s culture is being aware of cultural traditions. For example, the community of Tillery carries on the tradition of an old African Proverb to teach “respect, admiration, and love for the elders,” and before any community meeting begins, they ask permission from the oldest member of the community to begin the meeting (CCT Anniversary Book, p. 1). Knowing this community tradition provides the researcher a way to convey respect to the community.

The community of Tillery has a strong cultural heritage, and they are very proud and eager to talk about it. During the participant observation of this study, the researcher found community members were eager to talk about their recent Kawanzaa celebration. On the guided tour of CCT’s community building Gary asked the researcher if she knew what Kawana was. When she replied, “Yes,” he smiled and proudly displayed pictures of Tillery’s recent Kawanzaa celebration, which the CCT had sponsored the night before. The short conversation the researcher had with Gary about the beautiful Kawanzaa meal and celebration was not only enlightening but also assisted the researcher later that day when she met a new community member and was able to discuss with her the previous night’s events. The researcher was able to show respect for a community tradition by taking the time to learn more about it (Participant Observation).

The findings of this study demonstrate Steve honored the cultural traditions of Tillery. One example of this was found in the program for the Documentary Film We Shall Not Be Moved, A History of the Resettlement Community. The film, which tells the
story of Tillery’s New Deal Resettlement from slavery to the present debuted in September 2007. The program printed from the event includes a congratulatory message Steve wrote to the community upon the dedication of their historic marker for the Tillery Resettlement. Steve’s message to the community is pictured below in Figure 5.7. This letter indicates not only was Steve present for this special day in the community, but he was proud to be a part of their celebration.

Figure 5.7. Message to Tillery. This figure shows Steve’s Message to Tillery on the Debut of their Documentary Film (Documentary Premiere, 2007, p. 4)

Project leaders can also convey respect to the community by the manner in which they approach the community. Gary and Steve advise taking care to avoid any notion of the university being in the community to help the community. This approach often conveys to the community researchers believe themselves to be better than the community. Gary recalls he “connected immediately” with Steve because he “liked the way Steve presented himself.” Gary continues, “He didn't come in with a shirt and necktie” and he “never made us feel beneath, or that he was superior because he had a PhD…He wasn’t like I'm Dr. Steve Wing of the UNC Chapel Hill School of Health…he was just Steve Wing.” Laughing, Gary recalls sometimes he even had to tell Steve "Okay, we're going to this place this time, and you need to put on a tie" (Wing, interview, October 14, 2015).
Gary believes researchers can show respect to the community by being sensitive about the language they use. He notes, “Don't come in saying ‘I'm here to help you’” (Grant, interview, February 17, 2016). Presentation of project activities is vital and project leaders should avoid anything that could come across as being “uppity.” Gary notes:

There's just so many pieces that play into that. I could have been a PhD candidate if I had had the opportunity to go to school… is what they (community members) are sitting there thinking. I wanted to be a teacher, but I didn't have any way to go to school. My parents were sharecroppers. My mother was on welfare… she was a single parent. We've been made to feel less than all of our lives. (Grant, interview, February 17, 2016)

Gary stresses the importance of thinking through actions, words, and even mannerisms, to avoid conveying the message “you are somehow smarter or where you are because you are better than members of our community” (Grant, interview, February 17, 2016). He challenges researchers to recognize many community members are not researchers themselves because they did not have the same privilege and opportunities the researcher had.

Even if a researcher avoids saying things such as “I’m here to help you,” certain actions may communicate the same sentiment. For example, when the researcher enters the community with all project parameters already decided on, this conveys the same message. Gary proposes, “Why don't we say that we can help each other? What are your objectives, then you listen to what our objectives are, and then let's see how we can put
them together” (Grant, interview, February 17, 2016). When the researcher comes in thinking “he should sit at the head of the table,” this conveys a message of “we are dealing with these poor people who just don’t know anything” and “they wouldn’t be in this condition if they knew something, so let me go teach them.” Gary laughs, shakes his head and remarks, “How are you not aware of what you’re doing and how you’re presenting yourself?” (Grant, interview, February 17, 2016).

A Tillery community member, in a speech entitled Growing up a CCT Youth, delivered at Tillery’s Family Community Day in March 2014, notes “He (Gary) has incorporated our lives with universities…encouraging the involvement of scholars and professors to become part of our health projects…expanding our political knowledge and social events. And boy has CCT done a marvelous job of teaching them” (CCT Anniversary Book, p. 96). The research projects in Tillery are not university projects helping a poor community who cannot do things for themselves. The research projects in Tillery are projects in which university researchers are welcomed to join the community on initiatives and goals Tillery is already working towards completing.

Throughout the analysis of materials published by and for the community of Tillery, it is clear Tillery is an empowered community who takes ownership of their own projects, many of which university researchers take part in. In the credits to the documentary film of Tillery, the producer of the film is listed as “CCT” (Documentary Book, p. 2). Project materials clearly communicate the documentary was not a production of Duke University. The documentary was the community’s film because it was their story. In the vision statement of CCT, the community of Tillery notes, “We build on our
natural historic and cultural resources to promote economic independence, a healthy and environmentally sound life, the development heritage and agricultural tourism that honors and celebrates the spirit and fortitude of Tillery and an enhanced quality of life through our own outside participation in conferences, retreats, seminars and other educational activities” (CCT Anniversary Book, p. 7). A slogan the community of Tillery proudly displays is “WE MAKE THE DIFFERENCE” (CCT news, 2015).

The manner in which project activities are conducted serves as another way for PPSR project leaders to convey respect to the community. If community members are treated as if they are another generic community the researcher is gracing with his or her benevolence, this does not communicate respect. Community members, with a history of being treated as if they are objects and less than privileged members of society, will be sensitive to aspects of a project, which treat them as if they inferior. As part of the document analysis for this study, the researcher discovered a prior interview, in which Gary and another African American social justice leader were interviewed by New Solutions—a peer reviewed publication of environmental and occupational health policy. In this interview Gary’s friend tells a story of a specific instance in which their community felt disrespected by “aid” they were receiving. Gary and the researcher of this study discussed the story, which he remembers well. After Hurricane Floyd hit Eastern North Carolina (FEMA), the Federal Emergency Management Agency, sent aid to the community of Tillery and other communities devastated by the hurricane. The researcher of this study specifically reminded Gary of how he had described this aid during his interview with New Solutions. In this interview he said: "One of the most horrific scenes
that haunts me today is how the liberal well-to-doers sent truckloads of clothing to the site, and they were just dumped into a pile. There was no kind of process to it. It was like people were scavengers” (Slatin & Scammell, 2014, p. 218). He and his fellow community organizer stepped in and made sure the donations were neatly organized so that “people could feel human when they came to get the stuff, and not be made to feel like they weren't worth anything, and they had no value at all” (Slatin & Scammell, 2014, p. 218). The researcher of this study asked Gary how PPSR projects can avoid such a situation and the message it communicated to the very people the aid was intended to support. Gary replied:

You have to come in as an honest person. That would be one thing. Again, we get back to being a victim or the survivor of the society in which you have grown up in. The particular story there is the fact that White people eased their conscience because they gave all this clothing. They never asked one time, how are they being delivered… what's going to happen to them, or anything like that. That's my goodwill. We've got to find a way for you to question your goodwill. That would be the best way. Question your goodwill to ensure that, from beginning to end, there is ultimate respect each step of the way. (Grant, interview, February 17, 2016)

Throughout the document analysis, it became clear when Tillery embraced a program, (whether it was university or governmental), they always noted how that project treated the people of Tillery with great respect during project activities. For example, the community recalls a time when they traveled to the International Healthier Communities
Summit. During this healthcare summit, the community of Tillery received an award and the people at the summit “treated the people of Tillery like royalty” (CCT Anniversary Book, p. 27). The major point of this finding is PPSR project leaders should not only avoid conveying a message of disrespect to community members but should take care to convey respect. Figure 5.8 provides a specific instance in which the respect conveyed during project activities was greatly appreciated and noticed by a Tillery community member. In 2007, Tillery held monthly clinics which “debuted a telemedicine link that connected patients in Tillery to doctors at East Carolina University” through a partnership with Tillery and the Area Wide Health Committee (AWHC) (CCT Anniversary Book, p.29). The letter, pictured in Figure 5.8, is from a Tillery community member who was a patient at this clinic.
Figure 5.8. Letter from Tillery Community Member. This figure demonstrates a community member’s feelings regarding her experience at a health clinic (CCT Anniversary Book, p.28).
In this letter, the Tillery community member attributes her feeling welcome in this program to the fact she was “treated like a person and not a number” (CCT Anniversary Book, p.28). Also noteworthy is her comments on how the government of the United States (a powerful institution) has made her feel—“like a fishing net only to be dragged back in at election time.” In contrast, the way she was treated at this clinic made her feel that “she counts” as a citizen (CCT Anniversary Book, p.28).

A professor of African and African American Studies at Harvard University, who worked as an intern in Tillery during her years as a student, spoke at Tillery’s Community Day in March 2014. She says one of the biggest lessons she learned from the community of Tillery is “all people matter… Black, White, yellow, purple. People matter. Rich, poor, educated, un-educated…people matter” (Tillery Anniversary Book, p.103). If the goal of the university researcher is to work with the community and empower them, then this can be done by showing them respect and demonstrating through actions that they matter. As a community member notes, “The way to empower people is through education and nurturing. Let people know you are somebody and you can make something happen” (Tillery Documentary, 2007). Project leaders should find every way to actively demonstrate to community members they are respected and valued as people.

Finding: PPSR project leaders can confront the barrier of mistrust by entering the community through someone the community already trusts. The mistrust created by inequalities is a barrier, which cannot be ignored. This study found project leaders can confront the barrier of mistrust by entering the community through
someone who has the community’s trust. Gary recommends if a project leader is “truly looking to do real research and be inclusive of the community, the researcher needs to find someone in the community to connect with” (Grant, interview, February 17, 2016). In the past, Tillery community members have told Gary of instances in which a White researcher from a prominent university came by their house and started asking them questions. When Gary inquired as to what information the community member gave the researcher, the community member replied, "Well, I told him something, but no, I ain't telling him everything about me." Gary notes, “The distrust is just there, because you have not entered the community the right way.” He stresses the importance of entering the community the “right way” by “making connections with someone, or a group, that will be able to say to the community, "This person's okay. We can work with this person." He firmly believes that if your project or institution doesn’t “have time to do that” then you “won’t get real results” (Grant, interview, February 17, 2016).

Steve recalls he entered the community of Tillery by connecting with Gary. From this initial connection he began to regularly attend community meetings in different locations; a lot of them in churches, some of them in other kinds of community spaces. Steve recalls:

It started very quickly, in a way. I attended some meetings in Tillery and met the lead organizers there. Then, I actually, right away, met members of other communities that they worked with on this problem, and other problems including denial of access to public services, like sewer and water. (Wing, interview, October 14, 2015)
Entering the community through a community-based organization became “particularly important in the recruitment of study participants” (Wing et al., 2008, 1395). Steve and Gary decided it was best to introduce the study to community members through the community-based organization of CCT. CCT went (without Steve) to homes to discuss the study, bringing along brochures and information describing the project. If a person expressed interest in participating, the CCT then set up a meeting with Steve, who went with a representative of CCT to the community member’s home and discussed the project in more detail (Wing et al., 2006).

During the participant observation of this study, the researcher witnessed first hand the importance of entering the community through someone the community already trusts. After the researcher’s visit in Tillery, great conversation with Gary, and tour of the community history house and health clinic, the researcher waved goodbye to Gary and headed home. With no signal on her cell phone and without GPS, she soon realized she needed to stop and ask for directions. Still in Tillery, the researcher noticed what appeared to be a small, local grocery store. As she approached the entrance, she noticed four Tillery community members sitting in the store playing a game of cards. The researcher immediately felt a wave of suspicion as she entered the store. The game of cards went noticeably silent and eyebrows raised as she made her way to the fridge to grab a cold can of soda. The researcher politely said hello and asked how the community members were doing, but did not get much of a response back from them. Below is an analytic memo written shortly after the researcher’s visit:
As I entered the store, I felt a wave of suspicion. The Tillery community members were notably silent as they watched me. I remember feeling defensive. I didn’t do anything wrong. Why do they seem to be so skeptical of me? Then I remembered my conversation with Gary. How quick I am to forget. They have every right to be suspicious. I am not the first white researcher to pass through their store. They have a template of what to expect. The burden is on me to demonstrate that I do not fit that template. (Analytic memo, February 17, 2016)

Feeling awkward, the researcher mentioned she was in town visiting Gary and told them he was helping her out with a project for school. At the mention of Gary’s name, there was an immediate change in the community members’ demeanor. Their faces lit up, and the researcher felt the tension in the room subside. With a big, warm smile, one lady exclaimed, “Oh, well, isn’t that nice? You know Gary? He’s a great friend of mine” (Participant Observation). As the researcher reached for her wallet to pay for the drink, the researcher and community member chatted for a minute about the Kawanzaa celebration Tillery had held the night before. Then, this sweet Tillery lady, who the researcher had just met moments before, shook her head and said, “Oh no, you don’t need to pay for that drink. We are family here.” And just like that the researcher was being treated as a family member to their community—an experience she will never forget. These Tillery community members trusted Gary enough to know that any friend of Gary’s was a friend of theirs (Participant Observation).

A second aspect to this finding deals with how to forge relationships with the community. Gary, Steve, and the community of Tillery describe their relationship as a
long-term friendship. Gary notes after he and Steve got the grant, “that put us together even more… so the friendship just grew” (Grant, interview, February 17, 2016). Gary reports Steve started attending Tillery community meetings and “fell in love with a group called The Open-Minded Seniors.” Gary advises:

The researcher has to build a rapport, and it's a real rapport. You know how they say children know? Well, communities know when researchers come in honestly, or whether they're just trying to sell you a bill of goods…especially communities that have been in the struggle for social justice for long periods of time. (Grant, interview, February 17, 2016)

During the participant observation of this study, it was clear Steve and those on his research team had built real rapport with the community of Tillery. As Gary and the researcher were exiting Gary’s office, following the interview for this study, Gary asked the researcher if she had a minute for him to brag. Standing in the hallway just outside of his office, Gary proudly showed the researcher many pictures displayed on the wall of his great nieces and nephews and other family members, describing their accomplishments and how proud he was of them. He then pointed to a Christmas card of a young family with three children. He explained the lady pictured was one of Steve’s students and that she had spent a lot of time in Tillery. Reminiscing on the time they had spent together, Gary commented he still needs to meet the youngest two children and was looking forward to it. Clearly, the relationships built between the university researchers in this PPSR partnership and the community members are long-term friendships; they know each other as people outside of their research activities (Participant Observations).
Steve has a valued friendship with the community of Tillery. As Gary led the researcher around Tillery’s Community Center he pointed out a piano and explained Steve loves to play the piano for community events. Figure 5.9 depicts a photo taken Labor Day Weekend, September 1, 2007 at the Premiere of Tillery’s documentary film. As the caption of the photo explains, Steve provided the reception music for this community event.

Figure 5.9. Steve Celebrates with Tillery. This figure shows Steve playing piano and joining community members in celebrating the premiere of Tillery’s documentary film (Tillery Documentary, 2007, p. 21).

Another example of this friendship with the community is found in the Concerned Citizens of Tillery CCT News Notes, October-December 2015 Volume VII. In this edition of Tillery’s newsletter, the community reports on the latest summit of the Environmental Justice Network, which included a special recognition of the work of Steve fighting with
communities such as Tillery against environmental racism. Figures 5.10 and 5.11 include photos from the event, which were displayed in this same newsletter.

Figure 5.10. Steve Accompanying Tillery Community Member. This figures shows Steve playing keyboard accompaniment as Tillery member sings at an Environmental Justice Network Event (CCT Newsletter, p.4).
In this same newsletter, the community of Tillery describes “the man known as Steve Wing.” They write:

Steve is an associate professor in the School of Public Health at UNC Chapel Hill and a real warrior and friend of the communities that are being dumped on. As an epidemiologist, Wing has helped many communities, including Tillery, ward off environmental issues that are considered ‘environmental justice’ concerns because of the color and economic standing of the community…His research has been defined as ‘risk taking’ since it usually benefited the communities he was working with as well as extending his body of published research. (CCT Newsletter, p 4) The special tribute to Steve concludes with a warm expression of how the community is happy to be a part of this celebration of his work and of Steve as a person. The tribute concludes: “CCT members who worked with Wing over the years…came to know him as a friend of the oppressed and the communities targeted by large industries because they knew such communities would not fight back” (CCT Newsletter, p 4). Through this partnership with Tillery, Steve has become a cherished friend of the community. The members of Tillery believe the partnership examined in this study was made possible because of the long-term trusting relationship Steve and Tillery built with each other. Entering the community as a person and demonstrating to them he truly cared about them, during PPSR project events and beyond, overcame the barrier of mistrust the initially had.
Overview of Themes for Research Question 3

This PPSR project was chosen because from outward appearances it well aligned with the theoretical construct of a Third Space. In order to answer the final research question, “How, and to what extent, can PPSR project leaders create projects that are third spaces, which merge the discourse, practices, goals, and values of science with the discourse, practices, goals, and values of underrepresented communities?” The researcher considered if and how the design, interactions and activities of this PPSR project paralleled the theoretical construct of a Third Space. As the researcher examined project leaders’ insights on how, and to what extent, the project was able to merge discourse, practices, goals and values of science with the discourse, practices, goals and values of the underrepresented community, several themes emerged regarding what a Third Space looks like in a PPSR project and how a Third Space is created. The themes of this final research question are: Conscious Bridging, Equal Footing, and Challenges to Third Space. Through these themes the reader will be able to see to what extent this PPSR project created a Third Space and what specific actions were necessary to create this space.

Theme 1: Conscious Bridging

An overall theme of conscious bridging emerged from the data. The term used to describe this theme, “Conscious Bridging,” is borrowed from Gutiérrez et al. (1999) when they describe the intentional design of a Third Space, which involves consciously merging the discourses, goals, and values of science with the discourses, goals and values
of the community. A Third Space does not naturally arise but rather requires careful listening and attentive construction, grappling with the conflicts between two discourses and reframing the activities and understandings accordingly (Moje et al., 2004).

Finding: Conscious bridging was required to merge the discourse of Tillery with the discourse of the university researchers. Gutiérrez, Baquedano-Lopez & Tejeda (1999) explain learning contexts are multi-scripted resulting in inherent tension, but in a Third Space, no single language register is privileged. Both Steve and Gary recall grappling with conflicts and differences due to their frame of references and prior training leading up to the partnership. Gary recalls, “There were many compromises, and working together, and understanding languages of each other, and the language of the community, and the language of the university” (Grant, interview, February 17, 2016). Making a conscious effort to work through those differences “allowed us to become the good friends that we are.” Gary notes when researchers enter the community using scientific jargon this impedes communication and can be a “put off” to the community members. For this reason, prior to community meetings, Steve made a diligent effort to think through which terms would be considered jargon and then reworded these terms to a language more appropriate for the community. He notes Gary was helpful to this process. Steve advises using a language the community “doesn’t use and doesn’t have access to…attributes to the university being reviewed as a potential exploiter and representative of White power” (Wing, interview, October 14, 2015). To avoid this detrimental effect, whenever he was able, he switched over to using community ways of speaking about issues. Early on in the project during the training sessions with
community members, “sessions fostered rapport and trust between researchers, community organizers, and participants and helped bridge a cultural divide by translating technical data collection concepts into meaningful local language” (Wing et al., 2008, p. 1393).

Steve recalls not only was he careful about what terms he used when speaking with community members, but he was also very attentive to who was leading the conversations and discourse. Steve notes the PPSR project was better when he stepped back and listened instead of always talking himself. He advises:

I’m careful about not going in and doing all the talking…community members talk and tell me what is going on. And really this is in the best interest of science as well. If I don’t listen to them, and I go in asking all the questions and dictating the conversation then my science won’t be as good. I will miss things. I won’t know for example that they leave their windows open during the day etc. It’s not about listening to them so they can be more included in science. It is about listening because that makes science better. (Wing, interview, October 14, 2015)

Community members’ participation in the data collection for this study enabled the study to answer research questions, which could not have been answered otherwise. This study had research questions aimed at understanding “transient exposures in rural location” (Wing et al., 2008, p. 1394). In the past community members had reported strong malodors to air quality officials but by the time air quality officials arrived, the odors were gone. “Participant involvement … allowed the collection of real-time data on malodors that would not otherwise be possible” (Wing et al., 2008 p. 1395). Additionally,
by incorporating community frameworks and discourses this PPSR project was “able to develop a meaningful cultural framework that teaches us how neighbors interpret and respond to exposures from industrial hog operations; thus, quantitative relationships between exposures and health status can be ‘unpacked’ to reveal how community members understand” (Wing et al., 2008, p. 1393).

The translation between the researcher’s language and the language of the community continued through the conclusion of the project’s findings as well. This PPSR project produced two scripts—one used for publications and public action and the other promoted the community’s understanding of project results. As one publication from this study notes, “Soon after data collection was completed, the research team returned to each community with a preliminary report on environmental measurements and odor ratings specific to that community” (Wing et al., 2008, p. 1394). Gary notes the importance of the researchers returning to the community with the results of the study translated to the community members’ vernacular. He suggests charts as a useful tool for presenting information to the community advising, “You’ve got to find a way for us to know how to read it (the study results)” (Grant, interview, February, 2016). He challenges researchers to consider what information the community members would really be interested in and have the prior knowledge to grasp. He explains the issue is not that community members cannot understand the scientific journal findings, but rather community members do not have the training to understand the results written in scientific terminology. He notes it was helpful for Steve to “show it (the study results) to the community in maybe two or three little bar graphs” (Grant, interview, February,
If researchers hand the community the entirety of results without some kind of summary with charts and graphs, he concedes it is easy for community members to feel overwhelmed with all the information.

In Gary’s view, an important aspect of merging scientific and community discourses involves the researcher being present for translation. He also believes it is vital for the researcher to sit down with the community and explain the results in a simple manner. Gary notes it was vital for Steve and other researchers to sit down with the community and explain the scientific discourse so Tillery could “speak on their own behalf” (Grant, interview, February, 2016). He recalls after discussing the study results with Steve, Tillery was able to use the data to voice their community concerns to local and state officials. He advises, “The researcher needs to come back so that… when I'm looking at it… I can ask you a question. You can answer in a language that I can understand” (Grant, interview, February, 2016). He attributes the success of the PPSR partnership examined in this study to this translation between two discourses. Gary notes for the community of Tillery, this is very important for any research collaboration. He says:

From our perspective… you can't do this research unless you bring it back to us in a form that we can understand. Not what you're going to publish in whatever your next medical journal is, or whatever, but in a way that the community can understand it. (Grant, interview, February, 2016)

Steve and fellow researchers explained the results to community members and engaged in conversations, which “often led to discussion of environmental injustice and community
action” (Wing et al., 2008, p. 1394). The PPSR partnership examined in this study produced written forms, which were readable and useful to both the community of Tillery and to the university researchers. This took a conscious effort on the part of the researchers but was vital to the partnership’s success. The author of this study notes the need for herself to consider Gary’s advice in the analytic memo below.

*Spoke with Gary today about how and when to present the findings of this study to the community of Tillery. We both agreed it is important for me to return to Tillery. Gary advised members of the CCT will not be interested in the entire study, but they do want to hear the findings highlighting the beautiful friendship and partnership with Steve Wing. It is these findings I will share with them when I return in June.* (Analytic memo, March 14, 2017)

**Finding: Bridging the goals and values of Tillery with the goals and values of university scientists created a new, hybrid level of activity.** To illustrate how this PPSR project merged the goals and values of science with the goals and values of Tillery, the researcher now provides a summary of Tillery’s community goals, the goals of the scientific researcher, and then looks at how a scientific study was able to fulfill both scientific and community goals to create a hybrid level of activity.

**Community goals.** Tillery is a community with a strong sense of identity and clear goals, which are outlined by the Concerned Citizens of Tillery in their *CCT Anniversary Book*. As the book describes, many of Tillery’s goals well align with the seven core principles of Kwanzaa. The fourth principle of Kwanzaa is Nia, or purpose, which is “to make our collective vocation the building and developing of our community
in order to restore our people to their original greatness” (CCT Anniversary Book, p. 86). Members of Tillery have made it their collective vocation to achieve community goals based around community health, historical preservation, cultural awareness, and economic revitalization. The CCT believes “good health care is a basic human right,” and based on this belief they have “fought tirelessly since its (CCT’s) founding to improve community access to health care and create a healthier community in Halifax County” (CCT Anniversary Book, p. 26). The CCT Anniversary Book proudly recounts the various health initiatives the CCT has worked for and brought to their community. The community of Tillery notes:

Building community health extends beyond educating and increasing health care access. Community health is deeply connected to environmental justice, ensuring ground water is safe to drink and protecting the community from toxic industries and waste sites that would increase the risk of disease. (CCT Anniversary Book, p. 30)

The community of Tillery recognizes a healthy environment is vital to their community and has long been engaged in a battle to preserve the well being of their local environment.

A second major goal of the community of Tillery is historical preservation. This goal aligns with the second core principle of Kwanzaa, Kujichagulia (self-determination), which means the community will “define ourselves, name ourselves, create ourselves, and speak for ourselves” (CCT Anniversary Book, p. 86). The community of Tillery believes “you can’t know where you’re going unless you know where you came from”
A major motivation for community members taking part in the many historical preservation projects they have completed is their desire to “take ownership over their own story” (CCT Anniversary Book, p. 33). Among the community’s accomplishments towards this goal was their production, in partnership with filmmakers Charlie Thompson and Chris Potter, of “an award-winning documentary on the long history of the Tillery community” (Tillery Documentary, p. 36). This film “helps honor pioneers of the freedom struggle,” and as a community member in the documentary notes, “is a real history, a true history” (Tillery Documentary, p. 37). A friend of the community notes during a speech delivered at Tillery’s 2014 Family Community Day, “An Old African Proverb reminds us, ‘When Lions begin to write history; hunters will cease to be heroes.’ There is power in the pen. And, here in Tillery you own the power to write your story” (CCT Anniversary Book, p. 99). The documentary film was a major accomplishment towards Tillery’s goal to document themselves. In the dedication book for the film members of Tillery note:

We are an amazing, evolving and intergenerational community. Our single dream is to join the ranks of the prosperous, the peaceful and the documented, and to tell our story in a publicly accessible form, through oral histories, photographs, books, journalistic reports, college, curricula, film and video, and to testify about our struggle and injustice before the people’s most prestigious arm of the government, the United States Congress. (Tillery Documentary, p. 9)

This commitment of Tillery to tell their own story has resulted in many historical preservation initiatives including a historic marker designating Tillery as a resettlement
community, shown in Figure 5.12. At the dedication ceremony for this marker, in which relatives, dignitaries and community members gathered to celebrate this accomplishment, a Tillery community member addressed the crowd, “Finally, we have our marker. This marker has been discussed and planned for since 1994… “HALLELUIAH IT IS DONE!” (Documentary Premiere, 2007, p. 20).

![Tillery Historical Marker](image)

Figure 5.12. *Tillery Historical Marker*. This figure shows the marker, which marks and celebrates Tillery as a resettlement community (Documentary Premiere, 2007, p. 14).

Another historical preservation initiative the community is currently engaged in is detailed in the October-December 2015 issue of the CCT’s Newsletter. In this newsletter, Tillery community leaders note they are currently seeking national designation as part of the National Underground Railroad Trail. The community is working to get the National Park Service to officially recognize them as part of the Network to Freedom Underground Railroad project. Tillery community members place a high value on
A third goal of the community is cultural awareness. Tillery actively celebrates their culture and loves to tell others about their cultural traditions, holding many celebrations throughout the year including celebrations for Black History Month, Martin Luther King, Jr. celebrations, and Kwanzaa celebrations. Tillery strongly believes in “keeping alive the honored traditions from older generations” (CCT Anniversary Book, p. 40). A fourth goal of the community is economic revitalization, which community members admit has “proved no easy task for Tillery” (CCT Anniversary Book, p.42). Part of meeting this goal involves “resisting industrial economic development that puts the environment at risk or reduces local quality of life in exchange for only temporary low-wage work” (CCT Anniversary Book, p. 42). Members of Tillery further remark, “To secure economic justice for Black farmers is deeply connected to larger efforts at increasing the economic vibrancy of Tillery” (CCT Anniversary Book p. 44). In order to achieve these community goals, Tillery has been engaged in ten years of political action, “pushing the powers that be in order to improve living conditions and economic security” (CCT Anniversary Book p. 47). Figure 5.13 contains a picture and quote taken from Tillery’s December 2015 newsletter. The quote by Dr. Martin Luther King, Jr. captures Tillery’s spirit to be activists for social justice.
Tillery’s push to “consolidate the three ‘separate and unequal’ public school systems in Halifax” and their fight to “stop the criminal and racist whole sale of Black owned land in predominately farming economies” serve as examples of the community’s political battles for equality (CCT Anniversary Book, p. 2). Additionally, Tillery has been involved in a ten-year battle to fight for environmental justice. CCT’s 35th Anniversary Book details this fight, beginning with Tillery community protests against toxic waste sites being put in predominantly Black communities. Community members of Tillery became even more involved in this battle for environmental justice when over 20 years ago Tillery “pioneered efforts to regulate and roll back these (CAFO) businesses” (CCT Anniversary Book, p.48) and formed a group called Halifax Environmental Loss Prevention (HELP), which fought for the county to “pass ordinances that regulated the building and operation of confined animal feeding operations and community members” (CCT Anniversary Book, p. 48). Through this fight for healthy water and air, Tillery
community members began “lobbying and protesting the NC government to end industrial hog farming in poor African American communities” (CCT Anniversary Book, p. 48). In the words of community members:

    We are a low-income community, but this does not stop us from caring about the environment. People work all their lives and then can't enjoy it when they're older. We're fighting the hogs and other unsafe environmental hazards! God created three important things: oxygen, man and water. Where there is no water, there is no life. (CCT website)

The CCT became a “Groundwater Guardian” for eight years raising awareness on sustainable practices and studying the pollution of groundwater. They also established the North Carolina Hog Roundtable-- “a collection of community and environmental organizations that opposed the expansion of hog factories in North Carolina” (CCT Anniversary Book, p. 49).

    Researcher goals. Steve, along with fellow researchers from UNC, also has goals, some professional and others personal. As an Associate Professor at UNC, Steve had professional requirements to meet in order to achieve tenure, maintain his employment, and advance in his career. The University of North Carolina Chapel Hill outlines the internal guidelines for the faculty appointment, tenure, and promotion process in a 17 page document easily accessible online. These guidelines, which outline expectations for faculty members seeking tenure note, “Tenure-track faculty members have appointments that require research and writing, teaching, and advising” (UNC Website). Along with their teaching duties, faculty members make time for the “research and writing that must
be demonstrated for the award of tenure and promotion through the ranks” (UNC Website). The guidelines go on to say faculty need to demonstrate how their research and publishing serve the school’s mission of improving the lives of North Carolinians by engaging in practical scholarship. The school’s mission statement specifies the goal of the school “to improve public health, promote individual well-being and eliminate health inequities across North Carolina and around the world” (UNC Website). The school also values collaborative research and notes, “Most public health solutions require interdisciplinary inquiry, broad partnerships and public engagement for constructive action” (UNC website). The author of this study notes that Steve became an Associate Professor for UNC in 1995, the same year he established the partnership with Tillery. Since 1995, Steve’s curriculum vitae shows he has 88 referred journal articles and 12 book chapters, demonstrating he was able to conduct community research and still produce publications valued by his employer UNC. Along with Steve’s professional goals, Steve also has personal goals for his work. He notes:

> My motivation was to be able to work with them (Tillery), because their agenda was what I wanted to be a part of. For me, the opportunity to be able to connect my professional work with the civil rights movement and social justice movements, I thought that was a tremendous opportunity. (Wing, interview, October 14, 2015)

Steve explains he wanted to have a research partnership with Tillery because he “knew” the way poor communities of color are being treated is “wrong” (TEDx, 2013). He notes, “I wanted to use my skills to help document what was happening” (TEDx, 2013).
**Merging goals.** The data analysis revealed a level of hybrid activity between the university researchers and the Tillery community members was present in this PPSR partnership. Both the community members of Tillery and the university researchers had a common goal—to bring environmental justice to the community of Tillery. Based on their unique positions, resources and expertise, members of this hybrid community contributed to varying roles within this activity, but they worked toward a common objective—to end the placement of hog farms in poor Black communities who do not want the environmental pollution hog farms bring.

The larger level of activity started with applying for the grant, which initiated this PPSR research partnership. Gary and Steve together authored the grant proposal for their study. Steve recalls the federal government funded their PPSR research partnership in 1996 to “conduct research and education in a partnership that involved the county health department” (Wing, interview, October 14, 2015). This funding gave them the resources they needed and paid a portion of Steve’s salary along with the salaries of key organizers within the community of Tillery. The funding also enabled Steve to pay graduate students. Forming this partnership allowed both the university researcher and the community of Tillery to accomplish things they may not have been able to accomplish alone. Gary recalls before the partnership with Steve, the community of Tillery “had not gone after any federal dollars or even state dollars” (Grant, interview, February 17, 2016). He attributes this to a lack of infrastructure within the community. He recalls:

> Once I looked at the application (grant application) and it's all this jibby-jobbish, we didn't have time...we didn't have the infrastructure, or anything like that. That
was a piece that Steve was able to bring as part of this as well. (Grant, interview, February 17, 2016)

Gary recalls the grant was quite a bit of money. He and other Tillery community members realized they would need an “internal organ to take care of a grant” of such a size. The community of Tillery “looked at it from every angle,” and the more paperwork they saw, the more they said, “No, no, no” (Grant, interview, February 17, 2016). Gary also recognized having UNC’s name on the grant would strengthen the chance of the community obtaining funds to continue their fight. He notes:

I would definitely say the name UNC, you must admit, it carries weight, there's no doubt about that. It's UNC, but it's also White UNC. When you understand that, you are able to use that to your advantage, which is what we did in that case. I'm not fighting UNC. Give me the name. That's going to help us get this grant. We're going to get a researcher who is going to listen to the community. He's going to produce information that we can prove what it is we've been saying is true. (Grant, interview, February 17, 2016)

Initially, when the community of Tillery and Steve first started discussions about the project design, they had different interpretations about what was happening with the industrial hog operations and what the immediate project goals were. Gary recalls Steve believed the first thing they needed to do was to measure the health of the community. Gary notes, “I remember very vividly telling him, ‘No, the first thing we have to prove is that they are going into Black communities’” (Grant, interview, February 17, 2016).

Steve did not agree with Gary on this point, because in Gary’s view, “He's at the school
of health, just proving where they are is not necessarily the health focus” (Grant, interview, February 17, 2016). Steve conceded to the community’s priority by first researching where facilities were going, resulting in a paper published, which documents Tillery’s concerns were correct—industrial hog operations were predominately placed in poor, Black communities. Steve recalls the results of this study:

> We found that hog CAFOs were far more common in poor communities and communities of people of color, that this concentration was more extreme for integrator-owned or contracted CAFOs than for independent operations, and that the pattern was explained only partly by differences in population density. Furthermore, we found that hog operations were concentrated in areas where most people depend on household wells for drinking water. (Wing, Commentary, 2002, p. 439)

Gary recalls “in the process” of addressing the community’s concerns, “that also led to the many health questions that would come with it” (Grant, interview, February 17, 2016). Steve’s willingness to have Tillery community members be in the driver’s seat spoke measures to the community. Gary recalls the community thought, “Well, gee, here's somebody that's willing to listen to our community.” It was “from that point on” the partnership between Tillery and Steve was able to “move forward” (Grant, interview, February 17, 2016).

The hybrid level of activity between Steve and Gary led to the publication of several articles along with the presentation of study results at various conferences across the United States. The co-authored grant, publications, presentations, and community
partnership accomplished UNC’s guidelines for tenure. At the same time the public platform for their study results accomplished Tillery’s goal of providing their community with a voice. They were able to author their own story in a publically accessible form. Table 5.4 provides several examples of the public form in which this PPSR study’s results were displayed.
Table 5.4
*Publications Resulting from the PPSR Project*

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<td><em>Improving environmental health science through community-driven research</em>. University of Texas Medical Branch Sealy Center for Environmental Health and Medicine, Galveston, Texas, March 31, 2008 (with Gary Grant).</td>
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The story of how Tillery’s and Steve’s goals merged is further detailed in a timeline contained in CCT’s Anniversary Book. Prior to the partnership between Steve and Tillery, Tillery had succeeded in getting a moratorium preventing the expansion of industrial swine operations across North Carolina, but without evidence to back up their complaints, they knew there was a good chance the moratorium would be lifted. The community of Tillery had specific complaints: 1) During heavy rains the hog waste lagoons flooded and contaminated their wells resulting in health ailments to the community, and 2) the foul odor of the hog operations impeded their daily lives. However, without a scientific study linking their health problems to the hog farms, the moratorium was in jeopardy of being lifted. Together, Tillery and UNC’s research team participated in a larger level of activity, which found hog operations were about five times as common in the highest three quintiles of the non-White population as compared to the lowest. The evidence was clear. Whether intended or not, industrial hog farms were indeed most prevalent in areas with both high poverty and a high percentage of non-Whites. The conclusion of their study was “community concerns are real” (Wing, et al., 2000, p. 231).

The collective activity of the partnership did not end there. Steve, along with community members, also conducted a scientific study examining the health complaints of the Tillery community. Steve recalls, “Tillery already knew their community’s health was being affected by the pollution from industrial hog operations. The problem was that no one would listen to them without scientific data to support their claims” (Wing, interview, October 14, 2015). Together with the community, Steve and Gary conducted a
study, which resulted in graphs documenting the mean hourly hog odor and hydrogen sulfide levels in 16 communities, including Tillery. The study also resulted in qualitative data describing the context of the pollution, produced by interviewing community members about how the pollution interferes with their daily lives (Wing et al., 2008). Tillery’s reality (of living with pollution) did not change with the addition of this scientific study; rather, the study documented Tillery’s story in a publically accessible and credible form. Together the hybrid level of activity accomplished the goals of the community and the university researchers.

**Theme 2: Equal Footing**

This theme highlights the ownership of the PPSR project and roles each member played in the hybrid level of activity. Overall, both Gary and Steve stress the importance of equal footing between the community and university partner, noting at times one may have to challenge hegemonic interpretations in order to create a space in which all voices are equally valued. Research studies need to look “upstream” to the structures “perpetuating inequality” and “downstream to the communities that are affected… empowering communities to participate more effectively in determining their own future” (Wing et al., 1996, p. 130).

**Finding: Joint project ownership allows for more equal footing between the university and community partner.** In the PPSR project described in this study, the community of Tillery was not taking part in a scientific study of UNC’s. Tillery was not located outside the community of science and drawn into the community to take part in the study. Rather, the community of Tillery was insiders to the study—Tillery initiated
the study, conducted the study, and benefited from the study’s results. Steve and Gary both attribute part of the success of their project to the fact the project reversed the typical role of university as driver and instead placed the community in the driver’s seat. Throughout the data analysis it was clear to see this PPSR project equally belonged to both communities.

Although each community used their specific resources and participated in different ways based on these resources, this was not the project of a university who reached out and involved an underrepresented community in a scientific study. On the contrary, the community of Tillery initiated this partnership with a university researcher who was sympathetic to their community’s plight. Steve notes, “People are not so ignorant as to not realize…that people need clean water” (Siesinger Lecture, 2011). Gary recalls, “He (Steve) didn’t bring a grant to us. I actually sent the grant to him. We were warding off industrial hog growing facilities in my community…and somehow we got connected and we came together” (Grant, interview, February 17, 2016). The community of Tillery was engaged in a fight to protect the health of their community and Steve, a university researcher, joined them in their fight. Gary recalls although they needed the resources and power associated with Steve’s institution, the community of Tillery knew what was needed to better itself. He notes:

It's sufficient to say that we're still teaching researchers, ‘No, you do not have all the answers.’ It's basically true. Communities know what they need. I'm not going to say that they have all the pieces to get it done, but they know how to solve their
problem. They can't solve it without the rest of the pieces. (Grant, interview, February 17, 2016)

In fact this was one reason the community of Tillery wanted to collaborate with Steve and UNC—Steve did not enter the community thinking he had all the answers. The manner in which Steve approached the community was different than the community’s prior experience with researchers. Gary recalls:

He didn't come in and say, ‘I want to do a study.’ He basically said, ‘You know, if you all are going to really work this out, you're going to need documentation to support you.’ Well, we'd never heard that from a researcher before. Number one, they already have the design and everything is in place, and they come in, and here's what we're going to do… and pick up the community in the last phase of it. That was not his approach. (Grant, interview, February 17, 2016)

Steve recognized Tillery knew what they needed but had been denied the power to affect change for their community’s health. Steve advises, “To change the system, we (researchers and all people) need to support the communities being affected by environmental pollution” (TEDx, 2013). He suggests part of this support involves using the skills one possesses to stand up against “damages to human life and the environment” (TedTalkx, 2013). Likewise, Gary advises, even if a researcher is not racist, “you have an obligation” to help others not be racist. Part of building trust with the community of Tillery involved taking their side in the fight against abuse and inequality (Grant, interview, February 17, 2016).
Gary and Steve worked together to design a PPSR project that would produce scientific data to support the community’s concerns. Gary recalls the community of Tillery greatly appreciated the fact that Steve “had a sensitivity that communities should be in the driver’s seat” (Grant, interview, February 17, 2016). He advises other PPSR project leaders to be cautious about the manner of approach to a community. He stresses the importance of involving the community in “project development.” He warns, “Don't come in here trying to thrust something down the throat that I haven't heard anything at all about” (Grant, interview, February 17, 2016). Steve too reflects on the need to form research projects alongside community members. He says:

The challenge for researchers is to work with community members to frame questions, and design procedures to produce answers, that respect community concerns by investigating them with the best technical approaches possible, including newly devised methods to enhance community input and analyze data…Rather than facing a conflict between standard procedures and alternatives that are acceptable to the community but viewed as “unscientific” by scientists, both researchers and community members benefit from negotiating the use of rigorous methods. (Wing, Commentary, 2002, p. 442)

A Third Space creates a social environment where a person can reconceive who they are in relation to an academic community of practice such as science (Gutiérrez, 2008). A finding of this study was Tillery—a community accustomed to finding themselves subjects of research, through this PPSR project—became the conductors of the research. The research conducted through this PPSR project was for both the
researcher and for the community. Gary stresses the partnership with Steve worked because the aim was to solve a community problem, not just report on it. The community has enough stress as is, and if the study does nothing more than report negative things about the community, without working toward a solution, the community does not want to hear it. He recalls, “I would say that Steve understood those kinds of things” (Grant, interview, February 17, 2016). It was this understanding, which allowed their partnership to flourish. Both Tillery and UNC researchers jointly constructed project goals and activities, so they would result in benefits for both communities.

For this PPSR project, equal footing was also demonstrated through ownership of the project results. Steve and the community of Tillery both agreed since this was Tillery’s story, it was only right their community’s name be represented on publications resulting from the study. The act of including the community in the publication process reinforced that this study was not about the community; Tillery shared joint ownership of the study. Gary recalls, “There were no papers published without our names. What professor is going to give up his claim to fame? It was truly an equal partnership in every sense of the word. I say, it takes a special kind of researcher” (Grant, interview, February 17, 2016). In Gary’s view Steve did not lose anything by including the community’s name on publications. Additionally, he notes, “He gained. He gained a community that fell in love with him. Not only this one, but other communities as we moved across eastern North Carolina” (Grant, interview, February 17, 2016).

The creation of a Third Space involves a conscious effort to find hope and the tools, which will allow a community to author their own history of the future (Gutiérrez,
The analysis of this study revealed the purpose of this PPSR study was to provide the community of Tillery with tools (evidence in the form of a scientific study), which would enable them to author their own history of the future (a place where their community can live without the detrimental health effects of a highly-polluted living space). The results produced by the study were scientific (in the methods used), but this science was used for the benefit of the community of Tillery. Figure 5.14 shows a picture of Steve with Tillery community members displayed in a CCT newsletter. The caption of this photo recognizes and commemorates the fact that this PPSR study was done for Tillery—a scientific study conducted on behalf of their community. The caption of this photo reads:

Wing poses with many of those of us who took on the pork industry in North Carolina and saved many a poor, often African American or aging communities from the environmental destruction caused by industrial Confined Animal Feeding Operation (CAFO). As the community called Steve to the stage to speak, Gary Grant stated ‘For all who have come to these shores, America was the land of hope and opportunity. For all except the African people…And just as Moses went down into Egypt, so did CCT go down and Steve Wing went down.’ (CCT Newsletter, p. 5)
The joint efforts of the community of Tillery and UNC researchers led to “moratoriums on new hog factories in North Carolina and more stringent regulation of CAFOs statewide” (CCT Anniversary Book, p. 49). During the researcher’s visit to the Tillery History House, Gary proudly pointed out the concentration of hog farms in his county is much less than other areas and also much less than what it was projected to be. Figure 5.15 shows a picture hanging in Tillery’s History House depicting the concentration of industrial hog operations in North Carolina. The dots indicate locations of industrial hog farms. Tillery was initially projected to have 17 hog farms (similar to several counties in the southeastern part of the state), but thanks to the moratorium they were able to obtain, their county has only four (EH Documentary, 2009).
Gary goes on to speak of the victories this PPSR partnership brought to the community of Tillery. He explains:

We don't have an industrial hog farm on every corner. We had been targeted for seventeen, and only four got in. That's a great victory… Black and Whites walking into a county commissioner's meeting holding hands scared them to death here in Halifax County. They had never seen a diverse group of people come in on the same issue. The grant allowed us to talk with other communities about how we did it… what we did. We wouldn't have been able to do that, so that would be
one way that our community benefited. We became a model. We actually got data that we could use. (Grant, interview, February 17, 2016)

Gary firmly believes, “It takes all of us (communities and researchers) working together in order to really protect the community.” He goes on to add when groups with power “give or fully support the community in the way that they are capable of doing” great things can be accomplished (Grant, interview, February 17, 2016).

**Finding: Funding may present challenges to equal footing.** Gary and Steve both recall funding structures made it a challenge to maintain equal footing throughout their PPSR project. Funding is necessary, but as Steve notes it can “be tricky” and creates power imbalances (Wing, interview, January 5, 2016). The PPSR project between Tillery and UNC had to “navigate structural contradictions built into the roles and histories of the groups involved” (Wing, Grant, Green, Stewart, 1996, p. 140). Steve recalls some inherent inequities in funding and resources and the challenges these imbalances created towards an equal ownership of the project. He advises project leaders need to be careful when “partnering” with community organizations. He warns:

> Many times, community organizations don’t have money. They may have $500 or so, but when you are talking about a $500,000 grant, then their money is nothing compared to the money a researcher is coming in with. So, it is easy to go in with this rhetoric of, ‘we are here to help the community and we want to serve your agenda,’ but at the end of the day the money talks and can dictate whose agenda is really being served. So I say, the important question to ask yourself is does the community organization have the ability to kick you out if you aren’t doing right
by the community? Because if the answer is no, then the power is unequal and the community agenda will most likely not be served. (Wing, interview, October 14, 2015)

Gary and Steve were able to overcome this challenge by co-authoring the grant together. With both of their names on the grant, this project did not belong to UNC. This PPSR project belonged to both the community of Tillery and UNC; together they found funding to support their jointly formulated project. Despite co-authoring the grant, funding still presented a barrier to equal footing between the university and community. Gary recalls:

The university would get 40%? I think it was 40%. I know it's some astronomical percent. If the community handled the money, we were only going to get 12% for operating, something like that. It was just such a slap in the face to the community, that the university is going to get 40% of what the total grant was, and the community would only get 12%. Even though you would have to keep the same kinds of records that the university did. (Grant, interview, February 17, 2016)

Gary goes on to challenge, “The question is, what is different about us? If you've got to keep the same records and all, why are you going to try to give us less money?” Gary recalls, “Steve himself was very much opposed to that, and trying to figure out a way for us to do it” (Grant, interview, February 17, 2016). In the end, the community agreed the university would handle the finances because of the amount of money and lack of
infrastructure within the community to handle those finances. Despite these challenges with funding inequities, the partnership between Steve and Tillery grew. Gary notes:

Steve is just a very special person, and there's no denying that. Always, when we could talk, and even if there were issues at the university level with what he was having to do, or there were issues here in the community that we had to deal with, we were always able to talk honestly and frankly about it, and then we were able to move forward. (Grant, interview, February 17, 2016)

Both Steve and Gary agree one problem associated with funding is there are not many grants available to fund the type of research a true community partnership involves. Gary laments that although The North Carolina Environmental Justice Network was founded based on the work he and Steve accomplished together, in some ways their work has been limited because they “don’t have the funds” anymore. He notes, “To my knowledge, they are not out there anymore, to do the kind of work that we were doing” (Grant, interview, February 17, 2016). Steve comments that although funds are out there, the funds are limited and often this type of work (community-based partnerships) is not as highly valued in the field of science. He notes:

The whole funding thing is a source of problems; many problems. If the commitment of the scientists is just about money, then of course they're not going to keep working with the communities because they're not going to get as much money as if they were working for industry or government. (Wing, interview, October 14, 2015)
Additionally, the type of work necessary to affect change in communities suffering from institutional inequalities and environmental racism will not be completed in a short amount of time. Gary recalls, “Our grants were four years, and we had two of them. So that was eight years of solid connectedness there. I would say that's the kind of grant that is needed. You can't do anything, really, in twelve months” (Grant, interview, February 17, 2016). Both Steve and Gary acknowledge they are still fighting against environmental racism (years after their grant was completed), and it takes this type of long-term commitment to affect change. Steve notes it will be a “longer-term process” because it really isn’t a local issue. He explains:

This topic of industrial animal production is really global. Most of the pigs in North Carolina are now owned by a Chinese company, and the state and federal regulators are deeply involved in the process, and if they gave in here it would affect other states and potentially other countries. It would be more like trying to change the oil companies than trying to affect local land use decisions. So it is kind of a big issue and changes in policy will take a long time. (Wing, interview, October 14, 2015)

Additionally, Steve advises funding opportunities may be limited if the researcher plans to call for action and change on behalf of the community. He concedes:

I think my funding has been affected by my participation in trying to change policy. I don't know that, but I do know that the National Institute of Health has imposed new rules prohibiting people who get grant money from them from engaging in, for example, to use their term ‘overt calls to action.’ I'm supporting a
civil rights complaint against my state, and the organizers are recruiting people to tell their stories in these complaints. That's the kind of thing that funding agencies are really queasy about being associated with... Well, why would that be? Well, their budgets are voted on, in the case of NIH, by congress. In congress, the congress people get campaign contributions from big business, and they're lobbied every day by big business. Well, they don't want the federal agencies to be supporting social justice movements, because that makes it more difficult for people to be exploited for profit. I think it's pretty simple. (Wing, interview, October 14, 2015)

Despite the barriers he has faced in obtaining funding, which will produce results for communities of color and communities subjected to inequalities, Steve notes he and Tillery were able to get funding from NIH, which would be classified as a scientific funding agency. He advises, “So it’s not to say you have to go outside of science to do work that challenges the dominant paradigm” (Wing, interview, October 14, 2015). He attributes the success he and Tillery had in obtaining the grant to the fact that “at times, funding agencies will have these mandates to be more inclusive and this will present opportunities to do work that promotes democratic values” (Wing, interview, October 14, 2015).

Steve also offers advice to other project leaders who hope to do community-based participatory research in science. He advises, “Be careful about how you word your research questions and how you write your grant proposals.” By doing research ahead of time and getting to know the literature, “you can find out what is important to the funding
agency and tailor your proposals to their goals and what they are looking for but also you can work towards the goals of democracy and equity for all peoples” (Wing, interview, October 14, 2015). He also notes there are funding agencies available such as many “philanthropist organizations,” which are “funded by people who have made their money and share the values of democracy and equity for all people, so they are looking for projects that will promote those values.” He has found that even “industry and government sometimes need legitimization, so they do fund some of that” (Wing, interview, October 14, 2015).

Despite the availability of some funds, researchers who truly partner with communities of color in scientific studies, which reflect community concerns, may face backlash from the powerful institutions by which they are employed. Steve says:

Researchers, most of whom work in relatively privileged institutions, are placed in situations of conflicting loyalties if they conduct research in collaboration with, or on behalf of, communities burdened by environmental injustices. These conflicts can threaten the self-interest of researchers and may raise social and ethical issues that do not typically arise in research projects that respond to the agendas of institutions. (Wing, Commentary, 2002, p. 442)

Steve questions the ability of universities to “serve the public interest as we come more and more beholden to corporate interests and to governmental agencies that are very strongly aligned with corporate interests” (Siesinger Lecture, 2011). Even in the PPSR project examined in the current study, the ability of UNC to serve the interest of Tillery was called into question. When the results of the study with Tillery were first...
released (detailing the acute health effects of pollution coming from industrial hog
operations) Steve, along with the community, decided to release information on the
findings to several major state newspapers, which then ran stories on the findings of their
study. Steve immediately received calls from industry groups, including one industry
representative who was on the UNC Board of Governors. He recalls the industry
representatives were adamant to tell him “in their view, it was just good business to select
the cheapest land for hog CAFOs— and that just happened to be areas that were rural,
poor, and disproportionately African American” (Wing, Commentary, 2002, p. 439). The
next month, Steve was invited to speak before the House Agriculture Committee of the
North Carolina General Assembly. He remembers being excited the General Assembly
was taking an interest in the work he and Tillery were conducting. When UNC found out
about the meeting, the UNC-Chapel Hill Associate Vice Chancellor for Government
Relations set up a meeting with Steve. Steve recalls, “The administrators stated that they
did not want to tell me how to present our research, but they were clearly concerned that I
make a good impression at the legislature, which, after all, votes on UNC appropriations”
(Wing, Commentary, 2002, p. 439). The Associate Vice Chancellor at UNC also
accompanied Steve to the hearing.

Upon telling Gary about the invitation to speak before the General Assembly,
Gary issued a warning to Steve that the General Assembly “included a number of hog
producers, was friendly to agribusiness concerns, and was probably not very pleased with
our research” (Wing, Commentary, 2002, p. 349). Gary decided to go with Steve and
help him present the findings of the study. Many Tillery community members also made
the decision to support Gary and Steve before the General Assembly. After the meeting, during which Steve and Gary presented the results of their research and took a few questions, an industry lobbyist introduced himself to Steve, refused to shake his hand and instead gave Steve his business card and told him “that if I (Steve) did not send him one (a full copy of the research report) immediately I would be facing a lawsuit” (Wing, Commentary, 2002, p. 440).

As they prepared the full report for their research study, Steve considered what information about participants should or should not be included in the report. UNC’s Institutional Review Board (IRB), put in place to protect the rights of study participants, had given him and his research team permission to conduct the study with oral consent from participants. The research team was not collecting names of community participants but rather addresses associated with data. Each participant was given an Agreement to Participate and was “assured that their responses would be kept confidential and that their name would not be written on the questionnaire, although a link would be maintained between their address and responses” (Wing, Commentary, 2002, p. 440). At a community meeting, members of the community told Steve that they did not want the names of their communities to be included in the final report. The very day the report was released by the Health Department, Steve and a co-author on the report received a letter from the attorneys of the North Carolina Pork Council demanding all details of the study, including “the identities of all persons who worked on or contributed to the study (including persons interviewed)” (Wing, Commentary, 2002, p. 441).
The Pork Industry made this request based on the North Carolina Public Records Statute, which defines a public record as:

All documents, papers, letters, maps, books, photographs, films, sound recordings, magnetic or other tapes, electronic data-processing records, artifacts, or other documentary material, regardless of physical form or characteristics, made or received pursuant to law or ordinance in connection with the transaction of public business by any agency of North Carolina government or its subdivisions. (Wing, Commentary, 2002, p. 441)

Steve soon learned this state statute “does not protect documents collected in the course of research involving human subjects and requires public officials, defined to include university faculty, staff, and graduate assistants who work for pay, to turn over records in a timely manner” (Wing, Commentary, 2002, p. 441). He was told if he failed to comply, a lawsuit would be brought against him.

After discussing the issue with his university’s IRB, Steve soon found that UNC did nothing to protect the privacy rights of participants in the study. He recalls:

The North Carolina Pork Council… got copies of all my emails…they wanted the maps of where the people doing the study lived; they wanted all the records. And the University of North Carolina administration refused to protect those participants despite the fact that people live in areas where they really could be threatened by the pork industry. (Siesinger Lecture, 2011)

Steve reflects IRB is set up to protect people who participate in studies from harmful effects. The IRB for the community research study (which included Tillery and some
other affected communities) stated the privacy of community members would be kept confidential. Yet the University of North Carolina “refused to protect these records” (Siesinger Lecture, 2011). Not only did they refuse to protect the records, but also one university administrator told Steve if he “refused to turn over documents as directed by the university attorney,” the university would call the SBI [State Bureau of Investigation] and have him “arrested for stealing state property’’” (Wing, Commentary, 2002, p. 441). Steve notes universities operate under power structures as well. He explains:

You’re supposed to protect university participants. Well why wouldn’t the university do this? They said well the law doesn’t protect the records. Well why? The pork industry had an executive on the UNC board of governors and the lead university attorney was a personal friend of the pork council’s attorney. There are legislators that vote on the university budget that get large contributions from agro-business. (Wing, Commentary, 2002, p. 441)

Steve believes universities are often “captured by industry and governmental agencies linked to industry” (Wing, interview, October 14, 2015). This results in a situation in which university studies and procedures harm underrepresented, poor communities such as Tillery. Steve, desiring to stay true to his commitment to the community, consulted with a university lawyer who “agreed that we should withhold any information that could lead to disclosure of where the study was done, including maps, driving instructions, and any references in our communications or study materials to locations or names of persons that would identify locations in the study” (Wing, Commentary, 2002, p. 441). He and his research team spent hours removing all identifying information. Despite intimidation,
pressure and threats, he maintained his commitment to the communities to keep their identities confidential (Wing, Commentary, 2002). The incident prompted Steve to obtain a “certificate of confidentiality” from the US Department of Health and Human Services “to help protect identifying information even under court order or subpoena” (Wing et al., 2008, p. 441).

When an institution protects the rights and lives of some people over others, this alienates those exploited people from that institution. If that same institution comes to offer “help” to those exploited, they will likely not trust or want this help. Steve himself has been called into question by leaders of UNC. In the Fall of 2000, he accepted an invitation to speak at a sustainable Hog Farming Summit. A month before the conference, he was sent an email from the UNC Associate Vice Chancellor for Government Relations challenging his plans to attend and speak. This email was copied to the Dean of the School of Public Health and the UNC Chancellor. Steve relays the story:

Staff in the UNC system president’s office had written to the Associate Vice Chancellor: We have received several questions and complaints from legislators and others—received through different offices in the University—about the Sustainable Hog Farming Summit… Five faculty members at three different UNC institutions show on the Summit agenda as program participants (moderators or panelists). I’ve been asked whether those faculty members are representing themselves or the universities where they are employed, are attending on university time or their own, and whether they are paying their own expenses or is
someone else (presumably meaning the university or the conference sponsors).

(Wing, Commentary, 2002, p. 442)

Steve believes researchers “have a responsibility to report findings of studies even when they can be expected to produce negative reactions from industry, government, or universities” (Wing, Commentary, 2002, p. 442). Steve concedes researchers need publications and grants to advance in their career, but if their research “sheds light on institutional discrimination, environmental contamination, or health effects that could create legal problems for institutions that provide jobs and funding to researchers” the researchers “may be motivated to withhold or delay publication, or to provide benign interpretations even when there is evidence of harm” (Wing, Commentary, 2002, p. 442). However, Steve believes researchers have a responsibility to community members to report what they find, even if that affects their funding or standing with their research institute.

Even though there are funds available, Steve has found at times a long-term commitment to social justice and projects truly working towards the goals of underrepresented communities may require doing work unfunded. He notes:

For me, I've always felt like that if we have these critical perspectives, then we need to see ourselves as dissonance within an institution. That means doing stuff, sometimes, that's not funded; in fact, a lot of the time. (Wing, interview, January 5, 2016)

Steve stresses although researchers may “choose to walk away from pollution and conflict; most community members who live with discrimination, pollution, and conflict
have no choice but to accept or to fight injustice” (Wing, Commentary, 2002, p. 449). For Steve, it is an honor to take part in that fight.

As Steve and the researcher of this study were finishing one of Steve’s Skype interviews, Steve was on his way to Eastern North Carolina to an area bombarded with industrial animal operations to participate in a community meeting. He did not have any funding for it, but he was going. Not only was he not being paid for the time spent at this and many other community meetings, but his time spent there could have been spent engaging in other activities, which would further his career. Steve, however, does not view his participation in community-based research as a hindrance to his career. Steve reflects on his own career goals:

To conduct a science project that reflects the voice and agenda of communities of color does not mean a person has to sacrifice their career goals. It really depends on how one defines a successful career. If your idea of a successful career is to get the most publications or the most money, then yes, you will do some of this work at the expense of your career. If a person, however, values and has the goal of democracy and justice for all people, then pursuing this transformed definition of science will result in an accomplished career because you will be meeting your goals and doing the work you set out to do. (Wing, interview, January 5, 2016)

Throughout their work together, Gary and Steve have sought to use the imbalance of resources and power to demonstrate to others that it doesn’t take a powerful institution to effect change. For many of their project events and subsequent events of the North Carolina Environmental Justice Network, rather than use the facilities of UNC’s Research
Triangle Park, they opt to use Tillery’s small, wooden frame community center. In Gary’s words, “It allows the folk who came in from other places to see, it doesn’t take a million dollar building to bring about change” (Grant, interview, February 17, 2016).

**Theme 3: Challenges to a Third Space in PPSR**

This final theme emerged from several conversations with Steve concerning the theoretical construct of a Third Space. Through conversations between the researcher and Steve, which involved much description on the part of the researcher about the various aspects of a Third Space, Steve concedes he has “certain concerns” with the concept of a Third Space applied to a PPSR project and is “not quite comfortable with “how it fits his worldview” (Wing, interview, January 5, 2016). Steve’s challenges were not for the theoretical construct of a Third Space as a whole or for how a Third Space has been applied in other settings, but rather how this construct applies to the setting of a PPSR project. Although many of the principles of a Third Space well align with the larger level of activity, which existed in this PPSR project, Steve challenges others to critically examine assumptions behind the idea of a Third Space in PPSR and urges other PPSR project leaders towards a transformed view of science.

**Finding:** The idea of a Third Space in a PPSR project may perpetuate the dominant paradigm’s view of science. One particular aspect of a Third Space within a PPSR project, which Steve challenged, was the idea that a Third Space involves legitimizing and utilizing community ways of discourse and knowing (Gutiérrez et al., 1999). In his view this statement seems to imply community ways of knowing need legitimizing before they can be useful. In the case of this PPSR project the community’s
knowledge was legitimized by a scientific study providing evidence of the pollution brought by industrial hog operations. Steve, however, disagrees with the idea that “the community members needed quantifiable variation of pollution levels with health related outcomes and evidence of acute effects of air pollution caused by the industrial operations” (Wing, interview, October 14, 2015). He notes community members only “needed this data” because:

Observations of community members do not ‘count’ in the scientific literature used by policy makers and courts, researchers can maximize their service to communities by devising standardized procedures, including data collection and measurement techniques, that comport with professional standards, even as we may need to change those standards to improve science. (Wing, Commentary, 2002, p. 442)

Steve reflects on the “need” for the scientific study produced by their PPSR project. He notes:

In a way, I have felt like the work we did…no one should need that because it was already clear there were problems to me and to them. So, who needed this quantification? Well, maybe the government needed it, if they are going to take actions; but they still haven’t taken any action in my opinion that are really substantial. So that remains to be seen. To say they needed this information suggests that if they had it then they will do something. (Wing, interview, October 14, 2015)
Although a permanent moratorium now prevents additional hog farms from being placed in Tillery, Steve highlights here the fact that even with scientific evidence proving the community’s concerns regarding the pollution brought by the hog farm, the hog farms have not been moved and the polluting of Tillery’s water and air continues. Steve challenges why the community needed a scientific study to legitimize their concerns and then points out the irony that even with a “more legitimate form of knowledge” no actions have been taken to improve the community’s health (Wing, interview, October 14, 2015). He points out the reason poor, communities of color are not being heard is not simply due to them speaking in a discourse, which is different or viewed as less legitimate. In his view, the real issue involves the interests of groups with power being deemed more important than groups with less power. In an article published as a result of this PPSR study, Gary and Steve note:

A 1995 North Carolina Division of Environmental Management lagoon inspection study found Halifax tied for third place among North Carolina counties with the largest number of problems, with eight lagoons in danger of overflowing or bursting. A United States Environmental Protection Agency study has identified threats to the shallow aquifers that supply drinking water to most rural residents. (Wing, Grant, Green, Stewart, 1996, p. 132)

Despite these studies with “legitimate” data supporting community concerns, the hog operations in Tillery are still present and to this day hold in their hands a permit to spray hog waste onto the open fields located in the neighborhoods where Tillery (and other poor, African American communities) live (TEDx, 2013).
Steve also challenges the idea of a PPSR being a place in which opposing discourses can change conflict into a zone of collaboration and learning, a key component of a Third Space as a pedagogical practice (Gutiérrez et al., 1999). Steve concedes naturally because science is a specialized knowledge, there will be differences in the discourse of the scientist and the discourse of the community, but the term “opposing discourses” leaves the idea of the two discourses being “in conflict or competition” with each other (Wing, interview, January 5, 2016). Steve challenges others to consider why science has an opposing discourse, with a different trajectory than that of underrepresented communities. He believes the bigger issue is “science is for some people and not for others” (Wing, interview, January 5, 2016). He recommends avoiding any notion of “letting the community speak,” as if they need permission to speak (Wing, interview, October 14, 2015). This terminology may convey the idea that science is the space of some people, and these more powerful people, are going to permit helpless people the permission to talk a little. He says, “Having a voice should be everyone’s equal right, so no one should be granting another person permission to talk” (Wing, interview, January 5, 2016). A Third Space, although the concept is helpful in creating a culture of collaboration within the classroom, may be difficult to apply to the setting of a PPSR project because of the inherent power structures between teacher and student.

In Steve’s experience the “real issue keeping Tillery community members from science” was “not because Tillery community members viewed the world so differently” than the scientific view. Rather “the real issue is that scientific studies are typically used for the benefit of some communities and not others” (Wing, interview, January 5, 2016).
In his view, the goal is not to look for overlap between the underrepresented communities and the scientific community. He notes:

It all goes back to a person’s definition of science. I have a problem with considering the values and agenda of the community to be ‘unrelated’ or ‘in opposition’ to science. In my view science should include the concerns of communities of color. It’s not about making space within science; it is about transforming science and realizing that science is better when the studies are conducted to represent the voices and values of all communities. (Wing, interview, January 5, 2016)

Steve believes science does not exist as an unbiased entity. Science is not larger than the values, goals and voices of the people who make up and fund this body. Steve believes the picture of a Third Space as an underrepresented community and science merging together is flawed and makes the false assumption that science is an unbiased entity. He notes:

The community of science is made up of voices and interests of communities as well. Currently, the real issue is that science doesn’t include all communities/all voices/all agendas. So the voices of women, communities of color etc. aren’t equally represented in science or at times aren’t represented at all. The bigger issue is the need to transform science to include all people’s interests instead of maintaining the status quo where only the elite or those with money and power dictate the definition of science. (Wing, interview, January 5, 2016)
Steve believes PPSR project leaders need to practice a science, which is driven by the values of all people and not just those of the dominant group. In this transformed science, everyone has equal rights to speak. He says, “It’s not about making room for the voices of marginalized communities; it’s about realizing the status quo is denying them a right that is theirs, if operating under the values of justice and equity” (Wing, interview, January 5, 2016). Poor communities of color face real problems—problems that affect their health and ability to live. Yet, these problems “have not been taken up by industrial researchers or governmental researchers and academics” (Wing, interview, January 5, 2016). He notes when research questions come from the communities facing the problems, the questions tend to be different than questions academics typically ask. He also notes the obsession with experimental design removes all context and “questions such as who is being exposed to pollutants” become irrelevant (Siesinger Lecture, 2011).

Steve challenges project leaders to “search out those values driving the scientific questions you are asking and realize that science needs to be transformed to be driven by more values” (Wing, interview, January 5, 2016). Science is a method of inquiry but “science” is not value free. He advises:

If we leave the definition of science as is, to only include the interests of the dominant paradigm, then, yes, there are fundamental aspects of science and values of science that prevent the merging of underrepresented community values, goals, and agendas with those of science. But I disagree on this definition of science. Science is investigating the natural world. But the definition of science is much contested; science in my view should be transformed to include more than just the
interests of corporations and government. Science currently is very much driven by economic interests, and until that changes then yes, there are fundamental aspects of science preventing this merging. I believe the goals, values, and agendas of the underrepresented community should be included in science, because I value equality and democracy. (Wing, interview, January 5, 2016)

Steve agrees science “has a dominant paradigm and character, but it's not homogeneous, so there's struggle…between people who are comfortable working under the dominant paradigm, as well as people who are challenging it” (Wing, interview, January 5, 2016). For Steve, who has long been a part of challenging the dominant paradigm, he considers it a “privilege to not go along with the status quo” and instead “use the scientific method to work for social justice organization” (Wing, interview, January 5, 2016).

It has required creating “dissonance within the field of science,” but Steve’s goal is not to invite community members into science but rather open science up to new possibilities (Wing, interview, October 14, 2015). He notes:

Research can be done for people who are exposed to pollutants, or who are denied basic public health services, or who are being subjected to police violence, or to denial of adequate educational facilities; any of that. Research can be done in collaboration with the people who are experiencing injustice, not just for the people who are perpetrating the injustices. (Wing, interview, October 14, 2015)

**Finding: A Third Space could be superficially created without any real change to communities.** The final challenge Steve offers to the concept of a Third Space
within a PPSR project is for other project leaders to closely examine their motivation for creating a Third Space. He advises the elements of a Third Space are tools, which can be used for good or for bad. He notes:

Researchers can use terminology that's more similar to that community in order to control them and pollute their communities more. Dr. Privy (referencing character from community play) needs to know that too, and corporations and government officials hire communications specialists to try and understand the local community so they can control it. That, as a technique, could be used either for purposes of justice and liberation, or for purposes of social control and domination, and exploitation. That in and of itself… is a tool, and it could be used for good or bad. (Wing, interview, October 14, 2015)

He advises project leaders to examine their motivations for building trust with community members noting, “My motivation to participate in community activities wasn't really because I wanted people to trust me so that I could pursue my agenda” (Wing, interview, October 14, 2015). The community members of Tillery express frustration with environmental groups who “capitalize on how diverse” they are and “play games.” They state, “Let it be known that we will not allow them to play that game any longer. We will not allow people of color to be taken for granted, patronized, excluded, or used by traditional environmental groups who refuse to expand their agendas” (CCT website).

Steve’s motivation was to be able to work with the community of Tillery, “because their agenda was what I wanted to be a part of” (Wing, interview, October 14, 2015).
Steve agrees with Gutiérrez (2008) that PPSR project leaders should not deny the past but instead critically examine and engage in dialogue about oppression and possibilities for future action. Yet, he warns dialogue alone will not result in a changed future for oppressed groups. He says:

Healing will not take place if the meaning of oppressive events and the underlying belief they represent are not confronted and recognized as being flawed. What people need to fix is their values. You can go into a community and empathize with them all day long but if at the end of the day you do not fight discriminatory practices because they aren’t affecting you, then the impacts of dialogue will be limited. (Wing, interview, January 5, 2016)

He stresses the importance of examining one’s own “underlying beliefs about discriminatory practices and a science that does not promote democratic values” (Wing, interview, January 5, 2016). This careful and critical self-examination is “vital to true empathy.” When science only serves the interests of those with power it’s a perpetuation of colonialism. To create dissonance in the field, one must stand against this and have science projects that do not serve the interests of one group over another. Steve sees the hope in “being a part of scientific work that promotes the values of democracy and a science where everyone’s voice is represented. The beauty is in the process of working together alongside communities of color.” The value lies in “practicing a transformed science”—a science that reflects the voices of all people (Wing, interview, January 5, 2016).
CHAPTER 6: DISCUSSION AND CONCLUSION

Overview

The purpose of Chapter 6 is to discuss the findings of this study. This chapter will provide meaning to the results by tying them to past history, theory, research, policy, and practice. The chapter is organized into three main sections: a brief summary of the study’s background and purpose to re-orient the reader with the overall purpose of the study, a discussion of the study’s findings organized by research question and theme, and a conclusion with implications for practice and recommendations for future research and change.

Summary of Study’s Background and Purpose

Educational programs set up to provide opportunities for all, in reality often reflect social inequalities (Syed & Chemers, 2011). Such is the case for Public Participation in Scientific Research (PPSR) projects. PPSR projects have been proposed as an effective way to engage more diverse audiences in science, yet the demographics of PPSR participants do not correspond with the demographic makeup of the United States. Summative evaluations of who is participating in PPSR projects reveal Blacks, Latinos, American Indians, and all lower socioeconomic statuses are underrepresented in PPSR projects (Evans et al., 2005; Pandya, 2012). Research has suggested the fundamental organization of science and science educational programs may exclude and marginalize underrepresented groups from science, and thus the field needs more research into inclusive approaches, which avoid marginalization (Nasir et al., 2006). This study investigated the dynamics involved in a research partnership formed between a low SES African American community and a scientific research team. This study investigated any
factors, which may have discouraged the underrepresented community’s motivation to participate in a PPSR project. The study also explored how a specific PPSR project was able to overcome extant participation barriers. Finally, the study investigated how and to what extent the theoretical construct of a Third Space, as a specific engagement strategy, is applicable to a PPSR project. The research-based recommendations for PPSR projects desiring to initiate and sustain research partnerships with underrepresented communities well aligned with the theoretical construct of a Third Space, which has been described as an area between different discourses, or communities of practice, which has the potential to be productive for negotiating shared meanings and for blurring the boundaries between two communities of practice (Bhabha, 1994; Whitchurch, 2008). This study examined a specific scientific research partnership between an underrepresented community and scientific researchers to examine if and to what extent a Third Space was created. This study aimed to illustrate, support, or challenge the theoretical assumptions of a Third Space within the context of PPSR.

**Research Questions**

The research questions guiding this study are:

1. What advice do PPSR project leaders have regarding how to engage underrepresented communities in scientific research?
2. What are the barriers, if any, affecting an underrepresented community’s willingness to engage in a PPSR project, and how can PPSR project leaders overcome these barriers?
3. How, and to what extent, can PPSR project leaders create projects that are Third Spaces, which merge the discourse, practices, goals, and values of science with the discourse, practices, goals, and values of an underrepresented community?

The author of this study chose to investigate the research questions with qualitative methods because qualitative research seeks to understand how people describe and understand their experiences (Merriam, 2002). In this study, the author examined the experience of one underrepresented community and their university research partner. A case study approach was employed to understand the interactions and processes involved in initiating and sustaining a scientific research partnership between two unique communities of practice: the scientific community and the underrepresented community. The focus of this study was on the process of how PPSR project leaders approached and engaged underrepresented communities in scientific research studies. By providing a vicarious experience of a PPSR research partnership in which an underrepresented community and university researcher partnered in scientific research, the goal of this study was to draw out key approaches, attitudes, and lessons learned, which will be transferable to other projects in other contexts.

Discussion of Findings

The discussion begins with the second research question of this study, discussing the factors affecting an underrepresented community’s sense of belonging to the community of science and how these barriers can be overcome. Included within the discussion of barriers to belonging, the author links the findings on practical advice for engaging underrepresented communities in scientific research. This practical advice,
which came from the PPSR project leaders interviewed in Part 1 of this study, answers the first research question regarding practical advice on the process of how PPSR project leaders can engage underrepresented communities in scientific research projects. Finally, the author discusses the theoretical construct of a Third Space as it applies to a PPSR project, answering the third and final research question: How, and to what extent, can PPSR project leaders create projects that are Third Spaces, which merge the discourse, practices, goals, and values of science with the discourse, practices, goals, and values of an underrepresented community? Within the discussion of a Third Space, the author also links the practical advice offered by PPSR project leaders as it applies to the findings of this final research question.

Research Question 2: What are the barriers, if any, affecting an underrepresented community’s willingness to engage in a PPSR project, and how can PPSR project leaders overcome these barriers?

The first two themes of this case study, inequality and mistrust as barriers to belonging and overcoming inequality and mistrust, arose in response to the second research question. The author of this study discusses the findings of this research question according to these themes. Within the discussion, the author also incorporates the practical advice from Part 1 project leaders on how to engage underrepresented communities in a scientific research study.

Inequality and mistrust as barriers to belonging. Research Question 2 sought to understand why the field of PPSR as a whole has had little success recruiting underrepresented populations to participate. When asked about the lack of participation from underrepresented groups in science and PPSR projects, Steve described the issue as
more “fundamental” than science alone (Wing, interview, October 14, 2015). Gary also described the issue as bigger than science, noting, “It’s not just science it is who shows up to science” (Grant, interview, February 17, 2016). Science is part of a bigger system of institutions, which have historically and currently alienate underrepresented groups of people. This study found PPSR project leaders need to carefully consider how underrepresented communities have been treated by powerful institutions, and be cautious and humble when approaching the community. Powerful institutions, such as governmental bodies and universities, have caused great suffering for underrepresented communities. This suffering necessitates a humble approach and a willingness to learn about underrepresented communities’ contentious histories with these powerful institutions. As Project Leader 3 noted, there has been “a depth of wounding” that has occurred (Interview, February 11, 2015). That wounding, whether in the past or still being experienced, should not be ignored or devalued; rather, it should guide the manner of approach and the conversations project leaders have with community members.

Likewise, the findings of Part 1 of this study indicate if project leaders approach the community with an overinflated view of their university and the good it plans to do within the community, this will be a barrier to communication with underrepresented communities.

Underrepresented communities may feel exploited by institutions with power. Throughout the interviews for this study, project leaders warned against colonialism and the detrimental effects it has on a research partnership forming between an underrepresented group and a university researcher. Colonialism is defined as “the
exploitation of the periphery” (Kohn, 2012). Colonialism, for many, conjures up images of the British exploiting Native Americans, or American slave traders abducting African men, women, and children from their homes---a shameful part of the United States of America’s past. Yet, the logic of subordination, which guides colonialism, long endures even after the group with no power gains independence from the group with more power (Spivak, 1988). Practices, laws and policies can reproduce a logic of subordination, which keeps the exploited group from gaining full status within the dominant group’s social system. Conversations with PPSR project leaders revealed many underrepresented communities continue to feel and experience the logic of colonialism, and as Project Leader 1 warned, we ignore it at our “own peril” (Interview, February 12, 2015).

Research studies, often funded by powerful institutions, ask questions; yet these questions do not exist independently from other research questions asked or policies enacted by these same powerful institutions. Project Leader 3 recommended other would be project leaders to carry with them the consciousness of the community’s history, because it will affect the way the community interacts with a researcher. The Native American communities with whom she partners have memories of brutalization—their grandparents were forced from land her university now sits on. She advises histories such as these cannot be ignored but rather require a humble approach when trying to rebuild relationships, which have historically been abusive (Interview, February 11, 2015). Likewise, Walters and Simoni (2009), who studied factors impeding underrepresented groups’ participation in health research studies, found exploitation and inequalities within governmental and other powerful institutions have led community members to “remain
openly and justifiably suspicious of educational institutions” (p. 72). In the study, which involved mental health and HIV research in Native American communities, researchers found many of the community’s suspicions about the researchers’ educational institution resulted from the community’s past experience with colonialism. Hundreds of years after the British came to the Americas, stole their lands and killed their people, Native American children in the late 1800s and early 1900s were taken from their families and sent to boarding schools off their reservations. Reformers at the time, citing the many problems in Native American reservations, wanted to give the children a chance at making, what these reformers considered to be, a good life. The Native American children were forcibly taken to boarding schools and re-cultured according to the dominant group’s value system. These practices, although publically discussed as a way of helping the Native American community, were forced upon Native Americans and devalued their culture and practices. Additionally, these boarding schools are now known to have been a place where many Native American children were sexually abused and otherwise exploited. The logic of subordination lived on past the originating exploitive event—American Indians, their culture, their practices and people were treated as if they had a lower rank and value than those from the dominant group. Walters and Simoni (2009) found when they entered Native American communities hoping to do health studies, which would benefit the community, many community members did not trust the researchers’ intentions, citing the abduction of their children to boarding schools as a reason for their mistrust. These stories of abuse, whether personally experienced or not, have been re-told through generations. Walters and Simoni’s university was part of a
system of larger institutions, which had horribly abused the Native American community—leaving the community very skeptical of working or even interacting with the researchers.

As the PPSR project leaders in Part 1 advised, each community is different, and care must be dedicated to understanding each community’s unique history with powerful institutions. Through years of conversations with Tillery, Steve learned the community of Tillery feels the logic of subordination when they interact with institutions of power. Tillery community members believe they are disenfranchised in a system, which began with slavery and continues to this day. The characters of today’s story are different, but the story line is the same: the dominant group exploits those with no power, so they can gain more power. The experience of Tillery community members has led them to believe little has changed since their days of slavery. They are still fighting to be recognized as equals to Whites, fighting for representation in governmental bodies, for equality in schools, for an equal chance to own land, and for the right to live in an unpolluted environment. Yet, the larger system, to which science belongs, continues to treat Tillery as if they are of lesser value than those with power and money. Gary’s description of how Tillery feels treated by governmental agencies parallels the definition of marginalization. Marginalization means, “To put or keep (someone) in a powerless or unimportant position within a society or group” (Merriam-Webster Online Dictionary, n.d.). With no representation in powerful bodies, which make decisions affecting their community, and lack of access to information, Tillery community members are once again forced to accept the word of powerful White men and go along with programs claiming to help the
community, which in reality hurt them. Thus, the logic of subordination persists.

This study found it is vital to understand underrepresented communities’ perceptions of historical events. Through many years of relationship development, Steve learned Gary and other Tillery community members believe that powerful institutions and governmental bodies establish programs to keep low SES Black Americans “locked in poverty” (Tillery Documentary, 2007). As they see it, history is repeating itself. Not too long ago, in a governmental program set up to help the community, Tillery’s ancestors received plots of land located in the flood zones, while Whites received plots of lands located on higher ground. Today, Tillery community members see their children and grandchildren being sent to public schools with little access to funding. Neighboring, predominately White, school districts—Roanoke Rapids and Weldon districts receive supplemental tax funding to support their schools, while Halifax County does not. Halifax County schools, with lack of access to money are constantly struggling and facing closure. For years, Tillery has fought to put a supplemental tax on the ballot, but has been unable to gain the necessary support to pass a referendum. Tillery currently pays supplemental taxes, but the money helps finance education in Weldon and Roanoke Rapids. Their children are either bused to these wealthier schools or attend the poor, local schools (CCT, p. 61). As Gary notes, “It’s no mystery why low SES Blacks aren’t succeeding in school” (Grant, interview, February 17, 2016). He believes America’s most privileged want it that way, to supply them with labor. Science is just a part of a larger system, which many in Tillery see as being set up against them. In Gary’s words, “You
put us here, you keep us here… Why would I be interested in science?” (Grant, interview, February 17, 2016).

Tillery community members have grounds to doubt the intentions of powerful institutions. The same political bodies, which voted to bring the pork industries to their neighborhoods and pollute their air and drinking water, are the bodies making decisions denying their schools access to funding. These same powerful people are closely tied to the universities, which approach their communities hoping to do research. They are all part of the same system. Other researchers report similar findings regarding the connections communities make between powerful institutions. A study examining factors affecting African American’s participation in biomedical research found African Americans cited a racist educational system as a reason they would not participate in the study. Community members surveyed believed the larger system, to which the biomedical study belonged, did not have equal opportunities for African Americans, and thus they did not trust it (Bates & Harris, 2004). Consistent exploitation by institutions with power leads people to reject the help being offered. As Gary advises, “You have helped enough” (Grant, interview, February 17, 2016).

Another finding of this study is although the lack of participation in science is a more fundamental issue of alienation and exploitation at the hands of powerful institutions to which science belongs; science itself has exploited and abused African American communities. People with power and privilege, in the name of science, have treated African Americans as if they are inferior to Whites—perpetuating the logic of subordination. Gary advised scientific studies describe African Americans as inferior to
Whites. The literature supports Gary’s charge. A. Brandt (1978) reports on racism within the scientific community of the late 19\textsuperscript{th} century early 20\textsuperscript{th} century. During this time, medical reports were published describing Blacks as the “lowest species in the Darwinian hierarchy” with “excessive sexual desire, which threatened the very foundation of White society” (p. 21). Thus, Steve urged other project leaders to familiarize themselves with the history of science and underrepresented communities. He recommended specifically reading about the Tuskegee Syphilis Study and the forced sterilization practiced under a eugenics program for decades in North Carolina. Based upon his recommendations, the following paragraphs discuss these historical events.

In 1932, the Tuskegee Institute partnered with the Public Health Services to record the natural history of syphilis in the Negro male. The goal of the study was to learn what untreated syphilis looked like and how it impacted the human body both in life and in death. The 60-year study involved 600 Black males with syphilis and 201 without syphilis. Participants were told they were being treated for bad blood, a term which local community members used to refer to syphilis and other blood conditions such as anemia or fatigue. However, study participants were not given any treatment, even though previous medical research had demonstrated lack of treatment could lead to “cardiovascular disease, insanity, and premature death” (A. Brandt, 1978, p.23). Doctors leading the Tuskegee study expressed the belief that venereal disease in Blacks would go untreated anyway because they were “promiscuous and lustful” (A. Brandt, 1978, p. 23). In exchange for their participation in the study, which was conducted without the participants’ consent, the participants received free meals, medical exams and burial
insurance (Centers for Disease Control and Prevention, 2016). Subsequent investigations of the Tuskegee study found significant deception was involved in this study. The African American men participating in the study were not told they were involved in a study on syphilis. In 1947, 15 years after the study began, penicillin became available and was the recommended drug to treat syphilis. However, participants were not told about penicillin, and because they believed they were getting treatment, they saw no need to get additional treatment (A. Brandt, 1978). The “Tuskegee Study of the Natural History of Syphilis in the Negro Male” was not a secret study. Research articles on the study were published in prominent journals such as the Journal of American Medical Association throughout the duration of the study. It was not until 1972 when an Associated Press article brought the study to the general public’s knowledge that people became upset, and an Ad Hoc Advisory panel was assigned to review the study. After the panel investigated and found the study to be ethically unjustified, the study ended in 1972 (Bates & Harris, 2004). Bates and Harris (2004) has described the Tuskegee study as a “new form of slavery,” noting researchers felt they “not only owned the research findings but the very bodies of the men participating” (p. 1053). A. Brandt (1978) says:

In retrospect, the Tuskegee Study revealed more about the pathology of racism than it did about the pathology of syphilis; more about the nature of scientific inquiry than the nature of the disease process. The injustice committed by the experiment went well beyond the facts outlined in the press and the HEW Final Report. The degree of deception and damages has been seriously underestimated.

As this history of the study suggests, the notion that science is a value-free
discipline must be rejected. The need for greater vigilance in assessing the specific ways in which social values and attitudes affect professional behavior is clearly indicated. (p. 27)

Tuskegee was not an isolated case of science exploiting the African American community. Another highly publicized example of exploitation of an African American in the name of science is the case of Henrietta Lacks. Henrietta’s story is told in the book *The Immortal Life of Henrietta Lacks*, the non-fictional account by American author Rebecca Skloot (2011). Henrietta Lacks is best known as the source of cells that form the HeLa cell line, an immortal cell line used extensively in medical research since the 1950s. In 1951, doctors diagnosed Henrietta, a poor African American woman, with cervical cancer. During her cancer treatments, doctors removed two samples of cancer cells from Henrietta without her permission or knowledge. After her death a short time later, a scientist isolated and multiplied her cancer cells, creating a cell line named HeLa. Scientists have used and continue to use Henrietta’s cells to do countless experiments and make important medical discoveries. As Skloot (2011) reports, “Many for-profit cell banks and biotech companies have made millions off the sale of Henrietta’s cells” (p. 194). A vial of HeLa products can cost anywhere from $100 to $10,000 per vial. Additionally, according to the U.S. Patent and Trademark Office, there are up to seventeen thousand patents involving HeLa cells.

Like the Tuskegee study, doctors did not obtain permission from Henrietta or her family to use her cells. Additionally, they released Henrietta’s name and a photo of her to the public. Henrietta’s family was blindsided in 1973 when they discovered, through a
chance conversation with a dinner guest, that their mother’s cells were used all over the world to conduct research. The family did not even know the doctors had taken cells from Henrietta, let alone know that a multi-million dollar industry had been created from the use and sale of her cells. Skloot (2011), who interviewed many of Henrietta’s family members while writing Henrietta’s biography, reports on the event:

It was like a nightmare. She (Henrietta’s daughter) had read in the paper about the syphilis study at Tuskegee, which had just been stopped by the government after forty years, and now here was Gardenia’s brother-in-law, saying Hopkins had part of Henrietta alive and scientists everywhere were doing research on her and the family had no idea. It was like all those terrifying stories she’d heard about Hopkins her whole life were suddenly true, and happening to her. If they’re doing research on Henrietta, she thought, it’s only a matter of time before they come for Henrietta’s children, and maybe her grandchildren. (p. 180)

Henrietta’s daughter knew about Tuskegee; she had heard terrifying stories all of her life about what researchers do to poor, African Americans. Now, her family’s story too is another highly publicized account of an African American being exploited in the name of science. Many scientists and industries have benefited in their careers and financially from the unconsented use of Henrietta’s cells, and many in the African American community are aware of this exploitation.

Other underrepresented groups have had similar experiences with research conducted in the name of science. Shafer (2004) reports on a diabetes study in which blood drawn from Native Americans to study the effects of diabetes was later used in
another study, without permission, to study inbreeding. Benson (2001) provides an account of Native American children who were removed from their homes and placed in boarding schools being used in medical research without their consent. When there was an outbreak in the school of trachoma—a bacterial infection in the eye, which can lead to blindness if untreated—surgical techniques were tested on Native American children that led to permanent blindness. The logic of subordination persists. The history of underrepresented communities with science and research studies has led many in these communities to believe scientists, doctors, and researchers view them as subjects upon which to test treatments and surgeries, a belief supported by historical facts. Underrepresented communities are acquainted with a version of science, which has been used against them. They have been treated as subjects to be tested and humans without basic rights. Project leaders hoping to engage underrepresented communities in scientific research need to be aware of the history of science with underrepresented communities and humbly approach these communities who have every right to doubt their intentions.

Gary and others in the African American community recognize a scientific study can do more harm than good to the community. In their experience with researchers, researchers come promising good for the community, take what they need, and then leave, often publishing works describing the community as inferior and full of problems. Even the Tuskegee experiment began with public intentions to help the African American community. In 1926, nearly 35% of the African American population of reproductive age was infected with syphilis. It was a major problem for the African American community and researchers were working to find a cure. After some initial success with mercury and
bismuth, which had a cure rate of less than 30%, funding for the research was cut. Scientists who began the Tuskegee Syphilis Study hoped the study would justify the need for syphilis treatment programs, yet in 1945 when penicillin was discovered to be the treatment of choice, the Tuskegee study participants were not told of available treatments (Center for Disease Control, 2016). Somewhere along the line, a study, which set out to justify the need for programs to treat syphilis, denied African American participants to syphilis treatments. As Gary Grant concludes, “Studies that have been done either on us, or supposedly for us, always lost us somewhere in the process” (Grant, interview, February 17, 2016).

Steve Wing also recommended reading about the eugenics program practiced in North Carolina and other states. In 1929 the North Carolina General Assembly ordered the head of any public institution to force sterilization of any inmate or patient when “such an operation was deemed to be in the best interest of an individual or for the public good.” Decisions were made by the board about whether the operation would be “in the best interest of the individual’s mental, moral, or physical health” (Learn North Carolina, 2016). This eugenics program, although it changed names and at times departmental leadership, was in operation until 1977. Edwin Black (2003), in his book War Against the Weak: Eugenics and America's Campaign to Create a Master Race, expresses the view that the American upper class created and used eugenics as a way to get rid of people who they considered to be undesirable, many of whom were poor, African Americans. Nineteenth and twentieth century elites in society embraced the belief that lower class people would pass on their bad traits to their offspring, so in order to improve the racial
quality of the next generation, they used social policies to control how poor people could reproduce. Many viewed the eugenics program as a way to “propagate the Nordic race” (Black, 2003, p. 78). According to Black (2003) the eugenics policies “led to castration and sterilization of more than 80,000 people in the United States but also placed negative eugenics as part of high school and college curriculums across the country” (p. 78). Eugenics is considered by many to be a way those with power in society used science and social policies to control poor, often Black, communities.

The practical advice from Part 1 project leaders is for other researchers to commit serious time to learning and understanding the history their underrepresented community has with powerful institutions such as science. With a history so painful, it is vital to be cognizant of the abuse and community perspectives on the abuse. As Project Leader One advises, project leaders should avoid being the “ignorant giant” who enters the community without an understanding of the actual history of the community. The history of science with African Americans, arguably less known in the academic and scientific community, is well known in the African American community. Alicia Garza, co-founder of BlackLivesMatter, a hashtag and political project now turned into a social justice movement, advises, “Black folks living with disabilities and different abilities bear the burden of state-sponsored Darwinian experiments that attempt to squeeze us into boxes of normality defined by White Supremacy is state violence” (Garza, 2014, p. 2). She argues scientific studies are just one example in the world where Black lives are “seen as without value within White supremacy” (p. 3). She states, “Blacks are forced to live in a world where Black lives are systematically and intentionally targeted for demise” (p. 1).
For many African Americans, inequalities, social programs of control, police violence, and exploitation in the name of science are all remnants of the logic of subordination, which began with colonialism and continues to this day. As Alicia Garza concludes:

The state apparatus has built a program of genocide and repression mostly on the backs of Black people—beginning with the theft of millions of people for free labor—and then adapted it to control, murder, and profit off of other communities of color and immigrant communities. (p.3)

Science and educational institutions are a part of the state apparatus to which Garza refers, and in Gary’s words, it is “no mystery” why African Americans often hesitate to participate in that system.

Another finding of this study is systematic inequalities, exploitation, and the logic of subordination both in the past and today, create mistrust. Project Leader 5 warned project leaders’ membership into a privileged group, whether by race or class, may make a community automatically suspicious of a project’s intentions. Inequalities and abuse leave marginalized community members “very suspicious” of institutions of power and very sensitive to any interactions they have with people from these institutions. Inequality and stigmatization impedes trust, and this trust will cause a person to feel “reluctant to invest themselves in a domain where they could be subjected to biased judgment or treatment” (Cohen & Steele, 2002, p. 304). As Steve relays, Tillery community members have had many interactions with White people who treat them disrespectfully and with prejudiced. They have a template of what to expect from researchers, and it took quite some time for Steve to gain their trust and demonstrate he did not fit this template. Tillery
community members’ mistrust for powerful institutions resulted in fear—fear to participate in the study, fear of losing their jobs, and fear of losing other societal benefits.

Other studies on African Americans’ willingness to participate in scientific research report similar findings. Bates and Harris (2004) describe the “Tuskegee effect,” in which African Americans are less likely than Europeans to participate in biomedical research. In their study, they found African American participants were suspicious of biomedical studies based on the historical abuse of African Americans and specifically the abuse of African American participants in the Tuskegee Syphilis study. Participants interviewed, indicated they were apprehensive researchers were manipulating things in the study to serve the researchers’ own needs. Participants felt negative, mistrustful, and had major concerns they would be exploited if they participated. One participant admitted to steering clear of studies because of mistrust for people who have that kind of knowledge. In this participant’s words, “What are they trying to do to us now?” (Bates & Harris, 2004, p. 1056). Similarly, Shavers, Lynch, and Burmeister (2000) surveyed African American and White residents of the Detroit Primary Metropolitan Statistical Area and found 81% of African American respondents knew about Tuskegee. Of those knowledgeable, 49% said that they would not be willing to participate in future medical research. Researchers conclude distrust from knowledge of Tuskegee impacts the willingness of African Americans to participate in future medical research. Exploitation in the name of science has created mistrust for the institution.

The impact of traumatic, exploitative experiences is not isolated to the event itself but rather continues through how the event is retold from generation to generation and
also through a perceived continuation of the event’s meaning (Walters & Simoni, 2009). Tuskegee meant scientists viewed African American lives as inferior, bodies upon which to experiment. Thus even though no African Americans alive today were themselves involved in the syphilis study, the message Tuskegee communicated to others in the African American community is still felt today. In a preliminary study, which informed this dissertation research, the author asked members of the public why or why they would not participate in a citizen science project. One African American woman’s answer seems pertinent to mention here. When told the author was the leader of a citizen science project and asked whether she would be interested in participating, she replied:

Depends on the topic. If scientists wanted me to take pills for some experiment they had then no, I don't want to be a guinea pig. But if they wanted me to do something like what you are doing, taking surveys for them then yeah I would do that. (Lyons, Genareo, & Simpson, 2015)

The participant’s comments, which at the time seemed bizarre to the author, now resonate with the findings for the larger study. Although the author cannot be sure this African American woman had heard of Tuskegee, she had heard the meaning of Tuskegee: that scientist throughout history have used members of the African American community as guinea pigs upon which to experiment. Colonialism and the logic of subordination have deeply wounded marginalized communities; leaving scars that as Gary notes, don’t “go away…They are a reality that still is” (Grant, interview, February 17, 2016).

Chavez et al. (2003) advises researchers working in communities of color to be well versed in theories such as historical trauma and to empathize with the lived
experience of community members. Many social psychologists have described slavery and inequality as a cultural trauma all African Americans must bear. A cultural trauma occurs when members of a group believe they have been subjected to horrendous events, and these events mark their group consciousness and change the group’s identity. In such cases, even if a person did not individually experience the trauma, if the trauma was one of overwhelming significance, such as slavery, every person belonging to that group must cope with it. Ron Eyerman (2002), in his book *Cultural Trauma: Slavery and the Formation of African American Identity*, explains how the cultural trauma of slavery has impacted the African American identity, even to this day. He describes slavery as a social condition all African Americans must constantly reflect upon and remember. Slavery is a historic event, which has left a mark on the consciousness of every African American (Eyerman, 2002). Eyerman explains traumatic memories of slavery and its logic of subordination, left what Freud refers to as “indelible imprints” (p. 42) on the consciousness of every African American. The trauma of slavery affected the core of the African American identity. Whites with power abducted, abused, exploited and often killed African Americans because of who they were—Black.

Social psychologists explain it is not the event itself, which causes trauma; it is the meaning of the event. Slavery meant White lives had more value than Black lives. The trauma of slavery was Blacks were less valuable, less worthy, and lower in social status because of the color of their skin. Thus, when slavery was abolished, the trauma of slavery never ended. Blacks were still treated as if they were less than Whites, were still forced to live in separate parts of town, take lower paying jobs, accept the word of the
White man and work for the benefit of the White man. The voice of a Black man or woman still did not matter. They were free but they were not respected, not valued and not equal. The traumatic event of slavery may be over, but the trauma is relived when African Americans are made to feel less than Whites.

The trauma of slavery is still being lived by Tillery community members. The people of Tillery do not have clean air to breathe or clean water to drink because their voices do not count as much as the voices of powerful people in the hog industry and of governmental bodies who are closely tied to the industry’s interests. The basic quality of Tillery’s life is not as important as people in power gaining more power and more wealth. Tillery community members still live in separate parts of town, forced to watch funding being funneled out to wealthier, White parts of their county. They are still made to accept the word of the White man—long fighting and being denied access to political bodies, which have little to no African American representation. Tillery still works to benefit the White man—with one of the few options for employment being the very industry polluting the air they breathe and the water they drink. The logic of subordination and the trauma of slavery are still felt.

**Overcoming barriers to belonging.** Three findings arose as ways to overcome the barriers of inequality and mistrust felt by the community of Tillery. Despite Tillery’s initial hesitancy to partner with Steve in a scientific research partnership, together Steve and Tillery overcame the mistrust and created a horizontal research partnership. Gary and Steve advise open dialogue, respect, and approaching the community through someone
the community already trusts were key mechanisms, which allowed the existent barriers to be overcome.

**Overcoming through open dialogue.** This study found before any resemblance of a Third Space can be created in a PPSR project, PPSR project leaders need to confront the trauma of inequality and exploitation and subsequent mistrust underrepresented communities have for powerful institutions. One way PPSR project leaders can confront inequality is by having an open dialogue with community members about the abuse and alienation they have faced. The findings of Part 1 project leaders demonstrate the type of true dialogue necessary to overcome the mistrust inherent in the historical relationship between researchers and underrepresented communities. According to these findings, a true dialogue is horizontal and avoids one party assuming a position of dominance over another, which would beckon back to the vertical relationship of colonialism, in which one party assumes a position of superiority over another. The practical advice is to build in time for listening. With a relationship, which was historically vertical, it will take time to overcome mistrust and assure the community they are respected. Painful histories need to be dealt with head on, so together the researcher and community can work to heal the hurt relationship.

Several project leaders interviewed for Part 1 of this study stressed the importance of learning about and acknowledging the “contentious” history of the underrepresented community. The suffering and depth of wounding described by project leaders who have worked closely with underrepresented communities is also described as contentious. The word “contentious” implies the history of these communities is controversial, or likely to
cause a debate or argument. These groups have and continue to experience deeply distressing and traumatic inequalities, yet many do not recognize their painful experiences, instead denying or dismissing the abuse as a thing of the past. Such is the case for Tillery’s painful history of slavery and racial inequalities and injustice. John Rawls (2009), in his book *A Theory of Justice*, describes the racial injustice in the United States as “flagrant” but something society has been continually “indifferent” to (p. 107). McIntosh (1998) describes a form of racism referred to as unconscious racism, which is a key aspect of White privilege. Unconscious racism is the ability to walk away from issues surrounding race. PPSR project leaders need to carefully recognize the painful experiences of the communities with whom they partner. Walking away or avoiding conversations surrounding these contentious histories does instill trust. In Gary’s view, one reason the partnership between Tillery and Steve worked was that Steve was willing to be open and frank about racism and the abuse Tillery community members have experienced.

Psychologists who have studied and described trauma note the importance of how a traumatic event is remembered by different groups, noting the remembrance is often affected by politics and power. Traumatic feelings come from the traumatizing event but also from the anxiety of keeping it repressed. The refusal to recognize a person’s trauma can thus cause further trauma. Slavery and the subsequent logic of subordination is a trauma with mass denial and unwillingness to remember (Smelser, 2004). When a traumatic event has occurred, healing can only occur, in the words of Holocaust historian Saul Friedlander, “when memory comes” (J. Alexander et al., 2004, p.1). According to
psychologists the healing process involves, “recollecting and working through the symbolic residues that the originating event has left upon contemporary recollection” (J. Alexander et al., 2004, p. 1). Likewise, this study found conversations about racial discrimination and inequalities the underrepresented community faces are a precursor to any kind of research partnership forming. Project leaders recommend acknowledging science has been used against marginalized communities and often does not conduct studies benefiting the community. They stress the importance of an honest dialogue, not a dialogue in which the issues and uncomfortable realities are danced around. Gary warns it is the “institutionalization of racism” telling you “to get in there and get the data and come on back out,” but if project leaders truly want a partnership with an underrepresented community, a dialogue on past and present abuse is vital (Grant, interview, February 17, 2016).

The findings of this study are consistent with other studies investigating the relationship between African Americans and researchers. According to C. Jones (2000) when researchers fail to address issues of race and privilege, this leads to power imbalances and efforts between community members and researchers are not coordinated (C. Jones, 2000). Chavez et al. (2008) advises:

Successful community based research projects acknowledge the role of history; specifically, that the relationships between researchers and community members begins not with the project itself but centuries ago, with the advent of slavery and other forms of exploitation. (p. 89)
As Gary concludes, in order for trust to be built, conversations about racism and abuse are necessary. Makani Themba (1999) explains it is commonplace to ignore racism, but the pain it causes cannot be ignored. The people discriminated against, based on their race, will continue to feel the pain whether it is acknowledged or not. This study found denying or ignoring racism, whether in the past or present, will not inspire trust. When researchers deny racism or refuse to dwell on it, deeming it to be irrelevant to the current study, this sends a message to the community— that their pain is not real, and is certainly not important. As Michel-Rolph Trouillot (1995) explains in *Silencing the Past: Power and the Production of History*:

> The past does not exist independently from the present. Indeed, the past is only past because there is a present, just as I can point to something over there only because I am here. But nothing is inherently over there or here. In that sense, the past has no content. The past—or more accurately, pastness—is a position. Thus, in no way can we identify the past as past. (p. 15)

There is no such thing as a neutral project or study. Racism and discrimination is a living history for communities like Tillery. Failing to acknowledge this truth is a denial of reality and will not inspire trust with the communities who carry the indelible footprints and memories of racism and inequality.

Gary did not demand researchers solve the problem of institutional racism; rather, he insisted they must be able to talk frankly about the harsh reality of the inequalities African American communities such as Tillery are facing. He recognized many institutional inequalities are implemented through policies and practices, which are out of
researchers’ control. He simply asked researchers to not deny the reality his community is facing. Likewise, psychologists warn that insisting the traumatized group forget the past and look forward to the future, denies the reality of the traumatic event. This denial is harmful to the victim because no matter how hard the victim tries, the indelible memory the trauma left cannot be erased from his or her mind. The traumatic event, or the perpetuation of the meaning of the event, may be out of researchers’ control, but restoring the collective psychological health of the traumatized group is not. J. Alexander (2004) recommends open conversations, monuments, memorials, and physical reminders of the trauma as a means of “lifting societal repression and restoring memory” (p. 7).

Remembering is a tool used to work through the pain of trauma. As Gary notes, “If you (the researcher) are sensitive enough to understand those kind of things (the inequalities African Americans live with), then we can move past” (Grant, interview, February 17, 2016). Likewise, Adderley- Kelly and Green (2005) found the race of the researcher had no effect on interactions the researcher had with the community. Instead, they found empathy to be the factor affecting interactions. As long as researchers acknowledged the historical mistrust and bad past experiences of underrepresented communities, community members had more trust for them.

This study found empathy is a vital part to conversations about racism, inequality and abuse. In order for members of the traumatized group to join with members of the group responsible for the trauma, the perpetrators must accept moral responsibility for the trauma and participate in their pain. Only then will a collective identity be possible (J. Alexander et al., 2004). A researcher may never have personally exploited an African
American, or other member of a marginalized group, but the institutions the researcher belongs to have and in certain cases still do exploit these communities. Project leaders in this study recommend beginning with conversations acknowledging this abuse and accepting responsibility. Without these conversations, no true collective identity can be formed (J. Alexander et al., 2004).

Part 1 project leaders warn against false pretenses of caring, or giving lip service to communities’ painful experiences and concerns. False pretenses of caring are disrespectful and will be a barrier to communication. Likewise, Gary advised the community will not be fooled by false pretenses of caring. A person needs to be willing to hear about racism and inequality, but hearing alone is not sufficient. He notes if a researcher honestly cares, then they will vigorously defend and advocate for the community. He concedes institutional racism is deep and change will be slow, but the beginning of institutional change will be a change within the individual. Researchers need to be open to criticism and accept responsibility for racist beliefs within themselves. Thus, a critical examination of underlying beliefs on privilege, power, and inequality is a precursor to a partnership with an underrepresented community. If the researcher is blind to privilege and believes community members are where they are because they did not work as hard or because they belong to a culture, which does not value education, the community will feel these underlying beliefs.

Race has been and is now central to a person’s experience in society. Too often members of White America, in an attempt to avoid being perceived as racist, avoid conversations, which acknowledge racial differences (Omi, 2000). Yet, true empathy and
the ability to relate justly to communities of color can only be achieved by seeing race and racial inequalities and calling them as such (Mills, 2007, p.118). Likewise, Garza (2014) advises movements trying to achieve equity or unity without understanding “concrete differences in context, experience, and oppression… won’t be successful.” She warns, “White supremacist domination is perpetuated by pretending we are all the same and not acknowledging racism and domination” (p.3).

**Overcoming through respect.** This study found not only should PPSR project leaders engage in conversations and dialogue about racism and inequalities, but they should also take special care to convey great respect to the community. Project leaders in Part 1 advised the history of colonialism necessitates a proactive approach to signaling respect to the underrepresented community. Project leaders have found it vital to signal support and respect for the community through attending cultural events and carefully considering any actions, which may be perceived to communicate the message of colonialism. For example, if project leaders do not take the time to learn the culture of the community and their perspectives on knowledge, this may communicate disrespect for the community. The disrespect lies in the fact that one did not take the time to get to know the norms of the community. The underrepresented community often works on a different protocol than a university researcher. Demanding the community convert to the protocol of the researcher sends a message that the university’s way of doing things is superior to the community’s way, reinforcing the logic of subordination. A refusal to get to know or acknowledge the community’s norms, perceptions, and concerns does not communicate respect.
Likewise, Steve advised a familiarity with social justice movements such as the Black Lives Matter movement and protests against police violence proved relevant and important in understanding Tillery and communicating respect to them. The overarching directive of the social justice movement Black Lives Matter, is to “push for Black people’s right to live with dignity and respect” and be included in the American democracy that they helped create (R. Miller, 2016). The trauma of slavery and logic of subordination is Black lives are not equally valued and respected. Avoiding disrespectful actions is necessary but not enough. This study concludes PPSR project leaders need to avoid reactivating the community’s traumatic memories and take special care to show they respect the lives of the marginalized community members. Horowitz (1976) explains when a trauma becomes part of a person’s psyche, a defense is to avoid situations, which may “reactivate the memory of their trauma” (p. 4-5). Throughout the conversations with Gary and Steve and subsequent analyses of Tillery community members’ words and reactions, one can see certain actions on the part of researchers can and do reactivate the memories of the community’s trauma. Community members are attentive to people with privilege treating them as if they are inferior. Both Gary and Steve mentioned when a researcher introduces oneself with a title of honor, such as doctor, a community member may interpret this as yet another time they are being treated as if they are less than. Steve and Gary both recognized a certain amount of mistrust was initially present based solely upon the fact Steve was White. His Whiteness and privilege were reminders of things community members had been denied. Community members are accustomed to people with privilege believing and treating community members as if they are inferior and their
knowledge or way of talking about things is inferior. Likewise, Part 1 project leaders cautioned others to avoid proudly bearing titles of honor earned within a system of power and privilege the community may not respect or have access to.

Even if the intent is not to treat the community as inferiors, certain institutional languages, practices or policies may communicate such a message to community members. Part 1 project leaders found entering the community with all of the research questions decided upon may be perceived as disrespectful to the community. Rather, respect is communicated by sitting back as community members make decisions about research questions and how they will participate. A true dialogue builds in listening opportunities before all project parameters are decided upon. Project Leader 3 notes the methods of science may be offensive to community members. She discovered, through conversations with community members, that the scientific goal of obtaining high numbers of data was offensive to the community’s way of taking on personal relationships with creatures. To communicate respect to the community, she put some of her scientific goals on the back burner and instead positioned the community’s way of knowing as the focus of the study (Interview, February 11, 2015). Tenure, the grant raising narrative, and what it means to effectively contribute to a research agenda at times inhibit a researcher’s desire to conduct true collaborative studies with underrepresented communities. Project Leader 1 advises others to acknowledge science is not an objective pursuit of knowledge and noted science as a body of knowledge is limited when only White, middle class values drive scientific studies. Project Leader 1 also advised the hypothesis driven positivism of science tends to have well-defined notions of what
expertise is all about and may perpetuate the vertical relationship of colonialism (Interview, October 10, 2015). Thus, this study, along with others, recommends broadening the methods used in a scientific study and offering possibilities of participation (Roucheleau, 1994; Smith, 1999; Zavala, 2013). A constant focus on big data and survey techniques may be alienating to certain underrepresented communities. Using only the traditional methods of science within a project communicates the vertical relationship of colonialism: that the scientific way of knowing is superior to the community’s way. A horizontal relationship is created when the community members are creators of knowledge, teaching scientists what methods and aspects of data are important to them. This manner of approach changes how science gets done and allows for a true dialogue with community members.

Institutional practices may create moments of crisis, which make it difficult for project leaders to signal respect to the underrepresented community. Funding agencies have their own institutional practices, goals and agendas. When a project leader enters a community with all of the funding, the project starts with a vertical relationship, in which one partner holds the power over the other partner. As Steve notes, money dictates a project’s activities, and if a community does not have the power to ask the project leader to leave if they perceive the study is harming the community, then the ability of the project to serve the community’s interests is in jeopardy. Despite Steve and Gary’s attempts to begin the project with a horizontal relationship with project funding, a policy of the funding agency threatened their relationship by communicating the message of colonialism to Tillery. Consider Gary’s response to the funding agency telling Tillery the
community would get less money if they were to handle the finances. Gary, upset with this policy, asked, “What is different about us? If you've got to keep the same records and all, why you going to try to give us less money?” (Grant, interview, February 17, 2016).

The theory of cultural trauma explains traumatized groups will be highly attentive to events reactivating the memory of the group’s trauma. Tillery remembers being paid less than Whites and waiting in long lines (neglecting their fields) in order to prove themselves to governmental agencies, a requirement White farmers were allowed to avoid. Being told they would receive less money if they handled the money reactivated the traumatic memory of being regarded as less than White members of society, leaving Gary to challenge the funding agency, “What is so different about us?” (Grant, interview, February 17, 2016). Pryor, Kuupole, Kutor, Dunne and Adu-Yeboah (2009) also report on these structures within funding agencies, which “reinstitute hierarchical relationships within the team” (p.778) and place researchers as “reluctant employers” of community members.

Likewise, Walters and Simoni (2009) describe moments of crisis arising in research partnerships due to past abuse and the effects of colonialism. They advise, “The key to surviving these moments is to recognize when residual colonialization is triggered and to name it as such so that it can be externalized and transformed” (p. 575).

Institutional practices may perpetuate a logic of subordination. The manner in which a topic is described, or which research questions are asked, can reflect and reinforce imperialism (Spivak, 1988). The trauma of slavery was that because a person was Black, they were less than a person who was White—that White people were better and more
desirable members of society. When studies describe negative aspects of the African American community rather than focusing on the good; and when studies are conducted to serve the interests of those who already have power and privilege, these actions communicate the trauma of slavery that some people’s interests and lives are more important or better than others. Walters and Simoni (2009) found mistrust can be overcome by listening to the community and identifying colonial research practices. Other researchers agree that respect is vital to building trust with marginalized communities. Adderley-Kelly and Green (2005) recommend being sensitive not to offend or make community members feel like researchers are setting themselves above the community. One particular research practice their study found to be offensive to community members was when researchers administered a survey to community members by reading it to them, as if they could not read themselves.

Respect is not assumed; it is not a given. Marginalized communities live in a world where they are not respected, thus it becomes vital to find ways to signal respect to them. With a history of being disrespected, Tillery community members are sensitive to situations in which they feel a lack of respect. PPSR project leaders in this study recommend other project leaders make a conscious effort to convey respect and reassure community members they are equally valued. Likewise, Purdie-Vaughns et al. (2008) found the trust gap African Americans feel when they perceive threats to their identity can be closed by explicitly invoking fairness. Gary notes Steve “never made us feel beneath” (Grant, interview February 17, 2016). Steve rather took care to avoid evoking the feelings of Tillery’s trauma. Steve was not, as Gary says “uppity.” Steve did not come
into the community saying I am here to help you. As Gary reflects, “We've been made to feel less than all of our lives” (Grant, interview February 17, 2016). One reason the research partnership between Steve and Tillery was established and lasted so many years was that Steve took extra effort to evoke fairness and equality. Likewise, the Part 1 project leaders recommended avoiding any notion of a deficit view of the community, as if the community should be grateful for the help a project leader brings to the community. The deficit view reinforces the colonial view of the dominant group being in a superior position, which allows them to bestow help to a community who cannot help themselves.

PPSR leaders need to seek out ways to signal respect for the community’s knowledge. Part 1 project leaders emphasize the need to provide translation between the community’s way of discussing issues and the scientific terminology. When Gary made Steve aware Tillery used the term hog parlor, rather than Steve’s term “swine house,” Steve changed and began using the community’s term. No meaning was lost by Steve using the term swine, but by changing to hog, Steve was able to signal to the community he respected and valued their language. This action was a subtle way of communicating his words were not better than the community’s words. Throughout his time in Tillery, Steve made a conscious effort to “reinforce that it’s not that I’m on one level and they are on another level” (Wing, interview, October 14, 2015). Signaling respect will take serious time and requires dissecting actions, words, research questions, and patterns of communication both verbal and non-verbal. This study concludes partnerships with underrepresented communities necessitate a critical examination of aspects of the project, which may make the community feel inferior. Steve did not simply avoid actions, which
could be perceived as disrespectful; instead he took specific actions to convey respect to Tillery. He invited Gary to co-teach a class at UNC. With this action he communicated to Tillery their voice and wisdom is valuable. Steve also openly participated in community cultural events. These are both specific examples of actions Steve took to signal respect to Tillery.

Failure to signal respect and carefully consider how project actions may be perceived by community members may result in reactivating the trauma of the marginalized community. Gary described the aid FEMA sent to Tillery after they had been devastated by Hurricane Floyd as a “horrific scene” (Grant, interview, February 17, 2016). Truckloads of clothing had been donated, but a failure to carefully consider how the aid was delivered resulted in Gary feeling as if his community was viewed as scavengers. From his perspective, the lack of organization and the dumping of the clothing in piles made Tillery community members feel like they were not human, and as if they had no value at all. The trauma of slavery had been reactivated by the manner in which this aid was delivered. Gary challenged other project leaders to question their goodwill and ensure ultimate respect in every aspect of the project. Find specific ways to signal to the community they are not just a number; rather, they count, they matter, and they are valued.

**Overcoming by approaching the community through someone the community already trusts.** A final way PPSR project leaders can confront the trauma of inequality and exploitation is by approaching the community through someone the community already trusts. The mistrust created by inequalities is real and is ignored at the peril of the
researcher. Gary warns if a researcher does not enter the community the right way—by connecting with a person or a group in the community and building real rapport with them, then the results will not be real. If the researcher enters quickly and without establishing real relationships with the community, then the results will not be real either. As real as the mistrust, so must the rapport be. Steve and Gary had a real friendship.

Thus, Gary was able to serve as a mediator between Tillery and Steve. Steve would not have known his use of the word “swine” offended the community members had Gary not been there to advise him. During early meetings when community members became upset during the skits, which were used to initiate discussions about environmental injustice, it was Gary who had to calm community members down.

Steve was in the community at this point, holding meetings and yet community members still saw him as a potential exploiter because of past abuses. Even then Steve needed Gary as a mediator to say, “Wait, this (the skit) isn’t real” (Wing, interview, October 14, 2015). Likewise, other research shows community organizations, such as the CCT, are valuable resources, which can help researchers overcome barriers standing in the way of a research partnership forming. Community members are familiar with these agencies already (H. Chang, 1994; Delpit, 1988) and these organizations can be bridge builders because they have a deep understanding of the community’s history and culture (Carr, 2002; Chu et al., 2012; Israel et al., 2006).

Rapport is a pre-cursor to any conversations about racism and inequality. As Gary advised, researchers need to be open and frank about racism, but he advises community members should initiate these conversations. In his view, the job of the
researcher is to make the community members comfortable enough to do so. A friendship and real rapport will be vital to this process. In initial community meetings between Steve and Tillery, community members did not feel comfortable to talk about racism. For 45 minutes, they danced around issues of racism until Gary, as a mediator, stepped in and vouched for Steve, saying I know him. He is not a racist but he understands and acknowledges racism exists. As the sigh of relief echoed through the room, only then could a true dialogue begin. The conversations Steve had with Tillery regarding racism and inequality were initiated by Gary, the mediator, and made possible through the real rapport Gary and Steve had for each other. Gary and the CCT became the third party agency recommended by Part 1. Project leaders in Part 1 of this study advised a person such as Gary can become the solution to working within the existent structures of academia. With limited funding schemes and busy schedules, partnering with someone the community knows and trusts can build trust when this insider can vouch for the authenticity of a project’s intent and goals. This third-party agency also serves as a resource for getting to know the goals and priorities of the community. Adderley-Kelly and Green (2005) report similar findings. They advise the facilitation of relationships with key people in the community before they entered the community was a vital part to their successful research in the community. Researchers must be sincere in order to gain trust of community members. If the researcher’s real interests are the health and well-being of the community, this will help build trust. Chavez et al. (2008) warns if community members do not really feel as if they are true partners in research, they may carry on a discourse reflecting what they think researchers want to hear rather than what
they actually believe. They hide truth because they have learned early on White people are not interested, will not believe, and minimize the reality of their lived experience. Chavez et al. (2008) refer to these conversations as “public transcripts,” which will not result in true findings (p. 96). Gary referred to these public transcripts when he recalled the story from a Tillery resident regarding a researcher who came to her door without a real introduction to the community. She talked with the researcher, but she did not tell the researcher how she really felt. Researchers need to build a real rapport and conduct research studies, which in reality reflect the goals, values and needs of the community. Without taking care to do this, the results of their research may be clouded by these public transcripts.

**Discussion of Findings for Research Question 3**

The final three themes of this study—Conscious Bridging, Equal Footing, and Challenges to Third Space—arose in response to Research Question 3. The following section discusses the findings of this research question according to these themes. Within the discussion, the author also incorporates the practical advice from Part 1 leaders on how to engage underrepresented communities in a scientific research study. Although the findings of this study offer several challenges to the concept of a Third Space in a PPSR project, overall, this PPSR project well aligned with the conceptualization of a Third Space by creating the larger system of activity, which is fundamental to a Third Space. A Third Space acknowledges oppression and makes a conscious effort to find hope and the tools, which will enable a person to write oneself into the history of the future (Gutiérrez, 2008). The findings of this study were that a collaborative scientific study between a
community of color and university researchers was effective at providing the community of Tillery with a tool, which strengthened their voice. However, without systematic change within institutions of power and science itself, no real change will come to marginalized communities. Only when the goals, values, and agendas of underrepresented communities become the goals, values, and agendas of science, will communities be enabled to use the tool of science to write their history of the future.

**Conscious Bridging.**

*Merging discourses.* This study found conscious bridging was required to merge the discourse of Tillery with the discourse of the university researchers. Steve acknowledged the partnership between Tillery and UNC worked because he, along with the help of Gary, made a conscious effort to translate the language of the community and convert any scientific jargon into Tillery’s community vernacular. Tillery’s way of talking about things became the way Steve talked about things. Likewise, in a Third Space, other ways of knowing, expressing, and communicating are welcomed as “ethos and official knowledge” (Gutiérrez et al., 1999, p. 295). A Third Space is a place where the discourse of the community and the discourse of science are not in competition with one another but rather blend together. Intentionally using the language of the community and carefully considering the words he would use when discussing issues with the community was necessary to improve communication between Steve and Tillery, but it was also a vital part to overcome the initial mistrust Tillery had for Steve. Steve advised language can represent White power. When researchers use a language the community does not use and does not have access to, this language may remind the community of...
things they have been denied. Likewise, a Third Space does not privilege the language of science over the language of the community (Wallace, 2004). Words used, words not used and who speaks communicate privilege and power. Steve, by making a conscious effort to research and then use Tillery’s terms sent a message to Tillery that said—your way of discussing things is valued.

Gutiérrez et al. (1999) explain, a Third Space is a zone of collaboration between the “official” script and the script of the community. This PPSR project valued and prioritized these two scripts throughout the partnership. Gary emphasized especially when the project is over, data has been collected, and conclusions have been written, the researcher needs to be in the community. As important as it is to introduce the project in terms the community is familiar with, so it is vital to translate the results of the study into a form the community can understand and use to “speak on their own behalf” (Grant, interview, February 17, 2016). If results are not translated into a form the community can understand and use, then it is unlikely the research will be for the community. Additionally, researchers should carefully consider the message conveyed to the community when study results are published without interpretation for the community. Colonialism and the logic of subordination include the idea that some people have the right to speak on behalf of others. Thus it is vital to empower the community with results written and explained so the community can use the study to speak on their own behalf.

**Merging goals and values.** This study found bridging the goals and values of Tillery with the goals and values of university scientists created a new, hybrid level of activity. In a Third Space, rather than each separate community of practice working on
their own level of activities, a collective activity system is formed, a system with a larger level of activity (Whitechurch, 2008). Both Tillery and Steve had clear goals and directives to accomplish. This study found the merging of Tillery’s and Steve’s goals was made possible because Steve’s personal goal of social justice overlapped with Tillery’s goal to preserve the health of their environment. Steve considered the way Tillery and other poor, and often African American, communities were being treated to be ethically wrong. Steve saw the partnership with Tillery as a way to connect his professional work to his personal goal of social justice. Thus, Steve used science and his professional training as a scientist to work toward the common goal of bringing environmental justice to Tillery.

A Third Space sees community goals and scientific goals as standing side by side and reorganizes activity so that multiple voices and even tensions are purposely used as building blocks to form new types of activity (Gutiérrez et al., 1999). There was tension between the power and privilege of Steve’s university and Tillery’s position as an outsider to power, privilege, and influence. Yet, through the PPSR partnership, the power and privilege of White UNC was used to give weight to what Tillery had been saying all along—their community was experiencing negative health effects due to the hog parlors being placed close to their neighborhoods. Although both Steve and Gary agree the community should not have needed the name of UNC behind them in order to be heard, they used this tension as a building block. They recognized the way things are and worked towards the way things ought to be. However, the author notes that when the local government demanded a scientific study supporting the community’s claims about
their health, this demand privileged the language of science within the partnership. Although Steve noted the community journals added weight to the study and made science better, the demand for a scientific study worked against the creation of a hybrid language. Pryor et al. (2009) advise disciplinary boundaries are not likely to break down if funding agencies or other institutions demand one form of knowledge over the community’s knowledge. Pryor et al. (2009) refers to this as “invisible domination” (p.79) and notes it leaves very little room for privileging community knowledge and discourse more than a superficial and token privileging.

A Third Space is a zone for new interpretations of meaning where hegemonic interpretations are not assumed to be the correct or true interpretation (Bhabha, 1994). Initially, Steve and Gary did not agree about what the project’s priority should be. Steve, with his background and training as an epidemiologist believed measuring the health of the community was the priority. Gary, with his history and membership to an exploited group believed the first order of business was a study to determine if the hog industries were being predominately placed in poor, African American communities. Steve, because of his training and association with the powerful institution of UNC, had an advantageous position of power in the partnership with Tillery. A hegemonic interpretation would have prioritized Steve’s proposal of what research questions the study should initially begin to answer. A Third Space, on the contrary, creates an expanded level of activity by redefining what topics are relevant in the official space (Gutiérrez et al., 1999). Historically research partnerships involve tensions around knowledge (Pryor et al., 2009). The researcher is positioned as the expert and thus issues arise concerning what counts as
legitimate knowledge. However, within this research partnership these historical roles were reorganized, creating an expanded activity for both the scientific and underrepresented communities of practice. This PPSR project, true to the theoretical construct of a Third Space, prioritized the voice and ideas of Tillery—taking their lead on what the initial research questions of the study should be. Other research into community-based research reports similar findings on what elements contribute to a successful partnership with an underrepresented community. Chavez et al. (2008) advise the researcher should strive to silence oneself as a researcher and instead constantly question and examine power dynamics within the project. Chavez et al. recommend searching for solutions within the community and warn when researchers use only traditional forms of research and research questions defined as valid by their own training, this can be a form of institutional racism. One need not overtly say the community concerns are not valid to clearly communicate the same message. The dominant culture’s way of doing things is imposed upon the community by limiting what the study deems as credible and relevant forms of data. Chavez et al. recommend researchers search within themselves for unconscious, deficit views of the community, which can be revealed by dismissing community concerns as non-relevant to the study. Smith (1999) notes:

When Indigenous peoples become the researchers and not merely the researched, the activity of research is transformed. Questions are framed differently, priorities are ranked differently, problems are defined differently, and people participate on different terms. (p. 193)
**Equal footing.** Another theme of this study was this PPSR project strove for equal footing between the community and researcher in all aspects of the project. Equal footing in this PPSR project did not mean the community members and the researchers performed the same activities within the project. The researcher’s role and the role of the community were unique, based upon their prior training and expertise. Equal footing in this PPSR project was accomplished by equally valuing the voices and perspectives of both Tillery and Steve. Equal footing translated into both communities possessing the ability to influence the direction of project activities. In this regard, the PPSR project between Tillery and UNC modeled a Third Spaces’ active interpretation of roles, avoiding the situation in which one community has authority over another community (Whitchurch, 2008). A Third Space within a PPSR project reverses the typical role of the university as the driver of the project and instead places the community in the driver’s seat alongside the researchers. A Third Space breaks down power structures instituted by society and gives a new structure, one in which community members have a voice (Gutiérrez et al., 1999).

**Joint project ownership.** A Third Space, rather than being a place in which the hegemony of current society is perpetuated, is a space where individuals who have lost a sense of agency can experience control over their lives and their future (Emdin, 2009). The hegemony of research relates to who research is typically for. Gary noted a typical research study conducted for the community, in reality loses the community somewhere in the process. The research is conducted on the community but does not result in solutions or a product, which will empower the community. Research is defined as
careful study conducted to find and report new knowledge about something; the activity of getting information about a subject (Research, n.d.). Yet, research is towards an end. What research questions are investigated, how the results are displayed, and what results are highlighted depend upon the purpose of the research. In this regard, the PPSR project between Tillery and Steve did not perpetuate the hegemony of research. The purpose of the research was to give Tillery the ability to control the quality of their lives and their future. Before their partnership with Steve, Tillery had a voice and used that voice to plead their case for clean, unpolluted neighborhoods. Authorities, however, did not recognize Tillery’s voice as a legitimate voice. As Gary notes, communities already know the problems existing within them; it is the solutions they need access to. Steve did not come to Tillery in order to tell them something they did not know about their health. Both Steve and Tillery knew governmental bodies would only listen if Tillery had scientific evidence to support their health concerns. Thus, they designed a scientific study to investigate and quantify the health effects of industrial hog pollution. The research produced by this PPSR project empowered Tillery with scientific evidence to use in their fight against additional hog parlors being placed in their neighborhoods. This PPSR project, similar to a Third Space, made a conscious effort to find hope and the tools, which would allow Tillery to author their own history of the future (Gutiérrez, 2008).

Equality is defined as, “sameness in quality, power, status or degree” (Equality, n.d.). This PPSR project found true equality is very difficult to achieve within a society full of institutional inequalities. Institutional research practices, such as the university researcher bringing the grant to the community, may threaten true equality within a PPSR
project. As Steve explains, when the researcher has control of the money, the researcher has the power, and the ability of the project to achieve community goals is in jeopardy. Steve and Gary sought to overcome this potential threat to equality by coauthoring the grant, yet even then, project activities were influenced by power structures. Other community-based research projects report similar findings. Sullivan et al. (2001) explain, “Power imbalances often stand in the way of developing effective working relationships grounded in trust” (p. 136). Likewise Pryor et al. (2009) describe funding structures as a major fault line causing collaborative research to be “problematic, fraught with instabilities, which are liable to produce conflict and constraint” (p.780).

Powerful institutions, such as universities, are made of thousands of people playing roles. These roles contribute to the ability of the university to perform the myriad of complex activities they perform, but these roles also have histories, which may constrain true equality within the project. As Pryor et al. (2009) explains, research is not “produced in a vacuum but as a part of wider social negotiation” (p. 777). Power imbalances are built into the roles of researchers and the local communities with whom they partner. Research that grows out of state institutions, such as universities, reflects historical contradictions between the interests of the colonized and the interests of the colonial-capitalist state (Zavala, 2013). Part 1 project leaders note when a researcher enters the community with well defined research questions, this act breaks trust and reinforces the historical vertical relationships of colonialism, which presume the university to be in the position of dominance over the community. Thus, project leaders recommended the community be involved at the problem defining stage for a true
dialogue with the community. All project leaders noted the importance of conversations and then action. Action will be limited, and conversations may be nominal only if the project parameters are already decided upon when researchers enter the community. Likewise, Mora and Diaz (2004) note, “The entire research endeavor must be participatory in nature in order to produce qualitatively different research that is based on community-identified problems and needs” (p. 24).

**Challenges of funding.** Both Steve and Gary found established roles of who manages finances of the grant to be a challenge to true equality within the project. Although Gary and Steve were co-authors on the grant, NIH policy stipulated more funding would be provided if UNC handled the money. The funding institution stipulated the university would take a position of leadership within the project. In this case, institutional rules prevented equality and threatened the partnership between Gary and Steve. Tillery felt disrespected by the NIH funding rules. Tillery has memories of being treated as if they are second-class citizens. When they were told the project would receive less money if Tillery handled the money, they were reminded of their trauma—they live in a society where many view them as less capable and inferior. Steve’s response to the inequality was key to the maintenance of the partnership. When Gary came to Steve, upset about the policy, Steve did not tell Gary there was nothing he could do because this is the way things are always done. Steve did not have the authority to change the policy, but he did have a voice, which he used to speak on behalf of the community. Institutional constraints may stand as barriers to true equality within a community partnership, but they need not ruin the partnership. As Gary notes, Steve recognized inequalities within
the partnership for what they were, took the community’s side and spoke on their behalf. Pryor et al. (2009) advise lack of consensus is beneficial because it “opens up a discursive and transgressive space that may lead to a greater awareness of how we are caught up in the intricate web of our cultural assumptions” (p. 781). Chavez et al. (2008) notes when researchers make decisions based upon the way research has always been done at major universities, the research is being directly controlled by power structures and is reproducing the hierarchies of the dominant group. Project leaders from Part 1 advise maintaining a horizontal partnership with the community even when problems arise within the project. They note the importance of being open with the community when the difficulties come. A horizontal partnership solves problems together. In their experience, the community often responds in major ways and can be vital in the process of coming up with creative solutions.

The challenges funding presents to equal footing also apply to the purpose and end goal of the project’s research. Money is not neutral; money comes from a funding agency, which is often deeply situated within powerful institutions. The National Institute of Health (NIH) funded the research partnership between Steve and Gary. The NIH, with a mission to seek fundamental knowledge about living systems and to apply that knowledge to “enhance health, lengthen life, and reduce illness and disability” is situated within other powerful institutions (National Institutes of Health, 2016b). The NIH directly depends on the U.S. Congress to approve and fund their budget. Congress relies on campaign contributions from industries and wealthy corporations, such as the pork industry, who profit from the placement of industrial hog operations in poor, African
American communities with little political power and influence. In Steve’s experience, research truly for communities being exploited by powerful institutions is threatened by politics. Those with power hold ultimate control over what funding is available. Funding agencies often will not fund research with the potential to threaten relations they have with those who control their budget. Zimmer et al. (1993) concludes, “Science is inevitably political, and in the context of contemporary U.S. corporate capitalism...it contributes greatly to the exploitation and oppression of most of the people in this country and abroad” (p. 440).

Noam Chomsky (2003), American linguist, philosopher, cognitive scientist and historian, has argued the United States enforces hegemony. Rules, policies, and institutional constraints often prevent change in order to maintain the current power structure. Those with power benefit from others having no power; subsequently much effort is dedicated to the maintenance of the status quo. By way of example, consider the NIH 2012 Grants Policy Statement, which lays out guidance for grantee activities. According to these rules, grantees are permitted to work on policy-related matters across state and local governments and to translate public health evidence, but grantees are told they cannot use research produced by federal funds for the goal of “inducing members of the public to contact their elected representatives to urge support of or opposition to… orders issued by the Federal, state or local government” (National Institutes of Health, 2016a). The NIH policy advises grantees to “carefully consider” they do not “infer” communities use the research to contact their government. The policy goes on to say research created with federal funds cannot be used for the following:
Developing and/or disseminating materials that exhibit all three of the following characteristics: (1) reference to specific legislation or other order; (2) reflecting a point of view on that legislation or other order; and (3) containing an overt call to action. (National Institutes of Health, 2016a)

Tillery and Steve used the research produced by their study to file a complaint against their state. These activities would not be permissible under the 2012 NIH policy prohibiting overt calls to action. The decision to place industrial hog operations in predominately poor, African American communities was a decision made by the North Carolina State Legislature. Therefore, to engage in a scientific study using federal funds to gather evidence to publically challenge the state’s decision would no doubt be prohibited under the policy. Under NIH 2012 policy, Steve would not be permitted to accompany Gary to the state legislature, present the evidence from their study, nor call for the government to end the polluting of poor communities across the state.

On one level, the NIH policy seems intuitive. The government does not want governmental funds to be used against the government. If the government is working on certain goals and policies and a researcher uses the government’s money to work against these policies, then the research is counterproductive towards the achievement of governmental goals. On the other hand, the government is supposed to represent the people; governmental policies, in theory, aim to protect the individual rights of the citizens. If research discovers a governmental policy results in harm to citizens, then what is the responsible choice for the researcher? Or, beyond that, what type of research questions should researchers explore? Should researchers avoid inquiries that could
produce results, which are counterproductive to the initiatives of those with power? Steve recognized research truly for the community could create situations of conflicting loyalties. For many researchers, loyalty to the powerful institutions controlling their funding, career advancement and job will trump their loyalty to underrepresented communities and democratic values. Steve believes researchers “have a responsibility to report findings of studies even when they can be expected to produce negative reactions from industry, government, or universities” (Wing, Commentary, 2002, p. 442). He challenges fellow researchers to critically examine the values guiding their research. If the commitment of the researcher is to the values of democracy and equality, then these values must override fear of losing funding or fear of a derailed career.

Jonathan Lundgren, a US Department of Agriculture entomologist has become a public example of a scientist who claims the government has hindered his scientific career because of his research into a sensitive research topic. Lundgren, who has ties to anti-chemical and organic activist groups, campaigns against conventional agriculture and conducts research into the effect of pesticides on pollinators such as bees and butterflies. Lundgren claims when he published a study, which concluded neonicotinoid pesticides are a major cause of health problems in bees, the USDA censored his research and derailed his career. After publishing the controversial study, which challenged the government’s position on its use of pesticides, the National Program Staff removed risk assessment of pesticides from his project plan, meaning he was no longer officially on the task of conducting studies into risks of pesticides (Lundgren, personal communication, September 12, 2014).
Lundgren, who a few years prior, ran a governmental lab and won awards from both his agency and then President Obama, has now been suspended from his research and position within the USDA. Lundgren’s main offense seems to be the violation of the USDA’s ethics policy (Volk, 2016). These ethic rules state a scientist cannot use an official position to endorse any product, service or enterprise. As a private citizen, Lundgren may support policies conflicting with governmental policies, but scientists employed by the federal government cannot use science to support policies conflicting with existent governmental policies. Among other allegations, the USDA suspended Lundgren for refusing to focus on his job, which was research. After his study, which pointed out the dangers of pesticides, his superiors removed risk assessment into pesticides from his research objectives. When his science was not finding what the government wanted his research to find, he claims he was no longer welcome to pursue his research into risk assessment of pesticides. Is this good science, to abandon research questions that may conflict with governmental policies? By researching some questions and not others, does this action not endorse certain products, services, or enterprises?

President Barack Obama recognized the conflict of interest existing when political figures interfere with science and what findings are reported to the public. With a stated purpose of ensuring the integrity of science and building the public’s trust of science, President Obama sent out a Presidential Memorandum to all Heads of departments and agencies requiring them to implement a policy of scientific integrity (Obama, 2009a). In this memo he explained science guides administrative decisions and the public needs to trust the science behind those decisions; thus political officials should not alter scientific
findings. The memo pushed for federal agencies to make scientific findings and conclusions available to the public and for agencies to adopt whistleblower’s protection to ensure integrity. John Holdren, Assistant to the President for Science and Technology, issued his own memo in response to Obama’s and explained the scientific integrity policy reiterates political officials should not suppress or alter scientific findings, but rather all scientific information should be made available to the public. He explained the overall goal of the Presidential Memorandum was “to prevent political interference in scientific processes and expanded assurances of transparency” (Holdren, 2010).

Yet, it is doubtful that President Obama’s calls for transparency and the free flow of scientific information were accomplished by the resultant scientific integrity policies. The first department to respond to President Obama’s memorandum was the Department of the Interior. In their scientific integrity policy, the Department of the Interior defines scientific integrity as adherence to “accepted standards, professional values, and practices of the relevant scientific community.” They go on to say, “Improperly using scientific information for decision making, policy formulation, or preparation of materials for public information activities can constitute a loss of integrity” (Department of the Interior, 2014). The Department of the Interior also requires their scientists to take an oath promising they will not knowingly participate in particular matters, which cause a conflict of interest for themselves. Their policy addresses scientists’ participation in non-profit organizations, noting “The Department encourages employees to participate in outside professional organizations when it advances the Department’s missions, programs, and operations” (Department of the Interior, 2014). The researcher of this
study believes this policy does not prevent political interference in the scientific process. The policy prevents scientists from using science for any cause other than the reigning political agenda; thus, it reinforces and supports the status quo. Furthermore, the Department’s definition of scientific integrity is vague and seems to promote the maintenance of the status quo. What does it mean to adhere to the practices of the relevant scientific community? Is not science built upon conflicts? Does not the peer review process ensure the integrity of the science?

For Steve, the answer to these questions seems clear. As he explains, ethical issues arise and it depends on what code of ethics a person ultimately answers to. Institutions and governmental bodies have codes of ethics, but scientists are humans with their own ethical codes. So if the situation arises in which one must choose between their personal ethics and the ethics of the institution to which they are employed, then a choice must be made. Steve’s choice was to conduct research promoting democratic values and social justice. He knew his career would look different based on that choice, but his career goal was to use science for the good of communities such as Tillery. Although this meant often conducting meetings and studies unfunded, Steve knew he had accomplished what he set out to do: to use science to promote democracy and justice for all people.

**Challenges to a Third Space.** The final theme for this study was Steve’s challenge to critically examine the theoretical concept of a Third Space as it applies to PPSR projects. Steve believed the concept of a Third Space within a PPSR project may perpetuate the dominant paradigm’s view of science. To apply the concept of a Third Space to PPSR, one must presume science and the underrepresented community are
separate entities, which need to be overlapped. Steve encouraged fellow PPSR project leaders to critically examine the definition of science. Science is a systematic way to study the natural world through observation and experiment. Yet, science would not exist without the people and interests driving what research questions are investigated in the name of science. The fundamental problem Steve saw with the concept of a Third Space within a PPSR project is that science ought not to be viewed as a separate, unbiased entity. Science is a community of practice made up of people and values, which drive the norms of this community.

Steve questioned the description of a Third Space as a place, which seeks ways to legitimize and utilize community ways of discourse and knowing (Gutiérrez et al., 1999). Steve disagreed with the notion a PPSR study produced a more legitimate form of knowledge. He challenged the need for a scientific study to prove what was obvious to both him and the community—Tillery was becoming ill from the pollution caused by industrial hog operations. Steve urged others to consider the reason communities of color do not have a legitimate voice. In the case of this PPSR project, Tillery was not being ignored because they spoke a different discourse, one that was not officially recognized and legitimate. Rather Tillery’s voice was not heard because the interests of groups with power were deemed more important than Tillery’s basic concern for healthy lives. Even with the legitimate source of knowledge, in the form a scientific study, industrial hog operations continue to pollute Tillery’s air and have detrimental health effects on Tillery and other poor communities like them. Likewise, Project Leader 6, who works with poor, farming communities with little access to wealth and political power, concedes she has
been unable to find any scientists who are interested in the data generated through her PPSR partnership with the community. The community partners themselves expressed to her their fear that no one from the scientific community would be interested in the data collected on their community. She concedes their fears have proved true but hopes they can use the data for some civic action. Many community members every year get sick from the current water sources, and she hopes they will be able to use the data to fight for better access to clean water supply, but thus far no such action has been taken (Interview, October 20, 2015). This finding supports Steve’s challenge of the supposed need for a more legitimate knowledge source to support community concerns.

Gutiérrez et al. (1999) explain in a Third Space, opposing discourses change conflict into a zone of collaboration. The idea Steve challenged here is why are the discourse of the underrepresented community and the discourse of science in opposition to each other? Steve disputed the source of conflict between the community of science and the underrepresented community. In his view, the conflict exists because the scientific agenda is not for the benefit of the underrepresented community. Science is for some people and not for others. Other researchers have reported similar findings Rocheleau (1994) notes, “For some professional scientists, ‘participatory research’ implies that ‘we’ allow ‘them’ (rural people) to participate in ‘our’ research” (p. 5). Steve, along with Rocheleau (1994), calls for a transformed scientific agenda—an agenda promoting social justice and clean environments for all people. Science is not objective but rather is formed through the promotion of the values, political agendas, and cultural assumptions of the people who participate in it and who fund it. For a PPSR project to
truly be for the community, project leaders need to be open and honest about the values
driving the study and make sure the values of underrepresented communities are among
those driving the project’s values. Directives seeking to find commonalities between the
scientific and community agenda need to be carefully considered. Statements, such as
these, assume science is an unbiased entity, which needs to include the values of
underrepresented communities.

President Obama, at an annual meeting of the National Academy of Sciences,
spoke on the importance of science, noting, “Science is more essential for our prosperity,
our security, our health, our environment, and our quality of life than it has ever been
before” (Obama, 2009b). Yet, how can we ensure science, as a method of study, will be
used to improve the quality of life for underrepresented communities with little power
and political influence? In Steve’s view, this ideal will only be accomplished when
science educators and practitioners stop searching for overlap between science and the
underrepresented community and instead admit there is something fundamentally wrong
in a system, which does not already include the values and interests of all groups of
people. Steve calls for a transformed view of science—a science reflecting the goals,
values and agendas of all people. Within this transformed science, there would be no
need for a Third Space—etched out within a science owned by a powerful few—to
include underrepresented communities in a science, which was never theirs. In this
transformed science, there would be no need to create a space for underrepresented
communities because the values driving science would be the democracy and justice for
all people.
Institutional change does not come from one scientist and one community of color working together but rather from all people dedicated to the values of social justice and democracy working and moving together to transform institutions such as science into spaces, which represent all peoples and all values. Project leaders from Part 1 of this study advise seeking out donors who share the values of democracy and justice for all people. Project Leader 1 has been encouraged to see she is not the only researcher who sees the value of community-based research being used for civic action. She has joined a network of people who understand the importance of community partnerships and has seen a snowball effect of other university leaders, researchers, and university students who truly grasp the importance of a broadened definition of science. She described an “amoeba-like movement” towards using science to support civic action (Interview, February 12, 2015). Zavala (2013) challenges researchers to become part of grassroots research collectives to “generate spaces of recovery and healing, which become the fertile soil for seeds of inquiry and research that are inherently political, ethical, and accountable to the communities that make research possible” (p. 68). As one Tillery community member so wisely stated, “choruses, not soloists, are how we make our voices heard” (CCT, p. 89).

Situating Findings within Theories of Identity

This discussion concludes by situating the findings of this study within the theoretical framework, which guided this research. The following discussion on identity is organized according to the four themes found throughout the literature on identity: 1) multiplicity of identity, 2) social nature of identity, 3) discourse as a mediator of identity,
and 3) identity as a trajectory.

**Multiplicity of Identity**

One aspect of a person’s identity does not exist in isolation from other aspects (Wertsch, 1991). Thus, it becomes vital for project leaders to understand the multiple identities a person has and how these identities operate and influence the development of a person’s science identity (Gee, 2000). Steve could not form a scientific research partnership with Tillery without taking the time to get to know other identities community members held and considering how these identities would influence their motivation to participate in a research partnership. Likewise, theories of identity development show a person’s science identity is influenced by powerful forces such as race, class relations and how others interact with a person (Brickhouse et al., 2000). People construct knowledge through their prior experiences, interaction with the world and others, and through their culture (Bianchini et al., 2003).

Taking the time to understand the multiple identities of Tillery community members served a two fold purpose in the research partnership between Steve and Tillery. First of all, by understanding Tillery’s identity as Black Americans and the lived experience that brings, Steve saw how certain aspects of a typical research approach would negatively impact the likelihood of a research partnership forming. Additionally, by learning Tillery’s multiple identities, Steve was able to signal respect to the community and assure them he valued the multiplicity of who they are. Science practitioners cannot truly acknowledge the diverse experiences, traditions, voices, and histories of underrepresented groups unless they spend time in local communities getting
to personally know and understand local traditions, goals and values. If science practitioners hope to understand how existing identity trajectories may be used to motivate engagement in scientific activities, then they must spend time in underrepresented communities getting to know them (Polman, 2013).

**Social Nature of Identity**

The findings of this study support Wenger’s (2000) description of identity as something, which is at times chosen for people. The identification a person has with science involves the roles science has made available for that person within the scientific community of practice (Stryker & Burke, 2000). When a person considers participation in an activity, such as a scientific research partnership, the most important question leading to this decision is, “Do I belong here?” (Walton & Cohen, 2007). Historically, representatives of science have answered this question, and have with their exploitation of underrepresented groups ascribed an identity of outsider to members of underrepresented groups.

Underrepresented community members live under roles the dominant society has ascribed to them (Eisenhart et al., 1996). The dominant society has, for generations, pushed community members into outsider roles. Marginalized communities, such as Tillery, did not choose this outsider status; it was chosen for them. Tillery has for years made bids for recognition, bids to be in places of authority and power within the larger system of institutions to which science belongs. Yet, these bids have been rejected. How a person identifies with a community of practice is influenced by how a community of practice responds to the underrepresented community’s bids for recognition (Gee, 2000).

Science has ascribed an outsider status to underrepresented community members by historically abusing them, reporting only on negative attributes of these groups rather than focusing on positive qualities, and by treating them as inferior members of society. Other research supports the findings of this study. Past negative experience with researchers exploiting their lands or writing reports on them describing them as inferior, deprived and deficient lead to underrepresented community members seeing little to no place for them within a scientific study (Chandler et al., 2012; Delpit, 1988; Delpit, 2006a; Delpit, 2006b; Delpit & dowdy, 2008; Gearheard & Shirley, 2007). Research on identify formation shows negative storylines reinforce dis-identification with a subject (Martin, 2000). Cohen and Garcia’s (2008) Identity Engagement Model advises when people enter a situation, if they perceive threats to other identities they hold, such as being African American, they may choose to dis-identify with the new environment to protect their already established, primary identity. If an underrepresented community member perceives the environment of a science project will devalue aspects of who they are, a person will see these as threats to their social identity and will disengage to protect their primary identity (Steel et al., 2002). Carlone and Johnson (2007) describe this situation as a “disrupted science identity” (p.1187). This study concludes science and the
larger system to which science belongs have long ascribed outsider status to underrepresented community members, which has resulted in disrupted science identities.

**Discourse as a Mediator of Identity**

Dialogue is the vehicle by which people work out their identities (Davies & Harré, 1990). According to Bishop (2012) words themselves, along with structural patterns of discourse, convey positions and identities. Each community of practice, including the scientific community, has its own discourse, or “institutionalized use of language” (Davies & Harré, 1990, p. 45). Olitsky (2006) found even the way science practitioners talk about science conveys a message and positions people, at times placing scientific knowledge in a position of authority over community knowledge. Science tends to have well-defined notions of what expertise is all about, with scientifically trained people being skeptical about what unscientific people have to say about science (Latour & Woolgar, 2013). Polman (2013) explains project leaders may inadvertently reinforce outsider status to underrepresented communities by presenting science as an external source of knowledge and expertise, which has the authority to dictate project parameters and study goals.

Steve avoided positioning science in authority over community members by being very attentive to discourse patterns, which could reinforce the vertical relationships of colonialism. Steve did a lot of listening at community meetings before speaking, and always converted to the community’s way of discussing an issue when possible. Additionally, Tillery’s voice directed the initiatives of this research partnership. Steve provided space for community members to position themselves within the scientific
community by sitting back and listening as community members explained their concerns and desires and how they saw science as a method, which could be used to pursue their agenda. Tillery community members were the experts, authoring a study, with guidance and equipment from Steve, to create their scientific knowledge, which they used to fight industrial hog pollution in their community. Likewise, theories of identity show discourse patterns, such as who speaks and whose words have influence, function to create projected identities (Cross et al., 2008). Through conversations people position themselves and other people in relation to a particular community (Davies & Harré, 1990).

Discourse can also be used as a tool to show respect for the other identities a person brings with them to a science project. The literature on identity clearly reveals a person’s decision to participate in an activity, or not participate, is linked to identities the person has and the sense of belonging the person has within a given context (Zigler & Butterfield, 1968). Thus project leaders hoping to engage underrepresented populations in scientific research must take the advice of Steele (2011) and be identity conscious, seeking out strategies to increase community members’ sense of belonging within the scientific community of practice (Cohen & Garcia, 2008). Being identity conscious involves carefully constructing projects to be spaces where all communities and social identities are not only told they belong, but feel they belong (Uriarte et al., 2007). Steve was able to use discourse as a tool to show respect for Tillery’s other social identities by talking about issues Tillery deemed important. If a project leader refuses to discuss issues of racism, abuse and exploitation, this refusal is a form of denying (or at best belittling) a
part of the community member’s identity. This devaluing of their history and present day experience may be perceived as a threat to their other identities they have (Steel et al., 2002). Refusing to engage in dialogue about racism would have been a form of denial and a clue undermining Tillery’s sense of belonging within the research partnership. These context clues, described by Steele (2011) may cause community members to disidentify with the science project in order to protect their already established identity as a member of the Black community. Underrepresented community members will likely be very sensitive to these context clues. Underlying beliefs project leaders hold about racism and a general denial of White privilege may be clues within an environment that this is not an environment where their identity as Black, and the lived experience that identity brings, will be valued.

Identity as a Trajectory

Davies and Harré (1989) advise a person’s science identity results from what options they see available for themselves within the scientific community and how participating in science aligns with broader goals and purposes they have for themselves. Research has shown some marginalized communities may be discouraged from participating in science because science privileges White, middle class values (Eisenhart et al., 1996; Tobin et al., 1999). To motivate participation in science, science needs to overlap with other aspects of a person’s identity or goals they have for the future (Brickhouse et al., 2000). If there is no overlap between a community’s goals and the goals of a science project, then a person may have to adapt what Hughes (2001) refers to as dual identities, which must be managed and at times may result in inner conflict.
Scientific projects at times exclude underrepresented communities by not addressing their needs (Eisenhart et al., 1996). When science projects consistently do not address the needs of underrepresented communities, this functions as a way to reject communities’ bids for recognition within the scientific community. In a sense project leaders communicate the needs of community members are not as valuable or as important as the agendas of the funding agency, and may at the same time convey the message that scientific knowledge is superior to community ways of knowing (Mejlgaard & Stares, 2010; Mueller & Tippins, 2012a; Wilderman et al., 2004). People learn who they are in relation to a community of practice based on how others in the community interact with them (Erickson, 1987).

Steve positioned Tillery as insiders to the scientific community of practice by valuing their agenda and making their agenda the scientific agenda of the study. He recognized science is a tool and emphasized the importance of treating it as such. By using science as a tool to answer community questions, Tillery began the research partnership as insiders to a scientific study. This PPSR research partnership began with the purpose of investigating Tillery’s concerns. Likewise, research shows when projects directly link to improving the quality of life for underrepresented community members, they show increased participation and engagement (Uriarte et al., 2007; Bonney et al., 2009) and community members are better able to see a place for themselves within the scientific community (Gregerman, 2009).

**Conclusion**

**Implications**
This study concludes by offering the field of PPSR implications for practice and recommendations. The implications for practice offer an explanation for what the findings of this study mean for the field of PPSR as a whole. They explain what meanings were constructed from the data. Finally, the study concludes with recommendations for further study, along with recommendations for change informed by this study’s findings and situated within the context of current research.

**Engagement Strategies Responsive to a Community’s History**

A deep understanding of the historical relationship between underrepresented communities and powerful institutions, such as science, is vital to the development of engagement strategies. This study found for Tillery and other marginalized communities, inequalities and abuse in the past and present have created mistrust for any project or person who seems to be a part of the larger system, which has alienated them through inequalities. Likewise, prior research has found there is no such thing as a neutral project (Chandler et al., 2012; Delpit & Dowdy, 2008). Research into the development of a person’s identity concurs, describing a person’s identity as multiple (Gee, 2000) and situated in the wider context of belonging (Crenshaw, 1991). The development of a person’s science identity within a PPSR project cannot be separated from the prior experiences that person has had with science and with the powerful institutions to which science belongs. C. Brandt (2008), who followed the science identity development of three Navajo women, found the women’s science identity was dependent on the presence of a discursive place, which valued their personal history, culture and knowledge. Project leaders cannot value the history of a community if they do not know the history.
A deep understanding of the historical relationship between the community and powerful institutions, such as science, is also necessary for the construction of a Third Space. A Third Space requires knowledge of the discourses community members draw upon. A community’s prior experiences, interactions with the world and culture all influence their construction of knowledge (Bianchini et al., 2003). In order to engage in true dialogue with a community, one must be immersed in the thoughts of the community with whom he or she dialogues (Freire, 2000). A Third Space is mediated by privileging the socio-historical lives of the community members in an attitude of humility (Porter & Baker, 2005) and demonstrating a reflective view on status and privilege (Chavez et al., 2003).

**How Engagement Strategies Are Implemented Matters**

Actions speak louder than words, but the manner in which actions are carried out is also a tool used to communicate a message and position a community inside or outside of science. The findings of this study highlight the importance of how engagement strategies are enacted. Both Part 1 and Part 2 of this study found respect for a community’s culture, perspectives on knowledge and painful histories is vital to overcoming the mistrust many underrepresented communities have for researchers and science as a whole. However, the pilot and larger case study found the manner in which actions are enacted positions community members in relation to the project leader. Attending a community meeting may have seemed innocuous, but Steve advised attending the meeting in a state car and introducing himself with a title denoting a degree served as reminders of his privilege and status in relation to community members.
Likewise, research on identity theories confirms humans learn whom they are based on how others interact with them (Erickson, 1987). People live under the influence of societal roles—roles they are told are available for them (Eisenhart et al., 1996). Humans are social products, authored by the way others recognize them (Holland, 2001).

**Scientific Studies are Always Driven by Goals and Values**

Science as a method of study does not have goals and values separate from the goals and values of those driving the scientific study. Thus, rhetoric surrounding the need to merge the discourse, values, and goals of science with those of the underrepresented community will likely remain rhetoric unless the values and goals driving the study are the values and goals of the community. The larger case study found the conceptualization of a Third Space within a PPSR project may perpetuate the hegemony of science as a tool used to accomplish the goals of those with power. These findings suggest the problem of racial disparities in science may not be resolved by creating a space within a science project, which consciously connects the world of science with the world of the underrepresented community. Attempts to create synergy between WMS and diverse knowledge (Bianchini, 2007) may result in improved communication between two communities of practice, but as Bishop (2012) argues, increased motivation to participate in science results when a person sees science as valuable to the identity they are attempting to author. If science has not and does not assist a community in achieving community goals, incentive to participate in science will be low (LeCompte & Dworkin, 1991). People learn things for a purpose (Schank, 1983). When science is used as a tool to assist a person and move them towards personal goals, then motivation to participate
increases (Basu & Barton, 2007). When people see themselves as knowledge makers within the scientific body, they have more positive perceptions of science (Costa, 1995).

Structural patterns of discourse such as who speaks and whose ideas are recognized as relevant reinforce identities and convey positions (Bishop, 2012). Positive science identities are linked to the ability to influence the direction of the scientific discourse (Reveles et al., 2004). This implication challenges the field to consider what it means to produce scientific knowledge. Science is not neutral, gender free and apolitical knowledge. PPSR has been proposed as a way to change the way underrepresented community members view themselves in relation to science (Dirks & Cunningham, 2006). Yet, if a PPSR project does not produce knowledge for the community, then PPSR stands the potential to perpetuate the same message it set about to overcome—scientific knowledge does not belong to underrepresented communities. The fundamental disconnect between underrepresented communities and science is the pressing needs of the underrepresented community members differ from the priorities and values of science (Pandya, 2012). As Wilderman et al. (2004) advise, the more control the community has in determining PPSR project goals, the more impact the project will have on science learning and behavior change.

**Strategies of Inclusivity May Further Alienate**

By describing science as a community with goals and values different from the goals and values of the underrepresented community, the conceptualization of a Third Space may perpetuate the hegemony of science and further position the community as outsiders to science. Thus, strategies of inclusivity have the potential to reinforce the idea
science belongs to some people and not others. Steve questioned why science and the underrepresented community are discussed as oppositional discourses. Likewise, the theories of identity describe discourse as a tool used to position people. The way scientists and others talk about science can reinforce an elitist view of science only being for some people (Olitsky, 2006).

A Third Space is described as a place, which allows for a collective identity to form through the use of hybrid language. It is a place in which community members are able to participate and come to shared understandings with the scientific community of practice (Gutiérrez, 2008). This description of a Third Space defines the underlying disconnect between underrepresented communities and science as a barrier of communication, as if underrepresented communities simply do not possess the language skills necessary to participate in scientific conversations. Yet, this study found the underlying disconnect between a traditional scientific study and the community of Tillery was the purposes and uses of scientific studies. This implication suggests overcoming the fundamental disconnect underrepresented communities feel with science will require more than a communicative strategy.

Furthermore, Gutiérrez et al. (1999) describe a Third Space as a place where community and scientific goals stand side by side. They propose a Third Space is a place where science educators use the tension between the underrepresented community and science as a building block to form new types of activity. These descriptions of a Third Space assume the goals of the underrepresented community and the goals of science are inherently separate. The findings of this study, however, propose there may be a
fundamental problem with describing the goals of science and the goals of the underrepresented community as separate and in tension with each other. Gutiérrez (2008) describes a Third Space as a social environment where a person can reconceive who they are in relation to science, but this conceptualization fails to recognize science itself is a social environment. The current conceptualization of a Third Space—by presenting science as if it is inherently driven by goals, which are contradictory to the goals of the underrepresented community—assumes science to be an unbiased entity existing separate from the people who fund and conduct studies in the name of science.

A transformed scientific agenda results in a new conceptualization of what a Third Space within a PPSR project looks like. There is no need to create a Third Space within a PPSR project, if the scientific agenda is transformed into an agenda, which pursues the values, health, and well being of all people. There is no need for a Third Space, if the underrepresented community has not been placed in a second space, removed from the first space of what is defined as science. A transformed science would be one space—a space for all.

A transformed science does not place science and the underrepresented community in separate spaces, which necessitate careful work to bridge the goals between each. Rather, science is one large space driven by the values and goals of all people. Envisioning oneself as part of the larger scientific community of practice will only lead to temporary benefits, if the reality proves science is practiced for others. In a transformed science everyone has equal rights to speak and no group’s discourse is in opposition to science. In this transformed science, there is no need to imagine how
participating in science fits in the larger context of one’s life (Lave & Wenger, 1991) because science regularly produces results, which are used for the good of all lives.

**The Need for Institutional Change**

Institutional change is needed to transform science into a space, which works to accomplish the health and well being of all people. Walters and Simoni (2009) recommend indigenizing institutions so the values, cultures and principles of underrepresented groups are respected but also integrated within the value, culture and principles of institutions. Ginwright (2008) concludes research, which is truly emancipatory in nature, will “require us to move beyond our universities and professional associations to build new infrastructure that can facilitate the free exchange of ideas, tools, and people needed for the greater democratization of knowledge” (p. 21). Likewise, the findings of this study indicate institutional changes need to occur in both institutional reward systems and institutional funding schemes. Part 1 of this study found a true dialogue requires long-term relationships to build trust with underrepresented communities. Likewise, the larger study found project leaders may confront the barrier of inequality by taking time to dialogue with the underrepresented community about the alienation and abuse they have faced and by forging long-term relationships with community members. Yet research, including this study, shows community-based research is time consuming and does not bring as many publications or result in the high status publications required to obtain tenure or advance in the competitive field of science (Schensul, 2002). If the field of science as a whole is to transform into a space benefiting all people, then institutions need to begin rewarding the use of scientific methods to
produce results for underrepresented communities. Researchers within the field of PPSR have called for more Collaborative and Co-created projects in which community members and scientists jointly establish the research questions, which will be answered within project activities. Yet, Wilderman et al. (2004) found scientists often view PPSR projects with community driven research agendas as less scientifically rigorous than projects designed by scientists and ask citizens to help collect data on answering research questions originating within the current scientific community. Likewise, Dickenson et al. (2012) found when a PPSR project collects data for questions generated by scientists, these studies result in more peer-reviewed publications. The disciplinary priorities of science need to be the health and well being of all people, those with money and power and those without. The theories of identity reveal social practices ascribe identities (Gee, 2000) and existent social structures create disadvantage (Baldwin, 2000). Until the scientific community of practice places disciplinary priority on searching out these social structures, policies and methods creating and perpetuating disadvantage, it is doubtful the status quo of who participates in science will change.

A transformed science also necessitates changes within institutional funding schemes and requirements. Part 1 of this study found funding often stands as a barrier to true dialogue, because balancing the goals of the funding agency with the goals of the underrepresented community is often a difficult task PPSR project leaders must overcome. Likewise, the larger case study found funding threatens and at times prevents equal footing within the project. Which research questions are funded needs to be a societal decision reflecting the values of more than just a small sector of society (Hobbes
et al., 2004). The findings of this study suggest the field of PPSR needs more funding opportunities, which answer research questions generated by communities susceptible to environmental injustice and other inequalities. Until the goals and values of funding agencies coincide with the goals and values of these underrepresented communities, true equality within the project may be threatened and progress towards overcoming the barrier of mistrust may be minimal. The findings of this study also suggest funding requirements, which prohibit overt calls to action, may work against the establishment of a transformed science. Wilderman et al. (2004) found a key component of PPSR projects, which had engaged underrepresented populations in scientific research, was the projects collected knowledge and collectively implemented action that was for the community. Prohibitions by funding agencies against overt calls for action work to maintain the status quo rather than bring about change to current societal structures. Can science be for underrepresented communities, if scientists may only conduct research into questions aligning with governmental policies?

**Institutional Change Begins with Individuals**

The community of science is not external to the individuals who practice science, thus a transformed science will begin with individual change. As long as science is discussed as if it is an unbiased entity existing somewhere external to the people who practice science, equity within science will remain an abstract goal. The people who practice and fund science are the field of science. This research illustrated the process of how one scientist and one underrepresented community practiced a transformed science. This implication relates to the Part 1’s finding, which indicates one solution to
overcoming the mistrust underrepresented communities have for science is for scientists to become a part of the larger system and network of people who understand the importance of community-based scientific studies. The implication also relates to the larger case study’s finding, which showed real change comes to communities when individual scientists search out the values guiding the studies they choose to participate in. Scientists are humans working within a community of practice known as science. Within this system individual scientists are faced with a choice—to accept institutional practices perpetuating colonialism or to refuse and take a stand against them. The findings of this study revealed part of building trust with the community of Tillery involved taking their side in the fight against abuse and inequality.

Consider the Tuskegee syphilis study, discussed early in this chapter as a specific instance in which science exploited the African American community. Tuskegee ended because an individual researcher risked his position within the social system of science when that system went against the value of justice for all people. A 27-year-old social worker and epidemiologist, Peter Buxton, was performing duties for the Public Health Services, when he learned of the Tuskegee experiment (Heller, 1997). In November 1966, he filed an official protest against the study, which was rejected because, according to the services Division of Venereal Diseases, the study was not yet complete. Again in 1968, Buxton filed another protest, which was dismissed as being irrelevant. Buxton did not let that deter him. In 1972, he leaked the story to the Washington Star and then testified at the Congressional hearings, which eventually led to the termination of the study. In the words of Noam Chomsky, “Changes and progress are very rarely gifts from
above. They come out of struggles from below” (Chomsky, 2015). Buxton persisted for six years to end a study, which in the name of science, exploited African Americans, and he took this stand publically at a time he was building a career within the system of science. Yet, Buxton did not allow fear to stop him from doing what he knew had to be done. As Rosa Park advises, “I have learned over the years that when one’s mind is made up, this diminishes fear; knowing what must be done does away with fear.” Winoa Wheelter, a scholar on Native American and indigenous studies, describes decolonization as transforming. Decolonization involves being self-critical, but it does not stop there. It believes in the ability of people and groups of people to change (Wilson, 2004). In order for science to become a tool used to serve the interests of all people, individuals working within the system of science will need to start practicing this transformed science; from there, the network of people will grow.

**Recommendations**

The present research study set out to examine if and to what extent a PPSR project engaging an underrepresented community in scientific research overlapped the theoretical construct of a Third Space and if there were barriers to creating this space within PPSR projects. This study’s findings led this researcher to conclude the concept of creating a Third Space within a PPSR project fundamentally reproduces existing power structures and furthers the notion that science is a place separate from the identities underrepresented communities are creating for themselves. Based on these findings, this study concludes by offering recommendations for further study and change within the field of PPSR, with the goal of transforming science into a space for all people.
**Designing identity conscious solutions.** When addressing the problem of racial disparities in PPSR participation, solutions would benefit from being identity conscious. This study found knowing and valuing a community’s history and who they understand themselves to be was a vital part to overcoming the mistrust the underrepresented community felt for researchers and the institution of science as a whole. Likewise, psychologists have found when solutions to the participation and achievement gap involve taking time to cultivate respect and personal concern for who a person is and is trying to become, this opens up possibilities for creating a shared ideology or value system (Cohen & Garcia, 2008). Part of being identity conscious involves being knowledgeable and sensitive to issues of stigmatization and clues in the environment, which may undermine a person’s social identity. The community of Tillery had a template of what to expect from a researcher. They had felt judged and had been ascribed an inferior identity. Past experiences left them automatically suspicious of Steve’s intentions. They doubted a scientific study would be used for their good. These findings are very similar to findings of social psychologists Steel (2011), who concludes threats to other social identities a person has necessitate solutions, which identify these threats and work on improving relationships. Stigmatization may be allayed by showing people their abilities and belonging are not doubted and by conveying faith in people’s motivation and ability to succeed (Cohen & Steel, 2002). This study provided several examples of clues within a social environment, which threatened to undermine the social identity of Tillery. Steve’s words, discourse patterns, and manner of approach all became important clues to Tillery of how their social identity was perceived by Steve. The field needs more research
into what clues within the social environments of PPSR projects may undermine participants’ social identities and how PPSR projects can be designed as identity conscious solutions. The partnership between Steve and Tillery did not form and flourish by ignoring differences in history, race and privilege. The partnership rather confronted and focused on differences and painful experiences. As Alicia Garza, co-founder of Black Lives Matter, advises:

As people who have our minds stayed on freedom, we can learn to fight anti-Black racism by examining the ways in which we participate in it, even unintentionally, instead of the worn out and sloppy practice of drawing lazy parallels of unity between peoples with vastly different experiences and histories. (Garza, 2014, p.3)

Being identity conscious means embracing the vastly different experiences and histories of people, acknowledging abuse and working together to create a science, which is a place of freedom for all people.

The findings of this research also offer advice regarding whose voice should inform identity conscious solutions. Gary advised underrepresented community members need to be part of the conversations, if conversations truly aim for solutions. It is doubtful the partnership between Tillery and Steve would have been successful had Steve entered the community without the constant advice from Gary, who served as a guide for Steve to learn the history and present day experience of Tillery. Gary was by Steve’s side advising and offering solutions when issues of mistrust and threats to Tillery’s identity endangered the partnership. Likewise, studies in the field of science education have found researchers
and educators need to be in underrepresented communities learning from them and
dialoguing with them about the best approaches to making science equitable for all
students (Barnhardt, 2005). Co-generative dialogues with underrepresented parents and
students are key to valuing all perspectives and taking programs to higher levels of
learning and effectiveness (Emdin, 2009). It is through relationships and ongoing
dialogue “pedagogical spaces” will be created, which foster equitable learning
opportunities for all students (Beckett, Glass, & Moreno, 2013; Gilbert & Yerrick, 2001).
Knowledge of the multiple aspects of a community’s identity is vital when developing
engagement strategies, because if any aspect of a person’s identity is devalued, this may
result in disengagement with science (Brickhouse & Potter, 2001).

**Practicing a transformed science.** The field needs more studies illustrating what
transformed science looks like in practice. Zavala (2013) notes the rarity of participatory
projects growing from or tied to university settings, which truly support community
goals:

Regardless of how participatory or inclusive these projects may be, whether this
involves colonized youth undertaking the research as in the case of YPAR;
researcher goals, careers, and funding sources ultimately drive how the
knowledge generated from these projects is used. (p. 64)

This study provides a picture of what practicing a transformed science looked like
with one African American community and a university scientist. Yet, the study also
revealed institutional practices and constraints at times stand as barriers to the endeavor
of creating a transformed science. Despite these barriers, science is not an institution
larger than the people who practice and fund science. Thus, this study concludes scientists, funders, and all others who ascribe to the values of democracy for all people, may influence institutional change by creating dissonance within the field and conducting scientific studies, which supports all people. This study calls for more research depicting what a transformed science looks like in practice, as well as research documenting the process of practicing transformed science within existing institutional constraints.

Consider the finding of this study, which indicated PPSR projects need to build within projects time for true dialogue about the community’s prior experiences with science and powerful institutions. The suspicions community members have towards researchers have been formed through years of mistreatment and abuse. With a template of what to expect, built on years of bad experiences, a few positive interactions will likely not be sufficient to break down the barrier of mistrust. Other research supports this finding, advising trust comes through open, honest and ongoing dialogue (Ammerman et al., 2003). Yet the field needs more studies depicting specifically how time can be built into projects existing within institutional demands for increased number of grants and publications. Baldwin (2000) paints a vivid picture of issues arising when researchers respond to the call of practicing a science, which is used for the community. Baldwin found the vision of science being practiced for the benefit of the community to be difficult to maintain, specifically noting the vital dialogue and relationship building activities of community based research are often unfunded. Baldwin also describes a fundamental disconnect between what the community wanted to study and the researcher’s agenda. Baldwin (2000) concludes, “The products of our research are not
geared to changing the social structures that create disadvantage” (p. 185). Baldwin concedes the costs of engaging in research for the community, are at times more apparent than the advantages. Baldwin notes governmental agencies and the scientific community as a whole is less interested in research for communities. Baldwin advises other researchers, who believe in the importance of pursuing a science for the community, to publish on the process “so that we can learn from each other’s mistakes” (Baldwin, 2000, p. 189).

Some researchers have concluded the problem of racial disparity within science participation results from underrepresented communities not seeing how science fits within the broad context of their lives (Hughes, 2001). Yet this study revealed a different problem. Tillery community members did not view science as a subject without application to their lives. On the contrary, Tillery saw science and research as very practical but a practical power used against them and not for them. Tillery’s ways of knowing and viewing the world were not so different from the researcher’s way of knowing. Rather Tillery was hesitant to participate because they doubted if this scientific study would actually be used for them. Other studies report similar findings concluding overcoming racial disparities within science involves practicing a science, which is used to improve the quality of life for underrepresented communities (Roth & Lee, 2004). A transformed science investigates research questions, which pursue the health and well being of underrepresented communities. The findings of this study echo Uriarte et al. (2007), when they call for practicing a science with a wider set of values and a broader range of research questions, as opposed to research questions, which support the current
reigning political power. Horton (1997) explains for many underrepresented groups, science is not incongruent with their cultural ways of knowing; rather the disconnect lies with the meaning given to the way science explains. In other words, it is not the scientific way of explaining things, which the community finds to be alienating. Rather it has to do with the “webs of significance” (Geertz, 1994) or how scientific knowledge is presented and what it is used for.

This study also revealed the complexities of institutional funding schemes and the politics behind scientific research may stand as barriers to the likelihood of science being used for underrepresented communities. Fuller (2000) advises scientific research is for an end. Science is a form of inquiry used to explain and legitimize socially significant phenomena. Politics often dictate what studies are considered socially significant and how the results of the study are framed. If a scientist decides to go against the status quo of producing studies promoting a new market industry or governmental initiative, he or she often must seek funding from private funders, which “accelerates the flight of science from the realm of public to private knowledge” (p. 15). Fuller goes on to describe science as a “business” with specific “goal orientations” (p. 14). Many scientists are constrained to pursue hypotheses dictated by their funding agency, and if they question the status quo, they are stripped of their status and lose funding. Fuller describes this pattern as the “governance of science,” which results in minimal contestations of already existing claims to knowledge (p. 21). Science, as a “vehicle of global governance” is “used as an instrument” and as a “representative body in which a few speak for the many” (p. 8). Fuller is not alone in his critique of the status quo of science. Guston (2004) concurs,
arguing with the billions the government provides for scientific research and development, science is “deeply political” (p. 25).

With the current structure favoring maintenance of the status quo, the field needs more studies demonstrating how scientists can practice transformed science within existing hegemonic structures. Steve practiced a transformed science within the current structure of the university for which he was employed. His advice was not to give up because the system seems structured in a way, which prevents practicing transformed science, but rather to research and find donors sympathetic to the plight of underrepresented communities. Likewise, Baldwin (2000) encourages scientists and communities not to resign in defeat when they find funding constraints. Rather Baldwin recommends seeking funding from other sources, such as philanthropists organizations, and working “continuously and consciously, to influence the policy research agenda so that it reflects the concerns of underrepresented communities” (p. 189). Baldwin also advises building relationships with policy makers and learning how governmental agencies and departments choose research priorities in order to gain influence in the process. Similar to the advice of a Part 1 project leader, Baldwin advises using communications such as radio, television, and journals to raise awareness and bring community issues into the public light. Baldwin notes, “Choose to manage the difficulties in the hope of influencing policy, and adding to knowledge, in the longer term” (p. 190). Yet, Baldwin agrees with the author of this study that the field needs more research on what approaches work well and what approaches do not work well.
One specific solution, which needs to be explored in the context of the United States, is the science shop model developed in the Netherlands. Science shops, also known as “doorways to a university’s research community” (Raloff, 1998, p.298) invite community members to conduct research within the university system. University students meet with community members, who have research questions they would like answered. Students serve as mediators between the community and a university professor, who agrees to oversee the project. Science shops tend to be a low cost alternative to participatory research because students and professors benefit academically and professionally from participating. Students receive class credit and graduate students write theses and publications from the work. Professors participating fulfill their teaching requirements by supporting the study (Raloff, 1998). Although the science shop model has become popular in many countries across the European Union, more studies are needed examining this model within the context of the United States. Based on the results of this study, research needs to examine if the barrier of mistrust would inhibit marginalized groups from participating in these science shops. Research is also needed to determine if the publications resulting from these science shops would be publications with the same merit as publications produced from research outside of community based research. Would science shops serve as a superficial solution to a deeply historical problem within the United States?

**Teaching science as a historical and sociopolitical tool.** Finally, the researcher of this study offers recommendations for how to begin practicing a transformed science, beginning with a change within science education curriculums. Science curriculums often
present science as an objective discipline, which makes every effort to produce studies unconstrained by prior belief, resulting in unbiased data collection and analysis (Cobern and Loving, 2003). Yet, there is an “inherently social aspect to all knowledge construction” (Cobern & Loving, 2003, p. 59). A transformed science recognizes the social construction of knowledge and challenges the idea of fairly collecting data. Can data be fairly collected if it is not collected from all places and for the needs of all people? Cobern and Loving (2003) recommend science be taught as a method of study with universal laws but special attention be given to the “fashion of scientific propositions” (p. 51) and the “fashion of the discourse” (p. 51) used to examine phenomena as well as the values attached to which questions are asked in the name of science. Western culture has used science as a way to “judge the rest of the world,” and “used education to enforce change on those societies found deficit” (Cobern & Loving, 2000, p. 53). This study calls for science educational programs to present science for the sociopolitical tool it is and challenges programs to integrate within curriculums education on the painful history science has had with underrepresented communities. The empathy, found to be vital to practicing a transformed science, begins with knowledge of the whole history, not just the proud moments of science, but the shameful moments as well. Science majors, science educators, and those funding scientific studies, ought to know the history of science to prevent a situation described by Project Leader 1 in which a university researcher enters the community as an “ignorant giant,” unaware of the institution’s real history with the community (Interview, February 12, 2015). The author of this study challenges universities to have and promote the difficult conversations,
which are necessary precursors to practicing a transformed science. Shying away from controversial and emotionally charged topics will not promote healing and change.

Universities and educational institutions need to be places challenging the status quo and working to promote social justice. Yet, as Steve Wing warned, the more universities become beholden to corporate and political interests, the more likely they are to shy away from these conversations. With political and industry leaders providing funding to the university and sitting on university boards, university leaders need to guard the university as a space for the free flow of information and debate of controversial topics. As Steve found, his university in taking caution not to offend their funders, discouraged Steve from using scientific research to speak out against the pork industry. A transformed science necessitates university leaders and professors who are not willing to allow money to dictate which conversations are allowed.

By way of example, consider a recent case in which a political leader threatened to censure a university professor by blocking a course, which promised the discussion of controversial topics. Republican Senator Dave Murphy, who also serves as chairman of the Assembly Committee on Colleges and Universities, challenged the University of Wisconsin-Madison (UW) to cancel a course being taught as part of the African Cultural Studies Program. The course, entitled *The Problem with Whiteness*, advertises discussions surrounding what an ethical White identity entails. Senator Murphy has accused the class of prompting racial division and has demanded the university cancel the class. According to an interview with CNN correspondent Amanda Jackson (December, 23, 2016), Murphy wrote, “If UW-Madison stands with this professor, I don’t know how
the university can expect taxpayers to stand with UW-Madison.” Despite the protests of Murphy and others who have joined him, UW-Madison is standing behind their professor and supporting the free exchange of knowledge within classes (Jackson, 2016). The field as a whole needs more universities to promote dialogue on issues of race, alienation and exploitation. If Whites do not understand their privilege and cannot be challenged to consider how their identity as a White person has influenced their current position within society, they will continue to deny the reality underrepresented community members face.

Examining projects, rhetoric and within for remnants of colonialism.

Participatory research with underrepresented communities is used as a tool to communicate respect and signal to underrepresented communities scientific knowledge is not superior to community ways of knowing (Fawcett et al., 1995; Ribisl et al., 2004). Yet, the researcher of this study cautions a transformed science requires a close examination of project actions, rhetoric, and personal beliefs. Even inclusive, participatory projects may perpetuate the logic of colonialism and further marginalize underrepresented communities. Cobern and Loving (2003) advise hearing other voices or forms of knowledge in science projects or curriculums will not fix the “fundamental problem that led to the devaluing” in the first place (p. 63). Thus, the field of PPSR must consider how citizens are recognized within a project and what messages are communicated beyond project actions themselves. This recommendation relates to the finding of the larger case study that a Third Space can be superficially created without any real change to the communities. Even when a science project includes community
perspectives and descriptions of the natural world, these additions may serve as “tokens of cultural inclusiveness rather than serious participants in the discourse of science” (Cobern & Loving, 2003, p. 62).

This recommendation for change pushes the field of PPSR to move beyond adopting participatory approaches and inclusive strategies. It is a challenge for project leaders to consider the manner in which strategies are carried out and what the manner reveals about underlying beliefs. A participatory approach does not guarantee trust will be built with the community. The key component to building trust is demonstrating respect, reliability and transparency (Fernandez-Gimenez et al., 2008). This study found respect is signaled through the manner in which an action is carried out. How project leaders interact with the community sends a clear message of who project leaders think they are in relation to community members. A community who has long been treated as if they are inferior will be sensitive to the manner in which they are treated. Any notion of superiority, may further position a community member as outsiders to science.

Thus, the author of this study recommends critically examining the manner in which project activities are carried out. Scars from a wounding so deep have left marginalized communities sensitive to the reactivation of their trauma. It is vital to seek out an approach, which will communicate utmost respect. For example, part of Tillery’s trauma was being denied access to information, denied a voice in conversations resulting in policies, and being made to accept the word of the White man. A specific way Steve was able to respond to this trauma was by being cautious about the manner in which project results were communicated. With the advice of Gary, time was dedicated to
putting the research into a form the community’s prior knowledge and training enabled them to understand. University researchers sat down with community members to answer any questions they had regarding the results. Community members, with the help of researchers, gained an understanding of the data, which allowed them to speak on their own behalf before the North Carolina Legislature.

This recommendation also applies to the rhetoric used when publically and privately discussing project activities. The way researchers discuss underrepresented communities may further alienate them. This study found one reason Tillery is hesitant to participate in research studies is due to the tendency of many studies to present community members in a negative light. The field of PPSR, in an attempt to be more inclusive, may at times be guilty of presenting community members in a deficit view. Take for example the call within the field to include a more diverse group of participants. Brossard et al. (2005) note PPSR projects tend to attract citizens who already care about the environment. Without intention, a statement such as this may imply the demographic not participating does not care about the environment. Yet this study found Tillery cared very much about their environment. The real issue was before Steve, no scientist had cared about Tillery’s environment. Walters and Simoni (2009) recommend science projects seek out hidden messages reiterating the messages of colonialism—that one group is better than another.

Finally, this recommendation includes a call for researchers to search within and identify colonial attitudes and beliefs standing in the way of practicing a transformed science. As Gary advises, community members are not fooled by false pretenses of
caring. If a researcher partners with a community simply to get a certain demographic included in their study, the underrepresented community knows. Baldwin (2000) notes, “When researchers pursue their own interests, and not those of the people they purport to help, they are essentially parasitic: stealing respondents’ time, and benefiting professionally from their disadvantage” (p. 185). Baldwin concludes studies, which are for a researcher’s own personal agenda, maintain existing social structures and create dependence rather than community autonomy.

Techniques can be used for either purposes of justice and liberation, or for purposes of social control, domination and exploitation. This necessitates a close examination of who will benefit from the research and at whose expense. A transformed science fundamentally challenges the dominant paradigm’s view of research. Baldwin (2000) concedes true community based research, which explores questions of interest to the community, challenges the authority of skilled professionals. Baldwin notes, “The challenging of our rights to define research questions and methods threatens our academic identity. It involves a real surrender of power and a questioning of expertise” (Baldwin, 2000, p. 187).

Walters and Simoni (2009) recommend researchers look within to identify and change colonial attitudes and practices. White privilege is reproduced when Whites feel they are getting what they deserve and do not recognize the privilege they have. Race and oppression is not something people who are White must daily acknowledge. This study recommends scientists and science educators engage in a long-term commitment to seek out privilege and understand the societal forces behind the opportunities they have been
provided. Chavez et al. (2008) advise fellow researchers be critical of who they understand themselves to be. Similarly, Freire (2000) advises true dialogue cannot exist if researchers think they own truth and knowledge. If researchers consider themselves to be members of a “pure” group separate from other men, they do little more than deliver a message of salvation and dialogue at, instead of with, others. As Freire asks, “How can I dialogue if I regard myself as a case apart from other men—mere its in whom I cannot recognize other I’s” (Freire, 2000, p. 148). Likewise, this study found careful and critical self-examination is vital to true empathy. PPSR project leaders should search out the values driving scientific questions asked within a PPSR project and strive for projects driven by the values of underrepresented communities.

**Implementing solutions responsive to a community’s fundamental disconnect with science.** Two theoretical traditions inform the field of PPSR: Public Understanding of Science and Technology (PUST) and Public Engagement in Science (PES). The many types of PPSR projects, with their differing levels of citizen participation and measures of success, reflect project goals tied to these two traditions (Haywood & Besley, 2014). To avoid the confusion existing as a result of the many terms used to describe citizens engaging in scientific research, the author of this study chose to use the umbrella term PPSR (Shirk et al., 2012) to speak generally about projects in which citizens engage in scientific research with scientists. Yet, the findings of this study indicate the usefulness of carefully considering which of these two theoretical traditions is informing the PPSR project. The two traditions have different goals, thus it is important to distinguish between the two traditions. As discussed previously in Chapter 2 of this study, PUST can
be viewed more as an educational outreach in which scientists engage the public in research, assuming if the public better understands science, they will be more accepting of scientific results (Lewenstein, 1992). In contrast PES is a bottom up approach and a two-way dialogue between citizens and scientists around scientific and community goals (Mejlgaard & Stares, 2010). This study recommends project leaders spend time in the underrepresented community prior to determining which tradition best encompasses the primary goal of the PPSR partnership with the underrepresented community. The overall PPSR project goal needs to reflect the underlying disconnect the community feels with science. When project leaders spend time getting to know the community before project goals are determined, this may help avoid PPSR projects becoming generic solutions, which may or may not respond to the fundamental barriers standing between the underrepresented community and the scientific community of practice.

Shirk et al. (2012) recommend beginning with the end in mind and considering if the goal of the project is educational, to increase the public’s understanding of science, or to involve people in public policy decisions. If the primary project goal is to help scientists collect data, then a solution would be to invest in well-developed guidelines for data collection and to spend sufficient time training citizens (Delaney et al., 2008). Yet this study recommends carefully considering what the overall project goal is and if certain project goals may be in conflict with the overall goal. Likewise, Harnik and Ross (2003a) warn the usefulness of a PPSR project is lost when project goals are not balanced. For example if the overall goal of the project is large scale data collection for scientists and a secondary goal is to engage underrepresented communities in scientific
research, these two goals may conflict with each other. Large scale data collection may inherently favor traditional, big data scientific goals because the project does not provide opportunities for project leaders to intimately get to know the histories of participants and develop meaningful relationships with them.

This study found the fundamental disconnect between science and Tillery was the White privilege, which science represented. The methods of science were not deemed oppressive by Tillery, rather it was a larger felt alienation from the system of institutions to which science belongs, as well as an overall mistrust for how a scientific study could be used against them. Tillery has scars inflicted by powerful institutions and wounds they are not eager to re-open. This study recommends recruitment strategies consider how the unique histories of individual communities affect their willingness to participate in science related activities. The fundamental disconnects between the individual community and science, which can only be understood by spending time in the community and developing relationships with community members, ought to inform solutions aimed at broadening participation in PPSR projects. Bonney et al. (2009) recommend if the field desires to reach new audiences, significant research is needed into motivations for members of the public to participate. This study adds to this call, by proposing significant research is needed into specific barriers motivating non-participation and research on how PPSR projects can be built as solutions directly responding to these barriers.

The larger case study found historical and present day inequality alienates Tillery from science and the larger system, which science represents. The methods of science
were not the fundamental disconnect standing between Tillery and participation in the scientific community of practice. When Steve used the term swine, Tillery understood Steve well, but his use of the term upset them. Language is a tool used for authoring a particular identity (Reveles et al., 2004). The real barrier was the discourse of science reminded Tillery of a privilege they are denied access to. Based on Tillery’s fundamental disconnect with science, the Public Engagement in Science tradition informed the formation of project goals. Steve and Gary engaged in a two-way dialogue when determining project goals. The bottom up approach of Steve and Gary’s partnership directly reflected the barriers to belonging Tillery felt. With the deep mistrust Tillery community members had for science and research as a whole, the decision to answer Tillery’s research questions was vital to overcoming Tillery’s belief that science was not for them. Tillery was not empowered by getting the chance to collect data; rather Tillery was empowered by having the ability to influence the direction of the scientific study and decide what research questions would be answered. In this way, the project design was a direct response to Tillery’s underlying concerns with science.

Green and Mercer (2001) argue participatory research needs to be specifically defined and needs to include within the definition attention to who will be directly affected by the research results. They argue if participatory research has the goal of affecting social change, the real priority ought to be involving public in developing research questions, not in the labor-intensive data collection. When citizens direct the scientific process and power is restructured between citizens and specialists, a more legitimate science is created. Likewise, Warren (1989) recommends project leaders
critically consider whose knowledge is being built by the research and care be taken to avoid asking the community to answer someone else’s questions to build someone else’s knowledge. Guston (2004) advises community relevant research is “community-initiated” research, in which the voice and concerns of the community impact the research, in contrast to the current tradition in which research is driven by investments by private institutions. As Guston (2004) concludes, conducting scientific studies driven by questions and interests of communities would “help set a research agenda that is not captive to large economic interests” (p. 27). Citizen science becomes a place of collaboration when scientists and citizens co-construct knowledge (McCormick, 2007).

Yet, Warren (1989) argues knowledge produced in a scientific study will not be community knowledge unless community members are answering their own questions. The field of PPSR needs to see more examples of projects such as the partnership between Earthwatch and Starbucks, who partnered with local Costa Rican farmers in scientific inquiry into the decline in coffee bean crop. Citizens had economic interest in the study and saw the study produce results for their community (Chandler et al., 2012). Scientific and educational goals ought to be “developed within the broader goal of community self-determination” (Zavala, 2013, p. 65).

Wenger (2000) spoke of the need for community of practices to grow. Yet, if PPSR project leaders do not seek out the fundamental disconnect their community has with science, then they may spend time and efforts seeking to remedy issues which are tangential to the real source of the disconnect, resulting in superficial and at times counterproductive remedies. For example, if Steve’s primary focus would have been to
educate Tillery on the scientific process, this goal would not have confronted the fundamental disconnect standing between Tillery and science. This recommendation is based in the theories of identity, which guided this study. If a person believes trajectories of two identities are in conflict, then they may abandon one identity in favor of their core identity. Oppositional identities purposely reject mainstream goals and values (Bowles & Gintis, 2002). Using scientific discourse is an ability as well as a choice, and for some underrepresented populations, using scientific discourse causes conflict for them as they try to balance ethnic and academic identities (Brickhouse, 1994; Eisenhart et al., 1996; Gilbert & Yerrick, 2001; Lee & Fradd, 1998). For example, recall Brown (2004) who found students were able to use scientific discourse but chose not to because they were stigmatized by peers for using it. Thus, if the partnership between Steve and Tillery had the primary goal of developing scientific discourse skills, this solution may not have resulted in the partnership that occurred. The mistrust Tillery had for science had to be overcome before they had a desire to engage in science. Developing protocols aimed at helping Tillery members understand the discourse of science would have been a superficial remedy for the real wound. The real wound for Tillery was that science has been used against them rather than addressing the real issues they face. Tillery’s lack of engagement in science and other research studies was not because they did not believe they could; rather they did not want to, and at times made a conscious effort to avoid using the language of a tool, which had been used against them. Words themselves convey positions and identities (Bishop, 2012). Because Tillery had been marginalized by science and suffered at the hands of powerful institutions, the primary project goal
needed to be building trust and demonstrating, not just in theory but also in actual practice that science could be used for their community.

If solutions are designed around a false assumption about the underlying disconnect between science and the underrepresented community, then solutions may be counterproductive. For example, if the underlying disconnect is assumed to be the community does not understand science or that the community does not see the connection between science and their everyday experience, the primary project goal may be to give community members an opportunity to collect data. Project leaders would strive to send a message that says, “See, science is something you can do too!” Yet the underlying belief that community members do not know how to do science and need to be provided with opportunities to practice doing science, may perpetuate the deficit view of underrepresented communities. Tillery community members knew science was something they could do, with the proper training. If Steve had entered Tillery with a message communicating, “I am here to help you see that even you can do science,” this message may have reactivated Tillery’s trauma and served to alienate rather than welcome them to the project. As the findings of this study indicate, Tillery community members are very sensitive to any notions communicating they are less capable.

If the primary goal of the project is to provide citizens opportunities to practice the scientific method, with the goal of improving the public’s understanding of science, and this goal takes precedence over the goal of producing data a community can actually use, this also may further position the community as outsiders to science. This recommendation relates to the finding in Part 1, in which several PPSR project leaders
noted community participants feared no one would be interested in data about their community. Project leaders need to carefully consider the message sent to community members if no one from the scientific community is interested in the data produced from the community research. Does this not validate the community concerns about science not being for them? If the primary goal of the project is to demonstrate to community members science can be used for the community and science connects to their everyday life, then what effect will it have on the community when no scientist actually uses the data?

Bonney et al., (2009) note in their development of PPSR models they “deliberately exclude public engagement in scientific PES activities that involve members of the public in understanding and influencing public policy as opposed to participating directly in research” (p. 19). Yet, this study suggests research with no action may further alienate underrepresented groups from science. Perhaps the field of PPSR should consider what is meant by saying PPSR can empower the community (Bonney et al., 2009). The verb empower indicates the ability to make someone stronger and more confident in controlling their life and claiming their rights. Can empowerment happen with no action? If PPSR is for the community and research questions answered for the community do not result in action, does that not reiterate that science is not really used for them? The power of community based citizen science occurs when community members see the impact of their work on the local community (Carlone & Johnson, 2007). As the field moves forward, more research is needed into how PPSR projects empower marginalized communities and if empowerment can occur with no action.
Closing Remarks

In conclusion, the author presents a graphic representation, displayed in Figure 6.1, which depicts the formation of a transformed science. As the image shows, before a transformed science can be created, there are barriers project leaders must overcome. The historical relationship between underrepresented communities and powerful institutions, fraught with abuse, alienation, inequalities and mistrust, necessitates a relational approach when attempting to forge community research partnerships. Within these relationships, which may take years to develop, researchers must carefully and humbly communicate respect for a community’s culture, perspectives on knowledge and histories.
Figure 6.1 Transformed Science. This figure shows a graphic representation of this study’s findings.

For the community of Tillery, the alienation from science resulted from indelible marks left on their consciousness when science and other powerful institutions treated them as if they were inferior and less valuable members of society, because of the color of their skin. This cultural trauma left permanent marks on their identity—marks, which affected their willingness to collaborate with Steve in the PPSR project examined in this study. Through carefully and humbly confronting Tillery’s trauma and the resultant mistrust for researchers, Steve and Tillery were able to work through Tillery’s trauma and develop a horizontal scientific research partnership.
Along with confronting the barriers of alienation, abuse, inequalities and resultant mistrust, project leaders need to recognize science for the sociopolitical tool it is. Community-based research does not guarantee the research produced will serve the interests of the community. Even a humble approach, which respects and privileges the perspectives, voices, and knowledge of the community, does not guarantee a transformed science will be practiced. Zavala (2013) warns even when community-based research purports to serve the community’s interests, it may in reality perpetuate the colonial, vertical relationship of historical research. Research strategies, methods, and approach are of great importance, but it is even more vital that a project is held accountable to the spaces and to the community that give the project life (Zavala, 2013). To avoid perpetuating the vertical relationships of colonialism, project leaders need to seek out the values guiding a PPSR project and ensure the values of the underrepresented community are among those values. As Figure 6.1 shows, a transformed science is led by the values of all people. Practicing this transformed science may necessitate creating dissonance within a field, which has traditionally been used to perpetuate the status quo and serve the interests of those with power. Perhaps when science is consistently practiced for the good of underrepresented communities, as it was in the partnership between Steve and Tillery, underrepresented communities will consistently participate in science.

Steve’s decision to create dissonance within the field of science, related to his broader vision and commitment to the fair treatment and meaningful involvement of all people within the production of scientific knowledge, regardless of their race, color, national origin, or socioeconomic status. Steve saw a fundamental problem with how
scientific studies are typically used and decided to be the change he wanted to see within the field of science. This research concludes with an African Proverb the community of Tillery has claimed as their own. According to this proverb, “When spider webs unite, it can tie up an elephant” (CCT, p. 99). The pursuit of a transformed science will require all people, those with formal scientific training and those without, to unite and to transform science into a tool used for the benefit and justice of all people.
Forging Partnerships in Citizen Science Interview Protocol

Thank you so much for being willing to sit down and talk with me. The goal of my study is to gain a better understanding of the kinds of partnerships citizen science projects are forming within their communities. I'm hoping to find out what lessons we can learn through these partnerships, how they are established, the type of dialogue they allow, any difficulties or barriers to establishing them, and any impact they have on the project and community.

1. Establishing the Partnership.
I'm really interested in hearing about the partnership your project forged with_.
Can you tell me a little bit about this partnership?

*What led you to establish this partnership? What was your goal for this partnership?*

*How did you/your project initiate this partnership? Did you have contacts with leaders in the community? Can you offer us any insight as we are seeking to establish community partnerships?*

*How long did it take you to get this partnership going? Were there difficulties in getting this partnership established? If so, how did you overcome these difficulties? Partnerships are about give and take. Do you feel you had to “give up” anything or make compromises in order to establish this partnership?*

2. History/Culture/World of the Communities
I have been reading a lot of articles on dialogue and have been learning that the conversations we have with people can’t be separated from the community, history and place in which they occur. For example,^1^ specifically focused on the indigenous people of Alaska and how their history and culture affects the way they learn and know things.

*Reflecting on the particular community with which you have partnered, do you believe the history of the community affected the type of partnership you were able to establish?*

*Were you able to learn much of the community (as far as history and culture) with which you partnered or did the nature of your partnership not cater to that kind of understanding?*
Do you feel like you knew much of the history of the community before the partnership or was it something you learned along the way?

Did knowing the history and strengths of the communities help you make the project environment more friendly to them?

Did you observe any differences between the cultures of science and the culture of the community with which you partnered? How did you respond to those differences?

How did you work to build trust with communities you were attempting to reach?

3. **Dialogue with the Communities/Barriers to Dialogue**
   Part of my research involves looking at the types of dialogues we are able to have with the communities we are recruiting to scientific research. A concept that has really stuck out to me is the concept of receptivity.

   **Receptivity** - has to do with being able to receive and inclined to receive ideas, impressions, and suggestions.

   In your experience, do you find there to be a difference between how your project is inclined to receive the voices and perspectives of diverse communities and how much your project is able to receive these ideas, impressions and suggestions?

   What, if any, are the barriers and challenges that make it difficult to be able to receive ideas, impressions, and suggestions from communities outside of science?

4. **Effects of the Partnership**
   Was this partnership successful? In what ways? How did your project specifically benefit from this partnership? How did the community benefit in your eyes?

   What, if any, effects did the partnership have on your project’s data, reach, and the citizen scientists?

   Were there new possibilities for your project created by the dialogue you had with these communities?
Appendix B

Protocol for Initial Email Case Study Interview

Project Model Type
The Center for Advancement of Informal Science Education (CAISE) established an inquiry group to describe the various models for Public Participating in Scientific Research (PPSR), classifying models based on the degree of participation from the public (Bonney et al., 2009). Read the three descriptions below, which are paraphrased from the CAISE report, and choose which project model best describes your own. Feel free to explain if your project is not easily classified as one of these three types.

Contributory Project Model:
Researcher driven data-collection project. Scientists have research question, which require large amounts of data often spread over wide geographic areas. Citizens help scientist collect data and may also be encouraged to learn about the scientific process at the same time. Scientists determine all steps in the project.

Does this description fit your project?

________________________________________________________________________

Collaborative Project Model:
Scientists have research questions and ask citizens to help collect data. Participants may help design and refine data collection protocols and are actively involved in multiple research activities, including analyzing samples, interpreting data, drawing conclusions, and presenting results.

________________________________________________________________________

Co-created Project Model:
Members of public initiate research questions of concern to their community. Scientist and public participants work together to answer these questions. Participants are encouraged to take part in all stages of research process.

________________________________________________________________________

For the following steps in the scientific process, place an X by the steps citizens (community members) in the PPSR project are involved in. Then provide a brief description of how/to what extent participants contribute to that step.

<table>
<thead>
<tr>
<th>Step in scientific process</th>
<th>Do diverse community members participate?</th>
<th>Brief Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choosing or defining question(s) for the study</td>
<td></td>
<td></td>
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<tr>
<td>Gathering information and resources</td>
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<td>------------------------------------</td>
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<td></td>
</tr>
<tr>
<td>Develop explanations (hypotheses)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design data collection methodologies</td>
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<td></td>
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<td>Collect samples and/or record data</td>
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</tr>
<tr>
<td>Analyze Samples</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analyze Data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interpret data and draw conclusions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disseminate conclusions/translate results into action</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discuss results and ask new questions</td>
<td></td>
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</tbody>
</table>

**Additional Questions.**

1. From your perspective did citizens in this PPSR project fully engage in the scientific study? Engage minimally?

2. Did you observe any difficulties in motivating community members to engage in scientific research?

3. Are there specific events in the history of the community that may lead to community members feeling as if they don’t belong in a scientific investigation? (Feelings such as “Science is not something people like me do”).
Appendix C

Protocol for University Project Leader

1st Skype Interview Protocol

Purpose Statement

In this study I propose PPSR projects are more likely to recruit diverse participants when projects become a third space (Gutiérrez, 2008). A third space is created by combining a person’s social communities of practice (first space) with the scientific community of practice (second space) into a hybrid third space, which merges the discourse, practices, goals and values of science with the world a person experiences outside of science (Barton & Tan, 2009). Your project has successfully engaged diverse community members in scientific research. In theory you have created a space for diverse community members within the scientific community of practice. In our interview today, I am interested in learning how your project has been able to engage a diverse community in scientific research. In what ways, if any, has your project become a third space? Throughout the interview, I’m interested in demonstrating how the theory guiding this study works in practice. The more stories from your personal experience the better! The goal is to provide other project leaders with advice on best approaches/practices for engaging diverse communities in scientific research.

Establishing the Partnership.

1. What led you to establish the partnership between UNC-Chapel Hill and Concerned Citizens of Tilery? (Who initiated the partnership? How?)
2. What was the goal of the partnership?
3. How long did it take to get this partnership going?
4. Were their difficulties in getting this partnership established? If so, how did you overcome these difficulties?
5. Partnerships are about give and take. Do you feel you had to “give up” anything or make compromises in order to establish this partnership?
6. In what ways, if any, did the history of your community partner affect the type of partnership you were able to establish?
7. Did knowing the history and strengths of the community help create a welcoming project environment for community members? If so, in what ways?
8. How did you work to build trust with the community?

Communities of Practice

Communities of practice are like mini-cultures with agreed upon meanings and a shared history of learning resulting in boundaries, which define the community. Science as a practice has boundaries as to what is considered scientific and what is not considered
Scientific. I will ask you specifically about scientific vs. community ways of communicating, knowledge, practice and goals. Please share any examples from your personal experience working alongside diverse communities.

Scientific ways of communicating:
- Are there differences between scientific ways of communicating and the community/local ways of communicating?
- In your experience are there specific vocabulary or ways of talking in science that may alienate diverse community members?
- How do you create a scientific project that uses scientific ways of talking but does not alienate diverse communities?
- Can you think of specific examples of how your project has blended scientific and community ways of communicating? Do you have any advice for fellow project leaders on how to value both?

Below I provide definitions of three large ideas that will guide our discussion - scientific ways of knowing, practices and approaches, and agenda/goals. Feel free to clarify or disagree with any of these definitions!

Scientific Way of Knowing: Science values a certain type of knowledge. Science values investigating and organizing aspects of reality that we may access through our senses. Science is a way of knowing reality.

Scientific Practices and Approaches: Science is a method for systematically investigating reality. Scientific knowledge is often viewed as objective and value-free, a method of discovering the way the world is. The findings of science are often viewed as valid and trustworthy due to the precise techniques and methods used in their discovery (as opposed to other ways of knowing and studying the world).

Scientific Agenda/Goals: Social and political concerns and agendas drive the research questions asked in scientific investigations. Certain studies are valued and thus funded while other studies are not.

Differences.
1. Are there differences between scientific knowledge (what science considers to be valid knowledge) and the ways of knowing valued by the diverse community with whom you partner?

2. Are there differences between scientific practices/approaches (methods of describing reality) and community/local approaches?

3. Are there differences between the social and political concerns and agendas of science and those of the community?

Alienation.
1. In your experience has the scientific way of knowing and describing reality alienated diverse community members?

2. In your experience are there specific practices/approaches of science, which may alienate diverse community members?

3. In your experience have the differences between the social and political concerns and agendas of science and those of the community (if there were any) alienated diverse community members from science?

Common Ground.
1. Deetz and Simpson (2004) say that instead of trying to reach diverse communities with science, as if the scientific community holds truth, scientific project leaders should be trying to reach greater understandings together with diverse communities. Do you agree with this statement? If no, why not? If yes, how can this be done in practice?

2. As a PPSR project leader, have you been able to find common ground between science and community ways of knowing and describing reality that have served to create common purpose and vision between science and the community?
   - How do you create a scientific project that values scientific knowledge and ways of viewing reality but does not alienate diverse communities? How do you come to shared understandings, when the two ways of knowing may be so different? How do you equally value both? Can you equally value both? Is it necessary to equally value both?
   - How can PPSR project leaders allow Western Modern Science (defined as the systematic study of the structure and behavior of the physical and natural world through observation and experiment) and community ways of describing the world keep their own qualities but support each other’s growth?

   - Can you think of examples that illustrate how your own project has been able to value scientific and community ways of knowing and viewing the world?
   - Are there barriers that make it hard to find common ground between science and community ways of knowing and describing reality?
   - Do you have recommendations on best approaches for other project leaders hoping to create common purpose and vision between science and the community?

3. As a PPSR project leader, have you been able to find common ground between science and community practices/approaches for investigating the world that have created common purpose and vision between science and the community?
• How do you create a scientific project that values the scientific method but does not alienate diverse communities? How do you come to shared understandings, when scientific methods and community methods for investigating the world may be so different? How do you equally value both? Can you equally value both? Is it necessary to equally value both?
• Can you think of examples illustrating how your own project has been able to value scientific and community practices/approaches of investigating and describing the world?
• Are there barriers that make it hard to find common ground between science and community practices/approaches for describing reality?
• Do you have recommendations on best approaches for other project leaders hoping to create common purpose and vision between science and the community?

4. As a PPSR project leader, have you been able to find common ground between scientists’ and community members’ social and political concerns and agendas that have served to create common purpose and vision between science and the community?
• How do you create a scientific project that balances scientific research agendas with the goals and values of the community? How do you value community goals while answering research questions influenced by funding agencies’ social and political concerns? How do you equally value both? Can you equally value both? Is it necessary to equally value both?
• Can you think of examples illustrating how your own project has been able to balance the scientific research agenda with the goals and values of the community?
• Are there barriers that make it hard to find common ground between science and community social and political concerns and agendas?
• Do you have recommendations on best approaches for other project leaders hoping to balance the scientific research agenda with the goals and values of the community?

Growing the Scientific Community.

1. Science is a community of practice with defined ways of knowing etc. but it’s at the boundaries where growth in a community of practice occurs. New experiences can pull a community of practice along embracing new experiences can give new insight to a community. Have you experienced this to be true in your project? If so, how have the experiences of diverse community members benefited your project?
2. How did the community benefit?

2\textsuperscript{nd} Skype Interview Protocol

1. A Third Space is all about creating this system of larger activity, a hybrid community (science and diverse community) working together towards a common goal. From all accounts of your work in Tillery, this is what you are doing but you are doing it at times unpaid, funded by non-scientific agencies (environmental justice grant program), by being dissonance in the field, or to use your words “challenging the dominant paradigm.”

- Are there fundamental aspects of science or values of science that prevent the merging of underrepresented community values, goals, agendas with those of science thus necessitating the need for you to be challenging the status quo or to be dissonance within the scientific community?
- Is it realistic to have a scientific agenda that aligns with the community agenda and truly create this hybrid agenda or due to government and industry funding schemes backing “science”, is it more about being willing to take on community agenda even if that may mean at the expense of your scientific career/money?

2. Science has broader purposes and as you referred to in our previous interview scientific studies have “historically exploited certain communities and groups of people.” What message is communicated to exploited communities when discriminatory events occur? About science? About where underrepresented communities stand in relation to science?

3. In our first interview you communicated that historical and present day discriminatory practices affect underrepresented communities’ willingness to participate in scientific research because science is a part of the bigger issue of alienation from White privilege. I’m trying to delve a little deeper into understanding the hesitancy to participate in science.

- **Avoiding repeat?** What, if any, role do mis-portrayals in history (history being written to make underrepresented communities look bad or just inaccurate descriptions downplaying injustices) play in influencing people’s perception of researchers/ science? In your experience to what extent if any does this influence a person’s willingness to participate in scientific research?

- **Avoiding reactivation of bad memories?** A defense mechanism is to avoid situations that may reactivate negative memories (past bad experiences with scientific research) and if a person is in a situation where they themselves or people like them had past negative experiences, they will be especially vulnerable and sensitive to perceived bias or negativity. In your experience have you observed this to be true and to what extent?
• **Abandoning Cultural identity?** Certain researchers have proposed that participating in science may require underrepresented community members to feel they have to abandon their own cultural identity in order to participate in science. Even if it is less about how different the two cultures are and more about what science represents (White privilege), have you found any truth to this proposition? In your experience to what extent if any does this influence a person’s willingness to participate in scientific research?

• **Mistrust scientific agenda** - Science has been used as a tool to perpetuate White privilege. Maybe it’s not that community members see science as being irrelevant to their lives but instead they don’t trust the agenda. It’s less about the dominant discourse of science and more about science being used to promote the dominant cultural group’s agenda. In your experience to what extent if any does this influence a person’s willingness to participate in scientific research?

4. Research on science education shows complex and powerful forces such as race, class relations, and how others interact with a person all contribute to a person’s willingness to participate in science. In our previous interview you mentioned the impact of race and discriminatory practices resulting in certain groups feeling alienation from White privilege (science being a part of that bigger picture). In your view, other than racial discriminatory practices are there other forces or social identities that may result in this same alienation? For example, a person who holds the social identity of being a Christian may feel alienated from science because of certain conflicts they perceive between their faith and science. Are there other barriers to underrepresented community members seeing a place for themselves within science other than race?

4. **Solution.** Applying the concept of a “Third Space” to scientific research the solution is to merge the discourse, practices, goals and values of science with those of the underrepresented community. From our first interview it seems you see this as a given, but believe the issue is bigger (with the real alienation being between the community and White privilege) and the solution involves addressing mistrust, power issues and examining who’s agenda is being served in a project.

• Would you agree that it’s less about looking for overlap or common ground between underrepresented communities and science, and instead it’s more about presenting to the community science as something other than a tool to perpetuate White privilege and exploit underrepresented communities?
  o If yes, how can project leaders align a PPSR project with broader purposes underrepresented community members have for themselves as opposed to a tool for perpetuating White privilege?
• Are there specific status symbols (such as state car) that project leaders should avoid because they only reinforce the alienation community members feel between themselves and White privilege?

• In your experience can discourse be used as a tool to reposition community members in the scientific community of practice (from feeling like outsiders to becoming insiders)? Can paying close attention to matters such as who speaks and whose ideas are recognized as important function to reposition community members and help them not feel alienated from the scientific community?

• Research shows a person’s science identity can be strengthened by embracing other aspects of their identity, even if these aspects are seemingly “unrelated” to science. Making science a space where a person’s personal history, culture and knowledge are valued; a place of egalitarian and collaboration. What is your opinion on these recommendations? Have you found this to be true?

• Are there other ways have you been able to re-position community members to be more active participants in science?

• In our previous interview you mentioned that language/discourse is only a tool. And that to really overcome historical mistrust, the purpose of the research is key as is the motivation of the researchers.
  o You stressed the importance of motivations for trust-building activities and carefully considering whose agenda is being served and what the underlying commitment is for working with the community. How can project leaders communicate sincerity of motives to community?
  o How can project leaders demonstrate to underrepresented communities that scientific research can benefit their community, when most scientific research is conducted for clients in industry and government? In other worlds, how can project leaders, with a true motivation to use science as a tool for the goals and agenda of community, work within constricting institutions?

• Do you have specific examples of how your project has been able to demonstrate to the community of Tillery and surrounding communities that scientific research can benefit them, specifically when as you mentioned, no substantial actions have been taken by the government? In your opinion, has your work resulted in any type of re-conceptualizing of what science is and who it benefits?
  o How big of an impact does working together with communities to try and change policy have on re-conceptualizing science?

• What is your opinion on the push to increase the number of underrepresented groups in science? Could this need to increase numbers lend itself to superficial motivations and perhaps work against engendering trust? Ex. Token representation
How can we challenge the status quo? How can we be dissonance within an institution to work towards true equality as opposed to equality in numbers?

5. In our prior interview you mentioned the importance of learning about and recognizing the painful past and present history communities have with the institution of science (or associated institutions like government or any group of the dominant paradigm associated with White privilege). You gave me several examples of painful historical events such as Tuskegee, lynching, forced sterilization, police violence etc., which I have read about and was deeply saddened by.
   • I have observed and have been myself guilty of talking about abuses as if they are a thing of the past. In your opinion, what impact does this have on an underrepresented community—either brushing over their painful experiences or acting as if they are a thing of the past?

   • You clearly indicated in our first interview that you confront painful histories. In your experience, is there a best way or most productive way to talk about past and present discriminatory experiences?
     o What type of activities can be used to initiate discussions about injustice?
       (You previously mentioned your use of a skit...any other specific ways?)
   • disseminating research results: a way to overcome mistrust. Have you found this to be true? What part does disseminating research results in the community play in engendering trust?
   • A Third Space does not deny the past but rather uses it as a resource to critically examine and engage in dialogue about oppression and possibilities for future action. Instead of letting oppression leave a community defeated, a Third Space involves a conscious effort to find hope and the tools that will allow a community to author their own history of the future (Gutiérrez, 2008).
     o In your opinion can healing occur between underrepresented communities and the alienation from White privilege/institutions such as science? Especially if abuses are not a thing of the past but are occurring the present day?
     o How can project leaders make a conscious effort to give underrepresented communities hope and the tools that will allow a community to author their own history of the future?
Appendix D

Protocol for Interview with Community Project Leader

Introduction: purpose of interview
The partnership between Concerned Citizens of Tillery and researchers at UNC Chapel Hill is a great example of a scientific research study being used to benefit the local community.
As I have been reading about similar studies, I have found there are other researchers like Steve Wing who recognizes that science should be benefitting all communities and they have the desire to form the type of partnership you and Steve formed. But yet they are running into problems, for example, local communities being uninterested in partnering with them or skeptical about their motives. The purpose behind my study is to learn about key approaches, attitudes, and lessons learned that would be useful for other university researchers wishing to overcome the strained relationships that exist between many communities and researchers. Basically I’m hoping to get at what are the underlying tensions causing the strained relationship and what was it about the partnership between Steve and CCT that worked?

Establishing the Partnership:
Fortunately, I have been able to read your interview featured in New Solutions_2014 and learned a lot about what led you to establish the partnership between Concerned Citizens of Tillery and UNC-Chapel Hill, the goal for the partnership etc.

1. I read about the environmental grant you and Steve were able to apply for together. I wonder about the timing. Did you and Steve have somewhat of a friendship/relationship before applying for that grant?
2. Did you experience any difficulties in getting this partnership established? If so, how did you overcome these difficulties?
3. I wonder about the goals of this partnership.
   • Historically, university researchers come into a community with their own goals and then they may try to find goals of the community members that overlap somewhat with their goals or they may not even bother with that. Do you feel like that was the case with Steve? Whose goals were being represented in this study?
   • Did you have to make any compromises on your goals in order to partner with Steve?

Success of Partnership:
1. In your interview in New Solutions you mention difficulties local groups have in obtaining funding. Do you think funding was easier to get because of the partnership with UNC?
2. Were there benefits to having the University Name/access to privilege? 
I read in New Solutions Naeema Muhammed- referencing Hurricane Floyd disaster and how FEMA picked up 400 families and moved them to Rocky Mount to the coal ash landfill site and you were denied access to information about the site and were lied to about if it had been tested for human habitat.

“One of Steve’s students was getting ready to work on his thesis and so we was like, let’s get this White boy from UNC-Chapel Hill, this prestigious university, to go over to the same places, to the county offices, to the state, to the company had been using that landfill, the company producing the coal ash. . . . Get him to go talk with everybody because they’ll tell him whatever he wants to know. First, because he White. Second, he got UNC behind his name. We knew that would work. And he agreed that would be his thesis.

So, he did research and the doors just flew wide open to him. Companies let him come over there and sit and talk with them all he wanted, and they answered every question he asked.”

3. How did your community benefit from partnering with a scientific researcher? 
Ex. I read in the New Solutions piece you were able to get a permanent ban (no moratorium that would expire in two years) that said they cannot build any new facilities with open cesspools and spray fields.

- I am sure that to a large extent it was the work of community members and yourself that brought about this huge success. Did the partnership with UNC contribute as well? In what ways?

- Did your community view the partnership as a success? Did the research empower the community and if so in what ways? How can research help communities fight to protect their communities?
  
  o “fighting the same battles or the same kind of battles, and being able to have support with research and even through attorneys. I’m not sure whether it’s empowering or re-awakening the power. People can make a difference when they take that research and legal counsel, and then they are the ones who address the problem, not sending someone else to address it for them.”

  o “It can just be overwhelming and overpowering. People just can’t do it. Which then causes them to not only back away from the state organization, but also makes them a little bit leery of being, I think, out front even at the local level.”

Limits to partnership:
1. Is the partnership with Steve still going, and in what ways?

2. In the interview with New Solutions you and Naeema talked about realizing the community needs to take action themselves because, “They’re not going to stay with you.”
There are some who stayed long periods, maybe five years or so and we began to depend on them, thinking that they’re going to be there, but ultimately they left as well. Communities need to learn that early on…”

How do you think this affects the work you are able to get done? In your opinion what would be the result of a longer-term partnership?

Community Views on Researchers:
1. Generally, what is your community’s view on researchers coming into the community to conduct scientific studies?
   Steve mentioned issues of race, class and privilege affecting the way community members feel about researchers coming into their community. Have you found this to be true and in what ways?
2. What was it about Dr. Wing that was so different than your typical experience with researchers?
   “…but we had never met anyone like Steve Wing. He has done a lot helping to educate us and helping us change our mentality towards researchers; real people who are concerned about community having access to knowledge and data so that they can fight the battles against the government as well as industries that want to pollute in the communities.”

Barriers to establishing Partnerships between researchers and communities
I have read some articles other researchers have written in collaboration with communities often excluded from scientific research and they have some ideas on why researchers and members of these communities have poor relations. I wonder how your experience overlaps with what they have found. I thought we could first start by talking about different barriers and then move into solutions to these barriers.

Communication Barriers:
• In your experience with researchers (with Steve or prior to him) are there specific things about the language a researcher uses that can be a put off?
  - Anything that may make community members feel like a scientific research study is not something they want to be a part of?

• Are there specific things about the scientific method (ways of collecting data and describing the world etc.) that can make community members feel uneasy?

• Abandoning Cultural identity? Certain researchers have proposed that participating in science may require community members to feel they have to abandon their own cultural identity in order to participate in science. Have you found any truth to this proposition? In your experience to what extent if any does this influence a person’s willingness to participate in scientific research?
Barriers related to mistrust:

1. Mistrust scientific agenda-
   Steve Wing-“Science has been used as a tool to perpetuate White privilege. Maybe it’s not that community members see science as being irrelevant to their lives but instead they don’t trust the agenda.”
   Do you agree? In your experience to what extent if any does a mistrust of the scientific agenda influence a person’s willingness to participate in scientific research?

2. Whose voice and agenda is typically served by science? Who typically benefits from scientific studies? Do you believe your community’s interests are typically represented in scientific studies?

“One of the pieces that came out of that network was a paper on the role of researchers and attorneys. It takes all of us working together in order to really protect the community but oftentimes these groups do not give or fully support the community in the way that they are capable of doing. Because they are fearful of reprisals themselves, I would imagine.”

2. In your view, what are the issues that science needs to be addressing? What specific ways can research benefit Black Communities?

Naeema- “research and communities, all of this stuff that we just talked about are the kinds of things that I think should be involved in conversations with communities that need research. They need research because they have a problem that’s impacting their health”

3. Are there specific events in the history of the community in which science has exploited the Black community (or is currently exploiting) that affect the way you view a university researcher coming to your community to do research with you?
   “Generally, community folk do not like researchers and we have certainly good grounds on which to stand regarding that opinion...”

4. Are there ways to change community views on science and research?

5. Are there specific events, unrelated to science, in the history (past or now occurring) of the community that affect the way you view a university researcher coming to your community to do research with you?
   Memories: ex. “I was having interactions with White people every summer at Franklinton Center at Bricks, where interracial work camps were being held in the 1950s to the point of even crosses being burned on the lawn. I was witnessing crosses being burned on the lawn...goes on to reference lynching, police brutality
The Approach: how should researchers come to community partnerships (what attitudes and manner communicate valuing the community)

Solutions to Communication Barriers:

1. CCT and UNC successfully collaborated on a scientific research study. In your opinion, what made this possible? How were you and Dr. Wing able to scientific project that uses scientific ways of talking but does not alienate diverse communities?
2. Can you think of specific examples of how your project has blended scientific and community ways of communicating? Do you have any advice for fellow project leaders on how to value both?
3. How can researchers show respect to community’s history, culture, and perspectives on knowledge?
4. I’m looking for specific advice for researchers who want to do research for communities. Advice for ways to communicate?
5. Things to avoid doing? (ex. Steve mentioned he wouldn’t come into the community driving a state car because of the message that may send to community members).

Importance of opening up dialogue:

In your interview with New Solutions, you mention the importance of talking about environmental racism and other discriminatory issues “dialogue, and that’s the important thing, that children can begin to understand that all is not well in the world.”

1. Steve mentioned he found it helpful to confront discriminatory practices. In your experience, is there a best way or most productive way to talk about past and present discriminatory experiences? How does talking about it help?
2. What type of activities can be used to initiate discussions about injustice? Steve mentioned attending community meetings and performing a skit on environmental injustice as a basis for initiating discussion (Dr. Privy- talking about industry coming to town and how it was going to help the community—skits illustrating exploitation of community). In your opinion how important was it to confront the hurt and abuse?
3. I have observed and have been myself guilty of talking about discriminatory practices as if they are a thing of the past. In your opinion, what is the result of either brushing over a community’s painful experiences or acting as if they are a thing of the past? What will result if researchers take an attitude of well that wasn’t me, that was other researchers to let’s move on kind of idea
4. Have you found empathy to be important?
How do researchers demonstrate they are aware of historical mistrust and bad experiences of diverse communities? Experiences, that I as a White person can never truly understand?

5. Do you have any advice for opening up more dialogue addressing how things are not well in the world? Specifically between higher educational institute and the Black community?
How can healing take place? How can researchers build trust?

**Communicating Value to the community**

1. I want to reference a specific memory you shared in your interview with New Solutions, an event that you describe as humiliating and painful.

“One of the most horrific scenes that haunts me even today is how the liberal, more well-to-do people sent truckloads of clothing to the site, and they were just dumped into a pile. There was no kind of a process to it; it was like people were scavengers.”

Then Naeema talks about how your group would organize stuff ahead of time

“Everything was like neatly organized so that people could feel human when they came to get the stuff, and not being made to feel like they wasn’t worth anything, like they had no value at all."

“that’s one of the things that the EJ network does, as well, is to help people feel their own value, that they are worthy, that they are worthy to have clean air, clean water, and to be treated humanely by whomever, researchers, lawyers, government agencies, institutions of higher learning.”

- What really struck me when reading your words is that you were referencing an agency set up to “help” the community but yet the manner in which this “help” was delivered sent the message to community members that they had no value at all. How can researchers or institutions of higher learning communicate value?

- I’m in the field of education, specifically science education. Do you have any advice for science educational programs/ ways programs can be set up to avoid this and instead communicate value to the community and students in the Black community?
Appendix E

Codebook for Case Study Data Analysis

**Colonialism**

code description: The focus of this code is on power. This code refers to unequal power relationships in which a colonist (group with more political power) uses/exploits a group with less political power for their own advantage.

inclusion criteria: Any statement focused on one power exploiting another group with less power; includes references to a specific era in history 16\textquotesingle{}th century–mid 20th century when European powers established colonies throughout the world. Also includes references to slavery.

exclusion criteria: Does not include references to discrimination by an individual or institution based on race (the focus is based on equal power instead).

typical exemplars: “It goes back to colonialism—the interests of the dominant group being held in high value and the exploitation of underrepresented groups to serve the interests of the elite. This has been happening for centuries and it is still happening today. When science only serves the interests of those with power, it\’s a perpetuation of colonialism.”

**Institutional racism**

code description: The focus of this code is on a form of racism expressed in the practice of social and political institutions, as distinct from racism by individuals or informal social groups. It is reflected in disparities regarding criminal justice, employment, housing, health care, political power and education, among other things. Whether implicitly or explicitly expressed, institutional racism occurs when a certain group is targeted and discriminated against based upon race.

inclusion criteria: perceptions that social and political institutions are being prejudice, discriminating or antagonizing a particular group based on their race

exclusion criteria: does not include prejudice, discrimination or antagonism directed at a person for reasons other than their race. Also does not include references to an individual person being racist.

typical exemplars: “We purchased and we recently, within the last few years, discovered that we actually paid more for the land than Whites paid for the land. What else is new under the sun?”

**Racial discrimination and abuse**

code description: references to individuals targeting, discriminating, exploiting or abusing a person or group of people based on their race

inclusion criteria: perceptions that individuals are being prejudice, discriminating or antagonizing a particular group based on their race
exclusion criteria: does not include perceptions of prejudice, discrimination or antagonism directed at a person for reasons other than their race. Also does not include references to social or political institutions being racist.
typical exemplars: “We were there for…We’d been talking about the issue for 45 min, it might even have been an hour, and no one had said racist, or racism. They had danced all around the subject. They were saying it, but they wouldn’t say it. Finally, I said to them, ‘Look, this is Steve, and he’s here. Yeah, he’s White. But he’s been dealing with me for whatever number of times it was.’ I said ‘so he’s quite accustomed to hearing the word racist, racism. I can say to you, he’s not a racist, but he understands that there are actions, there are racist actions and there are people who are racist.’

Community history with science and institutions of education
code description: Includes any reference to the African American community and science. What has science said about the African American community. What scientific studies has the African American community participated in the past.

inclusion criteria: Includes any scientific study either the project leader or community leader references that involved the African American community. Also includes any reference to African American students with science in school.
exclusion criteria: Does not include any reference to scientific studies conducted with other underrepresented groups, only those with the African American community. Also doesn’t include general references to abuses of science unless specifically tied to the African American community.
typical exemplars: “We need to debunk the myths of what has been perpetuated about Black people. Our brains are smaller. We can’t learn. All those kinds of things.”

Symbols of privilege and status
code description: anything that represents, stands for, or reminds the community member of racial discrimination and White privilege

inclusion criteria: includes material objects representing status and privilege, also includes non-material objects such as speech and mannerisms

exclusion criteria:
typical exemplars: “Maybe if I had been in a state car, which I didn’t usually because of the meaning of that…”

Funding
code description: references to money provided, especially by an organization or government, for a particular purpose

inclusion criteria: includes all references to sources of money used for the PPSR project and references for money used for scientific studies and education

exclusion criteria: does not include references to money used for things outside scope of PPSR project, other scientific studies, or education
typical exemplars: “The whole funding thing is a source of problems; many problems. If the commitment of the scientists is just about money, then of course they’re not going to
keep working with the communities because they’re not going to get as much money as if they were working for industry or government.”

**Whose research project is it**

code description: Who makes decisions about the project, who is in charge, who has the power in the PPSR project
inclusion criteria: includes references to who makes decisions regarding project design, who’s goals and values are prioritized in the project and who the project results are used for
exclusion criteria: Does not include details on the specific goals and values represented in the project

typical exemplars: “Well we’d never heard that from a researcher before. Number one, they already have the design and everything is in place, and they come in, and here’s what we’re going to do, and pick up the community in the last phase of it. That was not his approach… he didn’t bring us a program that was already designed.”

**Community made to feel less than**

code description: This code includes events, practices, actions, attitudes, words and anything else that makes the community members feel inferior, outside the context of the PPSR project
inclusion criteria: This is about the communities experience historically and also in society today. The focus is on an action paired with a feeling; includes how the community member felt and the specific action that made them feel that way
exclusion criteria: discriminatory events alone without an accompanied feeling will not be included in this code; any event, practice, action, attitudes etc. specific to the PPSR project will not be included.

typical exemplars: “You (White people) have kept me in a ditch.” (feeling) action that evoked feeling—differences in schools for Black children and White children.

**Mistrust**

code description: feelings of suspicion and lack of confidence in something
inclusion criteria: include any reference to the action or event that inspired the feeling of mistrust, also include any reference to the feeling of mistrust even if action evoking the feeling is not specified.
exclusion criteria: this code does not include other negative feelings such as anger or hurt

typical exemplars: “It’s not just science. It’s actually who shows up. What America doesn’t understand yet is, we still don’t trust you, your White skin. Because we’ve been the victims, no we’ve been the survivors of your wherewithal.”

**Challenging science**

code description: This code describes any objection or query as to the truth/rightness about the way things are traditionally done in science
inclusion criteria: critical perspectives on science, questioning the norms of science and calls for change in science
exclusion criteria: does not include descriptions of the norms of science or definitions of science

**typical exemplars:** “For me, I’ve always felt like that if we have these critical perspectives, then we need to see ourselves as dissonance within an institution (science). That means doing stuff sometimes, that’s not funded; in fact, a lot of the time.”

**Third Space science**

code description: what science looks like when the scientific community of practice and the underrepresented community of practice merge.

inclusion criteria: also includes benefits of science and underrepresented community merging

exclusion criteria: does not include what it takes/ the process of merging or challenges to merging

**typical exemplars:** “I let the community members talk and tell me what is going on. And really this is in the best interest of science as well. If I don’t listen to them and I go in asking all the questions and dictating the conversation then my science won’t be as good. I will miss things. I won’t know for example that they leave their windows open during the day etc. It’s not about listening to them so they can be more included in science. It is about listening because that makes science better.”

**Conceptualization of science**

code description: how science is presented and defined

inclusion criteria: formal definitions of science, what is the norm for science, what are normal perceptions of science

exclusion criteria: funding of science

**typical exemplars:** “Science is investigating the natural world. But the definition of science is much contested.”

**Overcoming communication barriers**

code description: This code includes references to the language of the underrepresented community, the language of the researcher, misunderstandings because of language barriers and any translation that takes place

inclusion criteria: all references to language and terminology are included in this code, includes body language

exclusion criteria:

**typical exemplars:** “That aside, I had to be trained to recognize my language and how that would be a put off to community people…”

**Third Space community**

code description: what the underrepresented community is able to do when the scientific community of practice and the underrepresented community of practice merge

inclusion criteria: benefits of science and underrepresented community merging, includes specific ways community benefits from partnership with university/scientific community
exclusion criteria: the process of science and underrepresented community merging, also does not include great works community would have done without the merging with the scientific community

typical exemplars: “One I look at the application and it’s all this jibby-jobbish, we didn’t have time, we didn’t have the infrastructure, or anything like that. That was a piece that Steve was able to bring as part of this as well.”

**Agendas and goals**
code description: the object of a person's ambition or effort; an aim or desired result, a list of what needs to get done
inclusion criteria: goals and agendas of science, scientists, community member or funding agencies
exclusion criteria:  
typical exemplars:  
“I remember very vividly telling him, no, the first thing we have to prove is that they (industrial hog farms) are going into Black communities.”—represents goal of community

**Acknowledging abuse**
code description: reference to a non-community member accepting or admitting the existence or truth of abuse of the community to the community member; recognize the fact or importance of occurring abuses to the underrepresented community
inclusion criteria: non-community member denying or not recognizing abuse of the community
exclusion criteria: community member talking about abuse or non-community member talking about abuses of the community with the researcher

typical exemplars: “You will continue to be in denial, and I will continue to experience it (abuse/discrimination).”

**Community champion**
code description: a community member serving as an insider to facilitate scientist/researcher’s entry into the community
inclusion criteria: any reference to university researcher having connections to a community member and those connections helping the researcher interact and gain entrance in the community
exclusion criteria:  
typical exemplars:  
“So he makes his spiel. I noticed that when he finished, the applause was not thunderous. It was a nice applause, but it was not thunderous. Well, you can’t talk about it right now, but we’ll talk about it next week. He’s going “how did it go?” …And I go, let me see what they have to say.”

**Sensitivity to past**
code description: specific instances or references to the need for researcher/university
scientist allowing the history and community’s lived experiences impact the actions and attitudes of researcher

**Inclusion criteria:** any event, word, action deed referenced in terms of taking heed to the community’s past

**Exclusion criteria:**

**Typical exemplars:** “Be cognizant of your language. Is that the word I need to use? Did you listen to what the community was saying when they were speaking? – referencing community member not being confused, but rather being offended that researcher insisted on using different term than they used.

**Respect**

**Code description:** showing deep admiration/esteem for someone or something

**Inclusion criteria:** specifically noting instances and importance of project leader showing esteem for community members

**Exclusion criteria:**

**Typical exemplars:** “They didn’t start asking you for your insurance first thing. They asked you your name and how was your day going. They treated you like a real person.”

**Time building trusting relationships**

**Code description:** references to time spent building relationships and trust

**Inclusion criteria:** since it is established early on that relationships take time to build, this includes any reference to relationships and trust building even if the emphasis is not on time.

**Exclusion criteria:** references to time not specifically tied to building relationships. Ex. Time working on scientific goals.

**Typical exemplars:**

“Our grants were four years, and we had two of them. So that was eight years of solid connectedness there. I would say that’s the kind of grant that is needed. You can’t do anything, really, in twelve months.”

**True dialogue**

**Code description:** reference to the type of dialogue described by Paulo Freire, which involves listening, open honest talk, and a response based on the talk

**Inclusion criteria:** true dialogue (either the listening, open honest talk or response) occurring between science/university and the underrepresented community

**Exclusion criteria:** dialogue occurring between entities or people outside of scientific community or underrepresented community.

**Typical exemplars:** “She helped us design a skit that we would use as a basis for initiating discussions about environmental injustice. The skit didn’t have a script, it just had the characters. We would, for several years, we started a lot of these community meetings by putting on the skit.”

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Alienation  
**code description:** the state or experience of being/feeling isolated from a group or an activity/feeling as if one does not belong  
**inclusion criteria:** any reference to a person feeling like they don’t belong somewhere  
**exclusion criteria:**  
**typical exemplars:** “You’re affluent. You join a White church outside the community. Why would you have a connection with anyone?”
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