

Multicultural preservice teachers' views of diversity and science teaching

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Abstract

This collective case study of ten ethnically and culturally diverse preservice teachers reports their perspectives of diversity, diverse learners, and teaching science in diverse urban elementary classrooms. Data sources consisted of reflective writings from participating in a Book Club, and initial and final surveys. Findings reveal that the multicultural preservice teachers moved beyond simplistic understandings of issues of diversity to more inclusive and broader meanings. With these broader understandings came their concerns and fears for teaching diverse learners. Encouraging preservice teachers to develop positive dispositions necessitates supporting them in teaching for diversity.

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Introduction

Reform efforts in science education have a goal to improve science teaching and learning for all students (American Association for the Advancement of Science [AAAS], 1993; National Research Council [NRC], 1996, 2000). This requires a fundamental change in the teacher's role and the need for teachers to change their conceptions and practices concerning the teaching of science (Sanchez & Valcarcel, 1999). Changes in conceptions and practices involve teaching "science for all" (NRC, 1996). This mandate calls for all students to become scientifically literate, meaning "the deep and thoughtful acquisition of key concepts and ideas, habits of mind, attitudes toward science, and the scientific skills necessary for individuals to be effective members of a technologically and scientifically advanced democratic society" (Barton, Ermer, Burkett, & Osborne, 2003). The "science for all" mandate also challenges teachers to teach science effectively to students from diverse cultural, linguistic, and ethnic backgrounds. The goal is to hold high academic standards for all students and to increase teachers' understanding of students' language and culture as influential in learning (Lee & Fradd, 1998; Warren, Ballenger, Ogonowski, & Roseberry, 2001).

Science educators acknowledge that preparing teachers and working with teachers to teach science in urban schools for culturally, linguistically and ethnically diverse students are challenging tasks (Barton, 2001; Lee, 1999, 2002, 2003; Lee & Fradd, 1998; Lee, Hart, Cuevas, & Enders, 2004; Luykx, Cuevas, Lambert, & Lee, 2005; Rodriguez & Berryman, 2002; Settlage & Meadows, 2002). Barton (2001) noted many of these struggles are tied to issues of race and class, the inequitable distribution of resources, and the rich diversity of children who attend urban schools. Luykx et al. (2005) stated that challenges may involve teachers' "resistance" to teaching for diversity due to lack of knowledge or feelings of inadequacy or lack of preparation integrating nonmainstream students' languages and cultures into instruction. For preservice teachers to understand the complexities of teaching science in urban¹ schools, part of this means understanding their views of diversity, science, and teaching diverse learners.

As a science educator my task is to help preservice teachers to build perspectives about these challenges of teaching in urban classrooms as assets and not view them through deficit models of thinking (Barton et al, 2003; Sautter, 1994). I am committed to preparing preservice teachers to acquire the attitudes, behaviors, knowledge and skills that are essential for teaching culturally, ethnically, and linguistically diverse students. This conviction comes from “my own membership in a marginalized racial/cultural group” (Ladson-Billings 1995, p. 470; Moore, 2003a,b), and my desire for every student to learn science in meaningful and relevant ways. To that end, my attention to multicultural preservice teachers² was particularly worthy of note as I was curious about their perspectives regarding diversity and teaching science in urban elementary classrooms from participating in a semester long Book Club.

Relevant Literature

Given the recommendations for preparing preservice teachers for diverse classrooms, teacher educators must understand the urgency in this call. First, Hussar (2005) stated that the total elementary and secondary school enrollment is projected to increase 4% between 2002 and 2014. In 2003-2004, the public school membership of students of color was 41.2% (Hoffman & Sable, 2006). It is estimated that by 2020, 46% of the school age youth will be students of color (Pallas, Natriella, & McDill, 1989). On the one hand, as the number of students of color in K-12 classrooms increases, on the other, the gender, racial and ethnic make-up of teachers is not proportional. For instance, elementary and secondary school teachers have been largely female and White (Henke, Peter, Li, & Geis, 2005). The number of minority teachers was about 9% of the teacher population for the 16 percent of all minority public school students in 1993-1994 (Henke, Choy, Chen, Geis, Alt & Broughman, 1997). From 1999-2000, 75% of public school teachers were women (Snyder, Tan, & Hoffman, 2004). Furthermore, the percent distributions of teachers according to race/ethnicity were Black/non-Hispanic 6.7%, Hispanic 4.1 %, Asian/Pacific Islander 1.1 %, and American Indian/Alaskan Native 0.7% (Henke et al, 1997). Several years later, the National Education Association (1997) reported that 90.7 % of public school teachers in the United States were European American, while 7 percent were African American, and 2 percent were “other.” Increasing the number of

teachers of color to correspond to increasing numbers of students of color is a daunting task.

Second, the need for a more diverse teaching force is in high demand, especially in urban centers which suffer from the “revolving door—where large numbers of teachers depart their job for reasons other than retirement” (Ingersoll, 2001, p. 5). The number of Black teachers has been steadily declining since the 1970s, and the number of ethnic minority teachers overall does not represent the number of minority students in schools. Minority cultures are underrepresented in the teaching profession in general, representing only 14 percent of the total teacher work force (Foster, 1997). Sheets (2000) cautions that teachers of color should not be “expected to undertake the burden of educating the growing student population of color, especially those who attend high-poverty urban schools” (p.7); still, there remains a real issue of preparing multicultural teachers for increasing cultural diversity in schools. It is argued that there is a lack of scholarship pertaining to the needs and preparation of teachers of color (King, 1993; Sheets, 2000). Considering these concerns, the multicultural preservice teachers (MPSTs) in this study are the “other.” They are not the typical teacher candidate profile—White, middle-class women, from a suburban or rural hometown (Bollin & Finkel, 1995; Zimpher, 1989). These MPSTs self-identified as racially and ethnically diverse, with the majority of them representing racial and ethnic identities as Asian or Chinese American, and many of them desire to teach in urban elementary schools. Thus this study discusses preservice teacher education with particular attention to multicultural preservice teachers as representatives of diverse cultural groups and their views of diversity and science teaching.

Theoretical Understandings

Dispositions

“Disposition” is a term that fosters different meanings within education, ranging from “a tendency to exhibit frequently, consciously, and voluntarily a pattern of behavior that is directed toward a broad goal” (Katz, 1993, p. 2) to “characteristics, attitudes, conceptions of self, and intellectual and interpersonal” dimensions (Wenslaff, 1998). Further, the

National Council for Accreditation of Teacher Education (NCATE) in its Professional Standards defines dispositions as:

[T]he values, commitments, and professional ethics that influence behaviors toward students, families, colleagues, and communities and affect student learning, motivation, and development as well as the educator's own professional growth. Dispositions are guided by beliefs and attitudes related to values such as caring, fairness, honesty, responsibility, and social justice. For example, they might include a belief that all students can learn, a vision of high and challenging standards, or a commitment to a safe and supportive learning environment.

From these definitions, dispositions have broad and specific meanings associated with the kinds of skills, behaviors, and attitudes that teachers should possess. However, in the context of science and teacher education, a more specific definition is proffered by Howes (2002), who defines dispositions as "outlooks, attitudes, and expectations concerning one's own relationship with science, as well as toward children as learners of science" (p. 846). Her aim for focusing on dispositions was to help preservice teachers to teach science well for all students in elementary classrooms.

For many multiculturalists, dispositions extend to specific skills and characteristics that have been particularly valuable and effective in teaching students from diverse cultural, ethnic, and linguistic backgrounds (Banks, 1991a, 1994; Foster, 1994; Gay, 2000, 2001; Haberman, 1995; Irvine, 2003; Ladson-Billings, 1994, 1995; Swartz, 2003; Zeichner, 1996; Villegas & Lucas, 2002). For instance, Villegas and Lucas (2002) have proposed a number of characteristics that define culturally responsive teachers. The teacher: 1) is socioculturally conscious; 2) has affirming views of students from diverse backgrounds; c) sees himself or herself as both responsible for and capable of bringing about educational change; d) understands how learners construct knowledge; e) knows about the lives of his or her students; and e) uses his or her knowledge about students' lives to design instruction. Similarly, Gay (2000) proposes a set of culturally responsive skills and characteristics in which teachers use the cultural knowledge, prior experiences, and performance styles of diverse students in order to make learning appropriate and effective for them. Culturally responsive teachers are able to teach using the strengths that students have, to acknowledge cultural heritages of diverse learners, to build meaningful

connections between home and school, to use a variety of instructional methods that connect to the different learning styles of students and to multicultural materials.

Diversity Understandings

Many of the attitudes, characteristics, dispositions, and skills that are required of preservice teachers are vital to understanding and supporting diverse learners in the classroom and for making classroom environments safe and engaging. However, an essential question that is often taken for granted is “how does one define diversity and apply it”, especially to research, teaching, learning, and science instruction. For example, NCATE defines diversity as “Differences among groups of people and individuals based on race, ethnicity, socioeconomic status, gender, language, exceptionalities, religion, sexual orientation, and geographic region in which they live.” Within their diversity standard they state that “candidates should have the knowledge, skills, and dispositions to help **all** students learn.” With that, a definition of diversity covers a range of issues pertinent to learners, but the diversity definition does not touch upon aspects of teaching and learning. If one develops a working definition of diversity, then “how do you apply it” to research, teaching, learning and, in this particular study, to science teacher education?

Teaching Diversity

The curriculum and pedagogy that educators use in teaching preservice teachers about diversity are important in helping them to foster positive dispositions and to further their understandings of diversity. There are many studies that prepare preservice teachers for diversity using several pedagogical and programmatic strategies (Barrett, 1994; Cochran-Smith, 1991, 2004; Darling-Hammond, Chung, & Frelow, 2002; Garcia & Pugh, 1992; Gay, 2000; Hamre & Oyler, 2004; Houser & Chevalier, 1995; Irvine, 2003; Ladson-Billings, 1994, 2000; Melnick & Zeichner, 1998; Sleeter, 2001; Swartz, 2003). For example, in a self-study, Swartz (2003) used multiple epistemologies and emancipatory pedagogies to stimulate particular dispositions in White preservice teachers and to broaden their understanding of teaching diverse learners. These dispositions that the

preservice teachers developed were critical thinking, producers of knowledge, creativity, continuous learning, self-awareness, and integration of theory and practice. She believed that if preservice teachers have these dispositions, they are “more willing to routinely rethink long-held assumptions, consider new knowledge, and examine ways to change conventions” (p. 263). She concluded that “using the emancipatory pedagogies stimulated varied levels of engagement with several dispositions held by teachers who are effective with students of color” (p. 272).

The list of dispositions, characteristics, and pedagogical methods cited above for preparing preservice teachers about diversity are not exhaustive, but they provide a guiding framework for considering the attitudes, behaviors, knowledge, and skills that preservice teachers should have for teaching in culturally, ethnically and linguistically diverse classrooms. When considering issues of diversity, I argue that researchers have taken this term for granted and they must consider both broad and complex definitions of diversity in order to understand what it means to teach for diversity. This means looking at individual differences of students (such as race, ethnicity, socioeconomic status, gender, language, exceptionalities, religion, sexual orientation, and geographic region) and these individual students within and across group differences. This also means looking at diversity within education, such as teaching and learning generally, and teaching and learning specifically, giving attention to the particular subject matter. These perspectives reveal diversity no longer as a concept that is understood to be one or two or three dimensions of the student or individual, but looks at the complexity of diversity for teaching and learning, and differences among diverse learners. Understanding diversity is often taken for granted with very little attention given to the specifics of what diversity means in research, teaching, and learning.

The concept of diversity is a complicated issue that needs to be addressed in teaching, learning, and research. Therefore, the purpose of the study was to understand the perceptions of ten culturally and ethnically diverse preservice teachers, or multicultural preservice teachers (MPSTs) and their views of diversity and science teaching in urban elementary classrooms. By considering disposition, diversity, and science teaching, this study takes an approach not discussed in previous studies that look solely at developing

dispositions and characteristics generally in teaching, yet not considering how subject matter may impact the kinds of dispositions that preservice teachers need to develop. This current study also considers multicultural preservice teachers. As a collective group for research, they are not emphasized. The approach taken for preparing these preservice teachers was using literacy in science through Book Club and reflective writings. The Book Club was just one method of instruction to expose the preservice teachers to a different approach for learning about teaching and issues of diversity in the context of science. The research questions for this study were: What are multicultural preservice teachers' understandings of diversity? In fact, what do multicultural preservice teachers think diversity means? What are their developing dispositions, perspectives, and understandings for teaching diverse learners? What are their worries, concerns and fears as multicultural science teachers and teaching science to diverse learners in urban elementary classrooms?

Research Approach

Setting and Participants

For this study, I used a collective case study method by purposeful, homogeneous sampling (Patton, 2002) by selecting ten female multicultural preservice teachers enrolled a science methods course in a large urban center, New York City, USA. They were part of a larger study that looked at curriculum development, diversity, and identity; however, I selected this group of MPSTs because they represented a typical yet uncharacteristic group found in the science methods course. First, their gender was typical of most education programs where women more consistently enter teaching (Henke et al, 2005; Snyder et al, 2004); however, I was more interested in the group because of their identity (race, ethnicity, age, along with gender) as multicultural teachers of non-White backgrounds. The ten self-identified as being racially and ethnically diverse from completing a final course survey. The racial/ethnic composition is given in Table 1. All ten preservice teachers were fluent and communicated in Standard American English. Their ages ranged from 22-25 years. Second, the number of multicultural teachers found in this section represented nearly half of the student enrollment in the course (N=23).

This number as a group, 10, was a high enrollment of diverse racial and ethnic composition not traditionally found in many teacher education programs.

Table 1. Multicultural Preservice Teacher Profiles

Name ^a	Racial and Ethnic Identity ^b	Age (years)	Prior Science teaching experience	Science content knowledge
Blair	Chinese	23	None	Weak
Clara	Indian	24	None	Average
Elize	Italian/Lithuanian/American Indian	24	None	Weak/average
Gretal	Indian-South Asian	24	None	Average
Isabel	European/French	24	None	Average
Natalie	Southeast Asian	25	None	Average
Nina	Arab	25	None	Average
Uma	Caucasian/Croatian	24	None, but ESL adult teacher	No Response
Vanna	Asian American	24	None	High
Wanda	Chinese American	22	None	Weak

^aAll names are pseudonyms. ^bAll racial and ethnic identity categories were those stated by the preservice teachers on their final surveys

Data Sources

Book Club Reflections

The primary data sources for this study were individual final Book Club reflections and pre- and post-surveys that the preservice teachers completed on the first and last day of classes. The preservice teachers in the course read *Ways with Words*² (Heath, 1983) and participated in three Book Club meetings to discuss the book as it related to issues of diversity and science teaching. The ten were dispersed among other members of the class; however, Elize, Clara, Wanda, and Nina were in one group, and Uma and Blair were two of four members in a second group. The remaining four, Isabel, Natalie, Vanna, and Gretal, were each placed in separate groups. The MPSTs wrote a final reflection paper at the end of the semester to discuss their learning individually and collectively as a group member of the Book Club. For example, the final reflection paper

addressed issues such as: connections to the book as a science teacher and/or teacher in general; benefits of participating in the Book Club; biases, assumptions, and stereotypes of Trackton and Roadville students and diverse students in general; and new ideas that developed about issues of diversity and teaching science in urban classrooms.

Initial and Final Surveys

On the first day of class, the preservice teachers completed an initial diversity survey. This survey asked for responses related to defining diversity; making sense of science; planning and teaching meaningful science activities to diverse students; and assessing what students know and understand in science. On the last day of class, the preservice teachers completed a final survey. They responded to questions similar to the initial survey; however, the final survey questions solicited reflective thinking over the semester pertaining to their defining diversity; learning from Book Club; planning, teaching, and assessing science in diverse elementary settings; and revealing concerns for teaching science in diverse, urban elementary classrooms. In addition to the final survey questions, I collected demographic data, plans to teach in an urban elementary school setting, grade level interests, science teaching experience, and level of science content knowledge. Finally, I collected other data sources, which were artifacts from the course (e.g. drawings, reaction papers from course readings, lesson plans, group reflection paper from the Book Club, and final course paper). These sources provided additional contextual information and insights into the preservice teachers' thinking about diversity and planning science for diverse learners.

Data Analysis

I used several data analysis techniques for this study (Guba & Lincoln, 1989; Miles & Huberman, 1994; Patton, 2002; Strauss & Corbin, 1998). First, I collected the primary data (final Book Club reflections, initial survey, and final survey) and arranged them in a case record document for coding. This involved compiling, condensing, organizing, classifying and editing the data into a manageable and accessible file for each preservice teacher (Patton, 2002). With the emerging themes and codes generated from each

preservice teacher's data, I then combined and linked them through a process of theoretical comparison by comparing categories and creating properties for the categories that were similar and different for all ten (Straus & Corbin, 1998). In order to compare and contrast individually and collectively the MPSTs' beliefs and concerns about diversity and teaching science to diverse learners, I used display methods (Miles & Huberman, 1994) to produce tables of similar categories in order to make connections. For example, I organized the responses into tables and looked for common themes, changes in conceptualization in the preservice teachers' definitions of diversity, and views of teaching in diverse classrooms. A similar method of analysis (compiling, condensing, comparing, creating tables) was done with the initial and final survey responses. Analysis of the Book Club reflections and the initial and final surveys revealed three major themes: (a) expanding definitions of diversity, (b) understanding language, home, and community connections and connecting this to science instruction, and (c) expressing worries, concerns and fears centered on diversity and science teaching. Peer debriefing (Guba & Lincoln, 1989) assisted in finalizing the themes. The themes and dimensions of analysis are presented in the findings.

Findings

The ten multicultural preservice teachers (MPSTs) in this study self-identified as racially and ethnically diverse, representing racial and ethnic identities as Arab, Chinese and Asian American, Southeast Asian, Indian-South Asian, Indian, Italian/Lithuanian/American Indian, European/French, and Caucasian/Croatian. The findings communicated here report their perspectives both individually and collectively regarding their understanding of issues of diversity and teaching science. Additionally, the worries, concerns and fears they have about teaching science to diverse learners and teaching in diverse urban elementary classrooms are shared.

Expanding Definitions of Diversity

In Table 2, the MPSTs' definitions of diversity from the initial and final surveys are presented. The diversity definitions on the initial survey were very simple. Many of them

considered diversity to mean simply “variety” or “difference,” which these descriptors were not adequately delineated. Some defined diversity in terms of multiple social variables, like race, ethnicity, class, gender, age, and religion, yet they minimized it to the individual level (Gretal, Nina) or to the “unique” individual (Wanda). Though some of the MPSTs acknowledged acceptance of diversity in terms of backgrounds and beliefs, Clara’s initial definition implied “color blindness” or denial of difference (Frankenburg, 1993; Green, 1994; Paley, 1979). Her definition of diversity was inclusive, yet it focused on the individual as part of a larger community. She stated, “Diversity is the acceptance of what is different to the point of not seeing it as different but as unique and valuable to the existence of the whole.” None of the MPSTs addressed science in their initial definitions of diversity, or connected diversity to science teaching and learning; however, Gretal mentioned education generally in her initial definition of diversity, stating “In regard to education, diversity is in every classroom. Even if all students are of the same ethnicity, religion, race, SES, etc.” Her reference to diversity in this sense meant that students would be “diverse” even in homogeneous classrooms, or there was diversity found within similar groups. She did not allude to an understanding of diversity for teaching and learning, just the demographic makeup of a classroom.

Table 2. Definitions of Diversity

Name Definition of Diversity Initial Survey	Definition of Diversity Final Survey
Blair I think diversity is like variety. There’s all different kinds, sorts, and styles.	Everybody coming to class with their own wealth of knowledge/conceptions of how the world works. Everybody also has special talents and abilities that can help each other in learning more.
Clara Diversity is the presence of variety. Diverse populations means having people of different backgrounds, beliefs, faiths and walks of life. Diversity is the acceptance of what is different to the point of not seeing it as different but as unique and valuable to the existence of the whole.	Diversity is the presence of difference. Not only can it mean multicultural but can include differences in thought, practice, behavior, backgrounds, experiences. Any difference that creates a non-homogeneous environment is diversity.
Elize Diversity, a very interesting term. Diversity is a variety and range of many aspects of people, places or things.	Diversity is exactly what homogeneous is not. Diversity includes all the unique traits people bring with them to a group/community. Diversity can describe, but is not limited to, differences in gender, social status, culture, religion, socio-economics, intelligence, and experience.
Gretal Simply put, diversity is the existence of individual beings. In regard to education, diversity is in every classroom. Even if all students are of the same ethnicity, religion, race, SES, etc.	Diversity is a very broad term that encompasses a variety of characteristics that make members of a class unique. It includes aspects like race, ethnicity, gender, religion, disability, socio-economic class, language, sexual orientation, learning styles, etc.—can be an infinite list.

<p>Isabel No initial survey</p>	<p>Diversity is all encompassing in terms of race, age, gender, class, learning styles/abilities. Children are diverse in so many different ways then I think people automatically assume</p>
<p>Natalie No initial survey</p>	<p>Differences—being different. Being from different communities/countries, coming from different ethnic backgrounds, having different ideas/perceptions on certain concepts.</p>
<p>Nina Diversity I believe is a word that has many meanings in itself. Diversity can be specified as speaking about an individual or a collective group of people. Diversity can be related with a person’s race, ethnicity, gender, culture, and sociostatus. Diversity I believe is the definition of being different from another individual.</p>	<p>Diversity is such a broad topic. It really could stand and have many different definitions. Diversity could be your classroom, diversity could be you, or it could be this country. There is no right or wrong answer to defining diversity.</p>
<p>Uma I would define diversity as the differences that can open our minds to new ideas and concepts, allowing us the opportunity to grow in our understanding of each other and our world.</p>	<p>Diversity means difference and variety. It stems from all aspects of life from culture to ethnicity to personal interest and ability.</p>
<p>Vanna No initial survey</p>	<p>Diversity is what makes up a community. This includes everyone’s background, ethnicity, culture, sexual orientation, gender. There are and always be differences in a community, but drawing on these differences to expand the community’s knowledge would be great.</p>
<p>Wanda Diversity means to have variety/difference. Diversity among people means that the population may be made up of people from dissimilar backgrounds, who may think about the same issues differently, and will generally be unique from one another.</p>	<p>Diversity encompasses everything. It’s what makes each of us unique. It’s what sets us apart from one another. Diversity among a group could mean that they differ in any number of things including race, class, power, language, religion, beliefs, education, profession, knowledge, etc.</p>

At the end of semester, the MPSTs were able to expand their definitions of diversity. They were more aware of differences in language, diverse ways of speaking, communicating, and ways of thinking. They were able to connect diversity to the classroom and recognize diversity among or within similar communities of language and linguistic diversity within the same country. On her Final Book Club reflections, Nina spoke of these understandings: “Diversity does not mean that you have to belong from a different country or speak a different language, and diversity can even be simplified to say that my ways of thinking are diverse from your ways of thinking.” Additionally, by being more aware of diversity on a broader scale, the MPSTs considered the complicated nature of diversity and the importance of understanding it in order to be effective teachers. Wanda stated,

Diversity is a necessity, no matter what subject you are teaching, who you are teaching, and where you are teaching. Diversity awareness is important no matter how homogenous the community may seem, because no two students are exactly alike. Sensitivity to diverse backgrounds is essential if teachers want to go beyond the basic routine of teaching and want to make sure that their students are truly learning.

On the final Book Club reflections and final survey, their expanding views of diversity include social markers, diverse beliefs, educational experiences, thinking, communities, teaching and learning. The MPSTs thought of diversity as an asset for teaching and learning science. For example, Clara wanted to become a “diversity-conscious teacher.” She stated,

I re-defined ‘diversity’ for myself, which will prove beneficial to me as a teacher as I attempt to be a diversity-conscious educator of children. I learned the importance of making meaningful connections between students, the community, their experiences and science.

Not only did Clara redefine diversity on the final survey, she included a definition of diversity in her final Book Club reflections, connecting her understanding of the diversity found in the two communities:

Diversity does not only define those of another country, race or religion. It can include those of different minds, beliefs, and educational experiences. The students in Roadville and Trackton were not from a different country, and they were not separated by a language barrier. They simply came from different places, with different economic resources and educational experiences, and that in itself makes each town diverse.

With their expanded views of diversity, the MPSTs were able to appreciate and welcome diversity as an asset in their classrooms. Blair stated,

As a future teacher, most likely teaching in New York City, I’m 100% sure that I will come across a very diverse class. Instead of seeing that as a barrier though, thinking that I will have all these different students to accommodate to, I can instead, use the diversity for the benefit of all my students. They can use their different abilities, skills, and backgrounds and help each other learn more.

Similarly, Natalie stated, “I welcome all aspects of diversity in my classroom; in fact I think it enhances a classroom experience. When students of diverse backgrounds share ideas and knowledge, everyone is able to learn from one another.”

Learning about rural students from Trackton and Roadville provided a context for the multicultural teachers to think about the diversity found in urban elementary classrooms and for teaching science in this setting. Particularly, Elize connected what she learned about diversity from the book to improve her teaching practices in an urban elementary classroom. She stated, “I feel the reading of this book, along with the concurrent exposure to students [in Harlem], has positively shaped my teaching practices. I, myself, see changes in the way that I now teach.” The MPSTs learned about diversity from participating in the Book Club and expanded their definitions of diversity so that they could improve their current and future practice. Diversity became more inclusive in their thinking and talking about science teaching, and they were more sensitive to “difference” and “variety” that spanned individual to community differences, to educational differences and multiple ways of teaching and learning.

Themes Emerging from MPSTs Reflections

For this section of findings, the reflections that the MPSTs wrote were analyzed to find recurrent themes. Themes reported below appeared at least twice among the MPSTs reflections and learning from participating in the Book Club. A summary of the themes were discussed in the following way with exemplars from the teachers:

Understanding Language, Home, and Community as Connected to Curriculum

Getting to Know Students

The MPSTs discussed a great deal of the concept of “getting to know students” from reading about the communities of Roadville and Trackton. Getting to know students meant that the teachers wanted to know their students in order to plan science instruction. They felt that getting to know their students, their backgrounds, and communities was extremely important for becoming an effective science teacher. Natalie believed, “If a

teacher doesn't take the time to get to know his/her students', how will he/she be an effective teacher?" Additionally, getting to know students centered predominantly on bridging the gap between diversity and science teaching.

Sometimes the issues of diversity and teaching science seem so separate that bridging the gap seems almost impossible. However, a starting point can be to get to know the individuals in the classroom and try to express the content in terms they are more familiar. Thus diversity and science can be addressed by drawing on the foundation of knowledge the students come into the classroom with. (Vanna)

I learned that as a teacher, my duty is to really come to know my students; find out where they are coming from, why they are the way they are, what they are interested in, how they learn best, what they can relate to, and what they are familiar with (for example, their community). Only then, can I mold my lessons and teaching to *fit* their way/style of learning. (Blair)

The MPSTs understood the importance of connecting students' language, home, and communities for science instruction. This connection went beyond merely science teaching and learning but to building a community of learners within the science classroom and creating a learning environment that was respectful of learners' backgrounds and communities. It was the responsibility of the teacher to make these connections of language, home, and community in the science classroom.

I can't ignore community influences nor should I replace it with the standard norms of school. Instead, I should tie what my students learn in school to what they experience at home. Overall, I need to create a classroom environment that matches my students' home environment, and show them that their own experiences, their community, their classmates, and teachers are all equally valuable sources of information when it comes to learning. (Blair)

Making connections is essential to learning any subject, so family and community life need to be integrated into the classroom curriculum and instruction. Authenticity and relevancy are the keys to easing students into the school environment and language. (Gretal)

When the MPSTs discussed learning about diverse students' language-home-community connections and getting to know students, they also mentioned these more specifically in terms of planning, teaching, and assessing science. Planning science curriculum was a process in which "teachers should be able to differentiate instruction based on the needs

of diverse students who all bring with them separate experiences of science to the class” (Elize). Some of the knowledge and skills they gained about teaching science to diverse learners and becoming aware of assessment was transferred to their student teaching. Specifically, Uma discussed assessments that considered diverse learners, and Clara wrote about doing assessments for planning and teaching.

Assessing students is a very important aspect affected by diversity. Diversity in culture, language, ability, and even interest should all be considered when attempting to assess students. Not all students learn the same way and so they should not be assessed the same way. (Uma)

I am already using what I have learned about students and diversity in my kindergarten classroom. I have become better with assessing their knowledge and being able to plan accordingly. I have altered our curriculum in order to cater to the different needs of the students in the class. (Clara)

Collectively, the MPST’s thinking about science curriculum meant they had to think more critically about diversity, teaching, planning, and assessing diverse students. In this way, learning from the Book Club was very beneficial in helping many of them to broaden their understandings of diversity in teaching and learning and to reflect on their ideas of using and adapting curriculum to meet the needs of diverse learners.

The Book Club really made me think about diversity issues. I’ve started to think seriously about how I would develop curriculum that would be sensitive to diverse students. How do I develop curriculum that is appealing to students from all walks of life? How do I engage all students, regardless of their past experiences or their interests? Book Club has forced me to address these issues, by showing me two communities that would benefit greatly from a multicultural approach to teaching. ...Just having simple cultural and community-based awareness can help to bring so much diversity awareness into a classroom. (Wanda)

After reading the book, I started to think critically about curriculum development and how such affects students, not only now, but for years to follow. A genuine interest in curriculum development has emerged in myself as various related questions kept occurring to me... why do textbooks still focus on questions found right in the text; why is it that, outside of teacher prep programs such as ours, I rarely hear of teacher training on how to prepare students to think and ask questions as ‘scientists’? (Elize)

Still connecting their broader understandings of diversity to students, teaching, and learning, getting to know students and their communities, and developing curriculum that was critical were key aspects to understanding issues of diversity. With these understandings, the responsibility of the teacher was greater for connecting, planning, teaching, and assessing. Gretal stated, “The science curriculum should be developed only after understanding the diversity of students and finding meaningful, relevant material and lessons that take advantage of their past experiences.” She continued by stating that “the most significant responsibility of teachers is to revolve lessons around students.” Fundamentally, it was the teachers’ role in “making meaningful connections between students, the community, their experiences and science” (Clara), and realizing that “incorporating home life into school life can make a big difference when trying to learn something; otherwise students may walk away having learned nothing” (Wanda). Therefore, getting to know their students was an important role for the MPTs. They developed a critical stance toward curriculum planning that was connected to their expanding views of diversity and knowledge of diverse students.

Teaching and Learning Science

Most of the MPTs wanted to teach in urban elementary schools, though three stated they were not sure, and one had intentions of teaching in a suburban school. Their experiences in teaching science were consistent: all stated that they had no prior science teaching experiences prior to the course. As an assignment, all the preservice teachers had to plan, teach, and assess a science lesson in an urban elementary classroom or teach their lesson in the university classroom among their peers. Of the ten, six taught their lessons in an urban elementary classroom in NYC (Clara, Elize, Gretal, Isabel, Uma, and Vanna). They were able to make connections between understanding diversity in urban classrooms and teaching science.

Because of the diverse classrooms that the MPTs would have, they wanted to become an active part of the classroom environment. Teaching and learning science should be a collective process whereby teachers and students learn with and from each other. Gretal believed, “What helps in teaching science to a diverse classroom is openness on the part

of the teacher to learn from her students.” Additionally, teaching and learning science should closely connect to students. Vanna and Isabel shared common views about science teaching and learning that focused on students’ curiosity and questions, which was fundamental to learning science. They noted that their role as the teacher was to make science inspiring and engaging. Moreover within these statements were glimpses of their expanding perspectives about teaching science in diverse ways.

I hope to inspire students to freely follow their curiosity. Science is, after all based upon questions that need answering. If the students are encouraged to ask questions and take action to answer them, they are inadvertently experimenting and performing scientific research. (Vanna)

Science is not just direct instruction or cookbook lessons. It is building upon students’ knowledge and natural curiosities. However, all children do not come to school with the same knowledge or curiosities. As teachers we need to take the time to figure out what students know and what they want to know. It is only then can we make relevant connections. We have to be aware of the examples we use. We cannot assume that everyone in our class even has a home. Furthermore, science is a subject that can be more engaging. Developing that level of engagement depends on the teachers’ awareness of the students’ lives. (Isabel)

The MPSTs understood that differences among diverse learners meant engaging students differently in science based upon differences in language and culture, while at the same time appreciating and valuing these differences.

From the book club, I learned the importance of valuing all my students, because all of them have relevant and meaningful experiences, knowledge, and abilities that can be useful when learning science. I also learned the importance of relating the students’ community/home to whatever material is being taught in the classroom, so that the students will most likely be more interested and will find the information learned useful. (Blair)

Both language and culture had to be considered when teaching and learning science with diverse learners. Isabel revealed an awareness of not making assumptions about teaching diverse learners and making science relevant for them:

Not all children come to school with the same knowledge or curiosities. As teachers, we need to take the time to figure out what students know and what they want to know. It is only then can we make relevant connections. We have to be aware of the examples we use. We cannot assume that everyone in our class even

has a home. Furthermore, science is a subject that can be more engaging. Developing that level of engagement depends on the teacher's awareness of the students' lives. (Isabel)

Put simply, the book connected with me as a teacher just in all the issues that it made me aware of. For example, talking about language as a source of power and as a necessity in the science classroom made me think about language in a way that I hadn't thought about before. We sort of all just take language for granted, without stopping to think about how our lives would be different if we couldn't communicate in the ways that we are used to. What if everything I said was not interpreted as I meant it, and what if how others were speaking to me was different from how I was used to receiving information? (Wanda)

Teaching and learning science to diverse learners meant that the MPSTs viewed science instruction as an important and necessary part of the elementary classroom, with the teacher taking an active role in learning from her students and learning about her students. Collectively, the MPSTs understood that teaching and learning science should be more child-centered than focused on students' curiosities. They wanted to learn about their students so that instruction was engaging, centered on students' questions, and connected to the lives of their students. They were also being critical of the implications of using language in science teaching and learning.

Multicultural Teachers' Worries, Concerns, and Fears

After learning and expanding their notions of student diversity and different approaches to teaching science, in the final Book Club reflections they expressed their worries, concerns and fears for teaching in diverse urban classrooms and teaching science. Their worries and concerns reflected many of the areas already discussed, such as getting to know their diverse students and planning authentic, relevant, and meaningful science lessons. Still, many of the MPSTs expressed concerns about teaching science due to their weak content knowledge in the subject.

Only one of the teachers (Vanna) felt she had a strong or high science content understanding, while five (Clara, Gretal, Isabel, Natalie, Nina) felt they had an average level of content knowledge; three (Blair, Elize, and Wanda) stated they had a weak to weak/average knowledge of science, and there was no response from one (Uma).

Consequently, having weak science content knowledge meant that teaching science in urban classrooms caused them to worry about planning, teaching, and assessing science lessons. Wanda felt that teaching science was “too big of a challenge.” She felt unprepared to teach science because of her weak science knowledge.

Teaching science will be a particularly difficult struggle for me. Maybe it’s just because I’ve learned so much about the various aspects of teaching science, and don’t yet feel prepared to teach the subject. Especially, my weak science background does not give me much confidence that I can go with the flow of things as easily as I can with other subjects that I feel more comfortable with.
(Wanda)

Wanda’s concerns about weak science knowledge led her to believe that planning science would be exhausting. She stated, “I will have to put in so much extra effort to teach science well, that I will wear myself out in the process.” Similarly, Blair worried that she would not be an effective science teacher because of her weak science content knowledge. She stated,

My worry in science teaching is that I learned that to teach my students well, I really need to know the information myself. The problem is that I really do not feel competent in my own science knowledge. If I do not know the content/concept myself, how in the world will I help them truly to understand it?
(Blair)

Having weak or average science content knowledge for Gretal and Blair led to other worries and concerns. Both wanted to engage their students in learning science but getting to know their diverse students and planning science instruction were challenging tasks for them. These were concerns because they did not have prior science teaching experiences and they did not feel they were very knowledgeable in science content and curriculum development.

I am concerned that I will know some of my children but not all of them. I really do not want to leave any of them out. I’m afraid that will be likely just because NYC students are so diverse. My classroom will most likely not be homogenous. I am not sure if being able to design and implement lessons/assessments that will successfully teach all students. As a pre-service teacher, I have no experience and this is a major cause of concern for me. (Gretal)

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Time and teaching according to the standards or taking standardized tests caused additional worries and concerns for a couple of the MPSTs. These concerns, coupled with diversity, increased their fears. They felt overwhelmed with the responsibility of teaching science in urban classrooms that were so diverse and overwhelmed by not having time to incorporate their learning about diversity.

The time factor. I know that life gets really busy, and we can lose sight of what originally motivated us to become teachers, so I am wary of the fact that sometimes I may feel overwhelmed by the extra effort that will be necessary to incorporate and accommodate the diversity that my future classrooms will be made of. (Uma)

One of my biggest worries concerning science teaching is that I will not be able to teach in an atmosphere conducive to effective science learning due to pressures related to standardized tests. There is a significant push, especially in New York, to teach students the specific knowledge they will need for state testing. I am an advocate of public schools, but the bureaucracy concerns me. (Elize)

Although Elize was concerned about the bureaucracy, she was certain that she could plan and teach science: "I am confident, however, that I will be able to effectively teach science to all, and also accurately assess students by differentiating instruction, not just for those students in inclusive classrooms."

The MPSTs were excited about one day having their own classrooms, yet they felt anxious about being on their own and teaching science to diverse learners. They realized that teaching for diversity was "complicated" and "harder" than they first imaged. The responsibility of teaching and what this position entailed were reflected in concerns and fears given by Nina and Clara:

The issue of diversity and teaching diverse students is sometimes a tricky and complicated manner. I worry that when I do get my own classroom I will not be able to handle, for example 20 students that all have diverse backgrounds and that require different types of teaching methods. (Nina)

I became concerned and worried that teaching is harder than it seems. I am scared that when I am on my own, I will not be able to handle it. I do not want to simply 'handle' being a teacher and be able to get through the day. I want to be a fantastic teacher. I want to be the teacher my students remember for the rest of their lives, much like a small handful of elementary school teachers I remember to this day. (Clara)

Clara added that what she learned during the semester brought an additional fear for teaching science in diverse urban classrooms. She admitted, "I am scared that I will not be able to fluidly incorporate all my beliefs that I formulated during this course into my teaching."

One of the topics of much dialogue during the Book Club meetings and in whole class discussions was getting to know students better and using what teachers learned about students to plan and develop science curriculum. These tasks—getting to know students and planning science curriculum, coupled again with diversity—presented challenges, worries and concerns for the MPSTs. Particularly, Vanna and Gretal expressed concerns related to these issues of diversity, students and curriculum.

What do you do with information you learn about diverse students, and second, how do you plan for diversity? How do I plan curriculum and assessment for the beginning of the year if I have not yet met and do not yet know or understand my students? Do I leave the lessons open until I get a better feel for the students and what they want to learn? (Vanna)

If one student requires more creativity in learning where another prefers procedural or didactic approach, how could I balance or utilize both to make learning equally effective for both? Although I learned that diversity is an important factor, I still have not learned to be comfortable planning curriculum, lessons, assessments, etc. for my future students. (Gretal)

Taking into account all of the multicultural preservice teachers' worries and concerns about teaching science in diverse urban classrooms, getting to know students, and planning, teaching, and assessing, Gretal perhaps summed up their views and challenges of teaching science to diverse learners:

It is evident that an educator should know what each student brings into the classroom, but knowing students is not enough. The most important step is utilizing that valuable information to design a lesson plan that can utilize students'

strengths to change and clarify their misconceptions. I am concerned that I will not know what to do with the information I gather about my students. I may not be able to engage my students to learn science effectively, to channel students' strengths, interests, and curiosity to learn not only science content, but also to recognize important language differences; to use students' backgrounds to design appropriate curriculum, assessments, and teaching methods. I am not confident that I will be able to do this for my students.

The ten multicultural preservice teachers learned a great deal about teaching science in urban elementary schools, not only from participating in the Book Club but also from planning and teaching science lessons in elementary classrooms. They developed a broader understanding of diversity, including linguistic diversity and understanding science from diverse approaches. They learned the importance of getting to know their students in order to teach science that was connected to the lives and communities of their students. They became more critical of science curriculum materials, assessment, and their role in making science engaging, relevant, and meaningful for diverse learners. Even with this knowledge they learned and their expanding views of issues of diversity, their worries, concern and fears were connected to these same issues and presented challenges for teaching diverse learners and teaching science.

Discussion and Implications

This collective case study represents a small yet worthy population of female multicultural preservice teachers (MPSTs) from an elementary science methods course. The ten MPSTs self-identify as racially and ethnically diverse, representing racial and ethnic identities as Arab, Chinese and Asian American, Southeast Asian, Indian-South Asian, Indian, Italian/Lithuanian/American Indian, European/French, and Caucasian/Croatian. Though the study focuses on the final reflective comments from participating in a Book Club and responses from initial and final surveys, the explicit and implicit meanings one gains from learning about their dispositions and views of teaching science in urban schools are evident in their responses and from the analysis.

Many of the dispositions the MPSTs have are similar to what other researchers suggest for teaching diverse learners (Garmon, 2004; Gay, 2000, 2001; Ladson-Billings, 1994, 1995; Swartz, 2003; Villegas & Lucas, 2002; Zeichner, 1996), especially in developing

characteristics of culturally responsive teachers, such as affirming views of diverse students, understanding that students' backgrounds influence learning, wanting to know about the lives of students, and designing curriculum that builds on the strengths that students bring to the classroom (Villegas & Lucas, 2002). However, the dispositions and attitudes that the ten MPSTs hold are more encompassing of their expanding views of issues of diversity as connected to teaching, learning, and assessing students in science. The dispositions the MPSTs possess are: (a) expanding definitions of diversity: developing positive attitudes of students from diverse backgrounds; seeing diversity of students as an asset for teaching and learning science; (b) perceiving diversity of students as useful for teaching and learning science: constructing science knowledge from personal experiences, questioning, and curiosity; (c) understanding language, home and community connections: believing themselves to be responsible for making connections between language-home-community and science; planning, teaching, and assessing science based upon knowledge of diverse learners; and (d) developing a critical perspective for designing, adapting, and critiquing science curriculum. Furthermore, the MPSTs' dispositions and knowledge about diversity, diverse learners, and teaching science are the same dispositions and knowledge that are sources of their worries, concerns and fears. Although the contexts for this study are multicultural preservice teachers in urban elementary schools, these worries, concerns and fears speak to the overwhelming and demanding task of teaching for diversity, and specifically for preparing elementary teachers of science. All ten of the MPSTs come to understand that science instruction should be a major focus in the elementary curriculum and that diversity is important in teaching and learning science, yet diversity presents challenges for teaching diverse learners and for teaching science.

First, although the multicultural preservice teachers are culturally diverse, they have narrow conceptions of diversity in teaching and learning. Their definitions of diversity expand from over the course of the semester. For example, they appreciate and welcome the diversity of students—from individual differences to differences within communities—to understanding diverse ways of communicating, learning, and interacting within these communities, thus from very general to more inclusive and

contextual understandings. They become more aware of diversity within the classroom and how students' unique ways of knowing and how children's different experiences and curiosities can be used in the science classroom. Although overall enrollments trends project declines in the number of students in school (Grier, 2004; Hausser, 2005), the MPSTs will most likely encounter students from diverse racial, ethnic, linguistic, cultural backgrounds. These students will come from diverse homes and communities with diverse educational and experiential knowledge. For example, the number of students of color within NY public schools is 46.2 % (Hoffman & Sable, 2006). Therefore, the multicultural preservice teachers see diversities and differences as assets and opportunities for engaging diverse learners in science.

By developing a broader understanding of diversity in terms of pedagogy, this means teaching and learning science using multiple methods of instruction. Science is no longer seen as rigid, "just direct instruction or cookbook lessons methods", as Isabel states, but teaching science is more inclusive of diverse learners' interests, lives, knowledge, and communities. Teachers develop "sensitivity to diverse backgrounds" and are using methods of instruction that go "beyond the basic routine of teaching," as Wanda states. With a broader understanding of diversity that extends from the learner to communities to include diverse methods of teaching and ways of learning, the MPSTs focus their thinking on making science curriculum authentic, relevant, and meaningful by connecting science to the lives of their students. Curriculum development connects to their development of a science disposition—one that promotes positive, critical, and affirming attitudes not only for the diverse students they teach but also for themselves as science teachers and for the subject matter of science. For example, a science disposition encourages critical awareness of curriculum as an approach to teach diverse learners and as a place to continue professional development as teachers in science. The aim is to make science engaging for every student in the classroom.

Second, when the MPSTs move beyond simplistic understandings of issues of diversity to more inclusive and broader meanings, it complicates diversity; diversity becomes more challenging in planning, teaching, and assessing the range of diversities found among students in a classroom. Additionally, science as a subject-matter further complicates

understanding diversity. This is mainly due to the preservice teachers' weak content knowledge, and low confidence and experiences in teaching science. They feel that the diversity in urban classrooms is "too challenging" for them "to handle." The MPSTs are not sure how to go about incorporating diversity into their teaching and need many more opportunities to put their learning into practice. This requires examples in teaching generally and in science teaching specifically around diversity. Unfortunately, one science methods class is not sufficient for helping the MPSTs to gain confidence in teaching, planning, and assessing science. However, the one science methods course does make them more aware of the challenges of teaching science for diversity. This awareness reveals the cultural, pedagogical, and content complicated issues of teaching for diversity, and the responsibilities of becoming effective teachers of diverse learners, as Clara states, "teaching is harder than it seems" and admits that, "There is no doubt that book club has changed my views on teaching science in a diverse classroom."

Therefore, it is not only vital for this group of ten but for every teacher to have ongoing support in learning strategies for incorporating students' language and culture into science lessons and adapting the organization of the classroom and discourses for learning (Luykx et al., 2005). Preservice teachers must become cognizant of the fact that teaching for diversity is complicated and broad, as they consider issues of diversity—ranging from students to planning, teaching, assessing, to subject matter and local contexts—that go into teaching diverse learners. Additionally, science educators and teacher educators must provide support for every preservice teacher to work within their fears as opportunities to raise their thinking and learning to a level of sociocultural consciousness in teaching diverse learners (Banks, 1996). It is our responsibility for preparing preservice teachers about diversity as we address two key questions with our preservice teachers: "What to do with the information I gather about my students?" (Gretal), and "How do you plan for diversity?" (Vanna).

There are several approaches to preparing preservice teachers of this study to teach science around issues of diversity, such as collaborative reading networks (Book Club groups), pre-internship teaching in diverse classrooms (microteaching), reflective writing (Book Club individual and group papers), and supportive learning settings (field

experiences in urban elementary classrooms). Collectively, these pedagogical strategies are beneficial for initial introduction to issues of diversity within the science methods course. Yet, overall teacher education programs struggle to make learning about diversity more than “window dressing” and more of an inclusive and central focus of teacher education programs (Nieto, 2000). The “one size fits all” single course for learning about issues of diversity in teacher education is not sufficient, as Elize remarks, “Why is it that, outside of teacher prep programs such as ours, I rarely hear of teacher training on how to prepare students to think and ask questions as ‘scientists’?” Being able to incorporate new beliefs and understandings about science teaching and diversity into their evolving personal practice will involve continual professional development and support. In fact, every preservice teacher needs on-going assistance and professional development in promoting attitudes, behaviors, dispositions, knowledge and skills that are effective for teaching diverse students. Particularly for the preservice teachers in this study, continual professional development in science teaching and learning is desired, as preservice teachers have little teaching experience prior to student teaching and few opportunities to apply their new knowledge in authentic classroom settings prior to student teaching. Considerations for changes in institutional policies and practices to support preservice education are recommended, although this is not an easy task (Melnick & Zeichner; Price & Valli, 1998).

This study initially begins with an investigation of multicultural teachers in an elementary methods class in an urban city. My interests in researching multicultural teachers speak to the need for more research on teachers of color and certainly to the low representation of “others” in research and teaching (King, 1993; Sheets, 2003). A direction for future research is to look more closely at the intersection of multicultural teachers’ positionality—their race, ethnicity, class, gender, religion, culture, and educational history to understand this relationship to the development of a science disposition. For example, considering their status as “other” how might their own views of themselves help them to develop science dispositions that are uniquely centered on their individual and collective identities as diverse teachers? Did their dispositions for planning, teaching, and assessing diverse students in science allow them to connect to teaching

science in ways that were connected to specific cultural understandings of who they were as preservice teachers? How did their developing a science disposition contribute to their developing a different conception of who they were as “other” within science teaching? These questions are relevant as they address issues of identity within the discourses of dispositions and teaching for diversity research. Essentially these questions address how researchers can learn from and about multicultural preservice teachers to draw upon their unique and collective cultural identities as valuable sources for understanding diversity in teaching, learning, and research, and how issues of identity intersect with the teaching and learning of science.

Conclusion

We want preservice teachers to enter classrooms as new teachers well equipped with knowledge, skills, and a strong desire to teach science to *all* students (NRC, 1996, 2000; AAAS, 1993). Teachers of this sort we hope will enter classrooms aware of the many dimensions of teaching, know their responsibilities as teachers, and are knowledgeable of content, pedagogy, and students. We also want teachers who are confident, aware, and sensitive to the needs of *all* students. Yet, Yerrick and Hoving (2003) remind us that, “preservice science teachers have little, if any, experience trying on the role of teacher” (p. 393). Unfortunately, many preservice teachers are not eager to confront the complications of teaching for diversity, which is complicated, multi-layered and deeply connected to the values found in the dominant society (Banks & Banks, 1995; Rodriguez, 1998). However, the dispositions that we encourage preservice teachers to develop for teaching diverse learners will help them to think critically about issues of diversity and teaching diverse learners. Developing a science disposition will help them to think about the design and adaptation of science curriculum that it is engaging and connected to the lives of their students, which in turn will promote more positive, critical, and affirming views of science for their students and for them as science teachers. Additionally, this makes our charge as science educators vitally important in preparing not just multicultural preservice teachers but every preservice teacher in expanding their views of diversity, seeing it as an asset and an opportunity to teach all students in culturally sensitive, culturally relevant, and culturally responsive ways. It also means exposing their

worries, concerns and fears and providing opportunities and on-going professional development for them to address these issues. Ideally, our charge is to produce teachers who have dispositions of openness, self-awareness/self-reflectiveness, and a commitment to social justice (Garmon, 2004).

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¹The term urban in this study is used in a number of significant ways in referring to both local, district, and school systems. The term refers to: (1) location of schools and school districts found in a big, inner city, metropolitan area (not suburban, small town, rural), and particularly New York City, NY, USA; (2) low allocation of funds and resources, such as educational opportunity, access, and material and human resources in those schools and school districts; (3) high proportion of culturally, ethnically, and linguistically diverse students, i.e. students of color (non-White), and relatively high proportions of students of limited English language proficiency; (4) high poverty levels or low-income families, as measured by free and reduced lunch data; (5) underqualified teaching staff in terms of credentials and use of instructional approaches that promote passive learning; and (6) high truancy rates, low graduation rates, and underachievement of students. I understand that there are other issues, attitudes, and characteristics associated with "urban" but I have elected to narrow these focus for this study.

² The phrase "multicultural preservice teachers" is used in this study to represent preservice teachers from diverse ethnic, cultural, and linguistic backgrounds. The preservice teachers self-identified as belonging to or having more than one cultural group affiliation, and thus were selected. Students who marked only "Caucasian" or "White" were not selected as multicultural teachers.

³Ways Words, by Shirley Brice Heath (1983) is a nine-year ethnographic study, where Heath narrates the story of three culturally different communities, Trackton, Roadville and the townspeople, located in the Piedmont Carolinas in the desegregated south, 1969-1978. Roadville is a white-working class community of mill workers; Trackton is a black working-class community with a history of older generations of farming workers and recent generations of mill workers. The third community is composed of mainstream black and white educated people. This book is important in that it depicts a process of language development of children, from infant to pre-school, how they uniquely communicate with each other based upon cultural experiences, how language is passed from one generation to the next, and how knowledge of Roadville and Trackton children allowed teachers to teach them in school.