

ABSTRACT

Title of Dissertation

THE NATURE OF CULTURALLY RESPONSIVE
PEDAGOGY IN TWO URBAN AFRICAN
AMERICAN MIDDLE SCHOOL SCIENCE
CLASSROOMS

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This ethnographic in nature study explores how two middle school science teachers who have classes populated by urban African Americans teach their students and how their students perceive their teaching. Since urban African American students continue to perform lower than desired on measures of science achievement, there is an urgent need to understand what pedagogical methodologies assist and hinder urban African American students in achieving higher levels of success in science. A pedagogical methodology that theorists posit assists subordinated school populations is culturally responsive pedagogy. Culturally responsive pedagogy is defined as a teaching methodology concerned with preparing students to question inequality, racism, and injustice. Teachers who use culturally responsive pedagogy respect the culture students

bring to the class, and require that the teachers willingly do whatever is necessary to educate students (Nieto, 2000).

The teacher participants were two female African Americans who were identified by their school supervisors as being highly effective with urban African American students. The researcher presented the teachers in separate case studies conducted over a data collection period of nine months. Data were collected by participant observation, interviews, and artifact collection. Data were analyzed by application of grounded theory techniques.

Findings of the teachers' (and the students') beliefs about pedagogy that both assisted and hindered the students' performance in science were reported in a rich and nuanced storytelling manner based on multiple perspectives (teachers'; students', and the researcher's). Pedagogical methodologies that the teachers used that assisted their students were the use of cultural metaphors and images in science and applications of motivational techniques that encouraged a nurturing relationship between the teacher and her students. Pedagogical methodologies that hindered students varied by teacher.

Metaphorically, the teachers differed vividly. One was a nurturing mother, sister, and friend who assisted her students to cross the cultural line between the science classroom and their home and community. The other was a stern disciplinarian who painted a picture of order and hard work as keys for her students' success in school science.

The researcher, who promotes a social justice ideology, made implications and recommendations for science teacher education and public policy.

THE NATURE OF CULTURALLY RESPONSIVE PEDAGOGY IN TWO URBAN
AFRICAN AMERICAN MIDDLE SCHOOL SCIENCE CLASSROOMS

by

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Acknowledgements

I started this dissertation by giving my readers a brief peep into my early years in Cherry Hill where I grew up. When I look back and review the memories of those early years, I always think about my teachers in Cherry Hill, mostly my 6th grade teacher, Ms. Sarah Banks. I have heard that in later years, she got married and changed her name to Mrs. Sarah Rose. Mrs. Banks was a strict disciplinarian who didn't take "no mess" from any of her students. I was a talkative student who always demanded her attention. In those days, teachers had my mother's permission to paddle me if necessary, and she took full advantage of that freedom with an extra-thick ruler. I loved Ms. Banks: she encouraged me and all of her students to read lots of books, mostly science and travel. We all were very poor and had no money for travel; however, through her books, we traveled all over the world. She taught me how to enjoy reading and introduced me to science. Throughout my years working on this dissertation, I think about Ms. Banks, or Mrs. Rose, with gratitude for her being my role model and my mentor.

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Chapter I: Introduction

Positionality of the Researcher

I began this study recalling a lifetime of experiences growing-up in a low-income community in urban Baltimore. This study begins with these experiences because of their similarity to those of the research subjects. I experience a continuing need to document in writing my early elementary school experiences beginning in the early 1950s not long after the Korean War, when I, my mother, and my sister moved to south Baltimore in the McCulloh Projects, a 10-year-old project close to downtown. This new environment was home until I was 12 years old—rural/urban, low-income, 100% African Americans at the south end of Baltimore, then and now called Cherry Hill.

Cherry Hill was born in controversy. There was always a debate about where to build this community. The question in the late 1940s for Baltimore planners was whether to build in south Baltimore or in Herring Run. After World War II, Cherry Hill Homes was constructed near an amusement park in South Baltimore to house African American families, the main objective or justification being to provide housing for soldiers returning from World War II or, later, from the Korean War. The soldiers were going to work in the steel mills or the chemical industries and needed housing for their families, most of them with 4-6 children but many with up to 15. The houses were poorly constructed concrete shells the City called *projects* but which my family called home.

It was not until the 1960s that indoor plumbing was installed. Cherry Hill Homes rented 600 units before some streets were laid. The housing needs of widows and veterans were greater than expected because the GI Bill proved instrumental in allowing

many veterans to complete their education, secure employment, and, ultimately, become owners of the few private homes in the community.

Cherry Hill was much like a small town where everyone knew each other—a real neighborhood where families sat outside in the summertime and talked about their problems and issues while the children fooled-around and played marbles, jacks, jump rope, or tag. There were no air-conditioners and only a few families had fans. It sometimes got so hot inside these concrete homes that residents had to sit outside all night and often light a fire to ward off mosquitoes.

In 1948, my birth year, a group of veterans bought the first television set in the neighborhood for their clubhouse. Families who were lucky enough to have televisions invited their neighbors in to see “The Ed Sullivan Show” or “The Lucy Show” on Sunday nights. Many of the children gathered each week to see “The Lone Ranger.” Good behavior at home was the only prerequisite, and very few youngsters forfeited such a special treat.

Volunteers in the community were plentiful and successful at organizing church activities. There were Boy and Girl Scout troops, baseball teams, Mothers’ Clubs, and PTAs. From this nucleus of families and organizations grew many more social clubs and civic groups which banded together under the umbrella of the Cherry Hill Coordinating Council. From the group came civic pride, concern, and unity in fighting spot zoning and poor housing construction, in obtaining bus service, streets and curbing, sewerage, additional schools, and polling places. Voter registration was also a primary activity.

Healthcare in the community was poor. Many residents were too poor to have private doctors and depended on hospital emergency wards for minor problems. For

many years, there were only two doctors who resided in Cherry Hill. Those two doctors delivered most of the babies at home. In the late forties, when one of the doctors delivered triplets, it was quite a news event. More than 2,000 babies were born between 1945 and 1952 in Cherry Hill.

Each of the families who lived in the community received government support, welfare, or income from low-paying jobs or income from jobs at Bethlehem Steel in Sparrows Point or the shipyards in a small nearby community called Fairfield. Many of the families were first-generation Marylanders, newly arrived and anxious to find better jobs in the northeast. Many of these families moved north from North Carolina, South Carolina, Virginia, and Florida. Baltimore was considered a stopover before they continued their migration to the big city—New York—but the migration often ended in Baltimore. In this fairly small community, considered by some the dumping ground for Baltimore's waste since the City's incinerator was housed there, people were close, friendly, and dependent on each other.

Unemployment in Cherry Hill after 1968 rose markedly in sharp contrast to surrounding Baltimore. Cherry Hill was one of the hardest-hit in Baltimore because many families' fathers who worked in the steel mills and the shipyards—and most did—were either laid-off or fired. In addition, the fact that unemployment was high and the median education in Cherry Hill was around ninth grade made finding employment for adults extremely difficult.

Yet, despite this activity, only one elementary school, P.S. #159 (all Baltimore schools populated by African Americans had numbers instead of names, while white-populated schools bore famous people's names), was available to this burgeoning

population for five years, so it was forced to operate in three shifts. During that period, the Presbyterian Church Mission developed weekday church classes and a part-time nursery school. With that help, working parents could be assured that their children were properly cared-for. The churches were the hub of social activism and trained their members to take on leadership roles (Rehbein & Peterson, 1979).

The City of Baltimore eventually built three new schools in Cherry Hill in the 1960s, two elementary schools, #163, and #164, and one junior high school, #180.

Cherry Hill continued to grow and filled these new schools to capacity. The teachers, administrators, and staff at these schools were all people of color. I do not recall ever seeing White employees at #159 or #163.

Although Cherry Hill was majority African American, it was not unusual to see White people in the neighborhood selling products and collecting payments for those products. What I remember from first-hand and friends' experiences are that many of the teachers at the schools lived in the community or had earlier, or had a family member living there. Moreover, a number of the teachers maintained a sense of cohesion with their students by living in or in close to the students' home communities. Whether they lived in the community or not, teachers were familiar with the culture of each student. They knew what their students ate at home, how many siblings were in the family, where they lived in the community, where the library was, and if there was an parent absent from the household. This closeness also manifested itself in the way the teachers treated their students, often referring to them as their own children (Foster, 1995b).

My teachers knew my mother, aunts, grandmother, and many other family members. My teachers were well-known in the community. Mama trusted one teacher

so much that she even had permission to spank me if I got out-of-hand, which happened quite frequently. The teachers made us lie prone across a chair and hit our buttocks with a long thick ruler until we cried. They were given parental permission to discipline their students whenever they felt it necessary. The teacher in those days was one of the most important persons in the community, along with the doctor. If you asked any of the students what they wanted to be when they grew up, they would tell you that they wanted to be either a doctor or teacher. It would be interesting to know if today's children have the same respect for teachers and what role parents play in teaching their children to respect teachers.

The teachers all knew my favorite subject was science. The memory is clear of the teacher's taking the entire class outside in the Fall to collect leaves, acorns, and bird feathers. We took these once-alive items back to the classroom and laid them out carefully on colored paper, placed wax paper over them, and started our own personal science book. The teacher always complained to the administrators that either we did not have a science book or the books that we were using were outdated. I later learned that the books were hand-me-downs from White schools in middle class Baltimore communities.

My teachers always tried to be very creative and innovative; for example, one teacher asked each of us to bring in a flower to talk about the next day. Today, we call this activity "show and tell" or, better, "science inquiry." I was so excited to bring in my favorite flower, which was the only flower I recall growing behind our house. What I will always remember about the back of my house is that there was very little grass or soil. All that was there was cement. There was not any place to grow plants, flowers, or

grass; and even if there were, my mother did not have enough money to buy flower seeds. However, that did not stop her from growing what to her eyes was the most beautiful flower—the sunflower. I cannot now say where it came from; it just came—every single year. It grew at least six feet tall. Why it kept coming was not understood, and this researcher really did not care because it could be depended on to save her day. When the teacher asked all the students to bring a flower to class, the next day the entire classroom was a sunflower garden. Every child in that class had a sunflower. Even the teacher had one.

Remembering how the teacher connected the sunflowers that the students brought into the classroom that day reminded me that it is not just about the science curriculum: it was more about the relationship between the teacher and the students. Lisa Delpit, in her 1995 *Other People's Children*, writes of her 1989 interview with the exemplary teacher Jaime Escalante, widely known for his success with low-income Hispanic students in East Los Angeles (chronicled in the movie *Stand and Deliver*). He acknowledges his strong background in mathematics but insists that it alone does not account for his success. “Really, it’s not just the knowledge of math. ...My skills are really to motivate these kids to make them learn, to give them *ganas*—the desire to do something—to make them believe they can learn” (Meek, 1989).

After studying the literature on culturally responsive pedagogy, I am convinced that my elementary school teachers were effective teachers who practiced what Aikenhead (1999) calls “cultural border-crossing.” They brought the culture of their students’ families and communities into the culture of the science classroom.

While I remember a science teacher in elementary school, I do not remember having science in middle school; there must have been some science in junior high school, but I have no memory of it. I remember my social studies teacher in middle school, the nationally known Dr. Samuel Banks. I remember him because he was very strict and spoke perfect English. He demanded the best from his students and accepted nothing less.

Of the many subjects that I took in high school, the subject that I most appreciated was Mr. Epstein's physics. I loved that class: it was a fun class, and whenever I see Mr. Epstein I remind him of how much I learned in his class.

Years later, I started classes at the Community College of Baltimore with the goal to become a physician and did not consider any other career. College science was an enlightening experience: I had earlier taken two science courses at Johns Hopkins University and loved them. I loved college. I wanted to be all that I could be without any limitations. I felt that if I had to go to college, why not 'go for the gold' by doing my best? Why spend time in a limited career that wouldn't allow access to all of the fine things in life that would make one and one's family comfortable? I needed to show my three children through example that they should always 'reach for the stars' and try to realize their dreams. The only way for them to learn was by demonstrated example: if my children witnessed my getting up every morning and going to work on-time or going to college, my strong positive self-efficacy, much of what I learned in elementary school would rub-off on them. I finished CCB's two-year pre-med science program in one year and transferred to the University of Maryland Baltimore County. My UMBC experience was quite different from my CCB experience at CCB, a predominately African

American-populated college. The day I walked onto the UMBC campus, I quickly realized that I was “the minority” on this campus. The science department was not very friendly: I was told in advance that if I wanted to go to medical school, my chances of a recommendation from anyone in the sciences were nearly impossible.

My tenure in science at UMBC was very difficult—yet challenging. The search for role models in the sciences was difficult: there were no science professors with whom I came in contact who looked like me. Where were the role models I needed? I wished that I could call on teachers like those I had in elementary school. Where were the African American men and women who had contributed to the advancement of science, engineering, and mathematics? Why hadn’t I heard about all of the accomplishments of the past and present African American scientists who could have been my role models? I knew about George Washington Carver, the biochemist, William Michael Bright, the biologist, St. Elmo Brady, the first African American PhD in Chemistry (James, 1977), but what about the others who weren’t so famous? I did not become a medical doctor, but I did become a science educator, a professor at Baltimore City Community College.

During my education, I recognized the critical shortage of African Americans in science education and education in general and changed my direction to that career. As a doctoral candidate in science education, my goal is to make a change in the science education community—and this study is only the beginning.

I think it is essential to share my position beforehand so that the readers can understand that this science education researcher came from the same community as do the students in this study. I want my voice to be heard in the science education research community saying that it’s more than just about the science curriculum.

Statement of the Problem

It is accepted that public school systems in United States have been severely criticized for their inability to design programs and curriculums that enable teachers and administrators to adopt teaching strategies that promote the academic advancement of *all* students. This situation is of particular concern for those students who are not part of the dominant culture. How to effectively teach African American students in science continues to be one of the most pressing issues facing educators. Despite the plethora of school restructuring and educational reforms, the disproportionate underachievement of African American students is a consistent occurrence in U.S. schools (National Assessment of Educational Progress [NAEP], 1994, 1996, 1998). Increasingly, research on exemplary teaching strategies for African American students has been the focus of scholarship over the past decade (Foster, 1989, 1992; King, 1991; Ladson-Billings & Henry, 1991; Lee, 1995). This research results from the idea that identifying, describing, and analyzing successful teaching strategies for educating African American students can play an important role in reversing school failures (Delpit, 1995; Foster, 1992; Irvine, 1990). In particular, teachers and administrators have found it difficult to achieve significant success in classrooms comprised of students from diverse ethnic, socioeconomic, and cultural backgrounds. Since the declarations of the *1983 Report of the Commission on Excellence* that the United States was a “Nation at Risk” because of its mediocre educational system, Americans have witnessed a number of follow-up reports and improvement efforts in attempts to promote educational reform. These efforts, designed to improve the quality of education at every level, have virtually bypassed students of color (Quality Education for Minorities Project, 1990).

Traditional studies continue to show that minority students are at-risk for negative academic outcomes. An overwhelming number of these students of color are found in urban classrooms. Even with the relatively high minority membership in the 100 largest school districts, 40 of the 96 districts report 50% or more of their students as White, non-Hispanic. Of these 40 districts, 9 report minority representation of less than 25% of their student body. In 18 of the 100 largest districts, half or more of the membership is Black, non-Hispanic. As large cities in the United States and elsewhere struggle to provide high-quality education, they are too often faced with shrinking budgets and shortages of well-qualified teachers, especially in science (Tobin, Roth, and Zimmerman, 2001). Baltimore, Maryland, from 1999-2000, had 184,000 students. 88% of the students are identified as minorities, and often these minorities have high at-risk early adolescent populations (National Center for Education Statistics, 1999-2000). “At-risk” students are identified as those possessing three or more of the following characteristics: (1) lack of academic success; (2) poor self-concept; (3) antisocial behavior; (4) poor attendance; (5) high mobility; (6) dysfunctional family; and (7) history of child or substance abuse (Browne & Rife, 1991; Frymier & Gansneder, 1989). Also, the Children’s Defense Fund has found that compared with White children, Black children are two-to-four times more likely to (1) die before adulthood because of inadequate prenatal or postnatal healthcare conditions, abuse, or murder; (2) live in a single-parent household because of parental death, separation, divorce, or no marriage; (3) live in foster care or in the custody of a child welfare agency; and (4) be poor and living in substandard housing with an unemployed teenage mother (Edelman, 1986). Moreover, a clear majority of the research and ethnographic studies produced about multicultural education mention that in an urban

environment, students who are not of the dominant race are more likely to live in poverty (Kozol, 1988), have low self-esteem, come from a single-parent home (Staples, 1985), be abused, and have more health problems than White students. Once these minority at-risk students enter the science classroom, teaching style can have a profound impact on their academic success or failure.

Most researchers agree that at-risk students have been overlooked by the educational system. However, playing catch-up is not so easy as one might think, especially if the process involves making serious changes that require disrupting the child's primary cultural lifestyle at home. Studies have been conducted reviewing the theoretical function of education and how reform in the educational system affects minority students. For example, in *Black students and school failure*, Irvine (1990) writes that "conflict theorists believe that the power of the dominant social group determines economic and educational requirements, and that the interest of the powerful is primarily to maintain and reproduce the status quo, which results in a system of inequality for others." Under the status quo, at-risk students are left underrepresented, uneducated, and unskilled while the dominant race remains in a position of power in the system. In this position, the dominant culture allows minority students to move toward less-skilled jobs by encouraging low self-esteem, conditioning the students to be obedient and not ask questions, encouraging acceptance of authority, and leaving external control in the hands of the dominant culture.

If we accept these views, why would we expect social institutions controlled by the dominant culture, such as local public school systems, to effectively cooperate in

efforts to advance cultural diversity that would, if successful, result in their having to relinquish their power and empower the minority cultures?

Educators most certainly should be concerned with all children, but the education of children in poverty merits special attention. Schools' emphasis on literacy and mathematics, although appropriate, often results in science's receiving less attention than is warranted (Bauer and Toms, 1990; Schoeneberger and Russell, 1986; Sherwood and Westerback, 1983).

A primary reason scientific literacy should be of interest to the education community is that relegating any subject to second-class status fails to fulfill the promise of a complete education. In simple terms, scientific literacy is viewed as "basic understanding of scientific concepts" (Barnes-Svarney, 1999) and of the skills used to engage in scientific endeavors while displaying positive attitudes toward the various areas of science. If children of poverty (or any children) demonstrate high interest in a given area of study, that subject could well be a vehicle for overall learning. Science often serves as such a vehicle.

Also, students have expectations of their teachers, including the assumption that if their teachers are White, they speak a different language from their students. In both instances, the teachers and their students are in conflict because neither group understands the other's communication, resulting in stunted academic achievement, in students' writing themselves off as failures, and in diminishing student desire to be academically successful. Similar background does not guarantee productive, fluid, or uncomplicated relationships between teacher and student. Teachers even of backgrounds

similar to their students' sometimes judge students more harshly precisely *because* they are reminded of their former selves (Foster, 1995).

To resolve this dilemma, a teacher must find a method or strategy to implement a curriculum that incorporates students' expectations of the teacher and teachers' expectations of the students in order to produce a positive outcome. One successful method involves a cross-cultural process. Both the students' and the teachers' cultural histories are emphasized so that the students can actively participate in the learning process and feel like insiders rather than outsiders. Bringing culture into the classroom shows the students that the teacher and the administration recognize the importance of students' cultural backgrounds. Culturally responsive pedagogy dictates respect for the culture the student brings into the classroom and acknowledges the teacher's willingness to do whatever is necessary to educate the student. The term 'culturally responsive pedagogy' is used interchangeably with several other terms, such as 'culturally responsible,' 'culturally appropriate,' 'culturally congruent,' 'culturally compatible,' 'culturally relevant,' and 'multicultural,' to describe a variety of effective teaching approaches in culturally diverse classrooms (Irvine & Armento, 2001). All of the terms suggest that teachers should be responsive to their students by incorporating elements of the students' culture in their teaching (Irvine, 2001); however, this study uses the term 'culturally responsive pedagogy' because a responsive teacher is sensitive to the needs, interests, learning preferences, and abilities of her/his students (Irvine & Armento, 2001).

White teachers and teachers of color who are concerned about how African American students learn and who have chosen a culturally responsive approach can be effective with all students, regardless of race. Culturally responsive teaching strategies

are different from traditional methods of teaching in that they involve the students, the students' families, and the community in a learning process to which students can relate.

What are the pedagogical strategies that successful teachers adopt in a culturally responsive classroom and *why* do they work? Examples of some of these effective instructional strategies follow:

- Culturally responsive educators hold high academic and personal expectations for each child and believe that each child can learn and develop to the maximum level of his/her potential (Darling-Hammond, 2000)
- Culturally responsive educators provide each student with access to the necessary learning resources and sufficient opportunities to learn (Armento, 2001)
- Culturally responsive educators ensure that learning outcomes are meaningful, relevant, useful, and important to each child (Ladson-Billings, 1994; Nieto, 2000)
- Culturally responsive educators nurture learning-support communities for each child (families, peer, homework hotlines, community centers) (Armento, 2001)
- Culturally responsive educators facilitate the maximum growth of each learner by making informed academic adaptations that match and build upon the learner's prior knowledge, experiences, skills, and beliefs (Au, 1993)
- Culturally responsive educators build positive and supportive school classroom learning environments that are grounded in mutual and genuine respect for cultural diversity (Cochran-Smith, 1995)
- Culturally responsive educators promote classroom climates built on social justice, democracy, and equity (Delpit, 1988; Villegas, 1991)

- Culturally responsive educators promote individual empowerment, self-efficacy, positive self-regard, and a belief in societal reform (Banks & Banks, 1993)
- Culturally responsive educators value diversity as well as human commonalities (Green, 1993)
- Culturally responsive educators believe that it is their role and responsibility to provide effective and empowering instruction for each child (Oakes & Lipton, 1999)

Studies indicate that often when minority students are taught by teachers of the dominant White culture, the students are viewed differently from White students. Some have held that minority students perform poorly in schools because they have a different language, dialect, or contrasting rules for taking turns in conversation. When minority students and their teachers are unable to understand each other, both have a choice (Erickson, 1975; McDermott & Gospodinoff, 1976): they can turn the misunderstanding into a productive learning environment or into a nonproductive environment.

For students and teachers in an urban middle school science classroom, interactions can be doubly hard. For many students, learning the language and terminology of science is like learning a foreign language. How does one explain to the science education research community how intimidating science can be to the young ears of African American elementary and middle school science students? How does one explain the heightened intimidation if the African American students live in urban communities where the schools are suffering economically and thus science books are twenty or more years old and written in words that they cannot read or understand (Tobias, 1992; Jones, 1997)? How does one explain how profoundly these circumstances

affect a teacher's ability to teach the required science curriculum when not only do the teachers and students have limited access to computers and technology, but also the schools that are fortunate enough to have computers and technology are lacking teachers qualified to use them?

This study focuses on teaching practices in science education while acknowledging that the science curriculum is a separate important area to study. In this study, I follow the teachers day-by-day in the science curriculum being taught in each class; however, the main focus is on the teaching *practices and strategies*, not necessarily on the curriculum *per se*. Much of the so-called reform and the debate are about our schools' focus on curriculum: What should we teach? Whose version of history should we offer? What priorities should various subject matters be given? However, I believe it is *the way we teach* that profoundly affects the way the students perceive curricular content (Ladson-Billings, 1994).

Ladson-Billings' notions in this domain are strongly aligned with Giroux and Simon's (1989) thoughts on critical pedagogy:

Pedagogy refers to a deliberate attempt to influence how and what knowledge and identities are produced within and among particular sets of social relations. It can be understood as a practice in "moral character." As both a political and practical activity, it attempts to influence the occurrence and qualities of experiences.

When one practices pedagogy, one acts with the intent of creating experiences that will organize and disorganize a variety of understandings of our natural and social world in particular ways Pedagogy is a concept, which draws attention to the processes through which knowledge is produced.

If the effort to respect and honor the social reality and experiences of people of color is to be reflected in a pedagogical process, then as teachers on all levels, from elementary to university, we must acknowledge that our styles of teaching may need to change (Hooks, 1994).

Much research has been done on multicultural education and school culture; however, there is a dearth of research that focuses on examining culturally responsive pedagogy in an urban middle school science classroom. Like Ladson-Billings, I looked at two teachers' ideology, the teachers' ideas and beliefs about education, and what cultural responsive pedagogy means to them and their students.

Greater implementation of culturally responsive pedagogy in science education is advocated as a hopeful way to raise the quality of urban African American middle school students' understanding of science, increase self-efficacy, improve class attendance, and increase in-class participation. According to Schunk (1991), when people who are similar to us do something, we are more likely to believe that we can do it and ought to attempt to do it.

Rationale

In 1991, the National Science Teachers Association (NSTA) issued a statement on multicultural science education describing goals that lead to international leadership in science education. Three of those goals directly address curriculum and instruction:

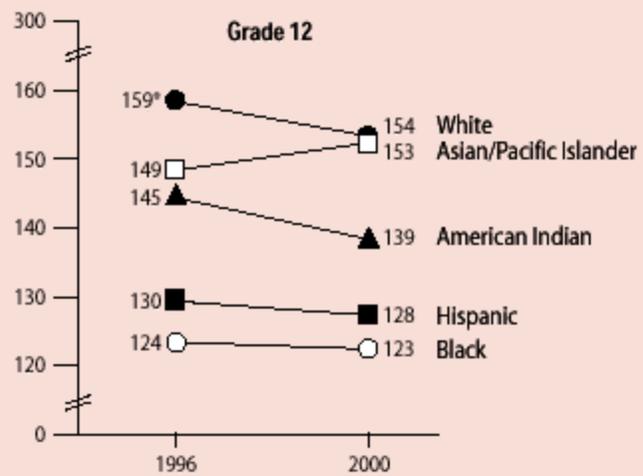
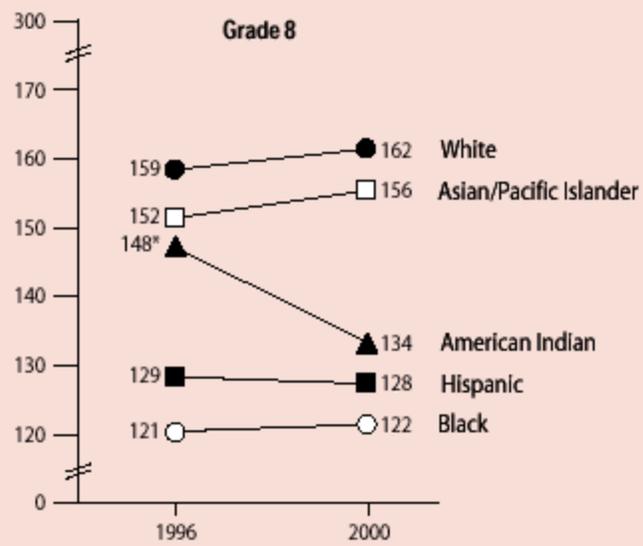
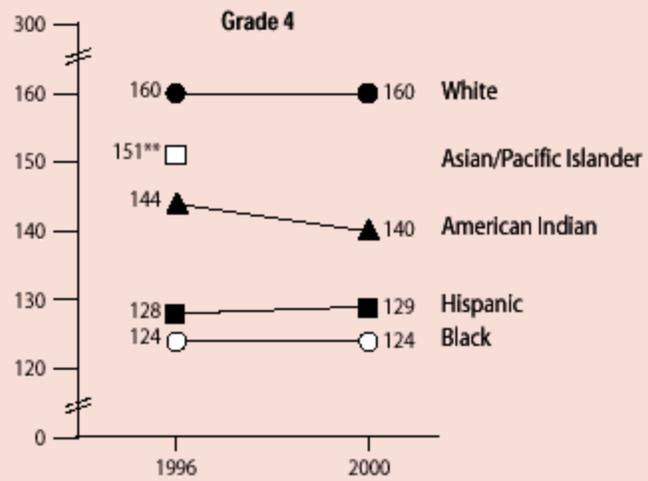
- quality science education must be accessible and provide knowledge and opportunities that enable culturally diverse students to become successful participants in our democratic society;

- cultural diversity must be reflected in curricular content and instructional strategies;
- science teachers must have the responsibility to present all children the opportunity to explore career opportunities in science (NSTA, 1991).

Magnifying this situation, many African American students seldom know about African American scientists in key positions in the science community other than well-known scientists whom they may read about in magazines or textbooks. Bloom (1976) claims that role models influence positively the attitudes of African American students.

For many education policymakers, one of the most frustrating failures of public schools—and a stark reminder that we have yet to successfully deal with diversity—is the persistent gap in achievement levels in science between White students and students of color. This gap is seen on nearly all wide-scale assessments, from the National Assessment of Educational Progress (NAEP) to state tests to those used by larger districts:

Figure A.—Average Science Scores by Race/Ethnicity, Grades 4, 8, 12: 1996-2000



Science Scores by Race/Ethnicity (Figure A.)

Average scores on the NAEP Science Assessment are examined for five major racial/ethnic subgroups: White, Black, Hispanic, Asian/Pacific Islander, and American Indian. For most of these subgroups, average scores in 2000 were not significantly different from those in 1996 across the three grades tested. However, scores for two subgroups of students have declined: American Indian students at grade 8 and White students at grade 12 both had lower scores in 2000 than in 1996.

Comparing students' 2000 performance across subgroups indicates that some subgroups had higher average scores than others. At grade 4, White students scored higher than Black, Hispanic, or American Indian students. American Indian students also scored higher than Black students and Hispanic students.

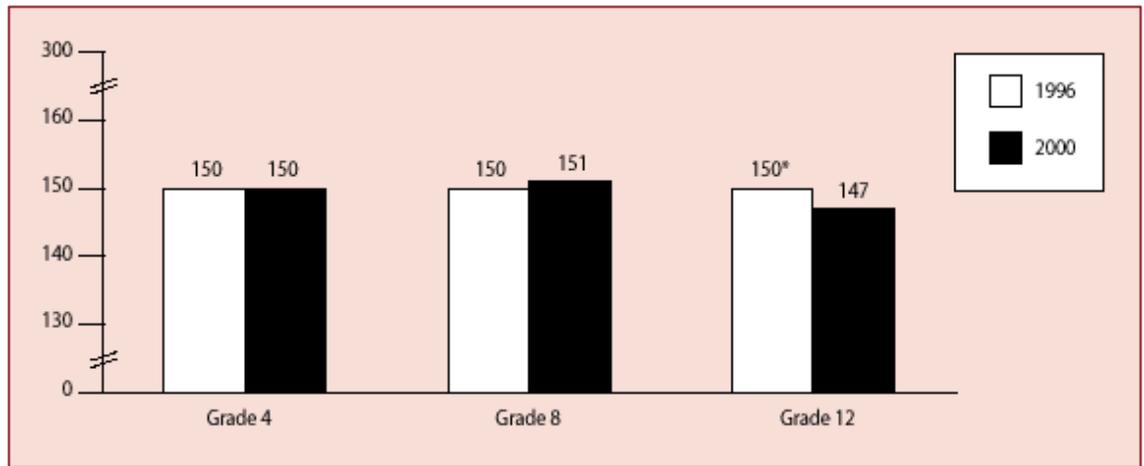
At grade 8, White students had a higher average score than any of the other subgroups. Asian/Pacific Islander eighth-graders scored higher than Black, Hispanic, or American Indian eighth-graders. Both Hispanic and American Indian eighth-graders scored higher than Black eighth-graders.

At grade 12, White students and Asian/Pacific Islander students both scored higher than Black, Hispanic, or American Indian students. American Indian twelfth-graders had a higher average score than that of either Black or Hispanic twelfth-graders.

For states, the gap persists even when students adjust to and improve overall on new statewide assessments (NASBE, 2002).

Recent studies show that nationally most students' science achievement as compared from the 4th grade to the 12th grade decreases after the middle school years

Figure B.—Average Science Scores, Grades 4, 8, 12: 1996-2000



*Significantly different from 2000

Even more serious is the fact that the achievement gap appears to be as wide or even wider when it comes to top-performing students. For example, on NAEP's most recent math assessment, while 20% of White 12th-graders scored high enough to be

proficient or advanced, only 3% of African Americans and 4% of Hispanics scored in this range. In a society that is becoming increasingly diverse, such disparities point alarmingly to a future in which people of color remain in an economic underclass, underrepresented in leadership positions in business, politics, and communities because of poor academic skills.

At the same time, such persistent achievement gaps tend to foster attitudes of low expectations for certain groups, both among the students in those groups and the school staff who teach them. Low achievement thus becomes for the future a self-fulfilling prophesy of continued low achievement and stereotypes. The Study Group believes that the nation cannot afford to leave great numbers of individuals—indeed, whole groups of people—behind. To do so would be as unwise as it would be inequitable and unjust.

The rationale for this study results from the fact that public schools have been under severe criticism for their inability to design science programs and science instruction that enable at-risk, unmotivated African American students to do the following:

- advance academically and become more competitive with highly motivated non-African American students who are better prepared academically to graduate high school
- attend college and, most importantly, successfully complete degrees in science and mathematics.

In particular, teachers and administrators have found it a challenge to achieve significant results in ethnically, socio-economically, and culturally diverse classes. In the past, efforts designed, in theory, to improve the quality of science education at every

level have virtually bypassed African American students who come to the classroom with so much anti-academic baggage that unless teachers are prepared in ways to stimulate these students to want to learn science, they will never be motivated.

While *never* may seem an extreme term, as a professor teaching first-generation college students, I see that most of my African American students' attitudes about science and learning science continue to be negative. It is important that teachers and administrators investigate ways to develop teaching strategies that are more effective and try to identify innovative methods to motivate their African American students to want to learn not only science but also all subjects. Equally important is the need to select strategies from a developing repertoire that lead to students' reaching their potential, feeling good about their accomplishments, and developing confidence in their abilities to tackle difficult problems and understand complex concepts (Pressley & McCormick, 1995).

Significance of the Study

The 1980s were an era of reform in science education in America. Various groups produced numerous reports denigrating the current state of education and calling for major reforms. Since 1985, educational leaders initiated many projects to improve curriculums, instruction, and assessment in science (AAAS, 1989; BSCS, 1989; Bybee, et al., 1989; Loucks-Horsley, et al., 1990; NCISE, 1991; U.S. Department of Education, 1991; and NRC, 1993). This type of major educational reform in science education is not new. Past reforms, such as the 1960s wave in the United States, failed to leave their mark.

Gains in high school completion by Blacks in recent years have narrowed the educational gap between Whites and Blacks. In 1971, 82% of whites and 59% of Blacks aged 25 to 29 had completed high school.

Progress is also evident in the educational attainment of minorities: both numbers and percentages have increased for African Americans, Hispanics, and American Indians completing high school, enrolling in college, and completing bachelor, master, and doctoral degrees in science and engineering. On the other hand, African American, Hispanics, and American Indians remain less likely than Whites and Asians to graduate from high school, enroll in college, and graduate. Field choice among bachelor and master degree recipients is now similar among racial/ethnic groups, except for Asians. African Americans, Hispanics, and American Indians earn roughly the same percentage of all science and engineering degree as they do of non-science and engineering baccalaureate degrees (NSF, 2000).

This study addresses a central question in educational reform: how does the multicultural research perspective provide a new view on science teachers' practices in an urban African American middle school science classroom? According to McGinnis (1995), new ideas in teaching science to all are being implemented by a few risk-taking pioneers committed to improving science instruction in our nation's schools. The educational movement driving this innovation is multicultural education (Atwater, 1989; Banks, 1988).

Culturally, science education can be viewed as both revolutionary and conservative because of the political and social changes occurring rapidly in science pedagogy and conservative because of the segment of society, which favors science that

is established or traditional and opposes changes in science pedagogy. The knowledge generated by research sometimes forces us to change the way we prepare our teachers to teach or even to discard entirely beliefs we have long held about ourselves and humanity's significance in the grand scheme of things. Scientific knowledge can surprise us, even trouble us, especially when we discover that our world is not as we perceive it or would like it to be (*Science for All Americans*, 1990).

American public school systems exemplify the simultaneous revolutionary and conservative challenges occurring in schools. Our public schools are a microcosm of the society in which they operate. Given a certain time lag, they incorporate a community's values, trends, social conflicts, and inequalities—all the social and cultural proceedings of the society-at-large (Tesconi & Hurwitz, 1974). For example, during the 1960s civil rights movement, American educators focused attention on minority and disadvantaged students. Educational theories and concepts developed that reflected the country's concern for children living in poverty. This concern extended to helping teachers and educators develop teaching techniques and strategies to help improve the academic achievement of African American students, which then led to helping other students of color and other students from non-dominant cultures.

Educational statistics in the United States show that minority populations are increasing among students and decreasing among teachers (Atwater, 1989). As the nation's student population becomes more culturally and linguistically diverse, science educators are increasingly aware of the need to address equity for these students (Lee, 2001). Teaching instructors across the nation to face the increasingly challenging task of better preparing pre-service teachers to work with students of diverse cultural and

linguistic backgrounds is a critical need. Most pre-service teachers are from White middle-class backgrounds with limited exposure to cultures other than their own (Ladson-Billings, 1995; Schmidt, 1998a, b). Their life and cultural experiences shape their beliefs about and perceptions of students from other cultures (Cabello & Burstein, 1995; Pohan, 1996; Sleeter, 1995). Without effective multicultural teacher education preparation, these teachers may transfer their preconceptions to their classroom work, with a potentially devastating impact on students from cultures other than that differ from their teachers' culture.

Research Questions

The study will seek to answer these research questions:

- How do two sixth and eighth grade science teachers of classes populated primarily by urban African Americans make sense of their efforts to make their pedagogy culturally responsive?
- What aspects of the two science teachers' pedagogy are identified (and for what reasons) by their six and eighth grade African American students as culturally responsive?
- Conversely, what aspects of the two teachers' pedagogy are identified by their students' (and for what reasons) as *not* effective in teaching them science?

Justifications for the Research Questions

This study, through observations and interviews and documents, interprets what motivates two middle school science teachers to go against the tide to explore an

alternative approach to teaching science in an urban public school to low-income African American students. These two teachers have been recognized as effective teachers by their supervisor and other administrators. The diverse perspectives (teachers', students', and the researcher's) examined in this study broaden the potential findings while acknowledging that positionality in observation influences perspective. The student interview questions assisted the researcher to determine how students thought about the effectiveness of the teachers' methods.

Basically, the questions follow a methodology similar to that used by Gloria Ladson-Billings in her book *The Dreamkeepers*. The difference is that I study two teachers who happen to be African American and African American students in two urban middle school science classrooms. Ladson-Billings studied eight teachers, at varying grade levels 1, 2, 5, and 6, 5 of whom happen to be African American and 3 of whom are White.

The Baltimore Study Site

This study is carried-out in Greenville (pseudonym), an urban middle school located in southeast Baltimore; the observed students come from several communities in Baltimore, including the southeast, east, northeast, and other sections of Baltimore. Many of the students at Greenville live in public housing, usually referred to by its members as “the project,” which is in walking distance from the school. However, there were other students who had to take public transportation to school.

Any discussion of Baltimore's historic Black communities that service Greenville Middle School must begin with east Baltimore. East Baltimore was a beginning location

for African Americans. From early times forward, Black Baltimoreans, slave and freeman, worked in the many industries which made the city a vital center of American commercial activity. As a researcher, I believe that this study would not be complete or 'pure' unless it includes a historical review of the culture of Baltimore City. That said, it is important that movements by ethnic groups to integrate school, college, and university curriculums with ethnic content do so from a historical perspective. A historical perspective is necessary to provide a context for understanding the contemporary development and discourse in multicultural education and to restructure schools, colleges, and universities to reflect multicultural issues and concerns (Cook, 1947; Taba & Wilson, 1946).

The Culture of Baltimore

Growing up in Baltimore was a unique experience that newcomers to the City lack. To know Baltimore is not simply to know the downtown inner harbor that most recent migrants to Baltimore rave about; neither is it Camden Yards where the Baltimore Orioles play baseball, or even Ravens stadium, where the World Champion Ravens football team play their home games. Baltimore City is a city of more than 200 ethnic neighborhoods—African American, Native American, Asian American, Italian American, Jewish American, Greek American, Hispanic American, Appalachian whites, and areas where Lumbee Indians join Germans, Irish, Poles, Bohemians, and Russians. Each of these ethnic neighborhoods has its own unique locations in and around Baltimore. Any discussion of Baltimore's historic Black communities must begin with East Baltimore.

From early on, Black Baltimoreans, slave and free, worked in the many industries which made the city a vital center of American commercial activity during the eighteenth and nineteenth centuries. Much of this activity, particularly shipping and shipbuilding, occurred in the eastern part of the City, around the harbor. By the late-nineteenth century, as occupationally diverse populations increased and industrial development occurred, African Americans began an intra-city migration to West Baltimore. There they continued to nourish the institutions and organizations which had served them well in the past (Maryland State Archives, Maryland Historical Trust, Baltimore Heritage Research Collaborative, 2002).

Many of these communities started as early as the 17th century. During this period, Baltimore ranked 10th among the largest city in the colonies, with most of its African American population being slaves (Graham, 1982). Baltimore was also a successful trading, financial, and political town.

Around the 18th century, there was a very strong Quaker influence among those who lobbied publicly for citizenship rights for slaves. To prevent passage of a bill that would ridicule the slaves, the Quakers published a poetic objection to the bill, which reads in part

This monster of a corporation, said Ralph,
Would ruin half the nation;
Have I not, therefore, giv'n the wink
For men to look about and think;
Call'd boldly the Address Calf;
Who hop'd to catch old Birds with Chaff?
Have I not told, without offense,
What arrant fools are men of Sense,
And mar'd their labour'd work, with Dots
To shew the ignorant its Spots?
Have U not prov'd thy reasoning fair,
The right of Negroes to Mayor?

Ir limb if City Legislature,
Like any other human Creature;
Or Judge if Court, styl'd Crim or Civil
Though black as Chimmey-Sweep or Devil;
And that we're bound it should be so,
By an Oath, as ye well know?
It follows, therefore, Clear as Light,
This Attempt is 'gainst the white;
For Council might resolve it smack,
Who were not standard white were black.
Hence, your white Mayor_ is a mere trick ,
Contriv'd by men Aristocratic;
I therefore move to strike out white,
This said, the many hemmed'd applause,
And Ralph took up another Cause (*Weekly Anglo-African*, Jan. 14, 1860)

The Quakers were usually very passive people who took a stand and publicly condemned proposals that denied the rights of African Americans. Even though the bill failed, Maryland Quakers, in 1789, on behalf of the Blacks, renewed the petition for emancipation before the legislators in Annapolis. Baltimore housed the first abolition society in Maryland of men who were interested in the abolition of slavery and other improvements in the community as well (*American*, July 5, 1889).

Throughout the 18th century, mostly Quakers and some others continued to advocate for Baltimore slaves not only to be freed but also to obtain a formal education. Eventually, in 1792, a permanent school for Blacks was built, the African Academy. Before this time, African Americans were fitfully educated, if at all, by kindhearted individuals, as indicated in the following advertisement which appeared in the 1780s:

A person of a liberal Profession is desirous of trying a benevolent Experiment, by instructing an ingenious Negro Lad in a Business that will give him if ingenious and docile, an accurate knowledge of the English language, and besides rendering him really a rational

Creature, will enable him in due time, to earn handsome wages
(*Maryland Journal*, 1785).

Baltimore abolitionists had a very difficult time convincing slavery supporters that Blacks were full men with minds capable of reasoning and entitled to freedom. Benjamin Banneker, a free Black with little formal education, a genius in the raw, was ably assisted in several endeavors that eventually made him the most widely known Black of the 1790s. His fame as America's first Black scientist rests mainly on an almanac he calculated, making a clock, and being a part of a survey team that mapped-out the land which became the nation's capital.

During the 18th and 19th centuries, Blacks struggled to find a place in the cultural life of Baltimore. Blacks were frequently physically attacked, harassed, murdered, and kidnapped for no reason. So outrageous was the kidnapping of Blacks situation in Baltimore by 1816 that at least two newspapers, one in the South and one in the North, applauded efforts just being set in motion to remedy what was occurring too frequently. Unkind notice was given Baltimore from outside concerning the continuing display of brutality, as in the incident in which a Negro boy was shot in the head and killed by his guardian because he wanted to tell his master that his temporary guardian wanted to sell him to the "Georgia men" (*Federal Republican*, 1816). In Baltimore, Black revolutionary veterans were similarly subjected to the worst kind of treatment, though they had contributed a share to giving birth to the country. Freed Blacks were unduly harassed if found without their freedom papers, and the most extreme penalties were enforced (*Telegraphe*, 1795).

In the 1800s and after the War of 1812, Baltimore suffered stagnation in the maritime trade. Hard times for Whites, immigrants, and Blacks led to bitter competition among native whites and the growing number of free Black workers and immigrants (Green, 1980). After the Civil War, African Americans who were former slaves, uneducated and with little or no money, moved into Baltimore hoping for a better life but instead found life very difficult. Discrimination and the heritage of the disabilities of slavery created additional problems. Despite the numbers of African Americans, they held no political power.

Numerically, before and after the Civil War, Baltimore Blacks constituted one of the largest Black populations of the nineteenth century, making Baltimore a significant place in Black life at this time. Indeed, at the time of the Civil War, the City had twenty-six thousand free Blacks and the State altogether had about one-fifth of the approximately four hundred fifty thousand free Blacks in the country, the largest concentration.

One of the major reforms of the 1800s was the development of public education in Baltimore. The eastern and western sections had one all-male school, Baltimore City College High School, which only white middle class students attended, and one all-female school.

Eventually German, Catholic, Lutheran, and many more ethnic churches opened their own schools with many of their own members as the teachers. By the end of the 19th century, many of these schools closed.

Baltimore in the early 1900s, contrary to the mistreatment of Blacks, seemed to rise to the occasion. Blacks had the largest and finest churches: The Rev. John Mifflin Brown, a Baltimore correspondent, wrote in *The Weekly Anglo-African*, a New York

publication, that Baltimore's churches had more Black homeowners than any other metropolitan area in the country. In the 1900s, Blacks like immigrants, resided throughout Baltimore City. They often shared alleys with Irish and other immigrants, some living in wood shacks.

In 1904, however, Baltimore's progress suffered a rude setback when a fire consumed most of its business district, including a number of historic structures. The devastated area was rapidly rebuilt, and Baltimore prospered through the First World War and into the 1920s. The Depression, however, was too great an obstacle for local initiative to overcome: economic distress and controls imposed during World War II retarded the physical development of the City. However, after World War II, Baltimore's economy began to thrive once again, as people spent heavily on consumer goods. As their standard of living improved, Baltimore residents were attracted to new housing developments beyond Baltimore's borders, and many people left as the city had grown in population every year since the mid-18th century began to shrink and adjacent counties experienced tremendous growth. Upper class Baltimoreans moved northward.

This suburban flight also initially depressed the economy, particularly in the downtown retail district. By the late 1960s, Baltimore's inner city was as financially depressed as it had been during the Depression. In response to the suburban migration, 'urban renewal' projects began, and low-income housing was developed for families who could not afford the luxury of owning homes; the history of Baltimore City makes it very clear that immigrants, African Americans, and Native Americans occupied the public housing projects.

Churches played as important a role in the African American community as they did in Baltimore's immigrant ethnic communities. The Methodist and A.M.E. churches established earlier continued to prosper and provided much of the schooling for African Americans in Baltimore, which they received through Sunday school. Support for the schools came from the church membership of interested white groups, especially Quakers, and prominent citizens. The first school to train African American teachers in Baltimore was established in 1900 by the Baltimore Board of School Commissioners and called the Colored Training School. It was renamed Fannie Jackson Coppin Normal School in 1926 in honor of a former slave who bought her freedom and became the first African American woman to earn a college degree. The institution became Coppin State Teachers College in 1950 and, when it broadened its curriculum, Coppin State College in 1963. Morgan State University was the second African American college to be chartered in Baltimore.

In the beginning, the few African American schools were taught by White teachers until an ordinance was introduced calling for the gradual replacement of White teachers by African American teachers in African American schools.

Baltimore's economy and cultural life, in addition to its geography, influenced its local development. Many Baltimoreans tend to have roots in clearly identified neighborhoods, and this sense of local identification has helped counter the alienation often associated with modern city life. In the late 1800s, the canning industry became important in Baltimore, as the riches of the Chesapeake Bay began for the first time to be preserved and shipped to other parts of the country. Older industries, such as

shipbuilding and transportation, remained industrially strong, and the City continued as an active port of entry for European immigrants and rural residents from the upper South.

This story changed after World War I. Housing had become scarce; and after the war, thousands moved into Baltimore to work in formerly war-related industries.

Returning veterans found homes even harder to locate. Overcrowding grew even more severe. The scarcity of homes and the poverty that resulted from the unemployment of many war workers resulted in visible slums by 1920. African Americans, who were not allowed in many neighborhoods and who were often the last hired and the first fired, suffered most. Like African Americans, European Jews faced restrictive housing covenants which excluded them from many neighborhoods. Discrimination and lack of jobs and education left many African Americans in poverty.

After World War II, the shortage of schools had worsened for African Americans. Inner-city decay and post-war prosperity accelerated suburban growth for White Baltimoreans. People who could afford to abandoned the inner city to people whose needs for city services were greatest. 1954, the year of the Supreme Court school integration decision in *Brown v. Board of Education of Topeka*, signaled a new beginning for Baltimore's African Americans: they became more involved in Baltimore politics. Despite the fact that African Americans were playing a more active role in Baltimore, middle class Baltimoreans continued to move into the suburbs and the City's public image remained poor (Green, 1980).

To address the housing issues for the City's lower middle class and poor, large urban renewal programs added \$1 houses, neighborhood revitalization programs such as the Federal public housing known as "projects" and occupied by African Americans and

poor whites. Survival in these Federal projects was a new type of struggle for African Americans living in Baltimore and other large urban communities. African Americans' social and economic situation deeply affected how, when, and even if they received education.

Life for African Americans in Baltimore in the late 20th century continued to deteriorate. Drug trafficking and gang violence gave "neighborhood" new meanings fraught with fear and desperation. Groups of youth claimed their own "hoods" (neighborhoods or claimed territories in various parts of the city) with automatic weapons, "beepers" as local communication resources, and fax machines and airline travel as means to stay in touch with counterparts in other urban areas. Gang life substituted for families that had either disintegrated through alcohol and drug abuse or incarceration, or had been incomplete to start with because of single parenthood, or devolved as powerless to influence the younger generation to hope for a brighter future resulting from hard work and continued education (Hagedorn, 1988; Padilla, 1987).

The Greater Baltimore Committee (GBC), 1999, arrived at the recommendations that follow by studying and identifying pressing problems facing Baltimore City and through their active involvement working on regionalism, public safety, education, downtown development and many other public policy issues that impact Greater Baltimore's business climate.

In 1995, the leadership of the GBC identified crime as one of the most serious issues facing our region and acted on that finding by developing and implementing a public safety strategy known as "Smart on Crime." Since then, the GBC has championed increased availability of drug treatment as a crime-fighting strategy throughout the

region, begun implementation of the community court and supported construction of the juvenile justice center in Baltimore and the Police Athletic League after school programs. The students at Greenville Middle school who were participated in this study are the products of the atrocious history of urban Baltimore City. Their struggles to survive are documented in their own voices in chapter three.

The correlation between the issues of public safety, education, and population growth is clear and compelling in Baltimore City. There are eight basic goals the GBC recommends for Baltimore City to achieve its full economic potential. Two of the goals are directly related to the education of the students of Baltimore City:

- Increase school attendance by the year 2004 to achieve the statewide average and increase Baltimore City's graduation rate to at least the regional average by the year 2011. The school system's strategy must be founded on the fundamental principle that students can only learn if they are in school. Then, a key long-term measure of the effectiveness of school reform efforts will be the graduation rate of the Class of 2011, which will be the first to have had the full benefits—from the 1st to 12th grades—of the education reform measures launched in 1999.
- Increase local funding resources. Baltimore City must fully commit to improving its education system by increasing its local funding share to the fullest extent that is practical and feasible. Meanwhile, it must find creative and effective ways to address the system's substantial capital and school renovation needs.

The history of what the culture was like for African Americans living in Baltimore forms the foundation of current trends and issues must be understood. Achievement in education must be assessed in light of the extreme political,

social, and economic hardships that African Americans have to overcome in order to attend school and achieve.

The Definition of ‘Culture’ As It Relates to This Study

It is my observation that each culture brings a unique view of what ‘culture’ means. The definition used in this study is that of Ogbu (1988) and Noble (1985): Ogbu’s definition is very much related to what I think of as the culture of African American students living in Baltimore’s urban enclaves. Ogbu sees culture as a way of life shared by members of a population, sharing knowledge, customs, emotions, rituals, traditions, values, and norms that are embodied in a set of behaviors designed for survival in a particular environment. Noble’s definition in some ways repeats Ogbu’s in that it includes the view that culture involves shared knowledge, consciousness, skills, values, expressive forms, social institutions, and behavior that enable a group to survive in and adapt to its environment. Culture is an important survival strategy that is passed down from one generation to another through the processes of ‘enculturalization’ and socialization, a kind of roadmap that serves as a “sense-making device that guides and shapes behavior” (Davis, 1984, p.10).

Key Terms (Located Throughout the Proposal)

Applied Ethnographic Research: Applied Ethnographic Research is concerned with understanding sociocultural problems and using such understanding to bring about positive change in communities, institutions, or groups (LeCompte & Schensul, 1999).

Conceptual ordering: The organization of data into discrete categories (and sometimes ratings) according to their properties and dimensions and then using descriptions to elucidate those categories.

Culturally Relevant Pedagogy: Pedagogy that is concerned with questioning (and preparing students to question) structural inequality, racism, and injustice in society. It also holds that educators should respect the culture that the student brings to the classroom.

Culturally Relevant Teaching: Teaching that uses the student's culture to transcend the damaging effects of the dominant culture. The negative effects are the result of not seeing one's history, culture, or background presented in the textbook or curriculum or by seeing that history, culture, or background distorted by the text or curriculum (Ladson-Billings, 1994).

Culturally Responsive Pedagogy: Pedagogy that is very similar to *culturally relevant teaching* except that the teacher is responding professionally to the problem.

Applied Ethnographic Research: Research concerned with understanding sociocultural problems and using the understanding to bring about positive change in communities, institutions, or groups (LeCompte & Schensul).

Description: The use of words to convey a mental image of an event, a piece of scenery, a science, an experience, an emotion, or a sensation by relating an account from the perspective of the student's culture (Strauss & Corbin, 1998).

Theory: A set of well-developed concepts related through statements of relationships which together constitute an integrated framework that can be used to explain or predict phenomena.

Chapter II: Literature Review

Early Theories of Culture and African Americans

It is well accepted among most educated African Americans that historically many in the dominant White community think that African Americans are unable “to do science” and that many white educators still feel that African Americans are intellectually inferior to Whites. George William Hunter in 1941 said

There is no real evidence that the environment changes the intelligence of people. Those of low-grade intelligence would do little better under the most favorable conditions possible, while those of superior intelligence will make good no matter what handicaps they are given.

Selden (1999) speaks of the early writing of Peabody and Hunt (1914/1924) about groups of nonwhites and immigrants who were considered society’s inferior races. The question was, “what was society to do with those judged constitutionally inferior?” The answer was, “Eliminate them.”

Eliminate them.
Only a few generations...would be required . . .to eliminate from society the feeble-minded and socially diseased . . .through a program of institutionalization and segregation.

It is never pleasant for an African American to recognize that these views were promoted by internationally known educators before the educational reforms of the 1960s and that, in many circles, they are still believed. Contemporary African Americans continue to strive to prove them wrong. To have a clearer picture of how these views originated, it is important to review the historical as well as philosophical contributions that have been made by earlier science educators and science researchers who embraced

these beliefs and by early science educators and science researchers who had the opposing view.

In order to gain an understanding of the effects and influences of culture and political status on schooling and educational achievement of African Americans in science, it is important to analyze the literature of these earlier scientists and researchers. It is also important to view from a historical perspective the movements by ethnic groups to integrate school, college, and university curriculums with ethnic content (Table A.). Historical perspective is necessary to provide a context for understanding contemporary developments and discourse in multicultural education and to restructure schools, colleges, and universities to reflect multicultural issues and concerns.

Table 1.—Landmark Events and Publications in the Historical Development of Ethnic Studies/Multicultural Education (Banks & Banks, 1995)

Year(s)	Event/Publication
1882-1883	<i>History of the Negro Race in America</i> by George Washington Williams
1896	<i>The Suppression of the African Slave Trade to the United States of America 1638-1870</i> by W.E.B Dubois
1899	<i>The Philadelphia Negro</i> by W.E.B Dubois
1915	The Association for the Study of Negro Life and History is founded in Chicago
1916	<i>The Journal of Negro History</i> begins publication
1921	The Associated Publishers begins publication
1922	<i>The Negro in Our History</i> by Carter G. Woodson and Charles C. Wesley
1929	<i>Race Attitudes in Children</i> by Bruno Lasker
1930	<i>Mexican Immigration to the United States</i> by Manuel Gamio
1933	<i>The Mis-Education of the Negro</i> by Carter G. Woodson
1936	Eugene Horowitz's study of young children's attitudes toward the Negro
1937	<i>The Negro History Bulletin</i> , designed for schools, begins publication
1939	<i>Negro Education in Alabama: A Study in Cotton and Steel</i> by Horace Mrs. Ann Adams Bond; first reported study by Kenneth B. and Mamie P. Clark on young children's racial attitudes
1941	<i>Deep South: A Social Anthropological Study of Caste and Class</i> by Allison Davis, Burleigh B. Gardner, and Mary R. Gardner
1944	<i>An American Dilemma: The Negro Problem and Modern Democracy</i> by Gunnar Myrdal with Richard Sterner and Arnold Rose

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- 1945 *Democracy Human Relations: Promising Practices in Intergroup and Intercultural Education in the Social Studies*, 16th yearbook of the National Council for the Social Studies, edited by Hilda Taba and William Van Til; *Black Metropolis: a Study of Negro Life in a Northern City* by St. Clair Drake and Horace R. Clayton
- 1947 A review of research on intergroup education is published in the *Review of Educational Research* by Lloyd A. Cook; first edition of *From Slavery to Freedom: A History of Negro Americans* by John Hope Franklin
- 1950 *College Program in Intergroup Relations* by Lloyd A. Cook; *The Authoritarian Personality* by T.W. Adorno *et al.*
- 1951 *Intergroup Relations in Teacher Education* by Lloyd A. Cook
- 1952 *Intergroup Education in Public Schools* by Hilda Taba, Elizabeth H. Brady, and John T. Robinson; *They Learn What They Live: Prejudice in Young Children* by Helen G. Trager and Marian R. Yarrow; *Race Awareness in Young Children* by Mary Ellen Goodman
- 1954 *The Nature of Prejudice* by Gordon W. Allport
- 1962 *Social-Class Influences Upon Learning* by Allison Davis
- 1965 *Compensatory Education for Cultural Deprivation* by Benjamin S. Bloom, Allison Davis, and Robert Hess
- 1966 *Equality of Educational Opportunity* by James Coleman *et al.*
- 1972 *Inequality: A Reassessment of the Effect of Family and Schooling in America* by Christopher Jencks *et al.*
- 1973 *No One Model America* (American Association of Colleges for Teacher Education); *Teaching Ethnic Studies: Concepts and Strategies*, National Council for the Social Studies 43rd Yearbook, edited by James A. Banks
- 1974 *Cultural Democracy, Bicognitive Development, and Education* by Manuel Ramirez and Alfredo Castaneda; *The Next Generation: An Ethnography of Education in an Urban Neighborhood* by John U. Ogbu; *Students' Right to their Own Language*, a position statement by the National Council of Teachers of English
- 1975 *Adolescent Prejudice* by Charles Y. Glock, Robert Wuthnow, James A. Piliavin, and Metta Spencer, sponsored by the Anti-Defamation League of B'nai B'rith
- 1976 *Curriculum Guidelines for Multiethnic Education*, a position statement issued by the National Council for the Social Studies; *Race, Color, and the Young Child* by John E. Williams and J. Kenneth Morland—a synthesis of research conducted in the late 1960s and 1970s on young children racial attitudes
- 1977 *Multicultural Education: Compliments, Issues and Application*, edited by Carl A. Grant, published by the Association for Supervision and Curriculum Development; *Pluralism and the American Teacher: Issues and Case Studies*, edited by Franck H. Klassen and Donna M. Gollnick, published by the American Association of Colleges for Teacher Education; *Pluralism in a Democratic Society*, edited by Melvin M. Tumin and Walter Plotch, Sponsored by the Anti-Defamation League of B'nai B'rith; *Standards for the Accreditation of Teacher Education*,
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	issued by the National Council for the Accreditation of Teacher Education, includes a requirement for multicultural education in teacher education programs
1983	<i>Ways with Words: Language, Life, and Work in Communities and Classrooms</i> by Shirley Brice Heath
1985	<i>Beginnings: The Social and Affective Development of Black Children</i> , edited by Margaret B. Spencer, Geraldine K. Brookins, and Walter R. Allen
1988	<i>The Education of Blacks in the South, 1868-1935</i> by James D. Anderson
1989	<i>A Common Destiny: Blacks and American Society</i> , edited by Gerald D. Jaynes and Robin M. Williams, Jr., National Research Council report
1991	<i>Shades of Black: Diversion in African-American Identity</i> by William E Cross Jr.

In the early decades of the 20th century, the assumptions that race and heredity were central to human development and social progress were basic components of American social thought. The belief that heredity was the primary factor in determining human improvement was a core assumption of the scientific, social, and political movement known as Eugenics. The Eugenics movement argued that if humankind were to improve, the parents of future generations would have to be carefully selected (Selden, 1999).

Franz Boas (1928), a cultural anthropologist, discussed the importance of recognizing the heredity in individuals in combination with the environmental influences that dictate physiological and psychological traits. His view was in direct opposition to the beliefs of other researchers when he said, “the differences of cultural outlook and of bodily appearance have given rise to antagonisms that are rationalized as due to instinctive racial antipathies.”

The “bodily appearance” he talks about is the difference in the shapes and sizes of African Negroes as compared to White South Africans and to such Europeans as North Italians, Scandinavians, and Germans. Early anthropological studies showed that the

intellectual level of human groups was determined by physical characteristics. Boas (p.42) argued that “so far as we can judge, the form of the foot and the slight development of the calves of the Negro; the prominence of the teeth and the size of his lips; the heaviness of the Mongol; or the difference in degree of pigmentation of the races have no relation to mentality. At least every attempt to prove such relation has failed.”

Considering the time of Boas’ book, it is amazing that his ideas were so intense and profound. Boas talked about how important stability is in a child's home-life:

... the firmer the habits that are instilled into the child, the less they are subject to reasoning, the stronger is their emotional appeal. If we wish to educate children to unreasoned mass action, we must cultivate set habits of action and thought. If we wish to educate them to intellectual and emotional freedom, care must be taken that no unreasoned action takes such habitual hold upon them that a serious struggle is involved in the attempt to cast it off (p.184).

Gay (1988) proposes that educational equality and excellence for children of color from economically impoverished backgrounds, recent immigrants, and limited-English speakers are inextricably interwoven. Pedagogical equality that reflects culturally sensitive instructional strategies is a precondition for and a means of achieving maximum academic outcomes for culturally diverse students.

The Culture of Science

Some of the ideas that originated from the early liberal specialists in science education encouraged cultural formation as well as technical formation. Ernst Mach at the end of the 19th century said,

Every young student could come into living contact with and pursue to their ultimate logical consequences merely a few mathematical or scientific discoveries. Such selections would be mainly and naturally associated with selections from the great scientific classics. A few

powerful and lucid ideas could thus be made to take root in the mind and receive thorough elaboration (Mach, 1886/1986, p. 368).

Mach was enunciating the view that good science education has a role to play in *cultural* formation as well as *technical* formation. Students being taught science should come to see and appreciate the role of science in the development of human social and self-understanding. Mach's ideas of cultural formation were not exactly the ideas that today's multiculturalist has in mind—but he was close. Other liberals who shared similar viewpoints were Percy Nunn and F.W. Westaway in the 1920s and 1930s. Joseph Schwab in the 1940s argued the cultural importance of science education with his paper 'The Nature of Scientific Knowledge as Related to Liberal Education' (Schwab, 1945): The facts of science and the experience of the laboratory no longer can stand by themselves... the facts must be learned in another context, cultural, historical and philosophical" (Conant, 1945, p. 155).

There are several models of scientific culture. Alberto Cordero describes his:

A scientific culture draws from learned considerations of human nature and the world and presents itself as resourceful enough to lay down certain fundamental aspects of the good life for man." Cordero outlines the cognitive, social, and personal values that inform the conduct of science, or what we might call the culture of science, and how these values' articulation requires that science be taught in such a way that students see and appreciate something of its 'big picture'—its history and epistemology.

Heilbron cautions that the history of science should serve the purpose of having students better understand science, not having them better understand history; and he rejects the 'history-as-sugar-coating' options that some teachers and textbook writers

adopt. In more recent years, Heilbron who is a physicist, uses the cliché ‘crossing the bridge’ when speaking about developing students’ interest and curiosity in science. Many times, images, people, places, and things are portrayed; things with which students are familiar, such as buildings, people, institutions, and instruments. Heilbron explains that the unexpected appearance of cathedrals as solar observatories may be a particularly good ‘hook’ with which to draw science students across the cultural bridge that supposedly separates them from students of the humanities.

What is Multicultural Education?

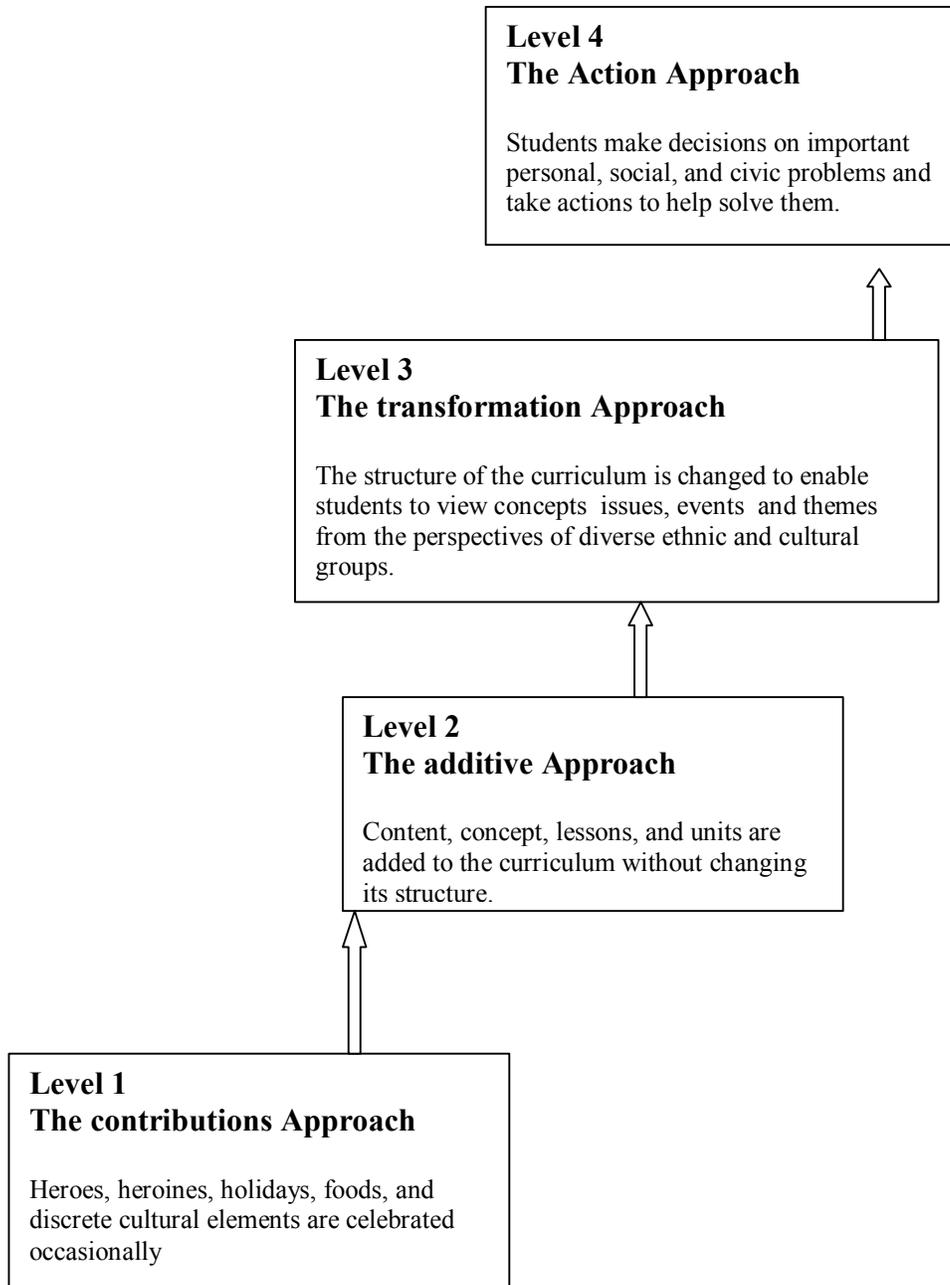
The historical development of multicultural education is often obscure. It is important to review the history of multicultural education literature in order to understand the direction it has taken in the past twenty-to-thirty years and how it can be adopted into the science curriculum.

There are several views on multicultural education—conservative, liberal, and radical view. Each is important to the historical development of multicultural education in an urban African American middle school science class. Many of the views are relevant.

Researchers such as Gibson (1976) and Sleeter and Grant (1987) cite five approaches to multicultural education, and only one of each of their approaches is similar to the others. One approach, according to Grant, concludes that a focus on the education of people of color is the only common element among the many varied approaches to multicultural education.

Banks (1991a, 1992) researched and formulated five dimensions of multicultural education based on his late-'60s fieldwork (Banks, 1970) through his 1991 work (Banks, 1992): (a) content integration, (b) the knowledge construction process, (c) prejudice reduction, (d) equity pedagogy, and (e) an empowering school culture and social structure. The content integration, empowering school culture in science education, and the knowledge construction are the three main dimensions of the present study. In addition, Banks and Banks (1995) proposed four approaches to multicultural curriculum reform (see Figure E. Approaches to Multicultural Curriculum Reform, next page):

Figure E: (Banks & Banks (1995)
Approaches to Multicultural Curriculum Reform



According to Banks, content integration deals with the extent to which teachers use examples, data, and information from a variety of cultures and groups to illustrate key concepts, principles, generalizations, and theories in their subject area or discipline. Educators have long considered content integration into the entirety of multicultural education an endeavor primarily for social studies and language arts teachers, not for mathematics and science teachers.

Empowering school culture and social structure describes the process of restructuring the culture and organization of the school so that students from diverse racial, ethnic, and social groups experience educational equality and cultural empowerment (Cummins, 1986). Empowering the school culture involves focusing on institutionalized factors of the school culture and environment that need to be reformed in order to increase the academic achievement and emotional growth of students from diverse ethnic, racial, and social-class groups.

Knowledge construction describes the procedures by which social, behavioral, and natural scientists create knowledge and the manner in which the implicit cultural assumptions, frames of reference, perspectives, and biases within a discipline influence the ways in which knowledge is constructed (Berger & Luckman, 1966; Gould, 1981; Harding, 1991; Kuhn, 1970). When the knowledge construction process is implemented in the classroom, teachers help students to understand how knowledge is created and how it is influenced by the racial, ethnic, and social-class positions of individuals and groups.

The early stages of multicultural education began with researchers interested in ethnic studies. Multiethnic education was to incorporate structural changes across the system. Multicultural education today consists of the development of theory, research,

and practice that interrelate variables connected to race, class, and gender (Banks & Banks, 1993; Grant & Sleeter, 1981).

Within the discourse of multicultural science education, three issues are usually addressed as relevant reasons for “multiculturalizing” science education: rapidly changing demographics, scientific literacy, and the demand for more scientists and engineers (Atwater, 1995). In the last three decades, the demographics of the nation and the nation’s classrooms have changed dramatically. In 1972, the overall enrollment of students from African American, Asian American, Hispanic American, and Native American groups in the nation’s public schools stood at 21.7% (Macznski & Joseph, 1989). When the figures were calculated for the 1999-2000 year, 39% of our nation’s students attending public schools were African American, Asian American, Hispanic American and Native American (NCES, 2000). A society that fails to educate its future generation will “lack scientific literacy, and our entire community will lose the contributions of these students in the fields of engineering, science and mathematics” (Atwater, 1994, p.172).

The research literature reveals that each specialist has a different perception of the nature of multicultural education. Gay (1992) pointed out that there is a tremendous gap between theory and practice in the field. In her view, theory development has outpaced development in practice, and a wide gap exists between the two. Much research has been done in the area of multicultural education and theories developed, but incorporating multicultural pedagogy into the structure, organization, balance, and presentation in the classroom is another manner.

There continues to be an emerging consensus about the importance of having multicultural education in the science classroom. However, what it might look like and how to prepare new and practicing teachers in it are still an open question. Multicultural education is sufficient in social studies, history, and social sciences, but there is not a need for multicultural education in the science or mathematics curriculum.

Why Culturally Responsive Pedagogy?

The sheer diversity among schools within and across various communities in the United States challenges educational researchers to identify realistic dynamics of school and community into teachers' approaches to instruction. Teachers' beliefs about and strategies in motivating students to learn have a major effect on not only how information is relayed but also how information is received, understood, and applied by struggling students. Creating conditions for the student to perform well has much to do with the learning environment, the classroom, and the teacher. According to Wenger (1998), when we are with a community of practice we learn certain ways of engaging in action with other people. We develop certain expectations about how to interact, how people treat each other, and how to work together. A hypothesis offered by Brophy (1986, 1987) is that many teachers do not understand all that they could and need to do to maximize motivation in their classrooms. Brophy's guidance on how teachers should motivate students can assist the science teacher to determine students' educational needs and in evaluation.

- Model interest in learning: teachers let students know that they themselves enjoy learning (e.g., reading, writing, problem-solving) and find academic activities rewarding and generally satisfying
- Communicate that there is much to be enthusiastic about what goes on in school
- Make classrooms low-anxiety places
- Send the message that what occurs in school deserves intense attention
- Induce curiosity and suspense
- Make abstract material more personal, concrete, and familiar
- Let students know the learning objective: provide advance information about upcoming content
- Provide informative feedback to students
- Adapt tasks to student interests as much as possible
- Offer choices among alternative tasks or alternative ways of learning content
- Provide novel input as much as possible
- Design instructional tasks to allow as much student autonomy as possible
- Design tasks with opportunity for activity
- Design learning tasks that result in a product
- Include games as part of learning.

Teachers can move forward to see how they might help students accomplish goals and reach desired conditions. Additional guidelines for teachers to follow should include

- Patience and persistence
- Practice and repetition
- Praise and recognition of hard work from beginning to end

- Creating a pleasurable community of practice to both the student and the teacher
- Maintaining teacher control, including being in control of student behavior
- Exuding enthusiasm and transmitting that enthusiasm to the students.

In addition to Brophy's theories, more recently Sockett (1988) says, "motivation has to be explicitly addressed as part of instruction and socialization rather than treated as a by-product. Teaching qualities of personal capability, such as effort, perseverance, concentration, self-restraint, and punctuality, is the role of the school. The task for the school is to foster a will to learn and "the teachers' role is to encourage both confidence and high achievement in their students" (Covington & Beery, 1976, p.5). The conditions for acquiring self-regulated learning and volition can be fostered in school (Corno, 1993; Pintrich, 1995). Thus, teachers and schools have specific responsibility to assist students in becoming self-regulated learners.

Wenger (1998) emphasizes the need to use various types of learning and motivational strategies in the classroom. She also emphasizes that educators are becoming more interested in students' previous knowledge as a motivating strategy to enhance their interest in science. Wenger says, "A learning architecture combines infrastructures of engagement, imagination, and alignment in support of learning communities." In order for teachers and administrators to understand previous knowledge, they must have some insight into the community and the environment from which their students come. This insight is especially important when students enter the classroom with misconceptions about science in general.

If serious attempts are to be made to offset the academic disenfranchisement of African American students, understanding the role that cultural socialization as

understood, respected, and imparted by teachers remains critical to the teaching and learning process (Howard, 2001a), also in a separate study, Howard (2001b) concluded, while culturally responsive pedagogy seeks to enhance continuity between home and school for culturally diverse students, the concept should serve as a precursor to improving students' school performance. Culturally responsive pedagogy must include a genuine belief by teachers in students' abilities and a commitment to structure content, instruction and assessment in a manner that refuses to accept anything less than students' absolute highest potential.

A Cultural Perspective as Applied to This Study

What is known about how the cultural research perspective provides new understanding of science teachers' practices? Pedagogy in science education for African-American and other minority groups has expanded in recent years, providing a window onto the impact of perspective on practice. No challenge has been more daunting than that of improving the academic achievement of African American students. Burdened with a history including outright denial of education, separate and unequal education, and relegation to unsafe, substandard inner-city schools, the African American community's quest for quality education remains an elusive dream (Ladson-Billings, 1994). However, African American students are only one minority with problems in the mastery of science and mathematics.

In recent years, culturally responsive pedagogy in science education has expanded for other minority populations, such as Native American, Asian, and Hispanic students. Yet science teachers are still faced with the task of how to manage and teach students of

diverse cultures when the materials and technology are still presented in a traditional context. Culturally responsive pedagogy is actively incorporated in Native American education. Native American studies indicate (Garrouette, 1999) that educational programs that respond to scientific and technical underachievement tend to focus on curriculums and methods that render science more accessible to Native American students (Garrouette, 1999). They do so by adapting to the “learning styles,” the interaction and social patterns, the common knowledge, and the community need that likely distinguish Native American students from their classmates. (Garrouette prefers the term “American Indian”; in this study, “Native American” is the preferred term.)

Garrouette points out that her study of Native Americans reviewed the scientific models of inquiry taught in United States schools. She examined models of inquiry typifying children’s science classrooms, using illustrative excerpts from a sample of textbooks published within the last ten years and used to train science teachers. These were the models of inquiry that teachers were likely to present in mainstream classrooms, making them the models that Native American students would probably encounter before arriving in a culturally responsive program.

Garrouette does not criticize these models or urge their abandonment in classrooms that wish to provide culturally responsive science education. Her goal is to draw out the differences between these models of inquiry compared to other possible models implicit in indigenous Native American philosophies, models that may well be taught to Native American students in addition to traditional classroom science. Garrouette identifies certain assumed areas of scientific inquiry into the natural world which are commonly presented to teacher trainees by their textbooks: Proper Objects of Inquiry; The Order of

the Natural World; Knowledge and Universality; The Nature of the Universe; Prediction and Control; Language; Ethics; Evaluation and Complexity; and The Nature and Sources of Knowledge. She compares the Native American models with their traditional classroom equivalents.

Ethics is one example of the difference in approach in traditional classroom science and in Native American. Classroom science shies away from entanglement in ethics much as it does with language. This model posits that the best way for scientist to keep themselves honest is to keep the domains of science and ethics strictly separated: “The scientist seeks to discover not what should be but rather what is” (Abruscato, 2000). They must not allow their personal values to influence their work. Objectivity figures prominently on lists of necessary scientific values and attitudes (Zeitler and Barufaldi, 1988). One author elaborates that “objective” persons use...processes [of scientific inquiry] in an impersonal manner—without allowing their desires and expectations to influence the process or outcome (Gega, 2001).

Compare this view with the indigenous model of inquiry into ethics. In many Native American models, one finds an unwillingness to “separate the search for knowledge from sacred learning or ‘religious’ training” (Beck, Walters, & Francisco, 1992). One is less likely, therefore, to encounter a division between ethics and knowledge, of “is” and “ought,” which is so characteristic of classroom science. As Santee Sioux Charles Eastman wrote of a traditionally-taught Native American, “every act of his life is, in a very real sense, a religious act” (Eastman, 1995).

He is unlikely to see the value in an objective approach that self-consciously holds ethical concerns and values in abeyance throughout the process of inquiry.

For him, spirituality properly pervades everything; ethics is not a realm of behavior separable from others. Learning to live in the world as it is becomes an integral part of learning to live in a good way.”

Developmental psychologists such as Bronfenbrenner (1978, 1988) and Glossop (1988) explain that our surroundings influence behavior and development mainly to the degree and in the direction that the participants themselves ascribe meaning to them. These authors admit that environmental patterns and properties that are visible only to outsiders may have some scientific bearing (Charron, 1991).

Most recent studies very similar to the Native American study indicate that minority students living in urban communities in many instances have a culture that is very different from the culture of the science classroom. Cultural clashes between students’ life-worlds and the world of Western science challenge science educators who embrace science for all, and the clashes define an emerging priority in the 21st century to develop culturally sensitive curriculums and teaching methods that reduce the foreignness felt by students (Aikenhead, 1999).

Without what Aikenhead (1999) calls cultural border-crossing, there will continue to be obstacles to nontraditional students’ effectively experiencing school science. Border-crossings take place between cultures or between microcultures (Aikenhead, 1996, 1997). Such cross-cultural experiences are the purview of cultural anthropology, to which we turn for our meaning of culture: “an ordered system of meanings and symbols, in terms of which social interaction takes place” (Geertz, 1993, p.5). This statement accurately describes the scientific community engaged in Western science and thus suggests cultural features that characterize science as a microculture. Others have argued

that science is a microculture of Western civilization (Maddock, 1991; Ogawa, 1986; Pickering, 1992).

Aikenhead (1996), like Garrouette, explores Canada's Native Americans' science concepts from a cultural perspective. He uses the term "First Nation" to identify these students as Native Canadians. They experience many of the same problems that relate to the education of African Americans, Hispanics, and Native Americans living in urban communities. First Nation history differs from tribe to tribe, but generally speaking, since early contact with the "White man," First Nation people were forced onto reservations (usually inhospitable land) where starvation and foreign diseases such as tuberculosis decimated them (Buckley, 1992). In the 19th and early 20th centuries, attempts (such as residential schools) at assimilating First Nation students into North American culture succeeded only in extinguishing the students' own culture and failed to provide an alternative cultural support system (Barman, Herbert, & McCaskell, 1998). People who left the reservations fared no better. "Neither the proactive (policy) approach of the United States nor the passive (no policy) approach of the Canadian government has led to significant change" (Brady, 1995, p. 361). Consequently, First Nation people are the most disadvantaged minority in North American education and the least represented in science and technology careers (Matthews & Smith, 1991; Nelson-Barber & Estrin, 1995).

Aikenhead's theory was to pull as many contributions as possible from Western science and add them to the First Nation pot in order to strengthen it. Aikenhead supports Madeline MacIvor (1995), a First Nation educator who wants students to learn

Western science but at the same time not be assimilated into Western culture at the expense of their own aboriginal culture and identity.

Researchers with a contextual orientation note that social beings and events are so closely tied to their surroundings as to be inseparable in real life as well as for research purposes (Charron, 1991). Finding innovative designs to enhance learning environments in a culturally diverse classroom can also be accomplished through bridging contextual scaffolds. 'Bridging scaffolds' are elements from life experiences that serve to connect new knowledge and experience to older, more articulated social experience (Boullion & Gomez, 2001).

Chapter III: Methodology

Method

This study was qualitative in design using ethnographic research. A qualitative methodology was used to analyze the nature of culturally responsive pedagogy in two Baltimore City middle school African American science classrooms. According to Denzin & Lincoln (1994), qualitative research is multi-method in focus, involving an interpretive, naturalistic approach to its subject matter. The qualitative researcher studies things in their natural settings, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them. Some of the techniques and procedures for developing grounded theory methodology was use for gathering and analyzing the data.

This study developed a theory about what is studied; the direction came after the data were collected, after time had been spent with the participants. This study did not seek to put together a puzzle whose picture was already known but rather to construct a picture that takes shape as the data is collected and examined. The process of data analysis is like using a funnel: things are open at the beginning (or top) and are more directed and specific at the bottom. The plan was to use part of the study to learn what the important questions are.

Research Questions

The research questions in this study were formulated to investigate topics in context and in all their complexity. This research focused on observing and understanding the behavior of the teachers and their students in their own frame of reference. Approximately nine months was spent in the school observing the students

and their two science teachers, who are in their third years of teaching. The data collection sources were diverse and ongoing.

- How do two sixth and eighth grade science teachers who teach classes populated primarily by urban African Americans make sense of their efforts to make their pedagogy culturally responsive?
- What aspects of the two science teachers' pedagogy are identified (and for what reasons) by their sixth and eighth grade African American students as culturally responsive?
- Conversely, what aspects of the two teachers' pedagogy are identified by their students' (and for what reasons) as not effective in teaching them science?

The Research Focus

I did not assume that enough was known about culturally responsive pedagogy in urban African American middle school science classrooms to recognize important concerns before undertaking this research. This research focused on observing and understanding the behavior and thinking of teachers Terri Thomas and Ann Adams and their students in their own frame of reference and, also, how students and teachers in the science classroom made sense of their world and what it meant to interpret what was happening in the classroom and what it meant to them—how people understand where they are and what that meant in their lives.

Why Ethnographic Research?

Within the qualitative methodology, this study used applied ethnography (LeCompte & Schensul, 1999). Applied ethnographic research methods involves human

interaction—direct observation; face-to-face interviewing and elicitation; and audio recording to document what administratively identified exemplary teachers who teach culturally responsive pedagogy in an African American middle school science classroom look like and what they actually do in the classroom. An ethnographic study that presents the best report assures the credibility of the study.

Ethnographic researchers learn through systematic observation in the field by interviewing and carefully recording what they see and hear, as well as how things are done, while learning the meanings that people attribute to what they make and do (LeCompte & Schensul, 1999). Using ethnographic research methods ensured that the data that was collected in the science teachers' classroom was gathered carefully and thoroughly and is reliable. The seven characteristics that mark a study as ethnographic are as follows, (LeCompte & Schensul, 1999):

- It is carried out in a natural setting, not in a laboratory.
- It involves intimate, face-to-face interacting with participants.
- It presents an accurate reflection of participants' perspectives and behaviors.
- It uses inductive, interactive, and recursive data collection and analytic strategies to build local cultural theories.
- It uses multiple data sources, including both quantitative and qualitative data.
- It frames all human behavior and belief within a sociopolitical and historical context.
- It uses the concept of culture as a lens through which to interpret results.

Research Setting: (Note: The information for this section is taken from *School Improvement Plan Data 2001-2002*, compiled by the principal and the school improvement team.)

Greenville Middle School was identified in 2001 as a ‘local reconstitution school’ because of a pattern of declining student achievement; it serves 664 students in grades 6 through 8. The school is 99% African American and both a Title 1 and Targeted Poverty school in which 80% of the students are eligible for free or reduced-price meals. The special education population is currently 11.5%; to-date 2000-2001 mobility rates are 40.7%. Some students walk to school, many live a distance from the school, and a majority of the students commute to school on MTA (Maryland Transit Authority) buses. The school has 77 staff members: 3 administrators, 1 facilitator who serves as a grade-level administrator, 17 mathematics, science, and social studies classroom teachers, 5 special education classroom teachers, 1 Autistic-Like Program (PAL) teacher, 3 Inclusion teachers, 4 science, English, and social studies temporary workers serving in teaching positions (2 lab assistants, 1 music position, and 1 math position). There are 2 physical education teachers, 1 art teacher, 1 home economics teacher, 1 health teacher, and 1 reading *Soar to Success* teacher. Additionally, the school has 1 middle grades liaison, 2 counselors, 1 instructional associate, 1 psychologist, 2 social workers, and 1 speech pathologist. Other support staff includes 1 in-house school mentor facilitator, 2 attendance monitors, 1 paraprofessional speech pathologist, 1 classroom special needs aide, 1 parent liaison, 4 classroom aides, 3 hall monitors, and 5 office assistants. The full-time professional staff includes 21 teachers with Advanced Professional Certificates,

14 with Standard Professional Certificates, and 14 with provisional status, including one Resident Teacher. Thirteen staff members have 0-2 years experience; 2 have 3-5 years; 9 have 6-10 years; 1 has 11-15 years; and 24 have 16 or more years' experience.

This school's eighth graders continue to perform below the State satisfactory standard in all assessed areas of the MSPAP. However, an analysis of data from the May 2000 administration of the MSPAP indicates that when compared with 1999 performance, scores improved, though slightly, in 3 of the 6 areas assessed: writing (from 10.0 to 10.8), science (from 4.1 to 5.1), and social studies (from 3.6 to 4.5). Standardized test data show that when compared with 1998-1999, median percentile scores on the 1999-2000 Comprehensive Test of Basic Skills (CTBS) improved slightly in reading and math at both grades six and seven. Disaggregated data indicate that girls continue to outperform boys on both the CTBS and Maryland School Performance Assessment (MSPAP). Student performance on the quarterly milestone assessments was generally less than satisfactory overall through the first and second quarters of 2000-2001. Fewer than 20% of the school's sixth, seventh, or eighth graders performed satisfactorily on the first and second quarter reading and mathematics assessments.

The Maryland State Department of Education and Baltimore City Public Schools On-Site Review Team indicated the overall school environment was "calm and orderly." While these findings are generally typical of the daily environment at the school, there remains a need by the staff to vigorously enforce the *Student Disciplinary Code* in order to maintain an environment conducive to student and teacher success.

The annual attendance rate for 1999-2000 was 87.2%. While still below the State satisfactory standard of 94%, it represents a 1.1 point increase over the previous year.

Participant Selection Process

- **The school**

The study participants and the school was selected because of the nature of the study—the school because of its location in an inner city, low-income community with a high percentage of African American students. In addition, after I visited more middle schools, Greenville was receptive to participating in a research study.

- **The teachers**

Before selecting these two teachers from Greenville Middle School, I attended several principals' meetings in Baltimore and asked principals, department chairpersons, and teachers if they knew of any teachers who were using culturally responsive pedagogy in a science classroom. I received many responses; however, most of the teachers who were using culturally responsive pedagogy were not teaching science. The recommended science teachers did not want to be observed or felt that they didn't have the time to spend on a research study. It was difficult to find middle school teachers willing to allow a doctoral candidate to observe them. Several reasons were given: (1) science was not their primary specialty; (2) they were ready to retire and being observed would be too stressful for them; (3) they would have to work too hard preparing lesson plans that would be observed and documented in a study; (4) they were not comfortable with the administration; (5) the students had disciplinary problems; and, finally (6), they were not getting paid extra to participate in a research study. Most of the concerns were from teachers in school districts in Baltimore.

Finally after having a conversation with the department chairperson/Academic Coach and the Principal at Greenville Middle School, Mrs. Terri Thomas and Mrs. Ann Adams were recommended as appropriate participants for this study. They were considered by the administrators to be exemplary teachers using culturally responsive pedagogy in a middle school science classroom. They were not recommended because of age, sex, race, ethnic origin, religion, or any social or economic qualifications. Each was required to sign an Informed Consent Form. The principal signed the Principal's Permission Form allowing me to do research with her employees and having complete access her building (see Appendix B).

Mrs. Terri Thomas and Mrs. Ann Adams were two African American Baltimore public middle school science teachers in their 3rd year of teaching. Mrs. Adams taught only 6th grade science and Mrs. Thomas 8th grade science and math. Mrs. Adams received her undergraduate degree in chemistry from Morgan State University; Mrs. Thomas received her undergraduate computer science degree from Montclair State University in New Jersey and minored in Mathematics.

- **The Students**

The teachers and I made the decision to begin the study by using all of the students in each of the teachers' classes because of the high rate of absenteeism in Baltimore City schools. Mrs. Thomas had twenty-nine students in the eighth grade science class to start and Mrs. Adams thirty-eight students in her sixth grade science class. The students were given a Parental Permission Form (see Appendix) to take home to their parents/legal guardian to sign. They were given the forms on a Monday and told to return them by Friday. The students who returned the forms by then would be given a

pizza party. The decision was made with the teachers that the students who returned the permission forms would be the ones to participate in the study. As it turned-out, twenty-four students in Mrs. Thomas' class and thirty in Mrs. Adams' sixth grade returned the signed parental forms. The pizza party was given that following week in the library conference room.

Data Collection Sources

The method described in this project was designed to guide the process of collecting, analyzing, and interpreting observations in two Baltimore urban African American middle school science classrooms.

The Student Surveys

Surveys were used to confirm and validate ethnographically defined patterns (LeCompte & Schensul, 1999). The students in Mrs. Thomas' and Mrs. Adams' classes who took the survey and stopped coming to school had transferred to other classes or to another middle school. Only the students who had taken the pre-survey were allowed to continue in the study. Of students who took the pre-survey, each teacher selected six students to be interviewed throughout the study. At random, I chose from each class one student to provide input regarding the relevance and applicability of classroom instruction and pedagogy to facilitate their learning and comprehension of material. The teachers chose to select the six students by putting in a hat the names of all students in

their science classroom who had good attendance and then had the students draw from the hat. Each of the initial groups of students had a pre- and post-interview.

Teacher and Student Observations

The data were presented in words and pictures rather than in numbers. The teachers and the students were observed during a science unit over a three-month period (see Appendix for copies of all data collection instruments). I made a concerted effort while observing the teachers and students to separate stereotypes and my opinions and judgments from the observations in order to get effective recording of the words, meanings, and opinions of the participants. The total research period was October 2002 to June 2003.

Both Mrs. Adams' sixth and Mrs. Thomas' eighth grade science classes met one day a week for 70 minutes and 4 days a week for 80 minutes. The teachers met each class five days per week, 70 minutes on Mondays and 80 minutes on Tuesdays through Fridays. Due to snow days, professional development days, a few sick days, and one jury duty day for Mrs. Thomas, the schedule went as planned. The teachers were responsible for escorting their science classes to their next class, subsequently picking up their next class and bringing them back. This procedure was done to keep the students in order and to eliminate disciplinary problems. That process sometimes took about 15-20 minutes. Once the students arrived in the classroom and then getting the students to quiet down, another 10-15 minutes was lost. Mrs. Adams usually took less time to calm her students. Warm-up drills began and eventually teaching would be underway. Several times in the middle of teaching an argument could erupt or some sort of disagreement would begin.

The 'in-class data coding chart' (see the appendix) was developed to not only keep track of activities that was occurring in each of the classrooms but also to indicate how much time was spent on each initiative. The teachers and students were observed sometimes three times each week and other times only once per week. I sat in the back of each class with my laptop and tape-recorded all of the activity in the classroom. A coding system was created to capture all of the movements, verbal and nonverbal conversations, verbal and nonverbal interactions with the teachers and the students (See tables 4 and 6 in the appendix). The coding system was used every 10 minutes during the class period for 30 observations in each of the teachers' science classrooms. In both Mrs. Adams' and Mrs. Thomas' class after the second week, the students seemed to adjust to my presence. Occasionally, the students came to the back of the class to ask me for help pronouncing a word or explaining a science concept. The teacher and I gave the students permission to interact with me at the beginning of the study. Coding was put on hold when the teacher had to leave the classroom, and I worked with the students until she returned. The following constitute ten basic beliefs of culturally responsive pedagogy used by Armento, 2001. These ten beliefs were used during the thirty days the I was observing the teachers. I posted the list in front of the laptop that I use to write code and field notes. Armento's ten beliefs kept me focused on what to expect in a culturally responsive science classroom. The ten beliefs also helped to confirm and validate what was happening in Mrs. Thomas' and Mrs. Adams' science classrooms.

Non-participant Interviews

Throughout the study, I had interviews and conversations with other teachers, staff members, and administrators at Greenville. I also walked around the community to get a feel about how far the students had to walk to get to a library. Doing my observations in the science classroom, I kept a copy of Armento's Basic Beliefs of Culturally Responsive Educators posted on my laptop as a reference.

Basic Beliefs of Culturally Responsive Educators

Culturally Responsive Educators (Armento, 2001)

1. Hold high academic and personal expectations for each child.
2. Provide for each child equitable access to the necessary learning resources and sufficient opportunities to learn.
3. Ensure that learning outcomes are meaningful, relevant, useful, and important to each child.
4. Nurture learning-support communities for each child (families, peers, homework hotlines, community center).
5. Facilitate the maximum growth of each learner by making informed academic adaptations that match and build upon the learner's prior knowledge, experience, skills, and beliefs.
6. Build positive and supportive school and classroom learning environments that are grounded in mutual and genuine respect for cultural diversity.
7. Promote classroom climates built on social justice, democracy, and a belief in societal reform.
8. Promote individual empowerment, self-efficacy, positive self-respect, and a belief in societal reform.
9. Value diversity as well as human commonalities.
10. Believe that it is their role and responsibility to provide empowering instruction for each child.

In addition to the basic beliefs by Armento, I also referred to Brophys' (1986, 1987) guidance on how teachers should motivate students and help the science teacher to determine students' educational needs and to evaluate.

The value of this study is that it will result in the rethinking of how to provide effective continuous teacher education (pre-service and in-service) so that science teachers can become effective teachers of African American students in urban middle school science classrooms.

Open-ended interviews with the teachers

I interviewed the teachers throughout the study. The interviews were held in different locations during the nine months, sometimes in the science classroom during the teachers' lunch break, other times before the teachers' first class period of the day, over dinner at a local restaurant, and even in the hallways during class breaks. The teachers were very accommodating to me—always willing to adjust their schedules to keep the study moving. Some interviews were recorded and for others, I simply wrote notes. After the interview, each teacher was given a copy of the interview to review and comment on.

Open-ended interviews with the students

The students selected by the teacher were interviewed at the beginning and at the end of the study; however, throughout the study, I had the opportunity to talk to each student and observe each while they worked in groups or alone. All 12 selected by the teachers had perfect attendance while the study was in progress.

Shadowing the teachers

Several times during the study, I shadowed each teacher starting early in the morning when she arrived at school and continuing until she left for the day. The shadowing involved traveling around the building with the teacher while she ran her errands, walking with her when she picked-up the students from each class, following her on cafeteria duty, observing her doing all of her classes, and observing her during breaks and lunch period.

Vignettes

Vignettes allowed the introduction of the teachers as well as the students and shared information of the teachers' individual pedagogical style and the students' reactions and responses to culturally responsive pedagogy.

Data Collections schedule

Table 2.—Teacher and Student Interviews, Surveys, and Classroom Observations Schedule and Science Units (Bondima, 2003)

Codes

BU = Beginning of Science Unit

EU = End of Science Unit

SPRS = All Students Pre-survey

SPOS = All Students Post-Survey

I = Open-ended interviews

PR = Pre-Interview

PO = Post-Interview

SSPRI=6 Select Students Pre-interview in each teacher's Class

SSPOI=6 Select Students Post-interview in each teacher's Class

Principal Interview = PRI-I

Chairperson/Academic Coach = CAC-I

COB = Classroom Observation

Unit = Astrology

Participants	September	October	November	December	January	February	March	April
Teacher-8 th grade (Mrs. Thomas)		PR	I, COB, BU	I, COB	I, COB, EU	I, EU	COB	PO
Mrs. Thomas's students		SPRS	COB, SSPRI	COB	COB	COB, SPOS SSPOI	COB	
Teacher-6 th grade (Mrs. Adams)		PR	I, COB, BU	I, COB	I, COB, EU1	I, EU	I, PO, COB	PO
Mrs. Adams students		SPRS	COB, SSPRI	COB	COB, SPOS	COB, SPOS SSPOI	COB	
Principal	PRI-I		PRI-I				PRI-I	
Chairperson/ Academic Coach	CAC-I			CAC-I				

I began the study by interviewing Mrs. Thomas and Mrs. Adams to determine their concepts of cultural responsive pedagogy in science education. Both teachers' concepts were later evaluated through a series of more interviews, observations, and shadowing.

The teachers were encouraged to review current practice and discuss the various ways that culture had been integrated into their work over the course of their careers. Each was given a pseudonym. Confidentiality was assured so that the teachers did not feel hindered or threatened by providing answers to sensitive questions. Interviews were conducted before school, during lunch, after school, or during teacher planning periods. The time flowed according to the teacher's schedule and responsibilities at the school and was not based solely on my convenience.

In addition to the pre-interview that occurred in November 2002, each teacher had informal, open-ended interviews once each month to address any concerns or issues that

surfaced during the study. At the end of the study, each teacher was administered a post-interview. Most in-class observations were audio-taped and photos were taken of such visuals as blackboard displays. On several occasions, it was difficult to audiotape the class and receive accurate data because of noise. On those days, I manually took notes and reviewed the notes with the teachers immediately at the end of the sessions.

Other environmental data included items such as bulletin boards; textbooks; handouts; videos; technological presentations; science projects; parent participation; and such community participation as churches, grocery stores, and libraries.

After each unit, students were given the “New” assessment test. This test is a new initiative that began in 2000. Initially, it was given only to students in language arts and mathematics. However, in 2003, it was administered to social studies and science students. For science, it is called the ‘Science Quarterly Milestone.’

An environmental visual scan was conducted at each site to provide insights into how cultural diversity and inclusiveness are embraced as part of the learning process. Bulletin boards in classrooms and in hallways were evaluated based on a set of criteria I developed. Questions include (1) use of role models from various disciplines displayed on bulletin boards, (2) use of themes such as “Black History Month” and other cultural celebrations in disseminating information, (3) use of tasteful “progressive youth vernacular” in reaching a broad cross-section of youth. Included in this evaluation are related school field trips and selection of class books.

Risks and Benefits

There was no risk to the participants in this proposed study.

Confidentiality

All of the collected information (students, teachers, name of school, district) in the study was kept confidential. Names of subjects had been removed from the data instruments and replaced with pseudonyms. Confidentiality was protected by not using names of individuals in any publications that result from the research. All data are stored in my office where only I have access to it. Raw data will be destroyed in 5 years.

Information and Consent Forms

The teachers knew that the purpose of this study was to observe them and their students in the science classroom. They knew that they were nominated by their principals and chairpersons as effective teachers of science to African American students in an urban middle school and as teachers who infused culturally responsive pedagogy into the curriculum.

A consent form was submitted to the principal for permission for the study to be conducted with the teachers and the students for a six-month period. The teachers received a permission form giving consent to be observed and interviewed. In turn, the teachers sent a permission form home to each student's parents/legal guardian to permit observation of the student in the classroom and to allow the student to fill-out the survey to be given several times during the study. Students who did not return their forms in a timely manner were not included in the study. See Appendix for copies of these forms.

Data Analysis

The qualitative data (including teacher and student interviews and my field notes and reflective journal entries) were transcribed and then coded. The qualitative data from field notes and transcripts were systematically searched and arranged to increase understanding. Data analysis was ongoing: organizing the data, breaking them into manageable units, synthesizing them, searching for patterns, and inventing categories.

I was able to establish ethnographic principles to analyze and present participants' classroom science teaching practices. The rich description that I reported allowed me to tell the story about what was happening in the science classrooms based on multiple perspectives (teachers', students', and mine). Not only were the events and happenings described but also the analysis was extended to involve interpretations that explain why, when, where, what, and how events occurred (Wolcott, 1994).

The unit of analysis is effective science teaching for urban African American middle school students. The study's focus is in alignment with federal, state, and district school systems' placing more emphasis on developing new curriculum materials aligned with *National Science Education Standards* (NSES, 1996). The *Standards* call for more than "science as process" in which students learn such skills as observing, inferring, and experimenting. Inquiry is central to science learning. When engaging in inquiry, students describe objects and events, ask questions, construct explanations, test those explanations against current scientific knowledge, and communicate their ideas to others. They identify their assumptions, use critical and logical thinking, and consider alternative explanations. In these ways, students actively develop their understanding of science by combining scientific knowledge with reasoning and thinking skills.

The importance of inquiry does not imply that all teachers should pursue a single approach to teaching science. Just as inquiry has many different facets, so teachers need to use many different strategies to develop the understandings and abilities described in the *Standards*. Nor should the *Standards* be seen as requiring a specific curriculum. A curriculum is the manner in which content is organized and presented in the classroom. The content embodied in the *Standards* can be organized and presented with many different emphases and perspectives in many different curricula (NSES, 1996).

The observed 44 students were African American students in these teachers' classes. As mentioned earlier, all students who turned in their Parental/Guardian forms were given a survey to fill-out at the beginning and at the end of the unit to provide their input regarding the relevance and applicability of classroom instruction and pedagogy to facilitate their learning and comprehension of material (see Appendix A). Permission forms that allowed the students to participate were sent out and collected by the teachers. Students who did not return the permission forms were not included in the research study. The students were promised a pizza party to encourage them to return the permission forms. The students who returned the permission forms also signed the Student Assent Forms (see Appendix B).

Each student was selected into this study as an African American attending a Baltimore urban middle school. Each of the teachers' students who returned the permission forms were part of the study, and the teachers' and students' identities were protected by pseudonyms. There was no financial compensation to any participant.

An important component of the data collection was a teacher profile compiled through analysis of a questionnaire designed to produce greater insights into teacher

preparedness, experiences, and cultural background. This questionnaire was complementary to and duplicative of the individual interview.

The study began by using observations of participation techniques to gain understanding of how the two teachers taught key science concepts. An observation table with codes was developed in order to capture the fast-moving activities occurring in the classroom. The coding system assured that all of the action and activities were documented and recorded. The classroom observation chart was used for both Mrs. Thomas and Mrs. Adams. Rich understanding emerged during the teacher interviews that followed the science unit. Each was interviewed at the beginning and throughout the eight-month study in 45-minutes-to-1-hour blocks. In April through June, I continued to interview Mrs. Thomas and Mrs. Adams to ask follow-up questions and for member review of recorded interviews.

From the beginning of the study, I transcribed all of the interviews and observations immediately to assure that I didn't miss any important information. Periodically, I had the participants read the completed document for their comments.

The analytic processes used were open coding, in which concepts were identified and their properties and dimensions discovered in the data, and axial coding, the process of relating categories to their subcategories, termed "axial" because coding occurs around the axis of a category, linking categories at the level of properties and dimensions (Strauss & Corbin, 1998).

I began analyzing the data by generating categories (concepts that stand for phenomena) to determine the concepts, the building-blocks of theory. The transcribed data were analyzed word-for-word, line-by-line, sentence-by-sentence, and paragraph-by-

paragraph. When I say “data,” I mean interviews, observational field notes, videos, journals, memos, manuals, catalogs, and other forms of written or pictorial materials (Silverman, 1993). This microanalysis process continued for months after the end of my time with the participants, allowing me to listen closely to what the participants were saying and how they were saying it.

I followed Strauss & Corbin’s (1998), major points about microanalysis: We are moved through microanalysis by asking questions, lots of them, some general but others more specific. Some of these questions may be descriptive, helping us to ask better interview questions during the subsequent interview. More important, we are stimulated to ask abstract theoretical questions (probing questions that stimulate discovery of properties, dimensions, conditions, and consequences such as who, when, what how, and why).

A thorough and intensive literature review enabled me to provide data to answer my research questions. This analytical process of open-coding and axial coding was very tedious; however, it allowed me to dissect accurately the huge amount of data.

In this study I am avoiding using the word “triangulation” to indicate that I used various data-collecting techniques, which I have indicated throughout this paper, because according to Bogdan & Biklen, (1998), the word is used in such an imprecise way that it has become difficult to understand what is meant by it.

Chapter IV: Participants' Environment, Classroom Environment, Observations, and Interviews

It is important to note that in this chapter, I added many quotations in narrative form from the participants so the reader can get a clear description or view from the participants' frame-of-reference of what was happening in the science classroom.

Mrs. Terri Thomas' and Mrs. Ann Adams' School Environment

The pseudonymous Greenville Middle School is in a Baltimore urban neighborhood, primarily residential, with buildings dating from the 1700s. Many of the houses have storefronts, a legacy of the shopkeepers and tradesmen who settled there.

After the Civil war, the sea brought immigrants, principally German and Russian Jews, who settled in the Greenville section of Baltimore. Through WWII, Greenville continued to be a diverse community, especially as Appalachian Whites and Lumbee Indians joined Germans, Irish, Poles, Bohemians, Russians, and Jews in the neighborhood.

Eventually, in the 1950s, urban renewal projects replaced the existing structures. Public housing replaced many of the homes and businesses that been built early in the 1700s and 1800s. During the 1950s urban renewal, houses were replaced by low-income public housing, and many middle class families abandoned the City, leaving behind lower middle class and poor families. The diversity of the community of this period continues today and still includes the original immigrant ethnic groups and now African Americans.

The Principal

My interview with Greenville's principal followed three months of checking her schedule and having her personal secretary trying to find time for the meeting. I saw her in the corridors almost every time I came to the school: she waved, asked how I was doing, and how the research was coming along, but she very seldom had time to stop even long enough for an answer. Even on these short visits, I learned something about her or a little bit more about her that was new to me. Each time I saw Mrs. T., I observed how beautiful she looked—hair always as though she had just stepped from a salon and always looking as though she were modeling Saks Fifth Avenue outfits. I was even more impressed with her energy: always extremely busy, running from one classroom to another. Occasionally, when we had a chance to talk between her appointments and meetings, she told me that she definitely would find time to meet with me. When we did finally meet, it was worth the wait. On a late Thursday afternoon in March, after the students had gone home, she took off her high-heeled shoes, slipped into slippers, and let me know that this was not the first time she had researchers working in her school. Before I could start my interview, she became engaged in a conversation with her Assistant Principal about an incident that had occurred that morning with one of the teachers. I waited until she settled down.

In the interview, Mrs. T. let me know immediately that she grew up in Baltimore, was raised by her grandmother, and is a product of Baltimore City Public Schools. The neighborhood where she grew up has changed due to urban renewal programs in Baltimore City. Most of the homes in her neighborhood either disintegrated or were torn

down. The principal talked about growing up in a community where she could experience her life and the world around her.

When we...when I was coming up, right behind [waving her arm] was a box factory. There was a lot of woods and things, so we could run and play. You know, dig...and I did planting. We did plant potatoes and see what comes out of. So we had that opportunity to experiment, and I don't know...we weren't confined. That's what I think is a good thing. Because that made me...my self esteem... that I could do anything. (Principals' interview in her office 03/12/03)

Without any assistance from me, Mrs. T. immediately raced into talking about her life as a child growing up in a poor family that instilled into the children's minds the importance of education. She talked about how lucky she was as child able to experience science and about how much she loved investigating and inquiring:

When I was younger... umpteen years ago, I used to be able to think of what I wanted to build and create. I had an opportunity to go out in the community and experiment. Meaning, I had a woods to go into...to find a frog. You know, we had frogs. We had wild animals, and we had all kinds of hands-on things in the woods to be found. I had opportunities to go and see if I could build this... what I created. I was creating my own hypothesis there not knowing what I was doing, but I went out and I had hands-on experiences building and making things... hands-on. (Principal in office interview 03/12/03)

This was Mrs. T.'s third year as principal at Greenville Middle School, having been earlier an assistant principal. She worked for the Baltimore City Public Schools for 28 years, and her goal was to start her own school. When asked if she had made retirement plans, she immediately said that retiring was the last thing on her mind. She graduated from 2 historically Black local institutions: Coppin State College, where she received her education degree, and Morgan State University, where she received her Master's. During the period of this study, she was in a doctoral program at Morgan State University.

Mrs. T.: I'm thinking about starting a school. I think that I can get more out of my students, out of African Americans... I know it. I believe I can do it.

Michelle: Are you speaking about a private school?

Mrs. T.: Well if it goes, if they still have vouchers, for charter schools. It's either that or I'm going to work to get this one (Greenville) right. Not only do I want to have the playing field right, I want to expand on it and try to create a six through fourteen. I also want a community college connection. (Principal's interview 03/12/03)

The Principal's Beliefs about a Culturally Responsive Teacher

As indicated above, Mrs. T. had been Principal of Greenville for nearly three years. Her educational experience has always been in predominately African American schools. Greenville Middle is 99% African American. She mentioned the fact that there were so few non-White teachers on her staff. Mrs. T. talked about her goals to create a new school that truly incorporates the students' culture in the curriculum, what she thought of as a Learning Center:

I'm for learning environments for African American students. I'll be looking at equity and adequacy in learning for our students, and if I can create that environment for our students, I think I'll find success. (Principal's interview 03/12/03)

She spoke of the responsibility of educators to ensure the maximum development of each and every child and that all students should have access to all available learning opportunities, especially in the areas of science and mathematics:

When you talk about teachers dealing with real issues with our students, especially in the science area, it's not only in science: it's in mathematics; it's in language arts because I do believe in the Nairobi Method. Nairobi Method is bringing real African American issues to all African American children. So...and I think that's a great thing and that kind of keeps them in the room and keeps them interested. When it comes to sciences... and you talk about bringing things alive to our children by relating things to the community, that's where our children are at a deficit in the community. (Principal's interview 03/12/03)

The principal was greatly concerned that African American students in urban middle schools do not have the same academic opportunities as students who live in affluent areas and who attend well-equipped public schools. She feels that teachers in urban schools do not give students the opportunity to discover and to inquire into science so that they can obtain the same knowledge and skills as the students in county schools.

She says of her experience as a student in an urban public school

because they were afraid to have you... in urban schools, to touch the things because you might break them. So they would just tell you what it would look like. It was a boring class, and your mind... you would just shut down from learning. (Principal's interview 03/12/03)

Mrs. T. pointed out that "African American learners must see, feel, and touch in order to understand, and educators of African American students must provide equitable access to the resources to assist them in this learning process." (Principal's interview 03/12/03)

She was a believer that the community is also responsible for students' learning: "There should be more people in the community involved." (Principal's interview 03/12/03)

She had very strong feelings about a culturally responsive classroom:

Michelle: Very good. What are your feelings about a culturally responsive science classroom? You've talked about culture in History, what about in science?

T: Well, that. Actually on the intercom today, every day, we are talking about African Americans in history. Now Black history is celebrated just one month, but it should be a twelve-month celebration. This month (March), our emphasis is on Black women and leadership and they are touching upon those who have impacted upon the school system and made tremendous gains in that. Our children are talking about that. They are talking about sports, they talk about everything that they can talk about in the science area. Culture to me plays a very important role. Not only in science. It plays an important part in the entire school. So, yeah, I expect to hear when you... perform or do something different in the class, bring up an African American who's made a

difference because we have made great impact on everything in history. There's a self-esteem that's connected with it...our children. That's what I talk about when I say the Nairobi Method. Reading books about African Americans that are making positive differences. Reading books about the child that was not...had a science project, but it wasn't as successful as they wanted it to be, but they went on. You know, you have to be real with children and real with the color, because primarily our school is 99.9% African American. So why is it always that we talk about your kid. So my thing is, if you can bring the African American up as many times...any time, any way. I love it. That's what I'm looking at.

Michelle: So your feelings about culturally responsible. The teacher teaching. Well, basically it's the same thing you just said. Only when they're teaching in a curriculum, they're bringing examples into the sciences.

T: Yes.

Michelle: You know sometimes they talk about hypertension and they might even talk about how blood pressure enters the family and the home. Anything that's related to it.

T: Yeah, well, in those classes when the teacher has the opportunity, and it should be included in their units coming up, that's what makes it a high interest level for the children when you talk about it. And when you make it home issues. We talk about high blood pressure where it's primarily in African American men. Most people have it in their family. Do they have check ups? Do they go to the hospital? What do you do to prevent it? Because that's one of the things that are most important and you talk about that. I think that African American cultural categories go hand-in-hand in talking. Here at a school with the curriculum that we have, I think it fits so well, because my teachers are bringing in their knowledge of technology and internet. They can just go right on the internet and pull off anything that's...that deals with the culture for the African Americans on that unit that they're talking about, which I think is wonderful. (Principal's interview, 03/12/03)

As the chief administrator at Greenville, Mrs. T. had strong convictions about bringing culture into the classroom. All her teachers were encouraged to relate to the students individually, making certain that regardless of the teacher's ethnicity, the students received appropriate teaching and learning that would build on their prior knowledge, experiences, skills, and beliefs. She encouraged teachers to introduce not only the students' culture but also other cultures.

I asked about her feelings related to existing research on teacher views of culturally diverse learners and the school and classroom practices that promote effective learning by diverse populations in classrooms taught by non-minority teachers. Should there be a course? Should universities incorporate cultural responsive pedagogy into the pre-service curriculum?

T: There should be. There should be more of it. Because I think people are realizing it today when they...if they even look at book adoptions and things that try to bring culturally diversity into the classroom. I'm looking at one here on urban learning centers and it deals primarily...because my population might change next year. So I'm looking at pedagogies and cultural things to do with Hispanics. We try to pull things like that into the school because learning takes place when people are comfortable with the environment that they're in. So, if you're talking about preparation, you need to have people come out of it or the people that are teaching those to teach, to understand the sensitivity of culture. How important culture is. When the pedagogy that goes with it because you have to study. You just can't walk in on something and expect to teach. I have a Jewish person and I have several White staff members, but they understand that I'm in a 99.9% African American culture here.

Michelle: Do you encourage them to have a culturally responsive classroom? 03/12/02

T: That's a definite. That's a definite. I challenge them because sometimes their perspective comes from a different view. Then I catch them. They have to understand that they are teaching African Americans, so... I don't want to hear about some history that's totally on the other side. Give me some reason why...how we can relate to it. I don't want to have a science that just talks specific about how whites have discovered and created. No. Get me my African Americans who've created things... because we have, and the sciences and the theories that they have come up with. Get something with literature and reading. Yes, it fits. If this was a multicultural, then I want a multicultural. They have to touch everything. We have to go. . . . I wouldn't just go African American because I'm an African American. I have a predominantly white.... I wouldn't do that. We have to understand the culture that we're in and how to make things fit in that environment.

Michelle: Crossing cultural borders?

T: That's right.

Michelle: These borders.

T: You put things in, but again it's not all African American. For the most part, it's

Primarily...and then we touch upon other cultures. It makes it real to the children. Actually I get.... I have a different behavior for my children. Because they have something to attest to. The problem that...African Americans...we have...we don't have a past to truly connect to. Most of my children... if we talked about family trees...that's why it's kind of hard when I say be careful. They can't connect. So.

Michelle: When you say, bring your mother, bring your father, and bring your grandparents.

T: That's right. They don't know about. It disconnects. I had situations that when it goes two generations. I don't know. Because my parents separated.

Michelle: Most of us don't know.

T: It just disconnects. To me, you know. This school is a connector piece giving them pride. We give them pride. The thing is we're trying to change the facts. It starts here... with...it begins with your education, so you can go out and make a difference in your home. Make a difference in the community. Make a difference in the city. Make a difference in the state, and make a difference in the nation. It starts here at school. That's how I stress that. We care about you at school. We have to stress different things because we pull in the help part. We pull in the social. The holistic child part. Then we pull the academics in. (Principal's interview 03/12/03)

The Principal's Opinion of Mrs. Thomas

Mrs. T. explained that she came to Greenville Middle School from a Baltimore elementary school where she taught math. She seemed to be very impressed with Mrs. Thomas: "She has a gift to connect mathematics and science." (Principal's interview 03/12/03)

Mrs. T. used the word *passion* when she described the dedication that her good teachers like Mrs. Thomas had for the field of education: "There's a passion that you have to see in people. They have passions for teaching. Some have it." (Principal's interview 03/12/03)

The Principal's Opinion of Mrs. Adams

When asked why she recommended Mrs. Adams for this study, she explained that Mrs. Adams arrived at Greenville one year ago after teaching science at another Baltimore middle school. She mentioned that Mrs. Adams had applied for an administrative position at Greenville; however, after speaking with Mrs. Adams, she knew she wanted her to teach science:

Dynamic person. I first met her...she came to me after I lost a teacher. Just by listening to her speak, I knew that I had a person who has great potential as a teacher. One thing about teaching to me is you really have to care about it. It's almost like going in the nun hood. Something spiritual. A spiritual calling to this. You just can't throw anything together for our children. You have to really plan. You can tell when children are really enjoying what they are doing. So when I see them in her class, I know that they're enjoying themselves and she's planned, had planned the type of lessons that could really embrace our children. (Principal's interview 03/12/03)

The Chair/Academic Coach's Background

I met Mr. C. when I worked in a teacher education program at Morgan State University. I remembered him as a very serious science educator and intelligent man and always respected his opinion about issues related to education. During that program, he spent a great deal of time mentoring high school students who were interested in becoming teachers.

Mr. C. is single and has no children, but he will quickly tell you that he has many nieces and nephews. Born and raised in Mississippi, the youngest of four brothers and six sisters, he was very proud to say how well his sisters and brothers were doing, how successful they had become, and how very proud his Mother is of them. His father was

deceased. Most of his sisters and brothers have baccalaureates, some Masters and Ph.D's; one sister is a judge. All but one of the ten siblings left Mississippi to live and work in other states. One brother, an auto mechanic, never wanted to move away from Mississippi. They all try to get together as a family during holiday seasons, Christmas and Thanksgiving, or weddings. He came to Baltimore after graduation from high school to attend Morgan State University. He received his BS in Biology and his Master's in Science Education from Morgan State. He is now working on his Doctorate in Science Education from Morgan State. I asked if he intend to return to Mississippi to live: "I would go only if I got a college appointment or something. Other than that, I don't see myself going." (Chairperson's interview 11/20/02)

Mr. C. is in his 2nd year at Greenville. He mentioned that he was brought to the school by the principal after her first year as Greenville's principal. They worked together at her previous school, where she was Assistant Principal.

I believed that it was important to know the background of the Chair to give the reader an insight into how and why he selected Mrs. Adams and Mrs. Thomas as the participants.

The Chair's Comments about Mrs. Thomas

Mrs. Thomas...Mrs. Thomas is good...now she came to us from teaching math. She was teaching math at...middle school. And she was highly thought of and highly regarded as a teacher, as a math teacher. She is another teacher with a lot of great ideas and a lot of energy, a lot of energy, and it shows in class. (Chairperson's interview 11/04/02)

Mr. C. is excited to say that as compared to the teacher who had Mrs. Thomas' class the previous year, she is very different:

They had a teacher last year who was very lethargic. Didn't do anything really. Gave the students the book and she didn't come with the experience and hands on so the students suffered. So when Mrs. Thomas arrived, it was different. The students ate up every thing that Mrs. Thomas gave them; they are like...we didn't get this last year and our teacher did not give us this. And I prepared her for that. I knew what the kids wanted to do. So that...give it to them and let them do until they can't do any more. I knew that they would have to get adjusted to that because it was going to be different in the sense that they didn't have that structure and a lot of hands-on and high order thinking activities. But they seem to have adjusted well. (Chairperson's interview 11/20/02)

The Chair's Comments about Mrs. Adams

The interview with the chairperson impressed me with how thrilled he was to have Mrs. Ann Adams as a teacher in the Science Department: "She works real hard and immediately established a rapport with the children." (Chairperson's interview 11/04/02)

He seems to assume that one of the reasons Mrs. Adams connects so well with the students is how she immediately incorporated the students into the curriculum because of her own ethnicity:

And I guess with her being young and Black, that made a difference. She jumped right into the science curriculum. That really impressed me; and everyone who came around and saw it, could see and could tell. She just got compliments all over the place for professionalism and you know she is always dressed well, and looks nice everyday, and just the way she carries herself, you wouldn't think that she's just 22 or 23 years old." He added, "When Mrs. Adams came along, she just came in like gangbusters. I really think that her having a degree in chemistry made it easier for her. She very enthusiastic, and within a week you couldn't even tell that she was new and fresh at the game. (Chairperson's interview 11/20/02)

I agree that Mrs. Adams is always well-dressed. Her makeup looked freshly done, and her clothes were always neat and stylish. She wears high heels and changes to

flats when she enters the classroom. She was always a perfect picture, dressing well to demonstrate to the students that they *deserve* a professional-looking teacher.

The chair also mentioned that during Mrs. Adams' interview, he became aware that she attended a public school very similar to Greenville. Being an African American woman with a chemistry degree made her uniquely qualified to teach science to African American middle school students. She teaches science to sixth graders and is also in her 3rd year of teaching. A 23-year-old native Baltimorean, she graduated from an all-girls public high school in Baltimore and then from Morgan State University with a degree in chemistry.

Mrs. Adams is married and has a two-year-old daughter and a husband who still attends college. According to Mr. C., Mrs. Adams was also considered an outstanding teacher by her principal. He talked about when both Mrs. Thomas and Mrs. Adams interviewed for the job, both the principal and he were pleased:

Michelle: When they came, did they have to be interviewed by the principal?

Chairperson: Oh, yes. When Mrs. Adams met with the principal, she had another interview at another school, and after talking with the principal, she decided not to go to the other interview. We were very happy. (Chairperson's interview 11/20/02)

The chairperson continued talking about how hard Mrs. Adams worked at the very beginning of her teaching at Greenville:

It was an adjustment for her, having one of the largest classes and we talked, and I said it's going to be different, but you can do it. I think that the biggest thing is that I see her growing and learning to deal with the large numbers of students in science. She has learned how to tailor her lessons to reach everybody with the classes being so large. But I think even with that, she's doing a good job. (Chairperson's interview 11/20/02)

Mrs. Terri Thomas

Mrs. Thomas' Background and Education

Immediately, just by talking to Mrs. Thomas on the telephone, I felt that I was drawn to her, detecting that she was a very interesting person—young, smart, and full of energy. I called her on the telephone and asked her if I could visit her classroom and talk with her about the possibility of her being a participant in the study. She was very pleasant and cooperative. We selected a day to meet; however, she called back the next day to postpone our meeting because she had to pick-up her children from the babysitter.

I decided that the best opportunity to talk with Mrs. Thomas would be to invite her out to dinner. She mentioned liking seafood, and that was fine. Mrs. Thomas asked to be picked-up on Friday evening after basketball practice. Mrs. Thomas proceeded to relate how much she looks forward to and enjoys playing basketball with the students and the male teachers on Fridays. She had been challenged by one of the male teachers and the male students to play basketball because according to the men, Mrs. Thomas said, “Girls can play basketball as well as the guys.” (After school interview 12/04/02)

Finally I met Mrs. Thomas, who was wearing jeans and a tee shirt. She was in what she called her “after-school attire.” She was very slim, athletic-looking, and full of energy. She also made it very clear that she loved seafood and her had a very big appetite. I realized that if I were going to get as much information as possible from this teacher, I must feed her a lot of seafood!

Mrs. Thomas was born and raised in an urban community in Newark, New Jersey, attended public school until the second grade, and then went into a gifted-and-talented program:

First grade I knew fourteen times tables. So when I went to second grade, I did third grade in the morning and second grade in the afternoon because math was in the morning. At the end of that year I tested into a gifted program and was in the gifted program the whole time. (in-class interview on Mrs. Thomas lunch break 11/10/02)

Mrs. Thomas is the youngest of 14 children whose parents raised them as Muslims. Her father died when she was ten years old, and her mother, who was raised as a Christian, converted back to Christianity. Mrs. Thomas graduated from Montclair State University in computer science education and moved to Baltimore because she just wanted to move. In her heart, she always had the desire to be a teacher:

I worked there for about a year and there was a woman who lived in my apartment building. I was discussing with her the fact that I wanted to teach. She told me about the Inspiring Leaders, not the Inspiring Leaders, the UMBC Project Height Support. Where you get the free Master's, certified for teaching, and you can teach at the same time. Within a couple of months. That's how I came into teaching. (in-class interview on Mrs. Thomas' lunch break 11/10/02)

Mrs. Thomas met someone who encouraged her to apply to teach in the Baltimore public schools. Contrary to what she studied in college, she wanted to teach in an urban middle school:

I knew I wanted to teach, but my background wasn't teaching, and then she showed me a way to teach without having to pay for it. When I first started teaching, I wasn't certified. I'm pretty good in every subject area except for Social Studies. So I said let me try out the elementary school. I needed. You know they were going to put us on teams. Somebody ought to be able to help me with that area, which they did. Since my certification is going to be K-8, I figured my second year I would try middle school to see which one I liked better. (in-class interview on Mrs. Thomas' lunch break 11/10/02)

Mrs. Thomas has been teaching for two years and is now in her third year in Baltimore. She began her first year teaching math. Throughout her interviews, she talked about how important math is for African American students. She strongly felt that

more teachers, especially teachers of African American descent, should major in science and mathematics as undergraduates in order to be qualified to teach science and mathematics to African American students in urban communities. Even though her favorite subject to teach is math, for the last two years she has been teaching science. When asked, she said that she preferred teaching math to science. Even though her first preference is math, she was committed to ensuring that her students grow to love science and understand the language of science:

I came here because science was the position that was open. Math is my love, but math and science go together. So I'm going to grow to love both of them. I never really liked biology, though. I can't explain why. Maybe it was the teacher and the way they gave it to me. You know? But math was always a game with me, and that's why I've grown to love math. If I had to teach something else, I probably wouldn't teach at all. But, these kids need science too. They need to understand the language of science. Someone who understands their way of speaking needs to help them to make that transfer. (Before school interview 03/10/03)

Mrs. Thomas received her Master's in education and received her administrative certificate in July 2003. During her undergraduate work, she didn't take any education courses. All of her courses were related to her program degree. According to Mrs. Thomas, while enrolled in her graduate program, she never received enough information on how to teach students of diverse backgrounds. Later, through her own research and two graduate education classes, she began to make sense of and became more aware of how important it is to make appropriate modifications to make math and science lessons culturally relevant. The instructors in graduate school talked about teaching in a multi-cultural classroom and teaching diversity in the classroom, but in her opinion not enough was said about working with urban African American students:

A lot of it was through surveys, which I've never used in the classroom because all I had was African American students. But maybe one or two classes...undergraduate level, they actually discussed how to work with kids of different races. (In-class interview on Mrs. Thomas' lunch break 11/22/02)

Mrs. Thomas made the point that her background was similar to the background and culture of the students she teaches; and because of that, she felt a special connection to her students that other teachers do not have. She felt that because she is a young, African American woman and her background is very similar to her students, she had been able to bond with them and understood their struggles to be successful. Mrs. Thomas emphasized the fact that it is her responsibility to share her experiences with her students so they will know that if she could learn science they can learn science as well:

Because I lived in projects just like they do and dealt with drug addictions, smoking and drinking, but from a different state, I'm a product of the same type of community, but I wasn't raised in Baltimore. They need to know that, they need to feel that. I am their role model. (continued after school interview 11/22/02)

Mrs. Thomas believed that educational programs and pre-service programs should be more intense. She repeated several times during her interviews her disappointment with the certification program she was in. It was a real task for her to push the instructors to concentrate more on the urban community. She seemed frustrated with the education system and how pre-service students are not taught enough about urban education:

I think that when the people do their externship during the last year, I think it shouldn't be all done in one city. I think you should go to different schools where you're actually exposed to. Because the classroom stuff is all well and good, but if you don't actually experience it, then you don't really know. (in-class interview on Mrs. Thomas lunch break 11/10/02)

Mrs. Thomas' Philosophy of Education

Mrs. Thomas expressed a very strong philosophy about education for all. She talked about how difficult it was for African American students to keep up and not fall behind in science. She regularly lectured her students about how important it is for them to take their education more seriously. Making sense of her culturally responsive teaching included her frequent lecture to her students reminding them of the history of the struggle for African Americans to obtain an education in America. For the students, it was a daily ritual. She became frustrated when her students seemed to ignore her:

I believe that education is important and that everyone should have one. Education is something that should not be taken for granted. Our people fought for many rights, one of which is to be educated, yet we don't take advantage of all of the opportunities that are afforded us. We need to learn as much as we can about whatever we can. (Mrs. Thomas' pre-interview 11/10/02)

Mrs. Thomas felt that she had learned lessons that she should share with her students that could benefit them in their career goals and that it was her responsibility to help her students to not make the mistakes she made. She saw herself in her students:

If I could do it over, I would pay more attention. I've realized, after years of misconception, that the grades you earn, beginning in high school, follow you to the end. Once you reach the age at which you are considered a young adult, everything that you do stays with you. It is never too late to turn around and try a little harder, or do a little better. But what we fail to realize that what was already done is already done. What we do from that point just averages into it, and we then need to work three to four times as hard just to be average. Ten times harder in science and math. (Mrs. Thomas' interview 11/10/02)

Mrs. Thomas wanted to make the point that it is not entirely the teacher's responsibility to motivate the student. Some of the responsibility must be the student's. The student must want to learn:

I had teachers during my youth that I accused of not doing a good job, and not making education very interesting. I've learned that it is not the teacher's job to make learning fun all of the time. It is

his/her job to make learning interesting and to spark our interest so we want to learn on our own. Had I applied myself more, education might have been more interesting. (interview 11/10/02)

Mrs. Thomas' Daily Routine and Research Schedule

Mrs. Thomas always characterized her day as requiring considerable energy. She said that in order to make her day work, she must get up around 5:30 a.m. to get her son and daughter off to school. She didn't have very far to drive, so she usually arrived at Greenville at about 7 every morning. Her daily research schedule has been compiled as Table-4.1 to simplify the many activities that occurred in her classroom over a period of months. Mrs. Thomas usually followed the Baltimore City Schools and Maryland State curriculum guidelines; however, the unusual number of snow days required some adjustments. In addition to the snow days, there were professional development days, holidays, her illness one week, and one week of jury duty.

A Typical Teaching Day in Mrs. Thomas' Science Classroom

Each of Mrs. Thomas' days started the same way. All teachers must go to each class to pick-up their students and chaperone them back to their classrooms, and then the lessons began. Below is a typical observed day in Mrs. Thomas's classroom.

A table shows the daily breakdown of Mrs. Thomas' in-class procedure and assisted me in following all of the activities in her class. Most of the time Mrs. Thomas had at least 24 students but sometimes gained other teachers' students due to their disciplinary problems, increasing the number to approximately thirty.

Mrs. Thomas' daily lessons were guided by her understanding of how to motivate her students. Her ideas were based on Brophy's (1986, 1987) recommendation that

teachers should motivate students by inducing curiosity and suspense, provide informative feedback, design instructional tasks to allow as much student autonomy as possible, and design learning tasks that produce a product.

Vignette (12/10/02)

Thomas: Every day that you show up without homework is a 0, so come prepared.
[noise]

Thomas: The homework from yesterday. I know it will not take you more than 15 minutes. [noise] Get busy. [noise]

Thomas: [noise] This is a word that we came across when we talked about [noise]). Now we're talking about being permeable. That means that they have little holes in them, the air pockets that allow the water to flow through. So, if I had something solid like a block, we have something like this, and then we have something like Swiss cheese where you see all the holes that go through. The water can run through the Swiss cheese because the holes are there, where it would be a little more difficult for the water to run through this rock. Okay. Swiss cheese is what we would use as an example of being permeable. We have the holes, to make the water run through easily. What type of rock or rock that is permeable weathers a lot quicker? [noise] Where this would mostly wear from the outside. [noise]. Circle [noise]. Now remember, right before the break we did the research on minerals and rocks. You remember what _____ looked like, which gave him a clear example of something that is permeable. This would mean it is porous. It has pores for the water to run through.

Thomas: You have the correct answer about [noise] to describe permeable, that has the holes. Permeable, that it has the holes.

Thomas: No, that is just the type of rock.

Thomas: On climate. How does the type of climate affect the way it weathers?

Thomas: Show me on page 45 where it says [noise]. Remember we don't just guess the answers [noise].

Thomas: So, she says _____ is when wet climate makes chemical _____.

Thomas: So the heat also _____. Now go back to the question. Why is the water necessary for the weathering to occur. This takes us back to the cell division section when you talk about why our bodies need water and our cells replicate. Water is necessary for chemical reaction. Okay. In the book on page 45 it states that when you have water you have chemical _____ occurs _____. Do not forget that [noise].

Student: So what is the answer to?

Thomas: People in the middle table in this group here come up. What I am going to give you is two cups. Two beakers and a cup. Inside the cup. [noise] Now what we are going to do is the discover activity on page 40 in your text. Turn to page 40.

[noise].

Thomas: Before you begin any activity you want to read through page 40. Page 40 discover. Read completely through. You want to take any precautions and read through the activity to make sure you have all of the requirements and follow the directions. Mr. [student's name] read.

Student: [students reading out of text]

Thomas: So, we have the _____ tablet, which is in the cup. We have the [noise] which is in one of the beakers. [noise]

Thomas: Is there anything that we are missing for the activity?

Thomas: Dr. [student's name]. Do we have everything required to perform the activity?

Thomas: Attorney [student's name] please stay on task. I have asked the same question several times. Okay. Do we have everything required to perform the activity? No, we need the warm water.

Thomas: The directions say, the directions read actually, that you are going to pour 100 ml of water into one beaker. Note that the beaker [noise] take a look at the measurements so you know how far up you are pouring the water. Once the water is poured in make sure that the person with the stopwatch begins the time. [noise]. Before you do it make sure that it is the ___ one and not the brown one. Better read the directions to make sure you are doing it exactly. [noise]

Thomas: Certain people here need to _____ in school. You are being extremely rude, and when it is your turn you are going to be frustrated when someone speaks over you.

Thomas: I didn't say Mr. [student's name], so you must be taking it personally because you are the person who is speaking. Thank you. [(student's name), please share.

Thomas Go ahead, Mr. [student's name].
[too much background noise to understand]

Thomas: Reading from questions. Do you agree or disagree.

Student: I disagree, because the little crumbs, they disappeared in that. The crumbs at the bottom.

Thomas: What are you looking for if the tablets are not present.

Thomas: Rule three, do we agree with or disagree.

Thomas: Okay, we are going to take thirty minutes for a twenty minute activity because \ we are waiting for people to pay attention, and then we are going to end up doing a bunch of book work, and I want to know why are we going to do stuff like this, why are we doing it when you are not going to learn anything from it. The whole purpose is, when you do something you learn a lot more than when you read it. If I ask you a question tomorrow about weathering, you will probably remember more about what we learned with this activity than you would about the four or five pages that you read. There is no reason to do it if you are not going to pay attention when we are doing it. Hold on a second.

Thomas: _____ gave an example of the Swiss cheese and the cube. How the Swiss cheese has the holes.

Student: We never eat Swiss cheese in my house. Black people don't know what Swiss cheese is. White people eat Swiss cheese. Black people eat yellow cheese. (giggle)

Thomas: [name], African Americans do eat many different kinds of foods and they do eat Swiss cheese. Go over to the Internet. Use my laptop. Look up Swiss cheese and the last 10 minutes of class I want you to give the class a report on Swiss cheese.

Student: What?

Thomas: You heard me. Now back to what we were talking about. Why did it happen? Remember what I said; you probably don't because it was a long time ago, but I will repeat it. When you are performing [noise] you do not get the result you are looking for if you do not follow the steps in order because [noise] and maybe there was a different temperature of your water. Remember we talked about what made your weather go [noise]. What type of faucet did you use when you went over there?

Student: Room temperature when we first went over there.

Thomas: So the temperature [noise]. In the experiment there is only one thing that changes. That will be a topic for discussion. Do you have a question?

Thomas: On your homework last night you were supposed to do your vocabulary sheet. There were seven words. Quickly, we are going to go through the words to make sure you have them down because some people had problems with the homework and did only six words or four words. The words that you should have come across in your reading.

Thomas: Yes, we can. One person from each group please carry the glass bottles over to the sink, dump out the water and rinse out the beakers, and you can leave them on the top.

Thomas: If you are looking at the bottom of page 41, there is a highlighted sentence.

Thomas: No problems with the discussion, just make sure that the words are _____. Study the words from the vocabulary. We have weathering, erosion, mechanical _____, *abrasion* is a word that most of you skipped. You will find *abrasion* at the bottom of page 41 right after the highlighted sentence. [noise] (Mrs. Thomas was teaching a earth science laboratory procedure. 12/10/02)

Mrs. Thomas' Students' In-Class Activity Schedule

Mrs. Thomas arrived at school every morning at about 7 a.m. and spent the first hour of the morning preparing for her first class, sometimes talking to a parent who unexpectedly stopped in to speak to her about a concern that cannot wait for a scheduled

appointment or chatting with another teacher in the hall. Occasionally, one of her students came in early for help in science or math. Mrs. Thomas seemed always prepared for her students. She very rarely took a sick day, and during this study took only one day for jury duty.

A coding chart was developed to keep an every-10-minutes record of all the activities in each teacher's classes (see Table 4.). The class period on Mondays was shorter (60 minutes) than those on Tuesday to Friday (80 minutes). The coding system allowed me to determine how many minutes Mrs. Thomas spent on each activity. The chart was based on 30 observations of Mrs. Thomas' science classroom.

For each class period, all teachers at the end of each class period chaperoned their entire class to the next class and picked-up students in their next classes. This process seemed to take away minutes from the next class, and many of the classes that were observed started at least 10 minutes late. The class usually ended earlier than the scheduled 80 minutes to allow each teacher to chaperone the students to the next class. It was always the responsibility of the students to clean and prepare their desks for the next class following them.

All of Mrs. Thomas' science classes started with the Warm-up Question for the day, usually about 15-20 minutes. Once the students got started, the majority of class time was spent with the teacher teaching, talking to the students, reading aloud, writing on the blackboard, demonstrating a topic. She spent a lot of time walking around the room talking to individual students and asking questions of individual students. Once the teaching started, the students asked many questions and often worked in groups. Usually group activities occurred in the Computer Lab or during the Discovery activities. During

the Discovery activity, students were allowed to walk around the classroom and converse with students in other groups.

Between the teaching and learning, there were a few students who regularly sneaked out of class, and occasionally the Science Chairperson/Academic Coach stopped by either to observe the class or to ask the teacher a question.

Mrs. Thomas' Beliefs about the Education of Her Students

Mrs. Thomas believed that her students could all be successful if the educational system incorporated programs into the curriculum that would help build African American students' self-esteem. Mrs. Thomas talked about the fact that the teachers played an important role in the students' self-development. She believed that the individual teachers were just as responsible as the parents and administrators for ensuring the maximum development of each of the students. Mrs. Thomas believed that each child could learn and each child wanted to learn:

What I've learned is that a lot of the reasons that our African American kids are not successful are not even that they can't learn; it is that they don't believe in themselves. I think that as part of education, we need to develop some type of character education, self-esteem, you know, self-help-type courses that should be not just electives; this should be a requirement. Where kids learn that the socioeconomic status can determine how well they do because a lot of the kids will say, well, you know, those kids in the county, they're doing well because they have all these things. It's not that they have all these things; it's that they make use of what they have. You know. If they would just learn to make use of what they have and believe that what they have is good enough.

Michelle: Right.

Mrs. Thomas: Then they would do a whole lot better.

Mrs. Thomas talked about teachers' roles in building students' self-esteem:

Michelle: Like the teachers. The professional . . .

Mrs. Thomas: Oh, that's just. That's a story in itself. The kids. I have heard horror stories about the way that my colleagues speak to them, and why they don't want to go to class, and how they do all the work, but because the teacher doesn't like them, they don't get the good grade. You know, who cares what high school I'll go to because if the teacher doesn't like me, I'm not going to do well. It's just as important as what we think of them, if not more important than what they think of themselves. If I sit here and cram into their head, you know that you're never gonna be anything. You can't do anything with yourself. You know...

Michelle: The teachers say these things to them?

Thomas: Yes. Yes. This is what the kids have told me, and I've actually heard teachers use profanity and talk down to the kids. You know, it's really upsetting to me. I had a girl crying on Friday because there are students, you know, spreading rumors about her. The teacher was actually helping it to continue. I was here in tears with her because the girl... I keep in touch with her mother through e-mail. I haven't met her in person yet. Anytime I want to communicate with her, she sends me e-mails. I get back and forth with her. She's doing such a wonderful job with this girl. I mean top-notch 95-across-the-board grade. It's like killing me the way she feels about herself. Well, you know, I did want to go to Western, but I don't think I want to go to Western now because they're saying all this stuff about me, and I'm gonna have to deal with all these girls. Western is a wonderful school. Because people are saying stuff about her, she would rather go to a zone school than a citywide school.

Michelle: Which would be worse?

Thomas: Right. It's not just because of her peers, but because of what somebody who's supposed to be molding her is doing. So, you know.

Michelle: Do you think you should have a talk with the teacher?

Thomas: Yes, yes I do. I spoke with her and she was just like... really. She was torn. She was torn to pieces. So, you know, I'm gonna discuss it in the team meeting in general so that the teacher doesn't take offense to it because we've had several issues with that one particular teacher. (After work interview 11/22/02)

Mrs. Thomas also believed that her religion, Moslem and Christianity, played a role in how she related to her students. She grew up in a very religious family that, until she was 10, practiced the Muslin religion. She felt that the religion helped to guide her in relating to her students and showing them how to respect themselves. Mrs. Thomas had

pictures all over the classroom of her family—her mother, father, sisters and brothers, her husband, and her children. She invited all of the students to bring pictures of their families to show the class:

Michelle: Oh, okay. Let me ask you another question that emerged from our conversation. I'm trying to see if it plays any role in your relationship with your students, your being raised a Muslim?

Thomas: Yeah, it does, but, you know, in school you sort of have to separate the religion from the school because, you know, not everyone being may come from the same background. Just thinking about my upbringing, it was like the man walked in front of the woman and women couldn't meet the eyes. It sort of . . .that's what made me not want to remain a Muslim because my Father, I don't think he raised me to be a Muslim woman. He always taught me that I was the same as any man, and I could do anything he did. You know, not to stand behind him. He taught me opposite of everything that he was teaching me about the religion. He gave me the spiritual aspect of it. You know, so I learned to worship my Lord and give thanks and know that there is a higher power. He gave me the choices. He taught me about the different other religions. I went to church with my aunt. Although I went to Muslim school until I was 10 years old. And, you know now it's like I look at the girls, and they sort of act like Muslim women in terms of thinking that the guy has to be in control of them, and they always have to listen to what he says, and do what he wants them to do. You know, it sort of takes me back to what remember from being a child. I felt like you have to do . . . (interview with Mrs. Thomas 03/10/03)

Mrs. Thomas made an attempt to build a positive and supportive learning environment in her classroom by using her own experiences. She felt that the students' sharing their culture and their family life within the culture of the science classroom allowed her to gain their confidence and made them more open to learning. At the same time, she tried to demonstrate respect. She asked the students questions that allowed them to share their feeling openly. Steele (1992, 1997):

Make students feel they are valued and that their culture is valued.
Include minority experience in the mainstream curriculum, not limiting it just to separate programs or special times of the year.

Michelle: How does that play out in the classroom in the way you're teaching? When you're teaching Science?

Thomas: In terms of group, they always want the boy to be in charge. They always want the boy to be the speaker. I tell them, you know the same thing he does, why is it that you're always depending on this one particular person. Or they are always separating all guys and all girls. Why is it that we can't have a mixed group? What's the problem? Can we not communicate? You know, it's like they're shutting down on each other. I want them to understand that just not in the science class, but everything you do you have to be able to communicate. And that's with your religion, with your education, with your job, career, just everything. (03/10/02)

Mrs. Thomas' Attitudes and Perceptions

Mrs. Thomas talked at length about how difficult science can be for the students and how hard it is for them to learn new words, but she felt that students still need to want to learn and must be encouraged by the teacher:

As an educator, I've realized that not all things can be fun, and you get what you give. If you come to school with the attitude that someone owes you something, then you are not really looking to learn. You have the mindset that someone is going to give something to you. Students need to come to school with the willingness to accept what teachers have to offer, and in turn, contribute their own experiences. Being a teacher does not mean that I know everything. It just means that I have a vast amount of knowledge in the area in which I am teaching, and that I am learning on a daily basis, just as are the students. Sometimes students know things that I don't, and can offer a way for me to better assist someone else. (interview on Mrs. Thomas lunch 1/13/03)

Mrs. Thomas felt that on most indicators and measurements, the school system has failed the students in the urban community:

I believe that the standards that are set for today's students are being constantly lowered. Lowering the standards only causes the students to work less. As an educator, I've been told that I am expected to set high standards for students. Not so high that the standard is unattainable, but high enough to get the students motivated to work and be proud of their accomplishments when they reach or exceed the standard. Currently, students are only expected to score in the 23rd percentile on standardized tests. Earning a score of 23% means that the student is below grade-level, but that is the standard set for promotion. Students can fail all classes and pass the standardized test and be promoted to the next grade-level. Students in the 5th grade, reading on the 2nd grade level, are being promoted

to middle school. Students in high school don't know basic multiplication facts, and many of them cannot pass the Maryland Functional Math Test, which is written on a 5th grade mathematics level. It is even more upsetting when I am sitting in a college classroom and I can differentiate between those who attended school in the City and those who did not, based on the way they read and speak. (interview on Mrs. Thomas' lunch break)

Mrs. Thomas' Use of Tools and Technology

Some educators are not well-prepared to educate. We are required to offer students exposure to technology, yet many teachers are unaware of how to use a scientific or graphic calculator, let alone a computer. Technology also includes the overhead projector, books on tape, videotapes for building background, etc., but the focus has been computers and calculators. For those who are knowledgeable about computers, there are not enough computers for the students to use, and computer time is not a part of the schedule. It is quite unrealistic to expect teachers to effectively complete a Warm-Up, Read-Aloud, Mini-Lesson, Independent Practice for a skill, Share-out, and provide ample opportunity on the computer. Students need time to become familiar with the computer in order to word process and do research. As I said before, I don't know everything, although many students have that belief, but I want student to take the time to double-check what I say. Find out for him/herself if what is being taught is correct, and then apply it. (interview on Mrs. Thomas' lunch break)

Mrs. Thomas believed that administration and the educational community must understand that effective teaching starts with the students. Her point was that teaching is not always about curriculum, but more importantly about relationships that teachers have with their students and the way we teach that profoundly affects the students:

The education system will improve when educators take back the schools. We are in such fear about what others will say concerning what we do in our classrooms. The underlying question in education should be who knows the students best? Children spend the majority of their waking hours in classrooms with teachers. We get to know them very well—some even personally. We know their strengths and areas of need based on formal and informal evaluations, yet we are told what our students need by someone who spends little if any time with them. We need to stand behind our beliefs and give the children what they need to be better prepared. We also have a difficult time communicating with parents. Parents spend much time complaining about the lack of concern of teachers and the quality of education that is being received in other school districts, but they don't

consider the lack of enthusiasm of the students, including their own. Teachers come to school well-prepared, with energetic lessons to get the students involved in their own education. Students come to school wondering what time is lunch, and what their friends did yesterday after school. Most of the problem is not due to the lack of concern of the teacher, but to the lack of preparation and concern of the students. Students need to take ownership of their education. (interview on Mrs. Thomas' lunch break)

Mrs. Thomas' Verbal and Non-Verbal Communication

Mrs. Thomas was very open, free-flowing, and fun. When her students entered the classroom, they seemed to pick-up her openness and freedom. She picked-up the students from their last class and escorted them to her science classroom. She moved around the classroom as if she were modeling in a fashion show. She hugged, touched, and played with students. All of her students were called by the profession or careers that they aspired to.

Mrs. Thomas immediately began her class with a warm-up question. Students usually continued talking to each other, so she stopped the class and asked the student who was talking to leave the classroom and go to another teacher's class. The other students playfully continued the warm-up and anxiously waited for Mrs. Thomas to start the lessons. Once started, Mrs. Thomas moved around the classroom checking on students' work and their assignments and readily answering questions. At some point in the class, she started to dance, which the students greatly enjoyed since usually was the dance style the students do. When asked about her dancing, she said that she had to change her approach to the way she taught so that the students could see that she was learning along with them, and science class should be fun and exciting. Her dancing occurred several times during the study.

Mohatt and Erickson (1981) investigated classroom interactions in the Native American community that closely resembled the African American community. They revealed that teachers who are most effective in communicating with students use an interactional style that the authors term “culturally congruent.” They say, “This notion of culturally congruent speech patterns, communication styles, and participation structures resemble more closely those of the students’ own culture.”

Michelle: Anyway. When I first started, again I’m repeating what I said before. When I first started, I was observing how...when you move around the classroom...in the midst of your teaching, you started dancing. I recognized it as an African tribal dance. That was a new piece for me and I just wanted you...to get your explanation of why you do that. Also, I just want to remind you that I don’t share who you are or anything, but when I’m talking to other students at College Park, I mention that I have a teacher that I’m doing research with and she started dancing. And they all said, ‘Find out why she did that?’ So I just wanted to know why you did that?

Thomas: Well, as you know, it’s amazing that when we were talking about motion and energy, and I know that, you know, energy is not create or destroy the transfer. I know that when kids get something to eat, and they get happy, the first thing they do is start dancing. You notice any time a child has food, they bounce, and they dance, and they start smiling. And when I get excited in class, I see that my class is getting down, and I start bouncing around. I always have music in my head. I don’t know why, but you know, I start bouncing around, and it sort of rubs off on them. It picks them up.

Michelle: And the dance that you do is almost similar to the dancing that they do.

Thomas: Well, I’m not that old. I’m not that much older. . .and I love African dances and urban music.

Michelle: Right, right. When we talk about cultural response teaching and energy, I’m wondering how you feel about how a dance fits in with cultural responsibility. (03/10/03)

Mrs. Thomas used her knowledge of the culture of the students to build connections that the students could understand. She was able to make appropriate teaching and learning adaptations that connected nonverbal communications to students who were struggling to learn:

I mean that's the way that we learned a lot. You know, our ancestors from Africa, they told stories and they. . . you know, lot of oral or verbal telling of the stories or reenactment through dance and theater and things like that. So, I mean, I guess it's just by nature and why not use these stories in science? (03/10/03)

Mrs. Thomas felt that her age was an additional advantage in her science classroom. She liked to dance and in some cases enjoyed the same music and socializing that her students enjoyed:

Michelle: Are you a dance teacher?

Thomas: No. I always... I like to dance, but I've always wanted to join the Alvin Ailey Dance Company. I like the way they dance and stuff. It moves you. It moves you...on the inside. The kids...like, you know, there's this one student who used to be in my 04 class who's now in 03, and she does this little dance that always makes me laugh. Every time she comes into the class, I do the little dance and the whole class gets all excited. I guess it's because I'm not much older than them. When they first see me, they think of me as teacher, and it sort of brings me a little bit closer to their level, it's easier for them

Michelle: Will that bring respect? And also do you think that you're doing that will make them kind of respectful, by identifying with you and what you're going in the class. Do you think that all plays together?

Thomas: I think it helps us to communicate and relate a little bit. Because just listen to how they talk about the other teachers who are quite different. It's not even actually the age difference. Just the way they talk about the other teachers, and when I observe the other teachers' interactions with them. It's always, I'm here and you're there, you know, the big separation. I feel like, you know, other than myself and the math teacher on the other side, we're the only ones that really do the extracurricular with them. You know, they stay after school with us. They come hang out with us. We go to the ball games, you know. If I run into the parents, like my daughter's Babysitter cancelled on me on Friday, and one of my student's parents watched my kids for me. (post-interview 04/03/03)

My First Day in Mrs. Thomas' Science Classroom

I first met Mrs. Thomas' entire science class while they were in the middle of a science lesson. I entered the classroom from the back door. Very few students paid

much attention to me just sitting in the back because they were whispering to their partners, watching the teacher, or reading. After spending many months in the classroom, I began to realize that the students were used to having visitors pop in throughout the class period. It wasn't a big deal to them. What I noticed immediately was that these kids were really large—big, tall, well-built boys and girls. Some looked as though they belonged in high school. Several boys were at least six feet tall.

Mrs. Thomas looked-up from her desk situated in the middle of the classroom close to the window where she could see the students on her left and her right and nodded her head to acknowledge to me that she saw me and also that she welcomed me into the classroom environment.

At my second visit to the classroom, Mrs. Thomas introduced me to the class. It took a few minutes to get them quiet, but eventually we had all of their attention. I introduced myself and told them why I was there:

Michelle: Good morning, students... [very few respond]; Good morning, students [more respond] How are you doing? You're not sleeping are you? [a few said no] My name is Michelle Harris Bondima, and I just want to talk to you for just a few minutes. Do you mind? [most say they don't] Let me tell you some things about myself, and later on I want you to tell me some things about you, ok? [they all say ok] I am a Professor at Baltimore City Community College.

Student: Where is that college?

[I give a brief description of where the college is located]

Michelle: Do you know what a professor does at a college?

Student: A professor is like our teacher, only you teach in college.

Michelle: Great. You are exactly right. Let me tell you why I am here. I am working on my doctorate at the University of Maryland in College Park and a part of my studies requires that I observe your teacher and you while you are working. Your teacher has been kind enough to allow me to do this study in your classroom and chose you guys for me to observe. What do you think about that? [they applaud] (my random conversation with the student 10/28/02)

After explaining to the students what I planned to do in their science class, the teacher proceeded to re-explain. As previously mentioned, the students were given permission forms to be signed by their parents. Students were told that those who brought their forms back on-time signed by their parents or guardian would be able to participate in a pizza party. As it turned out, even though some of the students did not turn in the forms, all were allowed to have pizza. Students who returned the forms were given an Assent Form to sign, allowing them to participate in the study and giving me permission to observe and interview them. Of the 32 who were given the forms, 24 returned them. The Student Surveys were distributed to all of the students who had submitted the Parent/Guardian forms. Students who had not submitted their forms were allowed to continue working on their Warn-up assignment. The survey took about 50 minutes because students continued to arrive late. One female student took 50 minutes to fill-out the form.

The 24 students were asked to answer each question as thoroughly as possible. Each of the questions required more than a *yes* or *no* answer. Answers could be in an essay form. Students were allowed to ask questions and were encouraged to feel free to ask for clarification. Many of the students who took the survey seemed uncomfortable at the beginning and a few reluctant to answer all of the questions, and I first thought that they just didn't want to be bothered. While they worked on the survey, I walked around the classroom to see if any of them needed help. After about 10 minutes, the class was very quiet and deep into the survey. Mrs. Thomas told me that most of the students were used to taking surveys because Baltimore City was always trying out new curriculums and running studies and subjecting the students to the changes.

Mrs. Thomas's Students

Mrs. Thomas' Students' Community and Home Environment

Most of Mrs. Thomas' students were born between 1987 and 1990, which meant that most of them were 13, 14, or 15. Many lived in the area around the school that was considered to be 'the projects.' However, several of the students had moved out of the area due to situations out of their control: either they moved to another house, moved in with a family member other than their mother or father, were placed in foster care, or for reasons unknown to the school. The students who lived out of the area had to take public transportation to school. A few of the students caught a ride to school from family members. Many lived with family members other than their mother and father, such as grandparents or aunts.

One student commented, "I have a little brother name Jack. I have lived with my great aunt since I was 4 years old. My mom died November 5, 2001." A second student commented, "One of the things from my background that you would probably know about is that my mother passed away and I live with my sisters and my brothers." Many of the students were very verbal about the fact that their lives were not happy ones: "I live in a horrible community." (Responses from the students' surveys 11/20/03)

During the entire study, many students shared the fact that they lived with people other than their biological family members. Some were living in foster care or were homeless. However, a few students felt that they were not as bad-off as some of their classmates. Another student commented, "My name is ___ I live in a ok neighborhood even though there's crime and drugs." A fourth student: "I don't feel safe in my neighborhood but I know most of the people." Another said, "I live with my mother,

father, sister, brother, grandmother, and grandfather. I don't have many friends. I just call them associates. I live in a community that has graffiti on poles and walls.”

(Responses from the students' surveys 11/20/03)

Most students had much to say about their community, their family, and friends. Some felt the need to share the fact that even though they had gone through a great deal in their lives, they were 'hanging-in': "Hello my name is _____. I have gone through a lot of things in my life like growing up with no mother or father that's why I am staying in school.”

The students were very open in sharing information about their personal lives. Most in Mrs. Thomas' class did not have the traditional so-called "All-American Family" life. Many were living in untraditional situations, such as foster care, being raised by a grandparent or relative, having been incarcerated, or having lived in a shelter for the homeless.

Mrs. Thomas' Students' Career Goals

Many of Mrs. Thomas' students were very innovative and positive about their future goals. They seemed to feel they could accomplish all their goals. Mrs. Thomas required each student to set goals and addressed each student by the name of what they aspired to be as adults: Mr., Mrs., Dr., Minister, Dean, Professor, President, *etc.* Some stated the following goals:

“My goal in life is to go college and get a job while I am in college.”

“I have lot of goals one is to be an zoologist, a basketball player, and football player.”

“My career goals is to be a construction worker.”

“Fix cars or go to college or fix computer.”

“I would like to attend college for 4 years. Then I would like to go into the music industry. My goals in life are to become a singer a very highly way to interact.”

“I would like to go to college get a job or some training to be a pediatrician.”

“I want to go to college but I really don’t know what I want to become probably a dancer.”

“My career goals are to be a veterinarian and owner of a sanctuary. Yes I want to go to college. I want to work at a pet shop.”

“I want to own a business and be a crime scene investigator or a lawyer.”

“I would like to design the next Lincoln Ext.”

“I would like to be teacher, Math/Science. I would like to pass all my grades.”

“My career goals is to own my own business. When I have that I want to have clothes, hair and men hair cuts in it.”

“Career goals...My goal in life is to be a teacher. I plan on attending a 4 year college before I start teaching. And while I’m teaching to go to school for accounting.”

“My career goals is to go to college and take up medicine and nursing. I want to work on hearts when I grow up even bigger.”

“I want to be a lot of this but mostly an actor. Also a pediatrician, singer, dancer, teacher, model, fashion designer and I want to go to college for as many as possible. Maybe all.”

“Yes, I do want to go to college and get a job I want to be a pediatrician or a hair dresser.”

“My career goals are to be a doctor, lawyer, meteorologist, basketball, baseball, and a sportscaster.”

“My career goals is to become an artist. I practice almost everyday.”

“My career goals are to be a singer, and a lawyer, yes I do want to go to college.”

“My goals are to major in business management. I do plan to go to college and be successful at what I do.”

“My career goals are to be a counselor take all my classes graduate from college and be a counselor.”

“My career goals are I want to be an actress/model. I do want to go to college, and I also want to get a job.”

“To go to City High School, and to get a job.”

“I want to go to college, and from college I want to go to the NBA.”

“Go to college and play pro-football.”

(Responses from the students’ surveys 11/20/03)

All but one student seemed to have set some sort of goals. There was never a discussion about whether they could achieve those goals. Most thought that if that’s what they wanted to do, there shouldn’t be any problems achieving that goal:

Michelle: What are your goals? What do you want to be when you grow up?

QQ: A scientist and a lawyer.

Michelle: A scientist and a lawyer? That’s two different careers.

QQ: A scientist can be like a Ph.D in science and it can be in astronomy. (Responses from the students’ surveys 11/20/03)

Mrs. Thomas’ Students’ School and Science Classroom Environment

The historical presence of African Americans in science was made explicit in Mrs. Thomas’ classroom. Pictures of famous African Americans—scientists, entertainers, doctors, lawyers—were posted on bulletin boards around the room. What was interesting to me was photos of Mrs. Thomas’ immediate family members and her extended family. When asked about the pictures, she said, “I invited the students, if they wanted, to bring pictures of their family members to class. When the students brought their family pictures in, I used that opportunity to talk about DNA and biology.”

In the corridor of the school were pictures of famous African Americans who had contributed significantly to African American culture and to American culture generally. (see Appendix). Around the classroom, in addition to the science books used for the science units, were books written by African Americans. The students were allowed and encouraged to read these books when they finished their Warm-Up exercise or if they had completed their assignments.

Only if given special permission by the teacher were students allowed to take books out of the classroom. Most of the science books and materials on display were bought by Mrs. Thomas (see Appendix D). All of the books listed were brought by her from her personal collection.

Each student was given the opportunity to communicate with me each day if there were questions or concerns. I sat at a computer table in the rear of the classroom in view of the students, who sat at tables of four in front of me, each with a partner. From her desk in the middle of the room close to the window, the teacher always had a full view of each student. She could move around almost in a circle. The blackboard was situated in front so that all students could view it and the teacher without difficulty.

When the students entered the classroom, the teacher always had an outline of the daily procedure. Throughout the class, Mrs. Thomas had to stop teaching to discipline certain students, and often she sent those students to the office or to another classroom. One young man had been sent to the office so many times that whenever he got caught talking, he simply got up on his own and headed out the door to the office. A few minutes later, he returned.

Class schedules were basically the same each day except Monday: Monday,

12:05-1:15 p.m., 70 minutes; Tuesday to Friday, 12:35-1:55 p.m., 80 minutes. Each class began with a 15 minute warm-up: Warm-up question for the day (11/18/02): How do magnetic strips form on the ocean floor? Why are these strips significant? The warm-up question generally took about 25 minutes before the teacher got into the lesson for the day. Generally, Mrs. Thomas spent the next 45 minutes lecturing and asking questions, always addressing each of the students by his/her career goals or by Mr. or Miss: several students were addressed by the title *doctor* or *attorney*. Mrs. Thomas explained that she did this because it gave them pride. She was very “touchy-feely.” She put her hands on each of the student’s shoulders while she talked. They didn’t seem to mind. As she moved around the classroom, she held individual conversations with each of the students and with each group while they wrote in their journals or had quiet time. When her back was turned on several occasions, students sneaked out of the room, watched to see if she was looking, and then sneaked back in. They seemed not to care that I was sitting in the rear of the classroom.

Mrs. Thomas’ Students’ Understanding of Science

When I asked the students about their feelings about their understanding of science, there were mixed responses. Some students liked science and some were disappointed. Some felt that this year was more challenging with Mrs. Thomas than it had been with the teacher in the 7th grade. All whom I interviewed attributed their understanding of science to the teacher. They expressed that science was not their favorite subject. Students’ comments follow:

“This year was more challenging than last year; I really had to study.”

“I think I have a good understanding in science because I have a good teacher.”

“I have an ok outlook on science. It’s not my best class but because of the teacher, understand it a lot better than last year.” (open ended interview with the students in during science class 11/15/02)

‘AJ’ felt that Mrs. Thomas always tried to simplify her science lessons so that the students could understand: “She’s a real nice teacher. She tries to put things as simple as she can, and she really teach science.” (AJ’s personal student interview in class 12/18/03)

Most of the students thought they had a good understanding of science and made clear that they had problems understanding words and terms and were willing to study harder, that some days were good and some not so good in science. They seemed to know where their problems in science centered and what they needed to do to solve them. They also seemed to be clear about their understanding of science. Of the 24 students surveyed, the majority felt good about their understanding of science. Some of their comments:

“I have a okay understanding of science because some of the words be confusing.”

“No I don’t have a weak or strong feeling about science.”

“Yes I feel I have a strong understanding of science because I can relate to science a lot to be science is every day.”

“I have a strong understanding of science because I can learn and understand quickly.”

“I feel that I have a “good” understanding of science I just have to work on my vocabulary and keep re-reading the sections that we are on and have done.”

“I think I have a ok understanding in science because I know something about it and something I don’t.”

“I feel I have a weak understanding of science I often forget data and info.”

“No I do not because its one of my best subjects but I forget once in a while.”

“I feel strong because I know I can do it.”

“I feel that I know some what about science I know a little bit but I would like to know more.”

“I have an ok outlook of science. It’s not my best class but because of the teacher I understand it a lot better than last year.”

“I feel like I have a good understanding of science, but not as good as I want it to be.”

“I think I have an okay understanding because some things I understand but then some things I don’t.”

“I sometimes have both because sometimes I have good days and bad.”

“I think I have a strongness in science because I knew a lot before I came here.”

“I have a ok understanding of science.”

“I think I have a okay understanding about science because something I understand others I don’t.”

“I have an almost strong feeling about science but I have a 92 average in this class so I do ok.”

“Sometimes it feel like I understand sometimes and then I don’t so I go home and study.”

“I have a okay understanding of science because I understand a lot but some things I need more explaining on.”

“I feel I’m strong in science.”

“I think I have a strong understanding about science, because I like science.”

“No because I don’t understand it.”

“I have a strong understanding of science.”

(Student surveys given during science class 11/12/02)

When asked about how often they thought about science, most students admitted that science was not on their minds after leaving the science classroom; they started thinking about science when they returned home and had to do homework. One student

said, "I don't think about science outside of this class." However, a few students mentioned that they thought about science often outside of class. Several remarks:

"I think about science because math is my favorite subject."

"I always think about science through the whole day because science is fun and easy."

"I love science except for last year because we really didn't learn. But other than that I always wanted to know about science my favorite part is the experience." (Responses from the students' surveys 11/20/03)

Library assignments were not given frequently by Mrs. Thomas. Students were allowed extra time to complete the assignment because of the availability of neighborhood libraries. Because of high crime and violence, the teacher didn't want the students out late at night. About half the students in Mrs. Thomas' class had access to a library near their neighborhood. If they were given a home assignment that required science research, they would not be able to complete the project in a timely manner due to the inconvenience of getting to a library. A few students' comments follow:

"Last year I use to go to the library now I really don't need to go because I understand what I am doing."

"I don't go to the library a lot, I go like once a year."

"I go lesser each year."

"I go to the library every 3 weeks."

(students responses from surveys given during science class 11/15/02)

However, students who used the library often did so when visiting friends or family members who lived near a library. One student said, "I don't go to the library at all. I go when I am visiting my grandmother." Also, those students who used the library had fond things to say about it. One student commented,

I used the library everyday because I loved working on a computer and reading books by Black scientist. I don't go to the library unless I am doing a report or something. (student interview during science class 11/15/03)

Students actively involved in outreach programs which they had been encouraged by Mrs. Thomas to attend also go to the library regularly. The outreach programs included library assignments in the curriculum. As one student said, "Last year I used the library every Thursday. It was a program." (students' interviews during science class 11/15/03)

Only two students talked about having access to a computer at home to do library assignments; however, one mentioned that he couldn't use the computer most of the time because the gas and electric were sometimes cut-off.

Mrs. Thomas' Students' Understanding of Science and Perception of Their Accomplishments in Science

When Mrs. Thomas' students talked about their perceptions of how they were doing in science, most felt they were doing well. They were very clear about why they knew that they were doing well. Some attributed it to the teacher: "I feel, so far, that I am doing excellent in this class. Before, like in September, I thought that I was doing bad but Mrs. Thomas had helped me improve."

Other students attributed their success in science to hard work, studying, and understanding science. Some student comments:

"I am doing great in my science class because I understand it."

"I think I am doing a wonderful job I do all my work."

"I think I am doing good because I do all my work and I get good grades on them."

“I feel I’m doing fine. You’ll do fine if you study.”

“I am doing so wonderfully in science class. I got a 98 in this class for first quarter.”

“Good because I do all of my work.”

“I’m doing great because I got a 98.”

“I’m doing good because I have a 92.”

(students’ interview during science class 11/15/03)

Mrs. Thomas’ Six Students’ Perceptions of Her Teaching and of Their Accomplishments in Science

Mrs. Thomas’ students had very positive things to say about how they felt about her personally and about her teaching. The six students she selected and the one selected by me gave their opinions of her teaching and whether it helped them in science.

Interviews with Carol, A.J., Bobbi, Mary, John, Linda, and Michael found the students very excited to talk about their teacher, the school, and science. A.J. was very excited to have been chosen. He seemed very mature and clear about his career goals. In the beginning, he talked about how much he enjoyed science; however, later in the unit, he had other thoughts, just rattling-on about how he felt about science and the teacher. I had to draw-out more of his feelings in the beginning.

A.J.: I like Science. Science is not. I don’t like. Like I enjoy it, but like at the same time, Science is not one of the things I would really like to do in a way. But at the same time, I enjoy everything about Science.

Michelle: Okay.

A.J.: I mean I love every little detail about Science because you know, Science is interesting. I look at it a different way. How everything relates to Science you know.

Michelle: Right.

A.J.: So I do like Science. I mean Science is cool, and like I said, it's not really...The teacher helps me to look at it in different ways...something I really don't want to do, but at the same time, I really enjoy it. I mean if it comes to that point in time that I have to do it, I would do it. So basically, I really do like Science.

Michelle: Then you are the type of person we need in Science. Everywhere you go... When you start getting in high school, tell us your teachers are going to try and pull you into that Science. You know Science is so exact. You know?

A.J.: Yes. (personal interview during classroom 11/20/02)

At the beginning of the study, A.J. was more concerned about his future after the eighth grade. He had applied to two of Baltimore's top citywide high schools and was waiting for a response. Even though he loved science, he wasn't quite sure that he wanted to spend his future or devote his career to science. Periodically, I checked in with A.J. to see how he was doing in Mrs. Thomas' class. He was unsure "between being a meteorologist or a neurologist." He thought that his teacher was responsible for his love of science:

Michelle: What is it that your teacher does that makes you still want to be a meteorologist or a neurologist? How does she encourage you?

A.J.: She always say, "keep on doing what you are doing. Just because somebody said you can't be that, don't listen to them. Just keep on doing what you want to do and you can succeed at it. You'll become whatever you want to become.

Michelle: How often do you think about science?

A.J.: Sometimes, when I go like to the aquarium or the zoo, I think about, 'yeah, Mrs. Thomas said that.' That's when I really think about it. When I look... at, like, if you have a conversation about... like wild life or trees, you say, 'Mrs. Thomas said that.' I got a better understanding science since she became my teacher. I just love her.

Michelle: What exactly does Mrs. Thomas do for you...to say that you love her?

A.J.: She calls me Doctor...Doctor A.J. I like that. All of the time. (interview 01/03/03)

A.J. talked about his teacher and how she was like a mother to him: “Mrs. Thomas even came to my house one day to check on me, to see why I didn’t show up for school. My mother was shocked. But after they talked, she got over it.” (personal interview during class 11/20/02)

Mrs. Thomas gave the students her e-mail address so A.J. and his classmates e-mail her in the evenings after school to ask questions and get homework help if needed. A.J. has been accepted into his first choice school (01/03/03).

When the interview questions were about his teacher, A. J. became energized: he made many comments about how he felt about her. In fact, all six students thought of her as a mother figure:

Michelle: So what do you think of your teacher?

A.J.: Mrs. Thomas. Let me give one word for her.

Michelle: Let me just say something to you, and I tell everybody, that I should have said. Everything that you say is confidential. So I don’t share this with the teacher or another student.

A.J.: Okay.

Michelle: It’s just for me.

A.J.: Okay. My one word for Mrs. Thomas. I can say, I truly I mean it, is *great*.

Michelle: Excellent.

A.J.: And *awesome* because it’s like when she do Science, I don’t know if you’ve seen it as much right now because everything is hectic. But when she do Science, it’s like she takes us to another level. She take you beyond. Okay. It’s like she has eighth grade and she take it at least a couple of notches up.

Michelle: Okay.

A.J.: She take it a little bit more. You know. So, like I said, she’s an excellent teacher. I mean I couldn’t pick nobody, no other Science teacher to be a better person in her category as one of the. What you were saying, like an exemplary teacher because

she does it. She lives up to exemplary. She takes it to another level, and that's what I've enjoyed because. I mean, it's like if you stick to what they tell you to do, I mean it gets a little boring. I mean, we... eighth graders, of course, but when you take it to another level and having us do stuff that we never thought that could happen and stuff, I mean I consider that as a gift. I truly think that's great.

Michelle.: Okay.

A.J.: I mean she's really a good teacher. She, I mean, she everybody has their bad time, but she's a good teacher. She do what she comes here to do. She do what she has to do. I mean, we learn from it. So when we go to high school, we won't. I mean, there's nothing we won't know. We'll be knowing everything we have to know. And then it interests us. She know. Instead of us sitting here, and she just talking, I mean it doesn't work like that. I mean, that's not one of her teaching styles. Us working together.

Michelle: Okay.

A.J.: You know... to figure out. Because I feel like students learn a little bit more when other students are helping. That's how I feel. Teachers are teachers. There are good teachers and everything, but I feel that you help more when you help somebody. Of course, she let us do stuff apart so we will learn how to do our individual stuff, but at the same time, it's like, you know. It's never when we walk in there, a bad vibe. Or we walk in there, it's we nervous. It's more of a mother connection. Does she say things that sounds familiar like, that using examples coming from home and the community. Yeah. Like I was saying, like she use it like, for instance, some Science got big words where kids really they know it, but they don't really know it, and they don't understand it. She changes, she breaks it down to us to make us understand it. So we won't be at the end of the day, what did Ms. Mrs. Thomas just say? Or I don't know what that means. Or like for homework, we get home and we like, what is that? No. We know exactly. Like for instance, I can give you a good one. We was working on Science body, and we were learning different types of stuff in our body like the. This is a good one. Like lysome or something like that.

Michelle: Lysome.

A.J.: Lyosom, yeah. She was. We was learning that type of stuff, and she was using words like, this word is like a bus. So like, for instance, then... we do take a test, we know exactly which word of that word is because we can, oh, that's the bus word. You know? So we know it, and when we get our test and we write it down, we write the word down, we know exactly what we're doing. Okay.

Michelle: You know. It's like all there is a matter of listening. If you listen, you know exactly what you're doing. Like I said, it's, every time you go in there, there's never a bad vibe. It's never a nervous, where you be nervous to go inside there or you

nervous to do this or that. You know. (personal interview during science classroom 11/20/02)

Bobbie lived in the Projects across from Greenville and was making excellent grades in Mrs. Thomas' class. She loved science and her goal was to become a veterinarian or an owner of a sanctuary. She wanted to attend one of Baltimore's magnet high schools, Polytechnic, when she graduated. Bobbie loved having research assignments from the teacher. When asked her feeling about the teacher, she said, "I think she's great. She can be a good teacher for many years, I hope that she stays."

When questions were asked about her understanding what the teacher was talking about in science, she said

Like if some people in our class don't get it, she like, now turn to this page, and she'll explain, and give us an example of a different thing on that page a real get down example and break it down.
(personal interview during classroom 12/18/03)

Mary is a talker. It didn't take much to get her started. She wanted to be a dancer and actress. When I met her, I noticed that when I talked to Mary, she liked to move around a lot. She constantly looked away from me as if she was talking to someone else. Her hair was braided and long and she played with it while talking. I commented about her school uniform, noting that her pants were different from the other students' and very tight. I didn't ask her any more questions about her pants because I wanted to save that inquiry for Mrs. Thomas, who later explained to me about Mary's clothes issues.

Mary let me know immediately that she was a good student and carrying a 95 in science but needed to study a little more. She felt that even though she had a good grade, she was not performing as well as she should:

Michelle: Okay. So how you doing in Science?

Mary: Okay. It's just.... I have to work on. I just have to study a lot. I pass the test. pass in a long time. I just feel though I should study more, maybe that way I don't have to worry about feeling like I could guess the answer. I'm doing fine.

At Mrs. Thomas' suggestion, Mary attended an outreach program called SHOUT (Students Helping Others to Understand Themselves). She was very proud to be a part of this program. Mary and other students went on trips and created projects to raise money for the program. Mary's goal was to either become a dentist or attend the School for the Arts:

Michelle: Sounds like you're gonna be successful over there. What's your major? I mean what do you want to do when you graduate from high school?

Mary: An actress or a dentist. I can ...

Michelle: Why can I tell? I can tell.

Mary: I like to dance. I went to the School of the Arts. I couldn't get in there, but that ain't stopping me. I can go for the next auditions, but it's another program. It's another program I can go to where they'll just except me automatically.

Michelle: Will they?

Mary: I don't care if they don't except.

Michelle: Why don't you go to the other audition?

Mary: ...I ain't ready and nobody could treat me or anything. My friend's mother took me there. I was just like, "Oh forget about it." There's other programs that I'm gonna go to and dance with.

Michelle: Oh, good. What kind of dance do you do?

Mary: I like doing modern. I basically do modern dance, like the street dancing, they do outside and whatever. I'm into everything, ballet, and modern dance.

Michelle: Good for you.

Mary: I'm into all kinds of dancing no matter what it is.

Michelle: Good for you. That's supposed.... [PA in background].

Mary: It doesn't matter what dancing, I like to do anything.

Michelle: So when you finish and go to college, you're going to college out of state?

Mary: That's what I'm thinking. That's my last year at the program, my teacher (Mrs. Thomas) says, she says don't go to a college in Baltimore, go somewhere out of state.

Michelle: We have a dance group here at the school?

Mary: They do, but I don't think they have anymore. My ex-girl... that I'm with now, we have a dance teacher that comes in. She's a nineteen-year-old, so she teaches us to dance Tuesday.

Michelle: Does she come here? Where does she practice?

Mary: Yes, um.

Michelle: Is she in college?

Mary: Yeah, I think so. I think she's at ... in college. So my ex-girl and her sisters we do different days. Different people come in and teach us different things and everything. (01/03/03)

Mary let me know that she was interested in science and dance. Her motivation for continuing in both came from Mrs. Thomas:

Mary: Mrs. Thomas?

Michelle: Yes.

Mary: I love her. She's like the second Mom to me. People keep asking am I her daughter? So when people ask me, we say yes. We say, 'yeah, that's my Mom, I'm her daughter.' But we are really tight. That's not really my Mom or my daughter. We just say it cause we do kind of look alike.

Michelle: So what is it about her that you like?

Mary: Everything. She will come to you like she's your Mom. She's like, 'How you doing dude?' She's like your Momma, your sister, your best friend. She's nice. She's very nice to get along with and everything. I never had a problem in with her. She never got on her nerves or anything or had a problem. I can just go talk to her.

Michelle: Because she can relate to some of the things that are going on with you?

Mary: Yes. (personal interview during classroom 12/18/02)

John was a smiling, happy student who wore braces. When I asked him how he was doing, he said ‘excellent, excellent.’ He was making 99 in science. And he was extremely proud of his grade. He wanted to graduate from college and be either a doctor or a lawyer. He wanted to be like his mother, and Mrs. Thomas had been encouraging him to go into science. She told him how important it was for him to use his mother as a role model:

John: I’ve got a lot of choices. Medicine, law. I want to go to like the weather, meteorologist.

Michelle: What made you choose the medicine, the law, a meteorologist?

John: Because I like talking about weather, basically. I like. Because I’ve been watching like the weather channel every day, and. . .

Michelle: They are never right.

John: I know, but I like...I like weather and the reason why I like medicine because for my mother into medicine. She like got me hooked on it.

Michelle: Great. Is your mother a doctor?

John: Yeah. She kind of like one. She leaning towards being one. But she works at Johns Hopkins.

Michelle: What does she do there?

John: I don’t know. But I know it’s something like a clerk. It’s like the people that like...so when they come in for emergencies, she the one they like talk to.

Michelle: Oh, okay. So is she in school?

John: No. She got. She just recently got out.

Michelle: Oh. What school did she go to?

John: BCCC.

Michelle: That's where I teach. So you're going to be a doctor. That's wonderful.

John: I also want to be a lawyer because I watch a lot of court shows with my grandmother. (02/14/03)

Linda was not having a great day when she came in for her interview. She wasn't feeling good and she wanted to go home. She talked about her family and particularly about her experience in a foster home when she was in the third grade. Whenever we talked about her career goals, she talked about her experiences in a foster home:

Michelle: What's your career goal?

Linda: Criminal justice and law.

Michelle: Oh, so you want to be a lawyer?

Linda: No, like Protective Services.

Michelle: Oh. What do you know about Protective Services?

Linda: I was a foster kid before.

Michelle: Oh, you were. You want to like change. What it is about it that draws you to it?

Linda: I see since I went through it, I know how children feel to be away from their parents, and I just want to help them to understand it a bit. When you go to foster care, I know you're gonna miss your Mother or your Father whether you live with that. If you were treated bad, you're gonna get treated better than what you did.

Michelle: So it sounds like you got a really good experience in foster care. Are you still there?

Linda: No. I'm back with my Mother now.

Michelle: Oh, okay. So are you happy now?

Linda: Yes.

Michelle: Good for you. How long have you been home?

Linda: Since the third grade. I went in the third grade, and I came back in the third grade.

Michelle: Oh, okay. Years and years ago, I had two cousins who were in foster care and it wasn't a nice experience.

Linda: This was an old lady. But when I get older, if she didn't die, I'm gonna go see her and tell her thank you.

Michelle: Good for you.

Linda: I live with my Mother, but I never met my Father, so.

Michelle: Well, you know a lot of people. I didn't meet my Father until I was twenty. I knew he was there, but he left my Mother when I was two and moved to New York.

Linda: My Father never wanted to see me, so. (02/014/03)

When I checked-in with Linda a few months later, she seemed to be more relaxed with me and willing to talk. She let me know that she still wanted to go into the field of protective services, criminal justice, and law: "I know how it felt, so I said I wanted to do criminal justice and law, and I wanted to adopt kids, and be a foster mother. I don't want to have no kids."

My conversation with Linda usually was spent talking about her missing father and how she wanted to do good for other children who were in the same situation as she. Linda could usually be found at her desk working on the Warm-Up questions. When I asked how it felt to enter Mrs. Thomas's science classroom and leave all of those problems behind, she said

I think about science a lot. Not more than I think about the other subjects, but a lot. Like when I'm fixing something to eat, which is every day, I think about science. You just look at it, and how much do I need to put in this or in that. Look at it. Mrs. Thomas taught me this. I know my distance, my measurements, and all that. So that's not gonna be hard for me.

I observed in the class that Mrs. Thomas also helped the students who were having problems in the math teacher's class. Linda was having math problems and frequently stayed a few minutes after class to get help from Mrs. Thomas.

Linda: Like...Mrs. Thomas she knows I didn't pass the Maryland Functional Math because it's kind of hard. Everybody says it's easy, but it's hard to me. So Mrs. Thomas like... what we learn in math... something's she work and she'll get something off the printer and she'll look at the board or whatever. Some days she'll explain... at her class to help us understand it, so my math teacher don't make me understand it. So I take it to Mrs. Thomas. I get here early in the morning and I go to Mrs. Thomas's class and we talk. Sometimes I tell her what I don't understand, and Mrs. Thomas will go over it with me. Like finding the missing "n" or value. Finding stuff like that. I know how to do stuff like that. She'll go over stuff that I don't get in math. She said she wanted to be a math teacher.

Michelle: Right. She likes math.

Linda: Yes. I think that my math teacher and her need to trade spaces. My math teacher, she don't like me. I do all my work in her class. I respect her and she gave me a 70, and I hate 70's. My mother said that it was good, and I told her not to me it wasn't. She said, "I know." She know I don't like nothing. All my grades, I like them 80 and above. (Personal interview during science 02/14/03)

Mrs. Adams

Mrs. Adams' Background and Education

Instantly at our first meeting, I was struck by her youthful appearance: she appeared to be no more than 18 or 19, with a youthful way of carrying herself. She was from an educated family: her father an ordained Baptist minister with his own Baltimore church; her mother a college graduate who had an FBI career; she has five sisters and brothers. Her mother and father divorced when she was very young and have both remarried.

My background basically, I came from a family...I guess you could say, hmm, were educated...very educated. I was not the first generation to go to college. So it's just continuing a tradition of a higher level of education. Hmm, I

graduated from Morgan State University with a degree in Chemistry and started teaching actually here at Greenville. This was my first teaching experience here. (After-school interview 11/22/02)

Mrs. Adams was very explicit about how she saw herself in science and relating to middle school students. It had seemed to her that it would be difficult for her to control middle school students, looking much like a high school student herself. She expressed her love of science in general and chemistry in particular. She described a great experience in her undergraduate program at Morgan in which her instructors were very caring and supportive: "Chemistry was hard, but I made it through." I expressed appreciation for her willingness to participate in this study and asked what made her eager to participate. She responded that she "enjoyed teaching and won't have any problem being observed." (After-school interview 11/22/02)

Mrs. Adams' Philosophy of Education

Mrs. Adams believed that regardless of students' background, they still had a chance at success. She talked about coming from a background very similar to her students' and felt that they had much in common. She felt a personal commitment to and understanding of her students because of her own background.

It's really kind of difficult to explain how you teach or how I teach African American children. I think the first thing is you have to look at the whole child instead.... a lot of people look at a portion of the child to say, you know, because they have this background, they may not be capable of achieving certain goals academically. Just from growing up in the city, and knowing how different, how diverse they are, you get an appreciation for teaching the children. It's kind of different for me. You know that these kids have struggles that they have to overcome, but despite all of that, you know because you grew up in that type of environment they can still overcome those types of situations. So I really think it's being more personal with the children. You know, getting to know them, understanding them better. It makes

it a lot easier to be able to teach...you know, let's say the majority. Because what happens here is, you can't reach all of us. You try. It's still get on that person and love them because all of them have issues just like we have issues, but once you make yourself more interactive with them. Instead of saying, I'm...they are the box, and I'm outside the box. We've got to step inside of the box with them sometimes, and say, you know what? I've had these experiences, and I know people that have had these type of experiences, and they have overcome them. That's the biggest issue, I think...right now...within...especially Baltimore City Public School System, we have so many children who have so many different issues, and they are not being addressed. (interview during teacher conference break 11/22/02)

Mrs. Adams' background in church influenced how she thought about religion and education. Her upbringing in a spiritual environment helped her to make sense of her efforts to make her pedagogy culturally responsive:

...the church is not doing what they should be doing as part of the community because that's a strong foundation. I think the church should play a more integral role in the lives of our children in the neighborhood. Because they are there. You know they really aren't reaching out. You know, having the after school programs that they could have if the school has the funding because the money is out there, especially for the church. Nonprofit organizations to get these different types of money, especially I know with my church. It's in the heart of this. We have excellent programs. We have after school programs, you know, to foster our kids. You know, they can go there and do homework and get tutoring, get something to eat, you know different things like that. I think that's what the school system is really, really missing. (interview during lunch break 11/10/02)

Mrs. Adams felt that parents had a critical role to play in the education of their children, but it was difficult to get them involved:

When the reality is they don't know how much involvement they play in the lives of their children, but since it is virtually nonexistent, as a teacher, I have to step in and say, 'Do things a parent should do.' But they're not doing it. (interview during lunch break 1/10/03)

Mrs. Adams felt that what was missing from the African American community was the 'father influence' that young girls needed:

I think it is extremely important for all young girls to have their father role model. Because they tend to get the idea that, you know, I have to reach out for love in other places, and different things like that. (interview during lunch break 1/10/03)

She used her cultural experiences to teach the students and their parents the significance of having parents actively involved in the education of the students.

Michelle: You have a great father?

Mrs. Adams: My father was extremely active. As well as my Mom. Extremely active in everything that I do. You know, he was always there for the support. Even today, if I need him for anything, I know I can count on him. And I can see that, especially in the young ladies that I teach, they are missing that intricate part in their life. They need somebody to be there. To be stern. To be a little bit more disciplined than what Mom usually would be. And to look out for things, especially the little girls that they know because they are men. They've been little boys, you know. Different things like that. To sit down and talk to them as. At times days I would spend different things like that, and girls are missing this. So that's why at a younger age now they are looking. I've had a boyfriend, you know, all of those different things. That if a father was there, and he was playing the role.

Michelle: Out of the survey that we did, some of them don't even have a mother present.

Mrs. Adams: Exactly.

Michelle: They have grandparents, foster care.

Mrs. Adams: It makes it extremely difficult to be without that. Without that support system. Like you said, a lot of them don't even have mothers. The grandparents are raising them or they are in foster care or different things like that.

Michelle: Right.

Mrs. Adams: And they are missing things that they should have. Within the foster home, I know that everybody wishes there were biological parents to take care of them. They still do function, and succeed in life, but a lot of it's not the parents that we. . . . (interview 01/10/03)

It was important to Mrs. Adams that she promoted a positive perception about herself as a teacher to her students, parents, administrators, and community. She wanted

to create a greater awareness by other teachers of their function as role models for their students. Mrs. Adams felt that physical appearance was also very important:

I think that, especially in this age, it is extremely important the way that you look. Especially interacting with our kids in the City, and when they see people every day with tennis shoes and Timberlands on, how can you not feel behind? All of those different types of things. So to me it's my professional responsibility, you know to get them ready for the real world. It's not always gonna be Timberland boots and jeans and different things like that. So I take it very, very seriously when I come to work. I try to look a certain way to prepare them for later on to let them know. But you know what, when you get into corporate America, it's not working with Timberlands, jeans. You should look a certain way. I think the kids have. In fact, I know they have related to that extremely well. Especially with the young ladies. It gives them something or somebody that they can look up to because they tell me all the time 'you know, I love the way you dress. I can't wait until I'm able to dress like you and everything.' So I know that it's influencing them in some way. You know, the kids they came to school in the beginning of the year, maybe their clothes weren't as neat or their hair wasn't combed. I always tell them that, you know, maybe you ought to go to the hairdresser to get your hair done. Be neat, be presentable. It's the way that you present yourself to them. They understand. They're getting a feel for what am I gonna have to do later on in adulthood. You know, this is not always going to be acceptable, what I see every day. It's not really the norm. It really isn't. Especially in the professional fields. So I think it does have an influence on them. A lot of influence. More than you know because they pay a lot of attention to what it is you do and what you wear, and so that's why you have to be very, very careful about the things that you do around children. The things that you say. Even, you know, when you might be in the teacher's lounge, and that's our time to converse amongst ourselves, you have to be very mindful of the things that you say or what it is you might be doing because they're watching. They're like little investigators. That's what I would call them in my class. They're investigating everything. They want to know what's going on. They want the most specific details.
(interview 02/03/03)

Mrs. Adams felt that she had a lot to offer a university or college in giving recommendations on how to train or teach pre-service teachers who were making preparations to work in an urban community:

The first preparation, I would say, is to prepare them for the parent involvement piece. Just in colleges or the universities need to let them know, you know, as a teacher you're coming into this field.

Especially in the urban city, you're gonna have to find other ways to reach the children other than the parents. You do have some other support system, but it is virtually nonexistent, and you know, teachers come out of the university thinking you know what I'm gonna have all of this support and everything is going to be great. You know, like the Wizard of Oz or something like that. The reality is it's not that way. It's always like. . .it's almost like a cultural shock to them. They believe in one thing, but their experience is going to be something completely different. And in the area of special education, it needs to be reviewed because in the urban community, there are really no perimeters set for special education at this point. It used to be self-contained when you can have between eight and twelve in a class. It's not like that anymore. So when you graduate from the university and think... okay, my cousin thinks special education or whatever it may have been, and then they get into the urban community, and they realize that there are 25 or more people and it's not as small as I thought it was going to be. So they have to prepare them for reality. Okay? I can't even just say just in the urban community because it's happening in Howard County too, Prince Georges County maybe not at the rate that it is in the urban community, but it is happening. So, two would be definitely revamping special education laws. Making sure that they have a clear understanding of what special education really entails. And letting them know that, you know what, you're going have to do small groups. . . . Teachers really do not have a clear understanding of what they are actually getting themselves into when they leave the university. . .and giving them more student teaching opportunities. They need that. (interview 02/03/03)

Mrs. Adams made an effort to bring cultural considerations into the curriculum in order to motivate the students. In particular, she felt that talking about African Americans who had made major contributions in science was important and meaningful to students and have a significant impact on student learning.

Michelle: Let's go back to culturally responsive pedagogy. You mentioned early in the year that you always include culture in your teaching. Would you say your cultural responsiveness is rising? Okay and you also said that cultural response is interesting is just basically what you said. Identifying the kids. Identifying with where they come from, who they are, and recognizing that, recognizing their culture.

Adams: That's all? (Smile)

Michelle: And this could be with African American kids, Hispanic kids, Asian, White kids, and they put the pieces, recognizing who they are.

Adams: Correct.

Michelle: How do you go about doing that?

Adams: Pretty much.... I just do it. For me it comes naturally.

Michelle: How do you bring the cultural of you students into your Science? I mean, you know, like when you're teaching? You did say something one day when we were talking. You were teaching. I forgot what the topic you were talking about. But you...

Adams: Astronomy. It's not necessarily the way I, Mrs. Ann Adams, say.

It's because I really don't plan from the cultural aspect. It's just, you know, you think on your feet. You relate to whatever you're teaching something they know about. You know, it could have been like with astronomy unit, talking about a Black astronaut. It's African American History Month, you know. That they're really not familiar with. They know somebody went to the moon. They know the first. Some astronauts are Black, but it's just bringing it out to them. Bringing it to their attention. It's just bringing it to their attention. Looking at things like their culture. I know they like different things like that. Plus he was a doctor. He left the medical field. You have to know science in order to be in the medical field. So just taking little things, you know, and making it work with the students. (interview during lunch break 1/10/03)

In one of Mrs. Adams' lectures, she briefly mentioned something about "Angels."

I ask her why she referred to Angels in her lesson when she had previously

acknowledged that religion and state should not mix, or was she talking about religion:

In so many of my students, good or not, they go to church or they have some understanding of church. . . even who Jesus is or who Mohammad might be. Whatever it be. And so they have some proof or understanding, some kind of knowledge, and so even though we're not supposed to talk about religion and all of those different things in school, it's kind of hard to really get around it with certain things because kids are inquisitive. They want to know, you know, when we talk about how the earth was formed. Well, that could fall. . .because if an asteroid hit North America, God did it. So you have to. You can't just brush them off. You know, you have to...kind of ask them in a round about way, because that's a part of their culture. That's what they think about. That's the norm for them. They go to church. That's what they've been led to believe. It's kind of hard to say how I really integrate the cultural within the classroom. It's just done. It could be the littlest detail. You know, we can't just say we have Black History in February. You just make every day off of that, and that's all you teach. (interview during lunch break 1/10/03)

Mrs. Adams' Daily Routine and Research Schedule

Mrs. Adams' routine was much the same everyday (see Table 4.). She was interesting to follow around. She started her day by waking up around 5 a.m. most mornings:

I go over my lesson very briefly for the day, in case I want to change something. . . .After that is the basic necessities of getting myself ready for work and my daughter ready for daycare. In route to the school, I always pick-up a newspaper. I try and glance over the front page and the Maryland section. I use the information that I watch on the news or read in the newspaper in class to keep the students current on events related to science or events happening around them and/or in their communities, and they lead to various discussions. Once in the building I do practically the same thing everyday. I come in to my room, put my objective, topic, unit, warm-up, class work, homework on the board. At 7:45, I stand at my door on hallway duty and greet my children as they come in. The students are in the homeroom from 7:45-8:05 a.m., and I remind them to make sure they have all supplies needed for the day. At 8:05 promptly, I start with the warm-up. From there I follow the class agenda. Sometimes having to waiver in time. (11/02/02)

A Typical Teaching Day in Mrs. Adams' Science Classroom

Mrs. Adams was a very regimented teacher in her science classroom. Students were expected to listen quietly when she was teaching and not talk unless they were contributing to the topic of discussion. Mrs. Adams began most of her science classes with directions about what the students were expected to produce during the class period. Warm-up questions, lecturing, reading aloud, labs and journal writing were all parts of the daily activity.

When students were writing in their journals, Mrs. Adams walked around to assist every student and answer all questions. She has changed the structure of her class to be more inclusive. It was very important that all of her students were included in the

learning process. She did not want any student sitting and listening and not participating in the learning process. She felt that every child should have the opportunity to learn.

Mrs. Adams addressed each of the students as Mr. or Miss when she was agitated or upset. The students seemed to know right away when she was upset and they immediately responded. Those who continued to talk were loudly ordered to the back of the room to read.

Vignette, 11/22/02

A 6th Grade Science Lesson Taught by Mrs. Adams

Adams: Please do not forget to copy tonight's homework assignment. What about the fun letters? . . . is still talking, I don't know why. Please, get out your journal. Give a brief description of the color in the planet. Think about that today. All permission sheets, all contact sheets have to be signed and completed. You need to raise your hand. All right, let's get started. Right now I am talking. In a journal give a brief description of the four inner planets. Now, yesterday when we first started talking about the inner planets I brought to your attention that the book, gave us information, general, I don't want to say wrong information, but it gave us a brief description of what the four inner planets [noise]. Can you recall specifically which inner planet it gave us a description of. So, I want you to think back to yesterday. Somebody give me one of those descriptions of the inner planets.

Student: One had a volcano.

Adams: Okay, one of the planets had a volcano or volcanoes that are larger than any volcanoes that can be found here on earth, that's right. Somebody else. You say that one of the planets' surface is hot enough to melt. Melt what? It is hot enough to melt lead, because it is very hot. It has very, very high temperatures. What is another one? Somebody else.....

Student: Not one planet has living creatures.

Adams: That is not what we learned yesterday. We know one other planet does have creatures and that is not what we discussed. Anthony. That is not part of the description. Somebody else.

Student: One of the planets has oceans, which have fish and other life forms in it.

Adams: That's right, that's three, one more. Three down, one to go.

Adams: Say it again, please. All of the four inner planets have small rocky surfaces. I am looking for one more. The atmosphere of one specific planet [noise]. So again, these are just briefly some of the things we discussed yesterday about the inner planets. Is there more information that we are going to find out about it. Absolutely, because yesterday we only talked about one of the inner planets. Which inner planet did we talk about yesterday. What inner planet did we talk about yesterday. We talked about Earth yesterday. Our intentions according to our objectives was to talk about Earth and what other planet ...? I have objectives on the board right there. You can take a look at it. Why don't you read it out loud, brief today's objective for us, please.

Adams: Which other planet, other than Earth? Besides Mercury. We did not get a chance to completely cover all of our objectives. So that means today there are some items we need to catch up on. Very quickly, I want you all to leave your journals open to your journal entry from today or to find a plain sheet of paper. If you all remember, when we took, when we had an opportunity to go the Science Center right before the Christmas break, and we went to the Planetarium. What is the Planetarium?

Adams: It is a domed-shaped place.

Adams: What did we see at the Planetarium?

Adams: A lot of planets.

Adams: Where are they located? Okay, so we saw a planet called "Planet" planet. The name of the theater, the dome-shaped theater was the Planetarium, but this answer won't be [noise] called Planet Trek. How many folks know what the word *trek* means, and a lot of you will go to different answers like a voyage, a trip, a journey that you go on, and you are absolutely correct. So this morning we are going to take a voyage or journey through the actual nine planets, so that is what we are going to be discussing for about the next week or so. Class, I told you all yesterday that the planets are divided into how many groups.

Student: They are divided into two groups. What is the first one?

Adams: The inner planets. What is the other one?

Student: The outer planets.

Adams: So the planets are divided into two specific groups. Today's read-a-long will come from a book that is titled *The Reader's Digest Children's Atlas of the Universe*. What does the word "atlas" mean.

Student: A book of maps.

Adams: In this case, this will be a book of the what?

Student: A book of the universe.

Adams: And so not only do you use atlases in [noise] we use them right here and during the course of the week or so, if you want to come up, I have about three or four different books about earth and space and you can come up and take a look at them and find out more information. You can come up at any time as long as the rest of your assignments are already completed and take a look and find out more information. Today's read-a-long is called "The Planets." If you take a look here on these two pages we have Jupiter, Saturn, Uranus, and Neptune. Okay. What do Saturn, Uranus, and Neptune have that Jupiter doesn't have?

Student: They have rings.

Adams: Who can tell me what the moons are made of? Anybody know? If the planets are made up of gas, what are the rings made up of?

Student: The rings are made up of [noise].

Adams: These are the only three rings that have rings around them. Students, you can find that information right here in our *Atlas of the Universe*. You might be absolutely correct. All right, the planets, I will advise you that there will be two quick writes at the end of today's reading. The planets fall into two main groups, small rocky worlds and large gaseous rich ones. They are like this because of how they formed. About 4.6 billion years ago the sun and planets were born from a cloud of dust, and the thickest part of the cloud became the core and grew even thicker as it sucked in mass. This core called the proto-sun grew hotter as it collapsed. Eventually nuclear reaction began and it started to shine as a star. What is that star?

Adams: The sun, exactly. Meanwhile, the rest of the cloud settled into a disc called the Solar Nebulus, which was slowly turning. The Nebulus was a hot area [noise] an icy cold that was [noise]. Particles in the Nebulus coiled and stuck together forming small [noise], which [noise] in more particles and grew larger. The bodies closest to the [noise] were too hot to [noise]. They evolved into small rocky planets. What are those small rocky planets called today?

Student: The inner planets.

Adams: What are the names of the inner planets?

Student: Earth

Adams: That's one. Mercury. Come on, I'm waiting. You told me Earth and Mercury, that's two. Students, help out.

Adams: Earth, Mercury, Venus and Mars. Those are the four rocky planets or like some

say, the inner planets. [noise] Jupiter, Saturn, Uranus, and Neptune formed. They are called giants because of their great size and because they are rich in hydrogen, helium, and other gasses. Who remembers the symbol for helium?

[lots of classroom noise]

Adams: We discussed this. Somebody go home this weekend and go to the library and look on the Internet. And while you're at the library I want you...write this down. [writing on the blackboard], I want you to look up a scientist by the name of James G. Spady. Write this down.

Student: Who?

Adams: Spady. You might not find his name in the library, but check anyway. He was an African American that I learned about as a student at Morgan State. Spady was an African American astrophysicist. He studied space astronomy. He had a lot to do with Apollo 16, the space ship. We are going to talk about him a little bit more at the end of this unit. He's not so well known, but he made a great contribution in science. Where did I leave off? Between Mars and Jupiter is a band of asteroids, rocky or metallic [noise] that never formed a planet. First question is, first question is. [classroom noise] Nobody's mouth should be open. "What is the cloud of dust called that forms into a disc?" "What is the cloud of dust called that formed into a disc?" That's number one. If I said it too quickly, here it is up on our board.

[PA system]

Adams: We talked about how the planets were formed from a cloud of dust. What was the thickest part of the cloud of dust, specifically what is it?

Adams: You are absolutely correct.

[classroom noise]

Adams: Mr . . ., are you talking again? Take a book, and go to the back of the room. Thank You! Sit up in the chair. Sit up. Sit up. Please answer the second question. What is the answer to question one?

Adams: The cloud that fell into a cloud of dust that fell into a disc is called the Solar Nebulus.

Adams: Alright, go quickly. Yesterday we left off talking about [noise].

Adams: We left off talking about the three main layers. All persons please take your textbook out. That is number one to do. [noise]]

Adams: Page 63. What is the main idea to page 63, under the main idea, I am thinking of another word. What is important to us on page 63?

Adams: What is the main idea for what all of the main ideas are on page 63?

Adams We are talking about the three layers of earth. What are the three main layers of earth? I can't hear you, nobody is talking except for....The core in the middle.

What does the earth's three main layers remind you of. Something that maybe you see every day or something you might do, give me an example of what the earth's layers might remind you of.

Adams: Okay, it reminds you of the sun, but that is not something you see or do every day, but it does remind you of the sun. Both the earth and the sun have how many layers? Three layers. Do they have anything in common. Yes, what do they have

in common?

Adams: Say it again....the core. Both the sun and the earth have a core at the center of the actual object. Think about something that was made from [noise]. The core of an apple. The earth can remind you of the core of an apple or an apple itself. The seed. The apple reminds you of the earth, why does the core remind you of the earth? The earth reminds you of an apple. What is what?

Adams: Excuse me.

Adams: Say it again.

Adams: He is explaining to us that an easier way to [noise], what the actual earth looks like, because when you look at the earth all of you see is the trees and the sky. You see the grass. You see those things that you can see with the naked eye. You don't actually see how the earth is actually shaped. You don't see all of those different things.

Adams: Go ahead...

Adams: Okay, the stuff that you eat [noise] once you peel the skin away, that is the part that will remind you of the mantle. Alright, first look at page 54. Now page 54 asks you to get into what? What planet are we talking about now? We're talking about Mercury. What about Mercury? We also know there is [noise]. It is the closest to the sun. You know all of these things because you did what?

Student: Read it.

Adams: Some of us read it, but some of us get through the page to find out the details. So, let's say this time [noise] and I am going to read all of the page, page 54, but I want to give you all your assignment for today before we get started. Today's objective says that we are going to find out about the [noise] by reading, that's the first one, and what is the other one.

Student: Writing.

Adams: Writing to compare.

Adams: What you are going to do today is, you are going to make some type of poster or chart. As long as your group gives the important information about earth, Venus and Mercury features. That is your assignment for today. You are writing about it. You are writing to inform somebody who may not understand it clearly. They may be doing it for a [noise] or information that is not true. Information that you want to convey, or get out, is factual information, because you write it, and the person who writes the text book is supposed to be an authority on the topic that they are writing about. So, let's get the book and look at page 54. Who will start reading for me?

Student: [student too far from mike and not loud enough]

Adams: Okay, stop. What is the planet Mercury made ofWhat is Mercury made of? What type of metal. You know what that means. Pay attention. Iron and nickel. Thank you. I am glad you were able to find it in the textbook. True or false?

Albert: True or false? Mercury has five holes.

Student: True.

Adams: [noise] Let's go back, let's go back, let's go back. ... What was your first answer?

Student: True.

Adams: You said it was true. So Lisa, do you agree or do you disagree with what Albert is saying.

Student: [too far away]

Adams: According to what? Absolutely. She says that she agrees with you, because according to the facts on page 64, it tells us that typically Mercury does not have any holes. Davon.

Student: [reading more from text, but too far away]

Adams: Okay. Can we travel to Mercury?

Student: [all together] "No."

Adams: Okay, so what can NASA send to outer space to find out about Mercury? What does the book say? It states that [noise]) The next paragraph. Mercury...Magnified photograph shows that Mercury has many flat planes and many craters on its surface. The craters on Mercury have been named for artists, writers and musicians, and composers Bach and Mozart. Anybody know who Bach and Mozart are?

Adams: This is information, that what we are trying to do here is make a connection from science to the musical world. Anybody here know who Bach and Mozart are? This is called the science/music connection. Sometimes we ask questions about [noise] that try to connect two subjects to one another. Who is Stevie Wonder? [noise] Alright, he is a musician. Bach and Mozart are both musicians, but they come from a classical period. They are blind? Who was it, Bach or Beethoven? Beethoven was Black? I know somebody is Black. This is what we are talking about. We are just trying to make a connection from science to music. Mercury's atmosphere is next.

Student: [student reads]

Adams: Okay, so what type of gas did they find in Mercury's atmosphere?

Student: Sodium.

Adams: Sodium. Thank you. The last paragraph. Mercury is [noise]. It is so close to

the sun that during the day the side facing the sun reaches temperatures of 450° C. Because Mercury has almost no atmosphere at night, all the heat escapes into space. The temperature drops to -170°C. Mercury does have a greater range of temperatures than any other planet in the solar system. So Mercury is unlike any other planet because it has so many different what? Because it has so many different gases. Temperatures. It has an extreme. One minute it is extremely hot, it's almost like being in your attic. (noise) by about 500°. They say during the day on Mercury it is about 450°, but at night it is extremely what? Cool. It is extremely cold. So, just from knowing that, could people live on Mercury?

Student: [all together] “No.”

Adams: Now in a group, I am going to give [noise] a sheet of poster paper and I am going to give each one a box of markers and [noise]. The following people are going to work as a group. . . please move to a table with student and student. [noise]. Move to group six. You have been given you assignment. All notebooks can go underneath the desk. Keep in mind . . . [noise].

Mrs. Adams' Students' In-Class Activity Schedule

This coding chart (Table 6.) was created to document every 10 minutes all of the activity occurring in the science classroom. The class period on Mondays was shorter (60 minutes) than the class periods on Tuesday through Friday (80 minutes). The coding system allowed me to determine how many minutes Mrs. Adams spent on each activity.

Like all of the teachers at Greenville Middle School, Mrs. Adams chaperoned each class of students to the next class and brought back the students in her next class. Unlike the other teachers, Mrs. Adams seemed to return with her class quickly. She moved right into the lessons and Warm-up as soon as the students were seated.

Mrs. Adams' Beliefs about the Education of Her Students

While waiting for the students to arrive, I noticed that the classroom was very neat, extremely clean. The science books were stacked neatly on each student's desk to accommodate groups of five students. The class was divided into 8 groups. Each of the sections included students of different levels. Mrs. Adams entered the classroom with

about 25 students following her and at the same time she was giving instructions on who should be talking and should not be talking. Most of the students were not paying any attention, but a few students went quietly to their assigned desk.

Discipline was very important to Mrs. Adams. She came from a family that was well-structured, both a mother and a father in the home. At some point, her mother and father divorced and her mother remarried. She lived with her stepfather and mother and also spent a lot time with her biological father, a clergyman. She drew many of her educational values from her family:

My background... basically...I come from a family, I guess you could say, hmmm, educated, very educated family. I was not the first generation to go to college. So it's just a continuing tradition of higher level of education. (interview 10/28/02)

Mrs. Adams' beliefs about her teaching and her students were embedded in her family upbringing:

I believe whole-heartedly that education is a foundation that can lead you in any direction of life you choose to go in. Without education, I think your options become few in numbers. Education is a tool that we can use to help sell ourselves to others in the world. Education combined with the right tools can lead to eye-opening experiences. It is also my contention that people, especially of African American descent, should not take education lightly because our African ancestors fought so hard for our people to have the right to an education. (interview 11/01/03)

Mrs. Adams' Attitudes and Perceptions

Mrs. Adams had mixed views about education:

I have a very positive and a negative attitude toward education. I think though, however, education is being taken for granted by students as well as staff. Often times people are only in the profession for the money and don't take their jobs seriously. I also am getting the perception that there are those people who take education seriously but not know what route to take to be effective. On the other hand, it is becoming more evident that there are educators who don't take their job seriously and the children are suffering. My negative attitude takes over when I witness

people not doing their best to educate students. (7/02/03)

During my conversations with Mrs. Adams, I felt that at any moment she might start crying when I asked her about how she felt about education. I asked her the best word she could use to describe her feelings about education:

The best word I could use to express my feelings about education would be the word *passionate* about what I do. I take my job as a teacher very seriously. I believe without passion teachers are not effective in educating our students. When you have passion, it drives, motivates the students to want to do things along the lines that are modeled by teachers. (7/02/03)

Mrs. Adams' Use of Tools and Technology

Mrs. Adams involved students in technology by scheduling the computer center whenever it was available. There was only one center in the school, and it was difficult to get at least one space a week. During the research period, I observed her using her laptop computer while the students did writing or reading assignments. Often, she dashed back to the computer to demonstrate or show the students some graphics related to the science topic she was teaching. On occasion, she copied from the computer and the next day brought in handouts. Students were given assignments that required that they surf the Internet while in the center. No assignments were made requiring the students to surf the Internet or use a computer outside of school:

I have been fortunate to have the opportunity to have access to technology in my classroom. The use of the Internet, for example, has helped to enrich my students, and using technology in the class. . .has afforded some students the opportunity to become aware of computer application who would not otherwise have had the opportunity. Technology has also helped me teach in a different way that allows the students the independence. I also believe when teaching, teachers should have the proper tools to help convey whatever thought is to be taught to students. (follow-up interview 07/02/03)

Mrs. Adams' Students

My First Day in Mrs. Adams' Classroom

The first day I visited Mrs. Adams' students was during the last week of October 2002. The students were very curious about who I was and why I was in the classroom, so I explained why I wanted to do research in their class and about my background. They

had many questions: they wanted to know where I taught and what I was teaching; they were very curious about how I was affiliated with three different colleges; and a few wanted to know the difference between a college professor and their teacher:

Michelle: Good morning everyone...How's it going [a few laugh and start talking]?
My name is Michelle Harris Bondima, and I'm wondering if you would mind if each of you could tell me your name and after you tell me your name I would like to hear what you would like to do after you graduate from high school? (my first interaction with the students 10/28/02)

They all started to talk at the same time and Mrs. Adams had to quiet them. They were so loud that I was beginning to wonder if I had made a mistake picking this class. Finally, most of them gave their names and said what they wanted to do after graduation. After they finished, I gave them some personal background.

Michelle: I am Professor Chemistry at BCCC, and I have been teaching for 26 years.

Student: How many children do you have?

Michelle: I have three children, but we will talk a little bit more about them later. (my first interaction with the students 10/28/02)

Again, I explained what a college professor did and how that was different from their teacher. I also explained to them the steps that I had to take to become a professor, and Mrs. Adams explained what she did to become a Baltimore school teacher. Also at the first meeting, Mrs. Adams allowed me to distribute the consent letters to take home for the parents to sign. Mrs. Adams and I informed the students that there would be a pizza party for the students who brought back the signed forms on time. Thirty-five forms were distributed.

At the second meeting with Mrs. Adams' students, thirty forms were returned. The student surveys were distributed to all who had submitted the Parent/Guardian forms. Students who had not submitted their forms were given the Student Assent form to sign

and then the Student Survey form to fill-out. Students who did not return the Parent/Guardian consent forms and those whose parents/legal guardian did not want their child involved in the research were allowed to continue working on their Warm-Up assignment. Mrs. Adams and I walked around the classroom to assist students who needed help with the survey. Some of the students were just sitting in their seats, not answering any questions. When we asked if they needed help reading or understanding the questions, they said no. One student needed more time to read. The survey took about 40 minutes. As promised, the next day I attended, we had a pizza party.

Mrs. Adams' Students' Community and Home Environment

Mrs. Adams' sixth grade Greenville students are 10, 11, and a few 12 years old, born in 1992, 1993, and 1994. Most lived in the area, but some took public transportation to school everyday. Several of the students lived in the Projects across from Greenville.

When I met Mrs. Adams' students, they were still getting used to being in a middle school. Some seemed shy, others very aggressive. For example, when they entered the classroom, they raced to their seats to see who could be the first to sit down. Mrs. Adams screamed at them, and then they settled down.

When I asked each student about her/his community and background, I received mixed information. When the students talked about their background, several were very open:

“My father died when I was a baby. My Mother died last February.”

“I am from Baltimore, Maryland. I was raised with 5 other brother and sisters. I am the youngest in the house. And I love my family.”

“With my family I like to go out to eat and thing. With my friend I like to.”

“My family is nice and respectful to each other.”

“In my background there are my friends and family and my cousins.”

“I love my whole family and I have no friends. My favorite hobby is football we are in the championship.”

“I have a nice community. I also have a great mother. In my community we all play together. There is a playground. We ride owl bikes, play basketball or play its. My mother go to work so she can feed me and put clothes on my back. But I hate when bissy season because my mother work from 4 am until 6 pm. But doing bissy season she brang twice as much money.”

“Me and my family get along well. We all play when we are together my friends are all Christian they do not curse at all.”

“I have 2 brothers. I like to play football and basketball with my friends. I like to play video games.”

“I live in Pleasant View Gardens. It is a very clean environment. My parents are great.”

“This year my aunt had a new born baby. His name is _____. I go to his house almost all the times to see him if it is fun to have a new cousin.”

“My family is a very good family. None of us does no type of drug.”

“I can’t tell my family business. But my friends great and my family is great.”

“My community was a clean than the children started to throw trash and crab shells that’s why our community isn’t clean anymore.”

“I was born and the community across the street from this middle school. I have a very nice community and a very nice background.”

“In my background I play with my brother, go to a boys and girls club.”

“My mother and father takes very good care of me. They send me to school in a proper way. They make sure I have a big coat to keep warm. On Halloween we want six flags.”

“My family is not a perfect family but love meant I love them so much. My family and I do a lot things together. I have a lot of friends and I one best friend I talk to a lot. My community is like my family to.”

“My life was a saw up. Because my father got life in jail and my grandfather died.”

“My friends I hang with are cool. That meant they don’t do bad. Like go around banking. They just play.”

“I am a sort of hard working student. I like to play with my brother and play sports.”
“My background is good my family friend and my community is nice.”

“My family is respectful nice. get along with each other.”

“My background is good my mother treat me good. My friends is disrespectful sometimes. My hobbies is, I like to run.”

“I was born in Baltimore. I was born in John Hopkins. Me and my family get along with each other. Some of my hobbies are riding a bike playing video games.”
(students fill out surveys and have a question and answer period 11/07/03)

Mrs. Adams' Students' Career Goals

Mrs. Adams' students clearly felt that they were performing well in her class and most felt they would graduate from high school and attend college. Most who filled-out the surveys were clear that they would attend college or would have a professional future:

[NOTE: These statements are uncorrected.]

“My career goals are to be a scientist, singer and an artist but before I can do that I have to go to college.”

“I want to go to college and become a doctor a lawyer or a singer.”

“I want to go to college and get a job.”

“I want to be a lawyer, go to college and get my degrees, so that I can become a lawyer.”

“Play in the football league.”

“My career goal is go to the college and after that a I want to be a basketball player.”

“High school, college and be a doctor.”

“I want to go to law school. Then when I finish law school I want to become lawyer.”

“When I get out of high school I want to go to college. When I get out of college I want to a lawyer.”

“I would want to go to college and study medicine so I can be a doctor.”

“I plan to graduate from high school go to college for 4 years. I want to attend Florida State University. Then I want to play football for the Miami Hurricanes.”

“I do want to go college for 13 years then I want to be a lawyer or a nurse. Sometimes I might play basketball and football.”

“After I graduate from City High School, I would like to attend at least four year college for lawyer. I would also like.”

“My career goals are to graduate from college a be professional football player.”

“My goals are going to collage and being a lawyer and doctor”

“I do want to go to college and get a job”

“My career goal is to go to college and finish. I want to get a good job that will last for at least 2 years.”

“My career goal is I want to be a football player and have very good job and also have two kids.”

“My goals are to go to college and play collage basketball for the Maryland and then play for the NBA and I want to a movie star.”

“My career goal is to go to college and go to the NBA or NFL.”

“I want to go to college to be a hair butition and to get a better education and to get my GED.”

“I want to go to college and go in cooking class, building class, and art class. I can be anything if I put my mind to it.”

“My career goal is to be a basketball player because I am so good at it and I play on a girl basketball team that the Raven sponser. I am going to stay in school and I will go to the best college so I can successful in life.”

“Yes I want to go to college because college is my dream leaving home going to school.”

“Yes I want a job because I want the ride thing in life. My career goals is raping.”

“I want to be corporate lawyer. For that I would have to go to college.”

“I want to become a basketball player with a schoolership and passed the SAT’s test.”

“My goals are to go to college and get a good job.”

“My goals are to get threw school and get to go to college also grow up and have a job.”

“I want to go to college after college I am going to run tracks.”

“I would like to go to college and be a police officer.”

(Responses are from the pre-survey that was distributed to all of the students who returned the parental/guardian permission forms 11/10/02)

Mrs. Adams’ Students’ School and Science Classroom Environment

On the first day in Mrs. Adams’ class, my first impression of her students was that they were rude, loud, disrespectful, and had difficulty following directions. When I spent an entire day with them, again I wondered if I had made a mistake in my selection of this class. After the 3rd or 4th day, my impression changed.

The students started their day with Mrs. Adams immediately after they completed their class with the math teacher. Mrs. Adams went to pick-up the students from each class after each period. While waiting for the students to arrive, I noticed that the classroom was extremely clean and very neat and orderly: science books were stacked in the middle of each section of 4-6 desks to accommodate groups of five students. The class was divided into 8 groups. Each of the sections included students of different levels. Students came in and immediately started sharpening their pencils and talking in groups. Mrs. Adams began class by quieting each student.

Instruction began with the Warm-Up exercise and the students taking turns reading from the textbooks. Mrs. Adams called-on each student and always complimented each after each reading. When they were not paying attention, the students were sent to the back of the classroom or to another teacher’s room. Mrs. Adams’ classroom was very student- and science-friendly with pictures of scientists of all ethnic groups around the room. The classroom was filled with a diversity of books—

science, language arts, social studies, history—most with African American themes or authors. Her students were encouraged to read books if they had to go to the back of the room for misbehaving. There were also beanbag chairs in the back so students who finished their work early could relax in them and read.

The classroom was spacious enough for Mrs. Adams to involve the 30 students in demonstrations and hands-on activities. For example, Mrs. Adams asked the entire class to come to the back of the room in order to demonstrate the shape of the earth. She demonstrated the earth as an oval. She had gift books that demonstrated the seasons and how the earth rotates. The students stood in an oval with the teacher in the center setting up a demonstration. She used various objects in her demonstration—beach balls, soccer balls, leather gloves, Christmas gift books, a plastic Halloween lantern, a Frisbee, and hand-drawn pictures. After these 20-minute demonstrations that occurred at least once a week, the students spent 20-30 minutes writing in their journals. Mrs. Adams spent the last part of the class walking around talking to each of the eight groups of students. At some point, she sat with them, read each one's work, and answered questions. She allowed the students to talk and share information and walk around the room sharing information with the other groups.

Mrs. Adams' Students' Understanding of Science and Perception of Their Accomplishments in Science

Of the six students whom Mrs. Adams selected to be interviewed, three were very attentive and were confident not only that they enjoyed science but that science came easily to them; three felt science to be a struggle. However, at the beginning of the study, I had the opportunity to talk to several other students who felt that science was not for

them. There were mixed feelings about science from several; several were disappointed that they were doing poorly in Mrs. Adams's class. When I asked the non-selected students how they were doing in science, their responses were

"Weak because I am failing and I don't like it."

"I feel I have a weak understanding in science."

"A weak understanding because most things I don't get."

"I feel I have a weak understanding of science because I just began to learn."

"I think I have a 50/50 chance understanding science because sometimes I know and sometimes I don't."

"I feel I have a weak understanding for science because I don't understand."

"Yes I have a weak understanding in science because I don't know some work in science."

(students survey 11/08/02)

One student said she understood science: "I feel I have a strong understanding of science because I always liked it and understood it." When asked why she felt that she had a strong understanding of science, she didn't know. She was not sure if it was because she did all of her homework or because she had a sister who was taking science at the community college and helped her with her homework. Other students, including the six selected by the teacher, responded,

"I think I have a strong understanding for science. Because I really like science."

"I understand science but some times I don't know but then I begin to understand."

"I feel I have a strong understanding of science because I like it"

"I feel I have a strong understanding of science because I get my class work done fast. I understand the work."

"I feel I have a strong understanding of science because I know what to do."

"I think I have a strong understanding of science because science is my favorite subject."

(students survey 11/08/02)

Many students in the beginning of the study were not happy with the grades they were receiving in Mrs. Adams' science class. Some attribute their failure to the science teacher in the 5th grade and wanted to make the point that it wasn't Mrs. Adams' fault. They indicated that Mrs. Adams gave too much homework and not enough time in school to complete their assignments and they had difficulty understanding the terms and that science generally was difficult. Other students attributed their success to working hard at home and at school:

Michelle: Do you like science, yes? No? maybe?

Penny: Yes

Michelle: you like it, why?

Penny: I like learning about the solar system and different things in the water and stuff... things like that. Because when I'm home I just learn about the solar system and all I think about is the solar system.

Michelle: Really, why do you thing about the solar system at home?

Penny: I just always like doing projects at home or ...just, ...I just like it. I think that it is interesting.

Even though some students felt they were not performing as well as they would have liked, many still had confidence that they could do better. Frank's interview:

Michelle: Remember when I first came to your class and I talked to you about why I would be in your class and that I would be observing you and your teacher? Well I just want to know what you think about science? How do you feel about science?

Frank: Science is like it is a big part of, of the environment.

Michelle: Which part of the environment? Why do you say that?

Frank: Because the trees and the grass help us live and the water help us to survive.

Michelle: OK, So what I also want to know, how you are doing in science? How are you

doing in Mrs. Adams' class?

Frank: I am doing... like, in the middle, good.

Michelle: In the middle? What do you mean by the middle?

Frank: Like, good.

Michelle: Good? Not excellent, but good?

Frank: Yes.

Michelle: Do you do your homework?

Frank: Yes.

Michelle: you have help when you do your homework? Anyone at home to help you?

Frank: Yes, my mother and my sisters.

Michelle: Oh, so everybody helps you with your homework? Aren't you lucky?

Frank: Yes.

Michelle: Do you like science?

Frank: Yes.

More than 60% of the 30 students observed in Mrs. Adams' class thought similarly: they attributed their accomplishments in science to the fact that they worked hard in class and at home on their homework.

Jackie felt that Mrs. Adams was 'too strict' and that her attitude turned Jackie against continuing her original goal of going into science. However, she still wanted to go to college:

Michelle: What changed your mind about being a scientist?

Jackie: Well, I kind of. I don't know.

Michelle: Did it have anything to do with your plans? What you're doing in class? You can tell me because I need to know.

Jackie: Mrs. Adams not gonna know?

Michelle: No, no. This is confidential.

Jackie: I don't like Mrs. Mrs. Ann Adams no more.

Michelle: Why?

Jackie: Because she's too smart.

Michelle: When you say smart, in which way?

Jackie: No cause. I mean when my father came to pick me up, I made a mistake and left my science book in Mr. Thomas' room. She didn't know, but she just made a comment. She said, "Don't leave your book in here." She said it real smart, and said, "Don't leave your book in here because." She said it smart. In a smart way. "Next time you leave your book in here, I'm not bringing it to you. If you lose it, you're just gonna lose it, and you're gonna have to pay for it." She said it in a smart way, though.

Michelle: So that changed your mind about being a scientist?

Jackie: No, not really. It's just because, well, sometimes I just. I really. I like science, but I didn't want. I really. I don't know. Because it was a certain part I wanted to be a scientist, then.

Michelle: You changed your mind? Do you think you're going to change it again? No?

Jackie: I probably will set my goal for something else too. I will go to college.
(personal interview with Jackie 02/19/03)

Interviewing Missy was a pleasant experience: she seemed well-grounded in the science classroom and on-task. She enjoyed being in Mrs. Adams' class and was doing fine. Missy was above-average in her grades and loved science. While observing her in class as she worked with the other students, I found Missy to be very excited about science and always asked her classmates if they needed help in their projects. She seemed to like wet labs and the freedom that Mrs. Adams gave the students to move

around the classroom during science labs. Whenever she wasn't sure of a question in science, she felt comfortable to be the first to raise her hand to ask Mrs. Adams for help:

Michelle: In the 6th grade. Ok, is this your first time in science since you've been in middle school?

Missy: Yes.

Michelle: Is it all that you expected? You can say anything that you want.

Missy: Yes

Michelle: Do you enjoy it?

Missy: Yes

Michelle: What about science do you enjoy?

Missy: I enjoy finding out things that I never learned about before, about how we have seasons, about the sun spinning on it's axis, stuff like that. I also really...really like collecting stuff for the experiments that we have in science. It's better than just reading in class. It's fun.

Michelle: How are you doing in science?

Missy: Fine

Michelle: What's fine?

Missy: uhm.

Michelle: How are your grades?

Missy: My grades are fine. My average is an 85.

Michelle: Do you enjoy your teacher?

Missy: Yes

Michelle: What about your teacher do you enjoy?

Missy: I have learned a lot from Mrs. Adams.

Michelle: OK, do you, does she teach things that you are familiar with?

Missy: Everything that she is teaching I'm just learning.

Michelle: Ok, what about the textbook that she is using?

Missy: Astronomy?

Michelle: Yes

Missy: I'm just learning about that too.

Michelle: What do you want to be when you grow up.

Missy: I want to be a lawyer.

Michelle: Oh, you want to be a lawyer. Why do you want to be a lawyer?

Missy: I want to be a lawyer because, I just feel that I want to be it.

Michelle: Have you ever talked to a lawyer?

Missy: No, but when I get to the 8th grade my mother was going to help me to do community service at a law school.

Michelle: Ok, so you think that science will help you to get there?

Missy: Yes

Michelle: Why?

Missy: Because science, I don't know.

Michelle: Yes, because science is like, when you take math and science and reading and writing, in order to be a lawyer you need to be good at that. Science helps you to do all of those things. You need to be a good reader. Math is important. When you are a lawyer, you have to calculate money a lot. Do you have any questions to ask me?

Missy: Are you a scientist?

Michelle: Yes, I am. I teach chemistry in college. Basically, that's what I need to know. The unit that you are doing is the sun right?

Missy: yes.

Michelle: Are there any questions about the sun or any questions that you don't understand or that you would like to understand more about.

Missy: We already did our KWL chart.

Michelle: What's a KWL chart?

Missy: K is what you want to know, no K is what you know, W is what you what to know and L is what you learnt.

Michelle: Ok, one other question that I need to ask you. Do you ever get to the library?

Missy: The library is right at my house.

Michelle: Oh, it's right at your house?

Missy: Yes

Michelle: How often do you get to the library?

Missy: Every time I do a lab report or when my computer stop working, I just go up there.

Michelle: Do you feel that there is anything that you can do in your community that relates to science in the classroom? Anything that you have learnt in your science classroom? Do you ever get to see a scientist?

Missy: Yes, you! [laughter]
(02/19/03)

Mrs. Terri Thomas and Mrs. Ann Adams

A Snapshot of Mrs. Thomas

- Mrs. Thomas was raised in the Projects, similarly to her students
- The Principal felt that Mrs. Thomas was an excellent Math and Science teacher
- Mrs. Thomas liked to participate with the students and their families after school and many times away from the school
- Mrs. Thomas felt that it was important to share her experiences with her students so that her students wouldn't make the same mistakes that she had growing-up

- Mrs. Thomas believed the administration was responsible for incorporation programs in the curriculum that could help build African American students' self-esteem
- Mrs. Thomas felt that the teachers played an important role in students' self-development and students self-esteem
- Mrs. Thomas believed that the educational standards had been lowered for African American students and that causes the students to work less
- Mrs. Thomas believed that some educators were not well-prepared to educate
- Mrs. Thomas believed that many teachers are unaware of how to use technology
- Mrs. Thomas believed that many of the problems in urban education were the result of lack of concern by parents
- Mrs. Thomas felt that her students must understand that communication was important for their survival as it related to their religion, education, with their jobs and in their careers
- Mrs. Thomas liked to dance in her classes. She felt that students should see that she was having fun and that science should be fun and exciting
- Mrs. Thomas addressed all of her students as Mr., Ms., Doctor, Attorney or whatever their future goals were
- Mrs. Thomas felt that it was not entirely the teachers' responsibility to motivate the students; some of the responsibility is the students'
- Mrs. Thomas felt that it was the teachers' job to make learning interesting and to spark interest

- Mrs. Thomas used her knowledge of the culture of her students to build connections that the students could understand
- Mrs. Thomas believed that her age was an advantage in the science classroom
- Mrs. Thomas spent lunch hours and after school time tutoring students in science and math
- Mrs. Thomas felt that science was difficult for her students
- Mrs. Thomas constantly reminded her students how important African American history was to their education

A Snapshot of Mrs. Thomas' Students

Mrs. Thomas' 8th grade science students:

- Some of the students lived in the projects around Greenville Middle school
- A few of the students took public transportation to get to school
- Mrs. Thomas' students were 13, 14, and 15 years old
- Mrs. Thomas had a mixture of students who either lived at home with both parents, lived in a shelter, were in foster care, or lived with a family member that wasn't their mother or father
- One of Mrs. Adams' students had two children
- Many of Mrs. Thomas' students' parent or parents were incarcerated or had either lost their mother or father or both to a violent death
- Most of Mrs. Adams' students were very positive about their future
- Students felt that Mrs. Adams was more challenging than their science teacher the year before
- They felt that they had a better understanding in science this year

- They felt that they had a strong understanding of science
- Most felt that science was their best subject
- Most students didn't use the library often because of the location
- Most students did not have access to a computer at home
- Most students attributed their success in science to hard work and studying and understanding science
- Most students had very positive things to say about the teacher
- Many students felt that Mrs. Thomas was more like a mother than a teacher
- Several students felt that Mrs. Thomas was responsible for their love of science
- The students felt that Mrs. Thomas had high expectations of their students

A Snapshot of Mrs. Adams

- Mrs. Adams preferred to keep the relationship with students' families on Greenville's campus
- Mrs. Adams came from a highly educated family. She's the third generation to attend college
- She graduated from undergraduate school with a degree in chemistry
- In undergraduate school, her instructors were kind and caring
- Mrs. Adams felt that because she grew up in urban Baltimore, she had a personal commitment to her students
- Mrs. Adams felt that her students had some many issues that have not been addressed

- Mrs. Adams felt that her background in church influenced how she thought about religion and education. Her upbringing in a spiritual environment helped her to make sense of her efforts to make her pedagogy culturally responsive
- Mrs. Adams felt that parents have a critical role to play in the education of their children but that it was difficult to get them involved
- Mrs. Adams felt that a ‘father image’ was missing in the African American community and many of the students did not have a mother present
- Mrs. Adams felt that it was her professional responsibility to look a certain way. She felt that the students should understand that they should always be prepared for corporate America
- Mrs. Adams felt that colleges and universities did not prepare pre-service teachers well enough to teach in the urban community. Teachers did not have a clear understanding of what they were getting themselves into
- Mrs. Adams addressed all of her students as Mr. or Ms.
- Discipline was very important in Mrs. Adams’ science classroom
- Mrs. Adams felt that the best word to describe her feeling about education was “passionate”
- Mrs. Adams used a great of technology in her science classroom; she scheduled sessions regularly in the school’s computer center.

A Snapshot of Mrs. Adams’ Students

Mrs. Adams’s 6th grade science students:

- Mrs. Adams’ students were 10, 11, and a few were 12 years old
- Most lived in the Projects across from Greenville Middle School

- Many of the students lived with family members who were not their mother or father
- A few of the students were in foster care
- Several of the students' parents, mother, or father and, in some instances both, were incarcerated or died violently
- Many lived in a drug community
- Many saw violence everyday
- Most wanted to go to college
- Some of the students felt that Mrs. Adams was "too strict"
- Most of the students felt that they had to work extremely hard in Mrs. Adams' class because she required homework and classroom to be submitted on time, with no excuses
- The students attributed their success to Mrs. Adams' strictness
- Few students felt that they had a weak understanding of science
- Many of Mrs. Adams' students enjoyed the science wet labs
- Many students enjoyed collecting items for science experiments

Mrs. Adams and Mrs. Thomas (similarities)

- Both teachers were African Americans
- Both teachers were raised in a religious environment
- Both teachers graduated from a public high school
- Neither teacher graduated from undergraduate school with credits in education

- Both teachers had Master's degrees in education, which they received as a part of their teacher certification program
- Both teachers felt that graduate school had not prepared them well enough for teaching in an urban environment
- Both teachers practiced a culturally responsive pedagogy in their science classrooms
- Both teachers believed that religion played an important role in education
- Both teachers were well-respected by the Principal and their co-workers
- The Principal felt that both teachers had a passion for teaching

Mrs. Thomas and Mrs. Adams Students' Achievement in Science

The student's achievement in Mrs. Thomas' and Mrs. Adams class was measured on a scale of 0 to 100. Grades 90-100 excellent, 80-89 very good, 70-79 good, 60-69 fair and below 60 is failing.

The final assessment for Mrs. Thomas' eighth grade science students that I studied was 95% pass, two students failed and had to repeat the science class in the summer of 2003 session.. Greenville's average eighth grade science score for all eighth grade classes was 94%.

The final assessment I saw for Mrs. Adams' sixth grade science students was that 90% passed and three failed and were scheduled to retake the course during the summer 2003 session.

Required Materials and Technology Used by Mrs. Thomas and Mrs. Adams (Handouts and Exams)

Mrs. Thomas and Mrs. Adams had Gateway laptops on their classroom desks. The laptops were the teachers' personal property. The computers in the back of each science classroom had been broken for several years. When they wanted to conduct an assignment that would require each student to have computer access, they took the students to the computer center; or, in several instances, the students were allowed to use the teachers' laptops. The Computer Center had 20 PC's, but most of the time several students had to couple-up and share. The Center had a technology teacher in-charge who essentially left the room when Mrs. Thomas or Mrs. Adams was conducting class.

The middle school science curriculum taught during this study for the 6th and 8th grades was adapted to accompany new materials and MSPAP supplements: Prentice Hall-Science Explorer Series; National Aquarium-Living in Water; Dale Seymour-Event Based Science; Chesapeake Bay Foundation-Chesapeake Choices and Challenges (Department of Instructional Services and the Office of Science, Mathematics, and Health Education). The lab handouts and materials were standard for all science classes. (Handout A.) The activity sheets used in class as well as in the lab were also standard for all of the science classes at Greenville (Scientific Method and Application-Handout B).

Handout A: Science Department Standard Lab Sheet Used by Mrs. Adams and Mrs. Thomas

Lab Report Scoring Rubric

This rubric is your guide to make sure you have a complete lab report and that you receive the maximum number of points.

Title	1 pt 0 pt	Title appropriate and placed correctly Title not given or does not match activity
Group Members	1 pt 0 pt	members given and names spelled correctly incomplete list of names or omitted entirely
Materials used	1 pt 0 pts	complete list given incomplete list or list not given

Purpose	2 pts	full goal of lab stated in complete sentence
	1 pt	goal of lab partially given or not in complete sentence
Hypothesis	2 pts	hypothesis matches purpose and in complete sentence
	1 pt	hypothesis somewhat matches purpose or not given in complete sentence
	0 pt	no hypothesis given or does not match purpose at all
Procedure	2 pts	procedure given in identified steps and all steps included
Data	3 pts	All collected data shown, graphs included and appropriately labeled (if required), source of data clearly identified
	2 pts	missing no more than one piece of data, no more than one item missing from graphs, or source not stated in completed sentence
	1 pt	more than one item missing from data, graph, and/or source of data not given
Analysis	2 pts	at least two statements about the collected data and in complete sentences
Conclusion	2 pts	conclusion addresses hypothesis and gives at least one detail of support or at least one reason for non-support of hypothesis
	1 pt	conclusion does not address hypothesis or give at least one statement of support or non-support

This rubric is a guide to help you prepare a good, accurate, and complete lab report. Keep this rubric in your notebook and use it when you have to write a lab report. Go through it step by step to make sure you have not forgotten anything

**Handout B:
The Scientific Method:
Understanding and Application
Yea, I can do that!**

**SCORING RUBRIC
(Science Department standard sheet used by Mrs. Thomas and Mrs. Adams)**

This rubric will be used to grade your work for this activity. Use this rubric to guide you through the activity.

Name _____ Class _____

Date _____ Rubric points _____ Score _____

Title of Activity (what do you want to know?)

1 pt Title give

0 pts no title given

Problem (what do you want to know?)

2 pts problem stated as a complete statement or question

1 pt problem stated but not in complete sentence or question

Research (gathering information about the problem)

1 pt statement given indicating where you find
information about the problem

0 pt no statement given indicating where you could find
information about the problem

Hypothesis (what do you think the solution to the problem is?)

2 pts hypothesis stated as a complete sentence and gives a
proposed solution or answer to question

1 pt hypothesis not stated as a complete sentence

0 pts no hypothesis given

Chapter V: The Study's Three Research Questions

RQ 1: How do two sixth and eighth grade science teachers who teach primarily urban African Americans make sense of their effort to make their pedagogy culturally responsive?

This study documented and interpreted the nature of culturally responsive pedagogy in two urban African American middle school science classrooms. I began this study with the questions that dictated the ground work for my research. I attempted to capture all of the rich and fruitful pedagogy that I had been told was used in these two science classrooms.

The study revealed through intensive observations, interviews, and shadowing how two middle school science teachers, Mrs. Thomas and Mrs. Adams, used culturally responsive pedagogy in two urban science classrooms, one teacher more than the other. This study explained how each of them developed her own unique culturally responsive teaching strategies.

According to Irvine and Armento (2002), culturally responsive pedagogy is one of several terms used to describe a variety of effective teaching approaches in culturally diverse classrooms (see Chapter I). This study used the term *culturally responsive pedagogy* because it indicated that all teachers should be responsive to students' culture and environment regardless of the discipline being taught.

Ladson-Billings (1994) talked about the pedagogical strategies that successful and effective teachers adopted in a culturally responsive classroom and gave examples of the instructional strategies. I observed Mrs. Thomas and Mrs. Adams as exemplars of the criteria that Ladson-Billings identified—teachers who teach in a culturally responsive

manner. Consistently, Mrs. Thomas and Mrs. Adams stepped out of the traditional curriculum they were prepared to teach to make their own independent teaching and learning adaptations. Mrs. Thomas played the nurturing mother, sister, friend in accomplishing her goal of ensuring that her students crossed the cultural line between the science classroom and their home and community.

Mrs. Adams portrayed the stern disciplinarian who painted a picture of order and hard work as keys to success in science.

In many instances throughout the study, Mrs. Thomas and Mrs. Adams connected their students' prior knowledge and cultural experiences such as filling their classrooms and the halls around their science classrooms with pictures and signs of famous and not-so-famous African Americans and other people of color with whom their students could identify as successful in science (see Appendix C).

Both teachers introduced new concepts by constructing and designing relevant cultural metaphors and images. Mrs. Thomas' use of many examples of cultural metaphors and images to help her students better understand some of the science concepts showed her awareness of the importance of assisting her students to have visual impressions of concepts presented in the curriculum.

Many of the metaphors included in these teachers' strategies were related to their personal interests. For example, in my conversations with Mrs. Thomas, she always expressed her interest in sports. Mrs. Thomas enjoyed contact sports, especially basketball, so much that her students, especially the boys, spent a lot of time after school playing basketball with her. Mrs. Thomas spent several hours after school on Fridays playing basketball with the teachers and her science students. Because of her interest in

sports, Mrs. Thomas related many of the metaphors and images in her science classroom to basketball terminology:

Like...the curriculum may say something with motion for instance in the energy in terms of golf. These kids don't understand golf. They've never played it. They probably never watched it other than seeing Tiger Woods on a commercial. Where...when I'm relating it, basketball...because most of the kids stay for the basketball games. So I gave an example, one Friday. It was funny because the kids were like, "This is my friend's class during the game." One of the kids said, "you know, I'm sitting and I'm thinking about your warm up and it sort of makes sense." The warm up was...imagine you're on a planet other than earth where there was either less gravity or less friction. Describe how the game of basketball would be different, and make sure you use the basketball and the players and the different things they go through in terms of jump shot and foul shooting. When I first gave the example in class, the kids really didn't get it. So I went to the game, and they said, "Oh, yeah, Ms. Mrs. Terri Thomas, friction is what gives you the grip on the floor, so they be sliding up and down and they wouldn't have control." And it became a science lesson during the basketball game. So some students sitting there saying, "This ain't science class." I said, "I didn't start the conversation." Sometimes I really think they're not listening to me, and I sit there and they would just start a conversation about something I mentioned last week. When we are giving examples, we need to give an example that the kids can relate to because most of the big stuff the kids don't understand. Or if we're gonna use what's in the book, we need to give them a little bit of their own background. Such as, ...one of the test questions was about badminton. The kids don't know what badminton is. So I say...I just say...okay who knows what volleyball is? Okay, who knows what tennis is? Okay, badminton is sort of a mixture of volleyball and tennis, and the next day I went to the Dollar Store and I brought in the rackets and the birdie so they could see what it was. We hit it back and forth. Because without the visual, without actually seeing it, they have no idea. The kids know the concept, but if you put it in terms that they don't understand, they won't be able to apply it. (interview 01/13/03)

Mrs. Thomas felt that the baseball analogy was extremely important because that was what she identified as what her African American students were interested in. She felt that sports was a "hook" to get them interested in science. Her theory was very much related to Banks and Banks' (1995) in their proposed approaches to multicultural curriculum reform, the transformational approach:

The structure of the curriculum is changed to enable students to view concepts, issues, events and themes from the perspectives of diverse ethnic and cultural groups.

Au (1993) reported that culturally responsive educators facilitated the maximum growth of each learner by making academic adaptations that matched and built upon the learner's prior knowledge, experience, skills, and beliefs.

Mrs. Adams' approach exemplified Ladson-Billings, Au, and Banks and Banks when she demonstrated examples of cultural metaphors and images to help her students in the science classroom. This teaching strategy helped make her class a culturally responsive science classroom. She was in-touch with the learning types that most of her students exhibited:

I guess. We do a lot of hands on activities and...hmm. our science class because I find that not all of our kids are the visual type or we have auditorial types. A lot of our African American children are kinesthetic, they are really hands on. And so just the smallest ideas...if it's, gravity or something like that on maybe we'll do something with a piece of cardboard and a toy car that they bring from home. It's hands on. It has to be something that they can touch and that they can feel, to try to relate it, to whatever area it is that we are discussing. (interview 01/29/03)

Throughout the study, Mrs. Thomas and Mrs. Adams were aware of the fact that they must regularly set high expectations for their students in their science classrooms. There were many moments when it seemed that science was not being taught. Mrs. Thomas and Mrs. Adams spent a large percentage of their in class time trying to maintain order, which left very little time to teach; however, the non-teaching and non-science moments were just as important to Mrs. Thomas and Mrs. Adams. Those moments were used to help capture the attention of students who were becoming uninterested in what was happening in the science classroom, to have them become more attentive. Both

teachers' determination to capture that "teachable moment" was readily observed in their classes. That "teachable moment" for Mrs. Thomas came unexpectedly to the students and me. It seemed to pep-up the students and motivated them to listen and observe. Wenger (1998) talked about various types of learning and motivational strategies that must be used in the classroom: Mrs. Thomas exhibited a motivational style that I have not found elsewhere in my science education research:

Michelle: Anyway. When I first started this study in your science classroom, I was observing how...when you move around the classroom...in the midst of your teaching, that you start dancing. That was a new piece for me...I just want you to explain...because... when I'm talking to other students at College Park, I mentioned that I have a teacher that I'm doing research with and she starts to dance in the middle of a lesson. They all said, 'Find out why she did that?' So I just want to know why you did that?

Mrs. Thomas: Well, as you know, it's amazing that when we were talking about motion and energy, and I know that...you know...energy is not created or destroyed just transferred. I know that when kids get something to eat, and they get happy, the first thing they do is start dancing. You notice any time a child has food, they bounce, and they dance, and they start smiling. And when I get excited in class, I see that my class is 'getting down,' and I start bouncing around. I always have music in my head. I don't know why, but...you know, I start bouncing around, and it sort of rubs off on them. It picks them up.

Michelle: And the dance that you do is almost similar to the dancing that they are doing in the community.

Mrs. Thomas: Well, I'm not that old. I'm not that much older.

Michelle: Right, right. When we talk about cultural response and motion and energy, I'm wondering how you feel about how a dance fits in with cultural responsibility.

Mrs. Thomas: I mean that's the way that we learned a lot. You know, our ancestors... they told stories and they...you know, lot of oral or verbal telling of the stories or reenactment through dance and theatre and things like that. So, I mean, I guess it's just my nature. (interview 04/16/03)

Mrs. Thomas' style exemplified what Wenger said: "A learning architecture combines infrastructures of engagement, imagination, and alignment in support of

learning communities.” In order for teachers and administrators to understand previous knowledge, they must have some insight into the community and the environment from which their students came. Mrs. Thomas and Mrs. Adams understood their students’ environment and community. They both spent time outside the classroom and the school in the community, Mrs. Thomas more than Mrs. Adams. They both made it a point to document in conversation with me that they grew up in the same type of environment and that they were willing to revisit and share with their students their life experiences. Mrs. Thomas felt that all pre-service teachers should be taught to understand their science students’ community and environment. The students recognized that their teachers cared about their community and their families.

The teaching strategies that Mrs. Adams and Mrs. Thomas used in their science classroom were not common. Minority students living in urban communities typically come from a culture very different from the culture of the science classroom. Cultural clashes between students’ life-worlds and the world of Western science challenge science educators to embrace science for all with the goal to reduce or eliminate cultural clashes and to develop culturally aware methodologies that reduced student alienation from science.

Mrs. Adams made sense of her efforts to make her pedagogy culturally responsive by always remaining optimistic in her expectations of all of her students’ character traits. Mrs. Adams was very stern, however, she had very high and promising expectations of each student. There were moments in the observations when Mrs. Adams seemed too strict, then, just minutes later, she spent an unusual amount of time helping the same student whom she had just disciplined. Cochran-Smith (1995) said that culturally

responsive educators build positive and supportive school classrooms learning environments that are grounded in mutual and genuine respect for cultural diversity.

We have a lot of them that are low skilled. But even with the low-skilled, they're still able to produce, at a high rate. And it doesn't seem that way based on test scores, but it, it's a difference. If you just ask them questions based on something that you want to know, they didn't realize they knew it, but they actually did have some concept of what is actually going on. (interview 01/29/03)

Mrs. Thomas, like Mrs. Adams, made sense of her efforts to make her pedagogy culturally responsive. She felt that education had changed, even in the short period that she had been a teacher at Greenville; however, she remained optimistic that all children can learn, and she was determined to prove that:

I still believe that all kids can learn science, but you just have to know how it is that they learn and be able to get to them. I feel that I can do that. Get to them. (interview 01/29/03)

The observations in this study validated my claim made in Chapter I that the two teachers in this study used their pedagogical practices to create a science learning environment encouraging students to pursue their cultural identities while pursuing high academic achievement.

Mrs. Thomas made sense of her effort to make her pedagogy culturally responsive by accepting the responsibility and commitment to assure that her students' culture was incorporated into her pedagogy and by instituting a positive classroom climate and positive relationships with parents and community. A positive classroom and positive relationships with parents were recognized in Chapter II as an indicator of a culturally responsive teaching environment. Mrs. Thomas on many occasions extended herself to picking-up students on weekends and taking them and her own children to museums, the

Maryland Science Center, and other educational institutions. Sometimes, during my observations, Mrs. Thomas even invited parents to participate:

Taking them home, talking to the parents, and some of them live right across the street, so I would walk right across the street and visit a couple of times. A lot of my kids from last year, we use to do movies on the weekends as a reward, so I would have to drive to their houses and pick them up or the parents would drop them off to me. I would meet them at the school. (conversation with Mrs. Thomas immediately after her discussion with a parent (01/12/03))

Neither Mrs. Thomas nor Mrs. Adams had an undergraduate degree in education; however, both attended graduate school to advance their studies in education and both received their Master of Science degrees in science education. The observations and interviews with Mrs. Thomas and Mrs. Adams indicated that they both were motivated to teach a culturally responsive science class because their backgrounds made them sensitive and aware of African American experiences. They were strong-willed and self-assured women, who were raised to respect religious diversity. They also came from a family that valued education.

Culturally responsive educators built positive and supportive school and classroom learning environments that are grounded in mutual and genuine respect for cultural diversity (Cochran-Smith, 1995). This belief implies learning about and valuing customs, beliefs, traditions, and mores that were unfamiliar to the teacher and to other students. It also implies basing the human interactions in the school and classroom on human dignity principles, on a sense of respect for each person, and on attitudes of optimism and hope. People are treated with civility, with gentleness, and with support, and students learned how to relate to one another with basic principles. Disagreements

are handled with discussion and with respect for alternative positions, not with attitudes of dogmatism and anger (Armento, 2001).

Mrs. Thomas and Mrs. Adams were culturally responsive teachers who extended to their science students, understanding, empathy, and trust, this was supported by my analysis of their interviews and my classroom observations. In table 3, I present prominent researchers' statements of their hopes for culturally response pedagogy and how Mrs. Adams and Mrs. Thomas stated that they met those hopes in their teaching practices with African American middle school students.

Table 3—Mrs. Adams', Mrs. Thomas', and Researcher's Interviews and Observations

Researcher	Mrs. Ann Adams	Mrs. Terri Thomas
Darling-Hammond, 2000 Culturally responsive educators hold high academic and personal expectations for each child and believe that each child can learn and develop to the maximum level of his/her potential	<ul style="list-style-type: none"> • “I’ve learned not to underestimate them.” • “These kids can do anything.” • You can’t take other people’s words for what they can do and cannot do...” • “I set high expectations that I think they can reach.” 	<ul style="list-style-type: none"> • ...science is hard, but they can do it, I trust them. • We have to have faith in them
Armento, 2001 Culturally responsive educators provide each student with access to the necessary learning resources and sufficient opportunities to learn	<ul style="list-style-type: none"> • “Half the kids do their reports on my lap top and I print them out.” • ...”because of the technological tools that they gave us with the text books that I’m able to do that with ease.” • “I showed them a little video clip ...when they see something that helps them explain a little bit more than just reading.” 	<ul style="list-style-type: none"> • .we use the computer center if it is available . • I try to do as much lab work as possible, maybe it’s because I’m a chemist.
Ladson-Billings, 1994; Nieto, 2000 Culturally responsive educators ensure that learning outcomes are meaningful, relevant, useful, and important to each child	<ul style="list-style-type: none"> • The Warm-Up question was, imagine you’re on a planet other than earth where there was either less gravity or less friction. “Describe how the game of basketball would be different, and 	<ul style="list-style-type: none"> • ..Begin aware of what it is that they do their surroundings, where they come from • ...just taking a variety of different strategies and trying to make it fit specifically for them.

	<p>make sure you use the basketball and the players and the different things they go through in terms of jump shot and foul shooting.and it became a science lesson during the basketball game.”</p>	<p>specifically for them.</p>
<p>Au, 1993</p> <p>Culturally responsive educators facilitate the maximum growth of each learner by making informed academic adaptations that match and build upon learner’s prior knowledge, experiences, skills, and beliefs</p>	<ul style="list-style-type: none"> • “...I’ll allow them to do diagrams instead of explaining using words because some of them had difficulty spelling.” • “I have kids who can’t read or write, but they can respond to me orally.” • “...it’s more of the building on what I thought they knew, and when I see that they already know it, extending a little bit more.” 	<ul style="list-style-type: none"> • ..as long as I am within the curriculum, if I don’t like it I try to find resources to make it so that I like it, and make it teachable
<p>Cochran-Smith, 1995</p> <p>Culturally responsive educators build positive and supportive school classroom learning environments that are grounded in mutual and genuine respect for cultural diversity</p>	<ul style="list-style-type: none"> • ...incorporate their life , their lifestyle, their culture into what’s going on in science. It could be chemistry, biology, whatever. Talk about sickle cell anemia when you’re talking about cells.” 	<ul style="list-style-type: none"> • T: ...The craters on Mercury have been named for artists, writers and musicians, and composers Bach and Mozart. Anybody know who Bach and Mozart are?This is information, that what we are trying to do here is make a connection from science to the musical world. Anybody here know who Bach and Mozart are. This is called the science/music connection. Sometimes we ask questions about (noise) that we try to connect two subjects to one another. Who is Stevie Wonder. • T: (noise) Alright he is a musician. Bach and Mozart are both musicians, but they come from a classical period. They are blind. Who was it Bach or Beethoven. Beethoven

		<p>was Black, I know somebody is Black. This is what we are talking about. We are just trying to make a connection from science to music.</p>
<p>Delpit, 1988; Villegas, 1991</p> <p>Culturally responsive educators promote classroom climates built on social justice, democracy, and equity</p>	<ul style="list-style-type: none"> • they have to learn to communicate their thought. It's important ...it's a manner of survival. 	<ul style="list-style-type: none"> • I demand respect in my classroom from them and they must respect their classmates.
<p>Banks & Banks, 1993</p> <p>Culturally responsive educators promote individual empowerment, self-efficacy, positive self-regard, and a belief in societal reform</p>	<ul style="list-style-type: none"> • ..she needs to understand that wearing tight clothes puts emphases on her body and not on her mind • I call them doctor, attorney, Mr. and Ms. to show respect, make them feel good. They need to know that they can not get there” 	<ul style="list-style-type: none"> • ...science have so much to do with the African American community in general, just by making them knowledgeable of some of the, hmm, things that the African American community have done to contribute, to remind them that when we are discussing the concepts to relate it to maybe somebody within our community who has vasesly contributed to it.
<p>Green, 1993</p> <p>Culturally responsive educators value diversity as well as human commonalities</p>	<ul style="list-style-type: none"> • “...I come from the same background that the kids come from.” • ..my mother was a drug addict , I have the same problems. I was hungry just like you going to school. I was wearing my neighbor's clothes, so I understand your problems. 	<ul style="list-style-type: none"> • ...we are the same, I'm not different than they are.
<p>Oakes & Lipton, 1999</p> <p>Culturally responsive educators believe that it is their role and responsibility to provide effective and empowering instruction for each child</p>	<ul style="list-style-type: none"> • The warm up was imagine your're on a planet other than earth where there was either less gravity or less friction. Describe how the game of basketball would be different, and make sure you use the basketball and the players and the different things they go through in terms of jump shot and 	<ul style="list-style-type: none"> • “...I find that not all of our kids are the visual type or we have auditorial types. A lot of our African American children are canisteci, they are really hands on.”

	foul shooting.	
Armento, 2001 Culturally responsive educators nurture learning-support communities for each child (families, peer, homework hotlines, community centers)	<ul style="list-style-type: none"> • They're really just big kids. Everybody wants to call me Mom or Auntie • I stay after school, and I listen to them. I give second chances. It's like you have to be a parent to these kids not just a teacher 	<ul style="list-style-type: none"> • They must do their homework and understand that is their responsibility • I don't assign library assignments often, they have a hard time getting to one.

RQ 2: In this study, what aspects of the two science teachers' pedagogy do their students identify (and for what reasons) as culturally responsive?

How the students in Mrs. Thomas' and Mrs. Adams' science classrooms identified their teaching strategies as culturally responsive became evident through the open-ended interviews, observations, and their pre-and post surveys.

Mrs. Adams' students

- The students felt that their teacher's physical appearance sent a message that they deserved a teacher who looked professional. The students felt this way because Mrs. Adams always looked perfect to the students' eyes, and she always dressed professionally. They were impressed and wanted to be like her.
- They felt that she respected them when she asked them to work extra hard to turn their assignments in on-time or they would be penalized. She always explained to them how important being reliable would be in the working world.
- She was always there for them to help them with personal issues.
- She let them know what she had in common with them.
- She high expectations of them.
- She demanded respect from them.

- She made a science a challenge.
- She expected them to learn science and understand science.
- She helped them with the computers.

Mrs. Thomas' students

- Mrs. Thomas' students indicated in their interviews that they knew that their teacher were aware of their culture outside the science classroom because their teacher understood their music.
- She was like a mother and a friend to them.
- She expected them to be successful.
- They liked being called by their professional and career goals. That was the highlight of their day.
- She shared her experiences with them.
- She remembered their problems.
- She recommended solutions to their problems.
- She didn't forget them.
- She knew their family situations.
- She came to their homes.
- She knew their community.

Both Mrs. Adams' and Mrs. Thomas' students

- The students could not, of course, articulate that their teachers' pedagogy was culturally responsive; however, they were clear about how their teachers' teaching strategies impacted on their science learning.

- Most of Mrs. Adams' and Mrs. Thomas' students interviewed felt that their science classroom was special and different from other classes.
- Their teachers treated them with respect; their teachers told them that they were smart and could learn.

Example of Mrs. Adams' relationships with her students

That Mrs. Adams connected to each student personally was made clear when she knew that Jackie loved to talk about fashion. Fashion was a typical topic of conversation with Jackie and her classmates, and Mrs. Adams' knowledge about Jackie's favorite topic transferred into applying science concepts to Jackie's interest in fashion. Following is an example of one of Mrs. Adams' relationships with her students

Jackie: Right. When like...sometimes when I'm home, I classify each thing differently like my shoes. I put black with black. Or my clothes. My uniforms and my running clothes.

Michelle: Oh, okay. How could you. When you talk about classify, what was Ms. Adams classifying?

Jackie: She was classifying animals and things, but we was really classifying animals, and she would teach you the different ways that we could classify other things. It's so funny, she told me that I could use my clothes. We even talked about me not...me thinking using the metric system. Laugh...I measured my shoes.
(interview 12/20/02)

Even though Jackie seemed to understand and enjoy science, Mrs. Adams' method of discipline had a negative effect on how Jackie looked at her future. Jackie's attitude toward Mrs. Adams changed drastically: the interview on December 20, 2002 is a clear indication of how important it was for a culturally sensitive teacher to understand and be in touch with a student's sensitivities and how not understanding had a long-term effect on a student's future goals. Jackie felt that Mrs. Adams' comments were offensive and therefore affected her future goals.

Throughout the interview with Tim, it is very clear that he is fond of Mrs. Adams.

To Tim, Mrs. Adams' class was less stressful than his other classes:

Michelle: So what do you think about science?

Tim: Science, I think that I'm getting better in the 2nd period because I understand more about it. I think it's getting better. Mrs. Adams is a good teacher, she makes things simpler for you. I remember last year in my elementary school, my class was big, that most of the time we couldn't get to stuff like this.

Michelle: How many students were in your class last year?

Tim: About 25 or 30.

Michelle: It's almost the same now?

Tim: ...people like to run the halls, stuff like that, and when the Mrs. Adams was trying to teach they would make a lot of noise and stuff.

Michelle: Did she get a chance to really teach or she was busy telling people to be quiet?

Tim: She was busy telling people to be quiet most of the time.

Michelle: Oh, so this unit that you are in right now, is the sun, earth science, right?

Tim: Right.

Michelle: You like it?

Tim: Yes, I didn't know that people knew that much about the sun

Michelle: Do you get a chance to go to the library?

Tim: No, but I went one time. I don't know about any around my way though, and if I did go to the library I would be on the, it's not school or something, because I don't have enough time, I do other thingsbecause before you know it, it's time for you to go to bed.

Michelle: Do you have many homework assignments for the library?

Tim: For the library?

Michelle: Library assignments where you have to go to the Library?

Tim: I had one, but I didn't really have to but, most of the time when I have to go the

library it's dealing with the computer, but since I don't have time to go the library I just write it on paper. I still get good grades though. (in-school interview 12/02/02)

Tim was extremely impressed with the fact the Mrs. Adams was a chemist. He seemed to admire the fact that his teacher delivered science information in a way that he could understand:

She's a real nice teacher. She tries to put things as simple as she can, and she can really teach science. She's a chemist. (in-school interview 12/02/02)

According to Schunk (1991), Tim exhibited one of the determinants of self-efficacy: when people who are similar to us can do something, we are likely to believe that we can do it and should attempt to do so. Tim did not express any desires to become a chemist like his teacher; however, he had never before met a chemist and felt lucky that his teacher was a chemist who looked like him.

RQ 3: What aspects of the two teachers' pedagogy are identified by their students (and for what reasons) as not effective?

Again, the students were able to identify through their interviews and surveys what they felt was not effective.

Mrs. Thomas' students

- Throughout the unit, Mrs. Thomas' students expressed their concern over the difficult time they had remembering science terms and words: "I am okay with science, but the words are confusing"; "I feel that I have a 'good' understanding of science I just have to work on my vocabulary and keep re-reading the sections that we are on and have done." (11/25/02)
Most feel that more study time at home is necessary: "Sometimes it feels

like I understand and then sometimes... and then I don't. So I go home and study.”(11/25/02)

Mrs. Adams' students

- The aspect Mrs. Adams' students identified as not effective was in the area of *accountability*. Many felt that Mrs. Adams was slow in explaining how they were doing in class; they felt they should be told more often about their progress. Each knew that if she/he didn't perform satisfactorily according to her standards, she/he would have a personal meeting with her: “I think I am doing excellent, because if I was doing bad in science I would be addressed by Mrs. Adams to work harder.” (in class interview 11/25/02)

Summary

In Chapter I, I indicated that in middle school science, for students and teachers in an urban middle school science classroom, interactions can be doubly hard. For many students, learning the language and terminology of science is like learning a foreign language. The heightened intimidation increased if the African American students lived in urban communities where the schools are suffering economically, and thus science books are twenty or more years old and written in words that they cannot read or understand (Tobias, 1992; Jones, 1997).

As I indicated in Chapter I, like Ladson-Billings, I looked at two teachers' ideology, ideas and beliefs about education, and what cultural responsive pedagogy meant to them and their students. These three questions addressed those concerns:

1. How do two sixth and eighth grade science teachers who teach classes populated primarily by urban African Americans make sense of their efforts to make their pedagogy culturally responsive?
2. What aspects of the two science teachers' pedagogy are identified (and for what reasons) by their eighth grade African American students as culturally responsive and
3. What aspects of the two teachers' pedagogy are identified (and for what reasons) by their students as not effective in teaching them science?

This qualitative study was able to view, from the perspective of those three research questions, what was happening in these two teachers' science classrooms; and I was able to capture the words and actions of the students and learn how the students felt about what was happening in their science classrooms. Many of the students' responses to what was going on in their science classrooms were expressed through their nonverbal communications. The students in both Mrs. Adams' and Mrs. Thomas' science classes could not verbalize whether their teachers' pedagogy was effective or ineffective in teaching them science; however, they did recognize whether they liked or did not like science and if the teacher had any influence on their decisions about science. They knew whether their teachers cared about their lives and their careers. In Mrs. Thomas' class, her students danced and sang if they were happy, and when I asked them why they started dancing, they would say simply that they "felt good." Those students who *felt good* tended to participate often in class and had fewer disciplinary problems. Mrs. Adams' students felt that her strictness was unfair; however, they continue to like science.

I spent nine months in Greenville Middle School researching, observing the teachers and students, interviewing the teachers and their students, shadowing the teachers and their students, spending an enormous amount of time with Mrs. Thomas, Mrs. Adams, their students, their students' friends, the principal, the chairperson, and the community to answer this study's research questions.

Chapter VI: Discussion, Implications, Recommendations, and Conclusion

Discussion

In Chapter I, my *Positionality* suggested that I entered the study with prior theoretical and political opinions. In the *Positionality*, I discussed coming from a community that was 99% African American, similar to the community of the students I studied for this report. In a sense, everything in Cherry Hill was culturally responsive; i.e., the community, schools, teachers, administrators. The staff were mostly African Americans and had the advantage of living in and being a part of the same community as their students and thus very much involved in the same culture as their students. According to Roman and Apple (1990), researchers are informed and transformed by the lived experiences of the group they research. Their own theoretical and ideological views are powerful, but these perspectives are also shaped by what they learn from their informants. The teachers who taught me and with whom I grew up practiced what Aikenhead (1999) called “cultural border-crossing.” As in Aikenhead’s study, Mrs. Thomas and Mrs. Adams also brought the culture of their students’ families and communities into the culture of the science classroom.

The students in Mrs. Thomas’ and Mrs. Adams’ science classroom who participated in my study were very similar to the students who lived in my community. They fit the profile that Edelman, 1986, (Children’s Defense Fund) discussed in the literature review in Chapter I: that urban African American students were two-to-four

times more likely to (1) die before adulthood because of inadequate prenatal or postnatal healthcare conditions, abuse, or murder; (2) live in a single-parent household because of parental death, separation, divorce, or no marriage; (3) live in foster care or in the custody of a child welfare agency; and (4) be poor and living in substandard housing with an unemployed teenage mother (Edelman, 1986). The students in Mrs. Thomas' and Mrs. Adams' science class also identified with the profile that Browne & Rife (1991) and Frymier & Gansneder (1989) spoke about in Chapter 1: (1) lack of academic success; (2) poor self-concept; (3) antisocial behavior; (4) poor attendance; (5) high mobility; (6) dysfunctional family; and (7) history of child or substance abuse. Once these students entered the classroom, they continued to be victims of educational neglect.

I agree with Irvine's theory that educational systems continue to ignore the educational needs of urban African American students. In Chapter 1 of *Black students and school failure*, Irvine (1990) writes that "conflict theorists believe that the power of the dominant social group determines economic and educational requirements, and that the interest of the powerful is primarily to maintain and reproduce the status quo, which results in a system of inequality for others." Under the status quo, at-risk students are left underrepresented, uneducated, and unskilled while the dominant race remains in a position of power in the system. In this position, the dominant culture allows minority students to move toward less-skilled jobs by encouraging low self-esteem, conditioning the students to be obedient and not ask questions, encouraging acceptance of authority, and leaving external control in the hands of the dominant culture. While I am fully aware that much is now broken in United States society and that the African American community has been differentially impacted negatively, as an educator I place hope in the

daily power of teachers to ameliorate conditions for their students (but not necessarily overcome all external constraints). Teachers, such as Mrs. Adams and Mrs. Thomas willingly enter the breach and by application of culturally responsive pedagogy in their science classrooms do all that a teacher could be hoped to do in such circumstances.

In this study, I looked critically at how two urban middle school sixth and eighth grade science teachers, nominated by their department Chairperson/Academic Coach and school Principal as being effective with their African American students, made sense of their efforts to make their pedagogy culturally responsive. Again, this study results from the idea that identifying, describing, and analyzing successful teaching strategies for educating African American students can play an important role in reversing school failures (Delpit, 1995; Foster, 1992; Irvin, 1990). Both the students' and the teachers' cultural histories were reported and the students actively participated in the learning process. By bringing the African American students' culture into the science classrooms Mrs. Adams and Mrs. Thomas showed the students that they recognized the importance of their cultural backgrounds. In addition to the concern of including the students' culture in the science classroom, success in science was equally important. As mentioned in Chapter I, schools' emphasis on literacy and mathematics, although appropriate, often results in science's receiving less attention than is warranted (Bauer and Toms, 1990; Schoeneberger and Russell, 1986; Sherwood and Westerback, 1983).

Culturally responsive teaching strategies in a science classroom are different from traditional teaching methods in that Mrs. Thomas and Mrs. Adams involved the students, the students' families, and the community in a learning process to which students could relate. I believe that Mrs. Adams and M used Aikenhead's method, *cultural border-*

crossing, to implement a curriculum that incorporate their students' expectations of them and Mrs. Thomas' and Mrs. Adams' expectations of their students.

Both Mrs. Thomas and Mrs. Adams showed evidence daily that they incorporated a culturally responsive pedagogy into their science curriculum. As earlier documented, both teachers manifested a fundamental belief in a culturally responsive pedagogy. However, my observations and open-ended interviews revealed that Mrs. Thomas, the eighth-grade science teacher, demonstrated more instances of a culturally responsive science classroom than did Mrs. Adams, the sixth-grade science teacher.

Each of the teachers demonstrated strategies that successful teachers use in a culturally responsive classroom. Mrs. Adams and Mrs. Thomas demonstrated and acknowledged through observations, open-ended interviews, and shadowing what noted research experts considered to be culturally responsive pedagogy. If their effort to respect and honor the social reality and experience of people of color is to be reflected in a pedagogical process, then as teachers on all levels, from elementary to university, we must acknowledge that our pedagogical styles of teaching may need to change (Hooks, 1994). Mrs. Thomas and Mrs. Adams demonstrated through this study how important the culture of their students was to them.

Darling-Hammond (2000) reported that culturally responsive educators hold high academic and personal expectations for each child and believe that each child can learn and should be able to develop to the maximum level of his/her potential. Mrs. Thomas and Mrs. Adams used their pedagogical practices to create a science-learning environment that encouraged their students to pursue their cultural identities while at the same time pursuing high academic achievement. Mrs. Thomas displayed her high

expectations for each of her students and expressed respect for their career goals by consistently referring to them by their career titles, such as doctor, attorney, judge, Mrs., or Miss. Mrs. Thomas' identification of each of her students with a professional title promotes what Armento (2001) calls belief in individual empowerment, self-efficacy, and positive self-regard.

In several interviews, Mrs. Adams talks about how she recognized that her students came into her class with prior knowledge of science and that they were smart. Her job was to bring out their knowledge and their intelligence:

A lot of them have prior knowledge of science and they don't realize it until you ask questions and actually draw the information out of them—the how's, the when's, the why's. . . even with low skills, they are still able to produce. (Mrs. Adams interview on her lunch break 12/16/02)

Each of these teachers had the mission to foster their students' will to learn. Each teacher showed high expectations for all their science students.

This study uncovered many indications that both Mrs. Thomas and Mrs. Adams promoted and encouraged high self-efficacy. Both teachers were strong, self-assured African American women. Mrs. Thomas had been challenged to play basketball when one of the male teachers and her students said "Girls can't play basketball as well as guys" (12/04/03). Mrs. Thomas used that opportunity to show her students the importance of taking the challenges which lead to high self-esteem, high efficacy, and high expectations.

As to their relationships with their students' families, I found that Mrs. Thomas was more involved than Mrs. Adams in reaching-out to her students' families outside the classroom. Considering that Mrs. Thomas' grew up in projects similar to those in which her students lived, it is not surprising that she developed stronger relationships with her

students than did Mrs. Adams. The students she connected with outside the classroom have Edelman's (1986) (see Chapter I, p. 15) at-risk characteristics—poor self-concept, poor attendance, and dysfunctional families.

Mrs. Adams tended to limit her personal relationships, as in her efforts and perseverance with her students and their families, to the school and the science classroom. She felt that strictness, consistency, and reliability are the necessary teacher characteristics to bring about student success in science students. She was always present and well-groomed, and her students could rely on her.

Again, one of the connections that Mrs. Adams and Mrs. Thomas had with their science students is that they came from urban communities. In the *Positionality*, I spoke about how when I was a child in elementary school, the professionals lived in the communities and were mostly doctors and teachers; however, in later years, due to the new 'freedoms' of integration, African Americans moved out of the cities into the suburbs. Many of these African Americans were scientists and teachers. They took a rich culture with them and left a poor community with too few positive role models. In Chapter II, I mentioned that African American students seldom knew about African American scientists in key positions in the science community other than well-known scientists whom they read about in magazines or textbooks. Bloom (1976) claims that role models influence positively the attitudes of African American students. Mrs. Thomas and Mrs. Adams became these students' role models and helped to build their students' expectations of what they could be when they grow up. The study indicated through interviews with the students that their teachers, as one student said, "*made me feel good.*"

Mrs. Thomas and Mrs. Adams developed teaching strategies that their students felt were effective in helping them to understand science. Those strategies lead to their students' reaching their potential, feeling good about their accomplishments, and developing confidence in their abilities to tackle difficult problems and understand complex concepts (Pressley & McCormick, 1995).

Although Mrs. Adams never lived in the projects, she did talk about coming from a low-income family like her students, one of the important connections both teachers had with their students. They both brought that connection into the science classroom. Of the two teachers, Mrs. Thomas seemed to relate more to the science students and their culture because her background was closer to theirs. She felt that the projects were safe and secure, like family, and brought that feeling to the culture of her science classroom. Mrs. Adams wanted her students to feel safe and secure and to have confidence in her. The task for the school and the teachers were to foster a will to learn, and "the teachers' role was to encourage both confidence and high achievement in their students" (Covington & Beery, 1976, p.5).

Mrs. Adams also talked about attending public schools like her students. She is a second-generation college graduate. Both of Mrs. Adams' parents graduated college and eventually moved out of their community. Mrs. Adams' perspective was slightly different from that of Mrs. Thomas, whose students saw her as a mother and friend and a teacher who cared.

While their students were not always aware of their teachers' intentions or concerns for their success in science, they recognized that their teachers cared about their future and their survival. Science was difficult for many of the students, and they often

seemed not to care about it. Many thought of science as ‘for Whites only’ until their teachers demonstrated that African Americans are scientists too. The students recognized and made sense of how hard their teachers worked to promote positive and supportive environments for their science students. Both teachers’ students indicated throughout the study that there was a connection and a bond that they had developed with these teachers that helped to build their self-efficacy and motivated them to excel. Aikenhead (1999) says, “Without cultural border-crossing, there will continue to be obstacles to nontraditional students’ effectively experiencing school science.”

The students in this study performed exceptionally well in their two science classrooms, compared to the challenges that they faced before coming to school everyday. I entered the study not knowing what to expect during the periods of observations. According to the in-class chart, less than 50% of the class time was spent on actual teaching. Mrs. Thomas and Mrs. Adams spent a large percent of their time on other concerns, including behavioral disruptions. In the beginning of my study, I was greatly concerned with that process until I realized through my data and observations that those non-teaching moments were the moments that interactions with the students were at the highest. Those moments became extremely powerful. Mrs. Adams brilliantly displayed her teaching strategies at those moments. Culturally responsive science educators need to integrate their concern for order in the classroom with awareness of students’ talking in ways that invert the perceived problem of too much talking. My study suggest that animated talk may become a powerful ally in the project of attaining high levels of achievement among African American students in science (Norman, Ault, Bentz, & Meskimen, 2001).

Implications

Although the 1960s produced a large body of literature on teaching the “disadvantaged” (Bloom & Hess, 1965) and the 1970s produced a body of literature about “effective schools,” none of it was aimed specifically at preparing teachers to meet the needs of African American students (Brookover, & Lezotte, 1979). This study with these two teachers suggests strongly that all teacher-preparation programs in colleges and universities must evaluate how they educate all pre-service teachers, but especially science teachers about the cultural experiences of minorities. This study implied that the two science teachers who were considered effective teachers with their urban African American middle school students built high expectations for their science students and were aware of and understood the cultural experiences of their students. However, in their interviews, the teachers expressed the view that cultural awareness was not encouraged in their graduate education courses. Mrs. Thomas, for example, mentioned that she received only limited preparation for teaching in an urban community. She felt that it was insufficient and ineffective. She had to rely on her own experiences to help her through her science classes. According to Ladson-Billings (1994), the pedagogical instruction that many teachers of African American students received from their teacher-preparation programs, from their administrators, and from “conventional wisdom” leads to an intellectual death. Thus, successful teachers, like the wise men of the Bible, travel a different route to ensure the growth and development of their students.

This research should not be interpreted to imply that science teachers have to be African American to practice culturally responsive pedagogy in an African American science classroom. Mrs. Thomas and Mrs. Adams were two African American teachers

who had high self-esteem and high expectations of themselves and their students, which was shown throughout the study. As indicated throughout the study, Mrs. Thomas and Mrs. Adams were not selected because of their ethnicity/race but because of how their teaching strategies were perceived by school administrators. The task of creating environments conducive to learning rests heavily on the talents and self-efficacy of teachers. Evidence indicates that classroom atmospheres are partly determined by teachers' beliefs in their instructional efficacy (Bandura, 1993).

This study also shows that culturally responsive pedagogy is not something to compartmentalize into set-aside months, such as African American History Month. African American culture is practiced throughout the year in the science classroom. Culturally responsive teachers attend to the culture of the students at all times. Both Mrs. Thomas and Mrs. Adams displayed throughout their classrooms and in the hallways pictures and signs of accomplished African Americans in science and other subjects. Mrs. Adams took her students on field trips that included the Great Blacks in Wax Museum in Baltimore and the Walters Art Museum. Students were given assignments in both teachers' classes to write short articles on their favorite African American science inventors.

Throughout Mrs. Thomas' classroom she displayed pictures of her family members and encouraged all of her students to bring photos of family members that they wanted to share with the class. This activity implied that the students in a culturally responsive classroom felt that their teachers recognized the importance of their family community and their culture. In Chapter IV, Mrs. Thomas said, "I invite the students, if they wanted, to bring picture of their families to class. When the students brought their

family pictures in, I used that opportunity to talk about DNA and biology.” These teachers were aware that many of their students were in a nontraditional family environment and allowed their students to make choices about sharing their family life or their community with their classmates. As mentioned in Chapter V, Mrs. Thomas’ student said, “ I have a little brother name Jack. I have lived with my aunt since I was 4 years old. My mom died November 5, 2001.” A second student commented, “One of the things from my background that you would probably know about is that my mother passed away and I live with my sisters and my brothers.”

Culturally responsive teachers strive to make a difference in their students’ lives. Both teachers in this study demonstrated how much they cared about their students’ success in the science classroom and in their community. Mrs. Thomas’ student said, “I used the library everyday because I loved working on a computer and reading books by Black scientists. I don’t go to the library unless I am doing a report or something” (11/15/03). Mrs. Thomas encouraged her students to research Black scientists throughout the year.

Culturally responsive educators hold high academic and personal expectations for each child and believe that each child can learn and should be able to develop to maximum level of his/her potential (Darling-Hammond 2000). This study documented over and over again that Mrs. Thomas and Mrs. Adams held high expectations of their students regardless of their students’ backgrounds. These teachers told them daily how important they were. Mrs. Thomas even called them by their career names. They also gave their students advice on how to reach their goals and the proper routes that would lead them to their goals, such as after-school and weekend programs. Culturally

responsive educators provide equitable access to the necessary learning resources and sufficient opportunities to learn for each child (Armento, 2001). Teachers who practice culturally responsive pedagogy maximize the learning of African American students in a science classroom.

This study makes the strong case that each of these teachers practiced culturally responsive pedagogy because they understood the culture of the community and transferred that information to the science classroom. Mrs. Thomas asked, “Who is Stevie Wonder? Alright, he is a musician. Bach and Mozart are both musicians, but they came from a classical period. They are blind? Who was it, Bach or Beethoven? Beethoven was black...?” (science classroom observation 11/27/02). Linking classroom content to student experiences characterizes the practice of effective African American teachers (Foster, 1987, 1989a; Ladson-Billings, 1991a, 1991a, 1991b, Henry, 1990; Ladson-Billings & Henry, 1991).

Students in a culturally responsive classroom think of the teacher as someone who respects them, has high expectations of them, and to whom they can turn for help. In Chapter V, Mrs. Thomas’ student AJ felt that Mrs. Thomas was “a real nice teacher. She tries to put things as simple as she can, and she really teach science” (personal interview with AJ 12/18/02). When I asked AJ what he meant by “she really teach science,” he said, “I understand her and I like science.” Students in Mrs. Adams knew exactly what her expectations were. They knew that she wanted the best and the finest from them and was not going to accept less. Jackie was one of Mrs. Adams’ students who expressed her upset at Mrs. Adams about a missing book. Even though Mrs. Adams was not on her

favorite teacher list, Jackie shared that she still liked science “*sometimes*” and her goals changed “*sometimes*”; she wouldn’t let her feeling get in the way of her success.

Recommendations

Based on what I have learned from my study, I make several recommendations. I recommend first that all universities should investigate how they prepare pre-service science teachers to teach in urban communities with students who are considered to be academically challenged. Neither Mrs. Adams nor Mrs. Thomas went the traditional educational route in their undergraduate programs to teach science in a middle school; however, they were dedicated teachers willing to build positive and supportive opportunities for their students. Zeichner (1992) produced a comprehensive review of the literature on preparing teachers to teach in a culturally diverse urban classroom. I used a few of the recommendations, as they applied to this study, indicating the criteria that all colleges, universities, school districts, and administrators should use to evaluate their teacher preparation programs.

Teaching was not Mrs. Thomas’ or Mrs. Adams’ first career choice; however, both chose to become educators for personal reasons unrelated to finance but more related to the desire to work with children and to make a difference in children who have been underrepresented in the educational system.

American Association of Colleges of Teacher Education (AACTE), (1995) demographic data confirmed that by the year 2020 about 40 percent of the nation’s school-age population will be students of color, and students of color already represent 70 percent of the student population in the 20 largest school districts. However, as the

number of culturally diverse students increases, the number of teachers of color is decreasing.

My study does not imply that a teacher must be African American to teach a culturally responsive pedagogy; however, AACTE, indicated that 80 percent of pre-service teachers are White females who are unfamiliar with the cultural experiences of their diverse students. What this study has shown is that the two teachers who happen to be African American came from similar backgrounds, similar cultures, had similar beliefs, spoke similar languages, and were able to bond with the students because of their similarities and backgrounds.

I strongly recommend that all new pre-service teachers who are going to teach in urban public schools where there are predominately African American students should be required to have accessible classroom material and resources to use in planning and implementing culturally responsive science lessons for African American students. All pre-service teachers teaching in urban African American schools, especially gatekeeper courses such as science, should be required to have field internships in such urban community sites as the local library, a homeless shelter where there are many students and their families, drug rehabilitation centers where many of the students who attend public school as well as their families are receiving treatment, local hospital emergency rooms, departments of social services, Juvenile Courts, and local police departments (and, by extension, similar efforts should be made to address the culturally responsive pedagogical needs of all other traditionally subordinated population groups).

I believe by having these types of educational experiences, pre-service science teachers will have the necessary community exposure to began teaching urban African

American students. Educating pre-service teachers in courses such as science should be community-based. Experience in the community will allow pre-service teachers the opportunity to see their students in their homes and in their community. Teachers who truly know their students will be able to empower their students intellectually, socially, emotionally, and politically because they will *know*

I believe that all teachers teaching in urban schools must be able to assist African American students to cross the cultural borders between their homes and community into the cultural of the science classroom. Those interested in teaching largely live in and embody different, often incompatible, social worlds from the students they are to teach, creating one of the great challenges for urban teaching and teacher education (Bourdieu & Passeron, 1979).

Rodriquez (1993, 1994, 1995) and Erickson, Mayer-Smith, Rodriquez, Chin, & Mitchell (1994) recognize that regardless of how innovative, collaborative, constructivist, inclusive, or intellectually stimulating a model of teaching and learning may be, if pre-service teachers feel that they do not have the confidence and support required to take risks during student teaching, they will fall back on traditional and safe teaching styles.

I strongly agree with Wenger (1998) that “in order for teachers and administrators to understand previous knowledge, they must have some insight into the community and the environment from which their students come.” To teach successfully in an urban school in ways that are potentially transformative, teachers have to learn how to identify and connect with the social and cultural resources of their students.

I am supportive of the research that Aikenhead (1997) has done in the area of cross-cultural science with First Nations (Native American) students. He supports the

research done by MacIvor (1995) in which they both believe that students should learn Western science but, at the same time, not be assimilated into Western culture at the expense of their own culture and identity. I support this theory as it relates to African American students. Like Native Americans and First World Canadians, African Americans have a rich culture that should be embraced and encouraged in the science classroom. In the culturally responsive classroom at Greenville Middle school, the students' culture was recognized and acknowledged by both teachers.

When I asked Mrs. Thomas if she could redesign teacher education so that teachers would be more effective and better prepared with African American students in science and what changes would she make, her response was

I guess it would be to make sure that they actually have a concept or idea of the science that they are actually teaching so they can be more effective with their actual students, more teacher-oriented training about different ways to convey science to the African American child. Not just the straight textbook teaching. So just coming up with strategies for the teacher in science that will actually help the students learn the subject matter. To be more proficient in the area.

As in the concept of 'No Child Left Behind' (NCLB), I am in general agreement to improve teacher quality by strengthening skills, improving knowledge, and promoting the use of scientific, research-based and effective practices in the classroom. However, I wonder if Mrs. Thomas would be considered a "highly qualified" science teacher since she doesn't have an undergraduate degree in a science content area. According to the United States Department of Education Academic Improvement and Teacher Quality

Programs, Office of Elementary and Secondary Education draft *Improving Teacher Quality Guidance (2001)*, Mrs. Thomas does not meet the requirements to be considered “highly qualified.” The results of this study indicate a possible flaw in the NCLB Act. One of the requirements of the NCLB is that middle school teachers must demonstrate their competence in science content by completing an academic major, graduate degree, coursework equivalent to an academic major, in the science subject they teach. Another area of the NCLB that my study puts into question is the promotion of one best practice for the teaching of science. Findings from my study suggest that a more sound educational research policy would be to place an emphasis in educational research pedagogies, with the socioeconomic construct of class as a mediating variable.

Conclusion

Aikenhead (2001) indicated, whether in classrooms or museums, learning science seems to be determined by 1. the difference between a student’s cultural identity and the culture of science or school science; 2. the effectiveness with which students are able to cross the cultural border between their life-world and the world of science or school science and, 3. the assistance students receive as they negotiate those cultural borders.

Without doubt, teaching and learning science poses many challenges even in the best circumstances. These challenges increase in number and intensity in those urban schools that must deal with inadequate funding, teacher shortage, lack of resources, and a high proportion of students from conditions of poverty (Tobin, Seiler, & Walls, 1999). I believe that my study makes a strong and compelling case that it is critical that teachers and administrators understand the culture of students. I am convinced that this study was just a small piece of a huge pie. Unlike quantitative studies that talk about significance,

theory-observation, compatibility, generalizability, consistency, reproducibility, precision, and verification, this qualitative research takes another direction to establish its work. My study's credibility and translatability are tied intimately to the rich detail of data presented and my careful analysis of such data.

Understanding the culture of students who came from urban communities certainly requires much attention by all pre-service teachers, school personnel, college administrators, and communities. For example, one student in Mrs. Thomas' eighth grade class was the parent of two children yet managed to attend classes regularly. In a few cases, several students in Mrs. Thomas' class were the heads of their households because their parents were dead, on drugs, or incarcerated. The readers of this report might ask why I feel the need to mention this in the second paragraph of my conclusion. It is very important to note that these Greenville students are those mentioned in the literature review. Hearing the voices of these students in their own words, in their own frame of reference about the life that they are living before they enter the science classroom is profound. Bringing culture into the science classroom shows the students that their teachers and the school administrators recognize the importance of the students' cultural backgrounds. Culturally responsive pedagogy requires respect for the culture the student brings into the classroom and acknowledges the teacher's willingness to do whatever is necessary to educate the student.

The literature review in Chapter II indicates that the bulk of the research and ethnographic studies produced about multicultural education mention that in an urban environment, students who are not of the dominant race are more likely to live in poverty (Kozol, 1988), have low self-esteem, come from a single-parent home (Staples, 1985), be

abused, and have more health problems than White students. Once these African American at-risk students enter the science classroom, teaching style can have a profound impact on their academic success or failure.

I argue that the students' culture is an essential feature of the classroom. The overriding issue we face as teacher educators is how to prepare and encourage teachers to cross the cultural borders and bring the community into the science classroom. I believe that teachers like Mrs. Thomas and Mrs. Adams must be supported and encouraged to continue their exemplary work in their science classrooms, and the system must be geared to ensure that such teachers like Mrs. Thomas and Mrs. Adams have the resources and technology to implement their work. Nothing in the facts or results of this study indicates that only African American teachers can be culturally responsive; however, it is clear that because these particular two teachers' backgrounds were similar to their students', teaching a culturally responsive pedagogy enabled them to relate more easily and more effectively to their science students. Therefore, I believe teachers like Mrs. Thomas and Mrs. Adams must be used to mentor other pre-service teachers who plan to teach science in urban communities. I also believe that because of the critical shortage of African Americans majoring in education, especially secondary science education, all teacher-preparation programs need to focus on making a priority the recruitment of and creating incentives for high school African American students and African Americans who are changing careers to become interested in science education in urban, predominantly African American schools.

I conclude with the hope that all colleges and universities will encourage more research in the area of culture and science, and that education departments include concentrations in urban education.

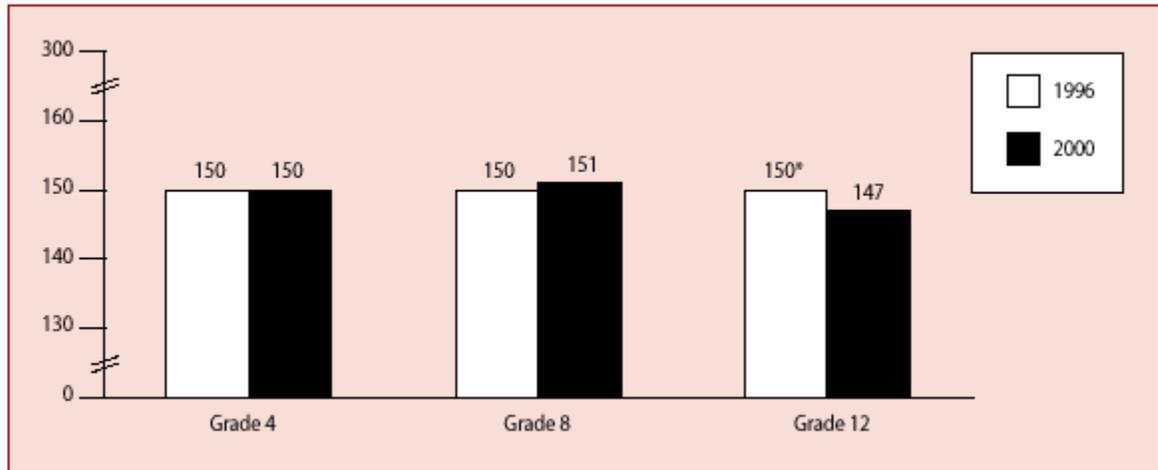
On a personal note, it brings me great joy to have had the opportunity to spend some time at an urban middle school observing in science classrooms African American students, most of whom work extremely hard to demonstrate that if given the opportunity, culturally responsive teaching can help create in those science students the self-efficacy, self-esteem, and respect which will allow them to be just as successful as any other science student. The two teachers observed for this study are very similar to those I had in Cherry Hill, especially Mrs. Adams, who was more demanding than Mrs. Thomas, though both demanded respect and hard work from their students.

I believe my study showed that both teachers used their personal beliefs about educating their students and the tools available to them to effectively incorporate equity and culturally responsive education into their science classrooms.

Appendices

Appendix A: Student Achievement in Science (USA)

Figure B.—Average Science Scores, Grades 4, 8, and 12: 1996-2000 (a repeat from page 30)



*Significantly different from 2000.

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1996 and 2000 Science Assessments. (Originally published on p. 1 of *The Nation's Report Card: Science Highlights 2000*.)

Results for Participating States and Jurisdictions

In addition to national results on students' science performance, the 2000 Assessment collected performance data for fourth- and eighth-graders who attended public schools in states and other jurisdictions that volunteered to participate. The results of the State Assessment are for students attending public schools only.

In 2000, 40 states and 5 other jurisdictions participated at grade 4, and 39 states and 5 other jurisdictions participated at grade 8. Not all jurisdictions met minimum school participation guidelines for reporting their results in 2000. Data are presented for each jurisdiction that met minimum participation guidelines at grade 4 in 2000 and at grade 8 in 1996 and/or 2000. The science state-by-state assessment was not conducted at grade 4 in 1996.

Average Score Results

Figure C. shows states' and other jurisdictions' 2000 average score performance at grade 4 in comparison to the national average score for public schools. Of the 44 states and other jurisdictions that met minimum participation guidelines at grade 4 in 2000, 20 had scores that were higher than the national average score, 11 had scores that were not different from the national average, and 13 had scores that were lower than the national average.

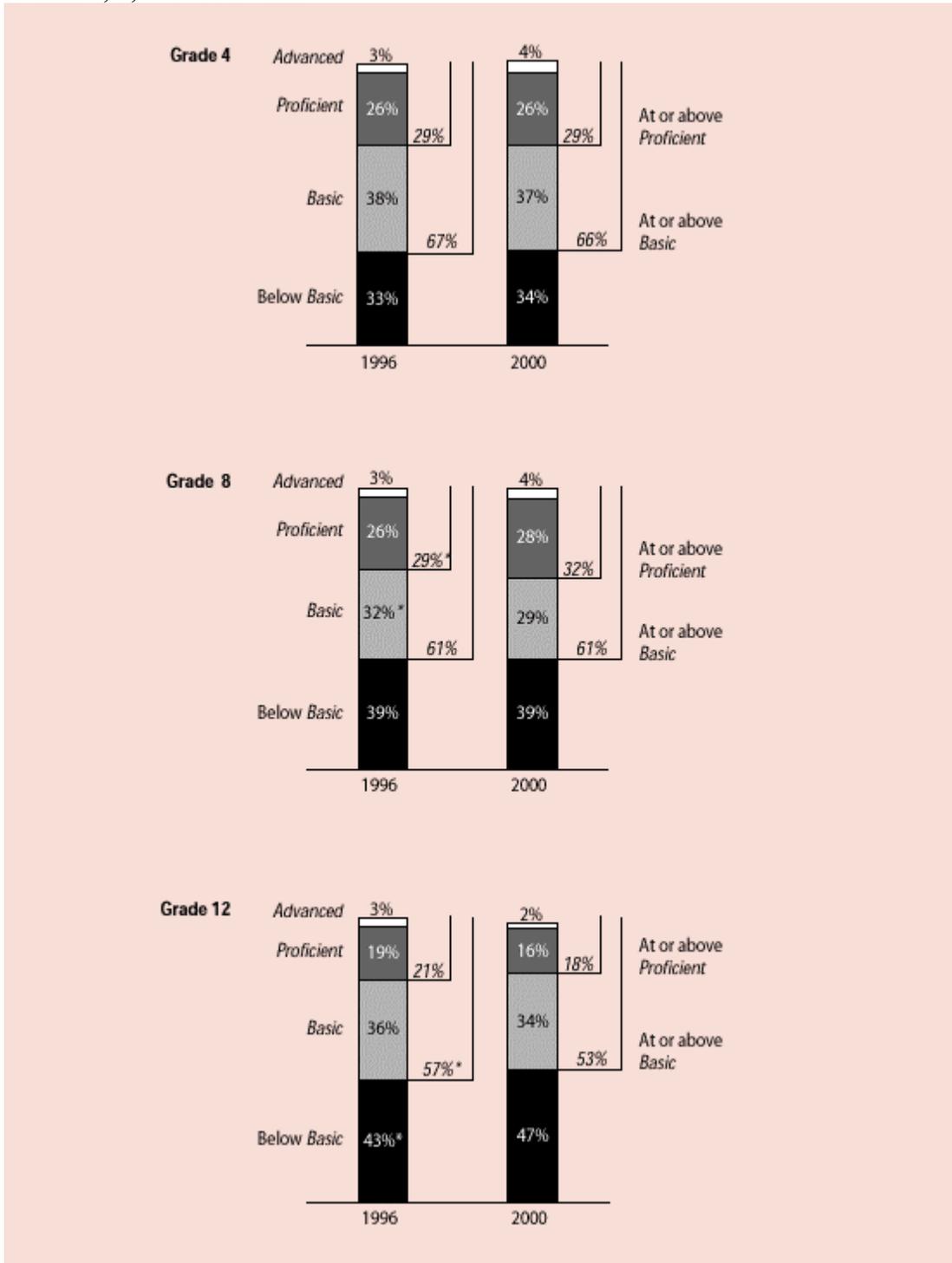
Figure D. shows that of the 42 states and other jurisdictions that met minimum participation guidelines at grade 8 in 2000, 18 had scores that were higher than the national average score, 11 had scores that did not differ from the national average, and 13 had scores that were lower than the national average.

A total of 36 jurisdictions met minimum participation guidelines at grade 8 in both 1996 and 2000. Of these, 1 state and 2 other jurisdictions showed significant score gains since 1996: Missouri and the Department of Defense Schools (domestic and overseas).

Achievement-Level Results

At grade 4, 12 states and other jurisdictions had higher percentages of students at or above *Proficient* than did the nation, 17 had percentages that were not different from the percentage for the nation, and 15 had percentages that were lower than that for the nation. At grade 8, 17 states and other jurisdictions had higher percentages of students at or above *Proficient* than did the nation, 8 had percentages that were not different from the percentage for the nation, and 17 had percentages that were lower than that for the nation.

Figure B.—Percentage of USA Students within and at or above Achievement Levels, Grades 4, 8, 12: 1996-2000



*Significantly different from 2000.

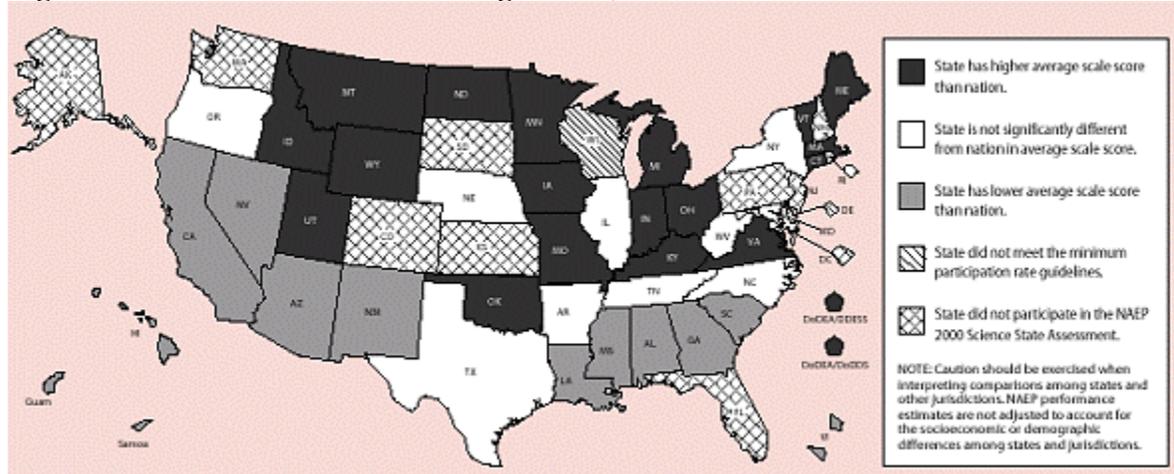
NOTE: Percentages within each science achievement-level range may not add to 100, or to the exact percentages at or above achievement levels, because of rounding.

HOW TO READ THIS FIGURE:

- The italicized percentages to the right of the shaded bars represent the percentages of students at or above *Basic* and *Proficient*.
- The percentages in the shaded bars represent the percentages of students within each achievement level.

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1996 and 2000 Science Assessments. (Originally published on p. 2 of *The Nation's Report Card: Science Highlights 2000*.)

Figure C.—State vs. National Average Score, Grade 4 Public Schools: 2000



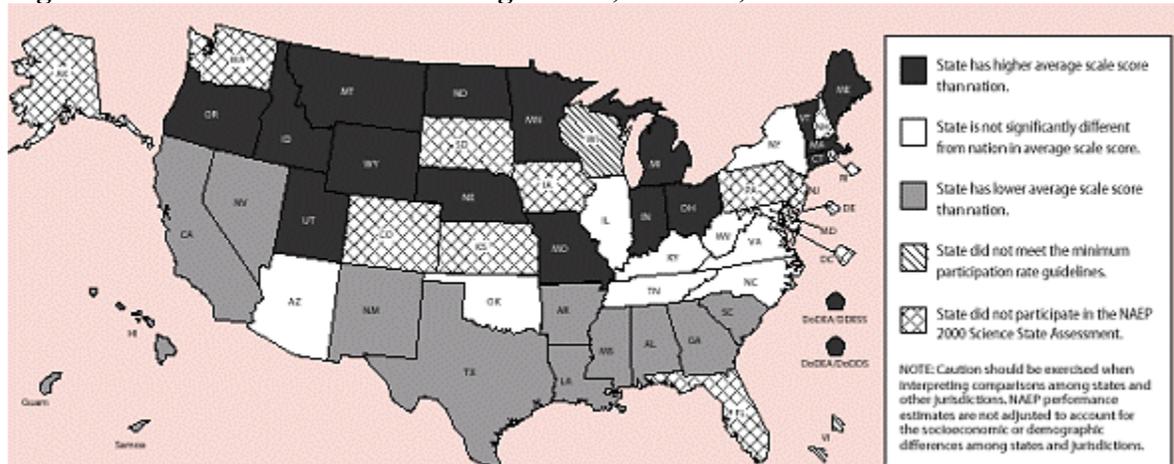
DoDEA/DDESS: Department of Defense Education Activities/Department of Defense Domestic Dependent Elementary and Secondary Schools.

DoDEA/DoDDS: Department of Defense Education Activities/Department of Defense Dependents Schools (Overseas).

NOTE: National results are based on the national sample, not on aggregated state assessment samples.

SOURCE: National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2000 Science Assessment. (Originally published as figure A on p. 4 of *The Nation's Report Card: Science Highlights 2000*.)

Figure D.—State vs. National Average Score, Grade 8, Public Schools: 2000



DoDEA/DDESS: Department of Defense Education Activities/Department of Defense Domestic Dependent Elementary and Secondary Schools.

DoDEA/DoDDS: Department of Defense Education Activities/Department of Defense Dependents Schools (Overseas).

NOTE: National results are based on the national sample, not on aggregated state assessment samples.

[SOURCE](#): National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2000 Science Assessment. (Originally published as figure B on p. 5 of *The Nation's Report Card: Science Highlights 2000*.)

National Results for Student Subgroups

In addition to reporting information on all students' performance on its assessments, NAEP also studies the performance of various subgroups of students. Studying the science achievement of subgroups of students in 2000 reveals whether they have progressed since 1996 as well as how they performed in comparison to one another in 2000.

When reading these subgroup results, it is important to keep in mind that there is no simple, causal relationship between membership in a subgroup and science achievement. A complex mix of educational and socioeconomic factors may interact to affect student performance.

Science Scores by Race/Ethnicity

Average scores on the NAEP science assessment are examined for five major racial/ethnic subgroups: White, Black, Hispanic, Asian/Pacific Islander, and American Indian. For most of these subgroups, average scores in 2000 were not significantly different than in 1996 across the three grades tested. However, scores for two subgroups of students have declined. American Indian students at grade 8 and White students at grade 12 both had lower scores in 2000 than in 1996 (Figure A.).

Comparing students' 2000 performance across subgroups indicates that some subgroups had higher average scores than others. At grade 4, White students scored higher than Black, Hispanic, or American Indian students. American Indian students also scored higher than Black students and Hispanic students.

At grade 8, White students had a higher average score than any of the other subgroups. Asian/Pacific Islander eighth-graders scored higher than Black, Hispanic, or American Indian eighth-graders. Both Hispanic and American Indian eighth-graders scored higher than Black eighth-graders.

At grade 12, White students and Asian/Pacific Islander students both scored higher than Black, Hispanic, or American Indian students. American Indian twelfth-graders had a higher average score than that of either Black or Hispanic twelfth-graders.

Differences in Average Science Score Gaps between Selected Racial/Ethnic Subgroups

The large gaps in average scores between White and Black students and between White and Hispanic students have remained relatively unchanged since 1996. None of the apparent differences in these gaps between 1996 and 2000 were statistically significant.

Achievement-Level Results by Race/Ethnicity

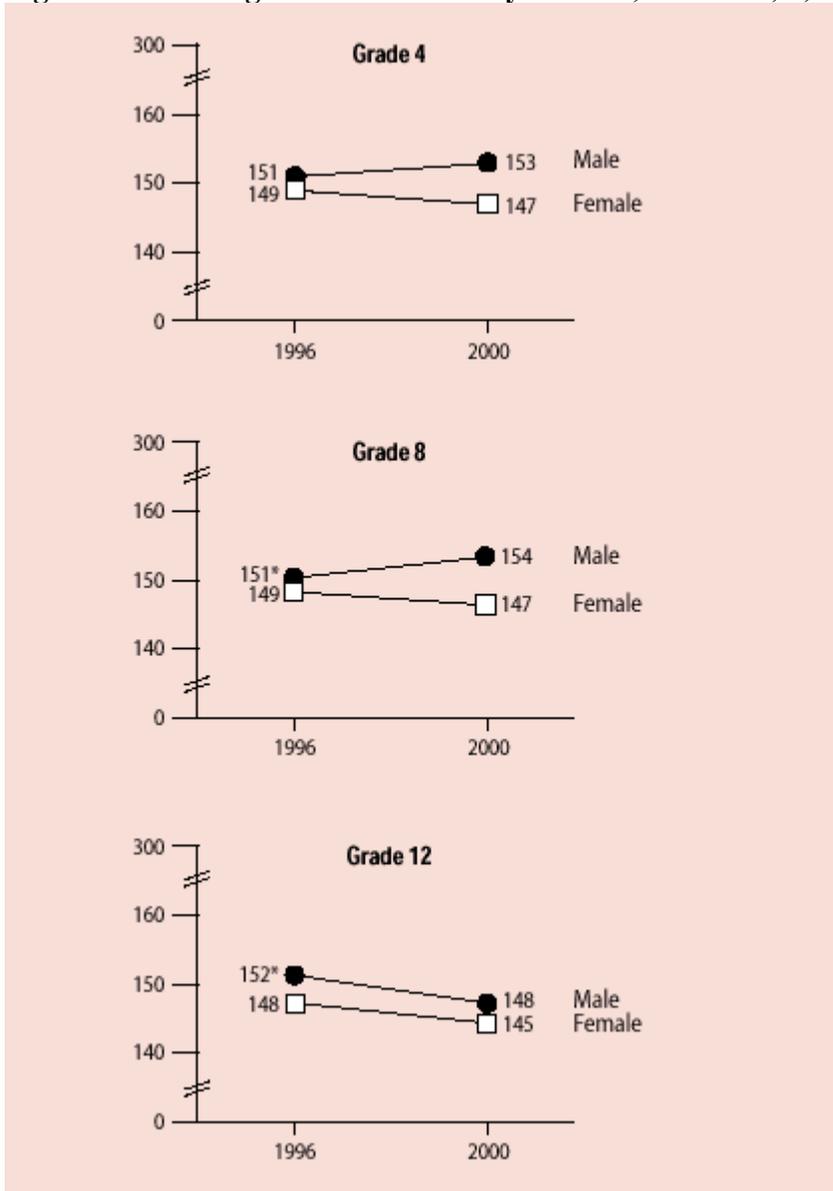
There was little change in the science achievement of racial/ethnic subgroups of students between 1996 and 2000. White twelfth-graders showed a decline in the percentage of students at or above *Basic*. None of the other apparent differences between 1996 and 2000 in the percentages of students at or above *Basic* or *Proficient* were statistically significant.

Comparing the performance of students in different racial/ethnic subgroups in 2000 shows that a higher percentage of White and Asian/Pacific Islander students were at or above *Basic* and *Proficient*, compared to the other subgroups. This finding was consistent across the three grades. Data for Asian/Pacific Islander students were not available at grade 4 in 2000 because special analyses raised concerns about the accuracy of the results.

Science Scores by Gender

Figure F. presents average science scores for males and females in 1996 and 2000. At grade 8, males' average score was higher in 2000 than in 1996, while at grade 12, males' average score declined in 2000 compared to 1996. Males outscored females in 2000 at grades 4 and 8. The apparent difference between the scores of males and females at grade 12 was not statistically significant.

Figure F.—Average Science Scores by Gender, Grades 4, 8, 12: 1996-2000 (USA)



*Significantly different from 2000.

[SOURCE](#): National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1996 and 2000 Science Assessments. (Originally published on p. 10 of *The Nation's Report Card: Science Highlights 2000*.)

The Role of Teacher and Student Factors in Science Performance

As part of the NAEP 2000 Science Assessment, students and teachers were asked various questions related to their background and classroom practices. Relationships were investigated between student performance on the assessment and responses to questions about teachers' undergraduate major, how computers were used in the classroom, and student course taking. While these findings may suggest a positive or negative relationship between performance on the science assessment and certain practices, it is important to remember that the relationships are not necessarily causal—there are many factors that play a role in science performance.

Teachers' Undergraduate Major Related to Science Scores at Grade 8

Results of the 2000 assessment show that while teachers' undergraduate major was not related to performance at grade 4, eighth-graders whose teachers majored in science education had higher average scores than eighth-graders whose teachers did not. While these results might suggest that teachers' undergraduate major has an impact on student performance at grade 8, it is also possible that teachers' educational background could influence the classes they are assigned to teach, so that teachers with specialized degrees teach classes with high-performing students.

Science Courses Related to Scores at Grades 8 and 12

Science achievement has been shown to vary depending on the type of science courses students take. Results from the 2000 assessment show that eighth-grade students who were not taking science performed the lowest (Figure D.). Eighth-grade students enrolled in a life science course had lower scores than their peers enrolled in earth science, integrated science, physical science, or general science.

Twelfth-graders who had taken first-year biology, first-year chemistry, or first-year physics at some point since eighth grade had higher scores than students who had not (Figure B.). The performance of twelfth-grade students did not differ by whether or not they had taken general science at any time in high school.

Appendix B: Data Collection Forms

Informed Consent Forms for Teachers

Project Title: The Nature of Culturally Responsive Pedagogy in Two Urban African American Middle School Science Classrooms

I state that I am over 18 years of age and wish to participate in a program of research being conducted by *Michelle Harris Bondima*, Department of Curriculum and Instruction, University of Maryland, College Park, Maryland 20742.

The purpose of the research is to observe and make interpretations of how two teachers teach culturally responsive pedagogy in middle school science classroom to urban African Americans students.

The procedures involve observing two teachers teaching one science unit over a period of 5 months. The unit will be taught over a period of 3 months. The project should take approximately 6 months to complete, from October 2002 until March 2002. The teachers will meet each class 5 days-a-week for 80 minutes each day. The researcher will observe each teacher and her students 3 days-a-week for 240 minutes per week. The students will be given a pre-survey at the beginning of each science unit and a post-survey at the end of each science unit. In addition to the pre-interview, each of the teachers will have an informal open-ended interview once a month to address any concerns or issues that may surface during the project. At the end of the study, each teacher will be administered a post-interview. All in-class observations will be audiotaped (see Schedule A). Pictures will be taken of visuals such as blackboard displays. No pictures will be taken of the teachers.

All information collected in this data is confidential, and my name will not be identified at any time. The data I provide will be secured with the researcher and destroyed after 5 years.

There aren't any physical or mental risks involved in this study

I understand that the study is not designed to help me personally but the investigator hopes to learn more about the teaching of middle school classroom science to urban African Americans. I understand that I am free to ask questions or to withdraw from participation at any time without any penalty.

Michelle Harris Bondima
University of Maryland College Park
410-462-7650

Name of Subject _____

Signature of Participant _____ **Date** _____

Student Assent Form

Project Title: The Nature of Culturally Responsive Pedagogy in Two Urban African American Middle School Science Classrooms

Dear Student,

You are being invited to participate voluntarily in the above-titled research project conducted by *Michelle Harris Bondima*, Department of Curriculum and Instruction, University of Maryland, College Park, Maryland 20742.

You will be observed during a science unit over a period of 3 months. The entire research study will take 6 months (October 2002 until March 2003). The researcher will observe you in-class 3 days-a-week for 240 minutes-a-week. You will be given 2 surveys, a pre-survey at the beginning of the science unit and a post-survey at the end of the science unit. The surveys will be completed in class at the beginning of the next class period after the science unit has been completed. If you choose not to participate, you will be assigned a project by the teacher while your classmates are filling-out the survey. All in-class observations of the will be audiotaped. Pictures will be taken of visuals such as blackboard displays. There will be no pictures taken of you.

The purpose of this study is to observe and understand your science teacher's way of teaching science. This study will have no negative affect on your grade. Participation is voluntary.

The students and teachers participating in this study will benefit because it will help science educators understand how science teachers can use their teaching practices to create a learning environment that will encourage students to pursue their cultural identities while pursuing high academic achievement.

There are no physical, emotional, social, or psychological risks associated with this study. You have the freedom to ask questions at any time. You also have the freedom to withdraw from the study at any time without any penalty.

Any information about you, your activity in this study, your answers to the surveys with the researcher will be held in confidence. The information that you provide will be identifiable only by the last 4 digits of your social security number.

The data that is collected will be secured with the researcher and destroyed after 5 years.

Circle one: I wish to participate in this study YES NO

Student' Signature Today's Date Last 4 digits of your Social Security #

Permission Form For Parents / Guardian

Project Title: The Nature of Culturally Responsive Pedagogy in Two Urban African American Middle School Science Classrooms

I state that I am over 18 years of age and the parent or legal guardian of this child. I give my permission for my son(s)/daughter(s) to participate in a program of research being conducted by *Michelle Harris Bondima*, Department of Curriculum and Instruction, University of Maryland, College Park, Maryland 20742.

My child will be observed during a 3-month period in a science unit. The entire research study will take 6 months (October 2002 until March 2003). The researcher will observe the students in-class 3 days-a-week for 240 minutes-a-week. The students will be given 2 surveys, a pre-survey at the beginning of the science unit and a post-survey at the end of the science unit. The surveys will be completed in class at the beginning of the next class period after the science unit has been completed. Students who aren't participating will be assigned a project by the teacher. All in-class observations of the students will be audiotaped. Pictures will be taken of visuals such as blackboard displays. There will be no pictures taken of the students.

The purpose of this study is to observe and understand the science teacher's way of teaching science. This study will have no negative affect on my child's grade. Participation is voluntary.

The students and teachers in this study will benefit because it will help science educators understand how science teachers can use their pedagogical practices to create a learning environment that will encourage students to pursue their cultural identities while pursuing high academic achievement.

There are no physical, emotional, social, or psychological risks associated with this study. I have the freedom to ask questions at any time and I also have the freedom to withdraw my child from the study at any time without any penalty.

Any information about my child, my child's activities in this study, my child's answers to the surveys with the researcher will be held in confidence. The information my child provides will be identifiable only by the last four digits of his/her social security number.

The data collected will be secured with the researcher and destroyed after 5 years.

Michelle Harris Bondima
University of Maryland College Park
410-462-7650

Name of Student _____
Signature of Student _____ Date _____
Name of Parent/Guardian _____

Signature of Parent/Guardian _____ Date _____

Principal's Permission Form

September 12, 2002

Dear _____

I request your permission to conduct my dissertation research with teachers in your building during October, November, and December 2002 and January, February, and March, 2003. My purpose during those 6 months is to conduct an investigation in the area of effective pedagogy in an African American middle school science classroom.

Your school was selected because of its reputation for having teachers who are engaged in effective and innovated teaching in science.

I hope to conduct my investigation in the following:

- a. Describe the research to the teachers at a face-to-face meeting
- b. Seek written permission from the two science teachers whose classrooms will be observed
- c. Establish a schedule of interviews with participating teachers
- d. Determine a pre-conference/observations/post-conference schedule for a period of 6 months
- e. Observe the two teachers and their students over a period of 3 months
- f. Give a pre-survey and post-survey to the students being observed
- g. Provide verbal and written feedback to involved teachers regarding findings at the conclusion of the project

Certainly all of the information gathered in the study will remain confidential.

Only participants, peer evaluators, and I will have access to the data. Names of subjects will be removed from the data instruments and replaced with a code. Confidentiality will be further protected by not using names of individuals in any publications that result from the research.

Both teachers will be informed that their participation will have no impact on their job performance evaluations as structured by the school district. Their participation will not influence their ratings and no information will be added to personnel files.

All participation is voluntary; refusal to participate will involve no penalty or loss of benefits to which teachers are entitled and participants may discontinue participation at any time without penalty. This project should be a positive opportunity for school

personnel to analyze current practices and to gain insights which could lead to future changes in educational practice.

Thank you for your consideration of this request.

Sincerely,

Michelle Harris Bondima

Doctoral Candidate

Curriculum and Instruction

University of Maryland College Park

Cc: Dr. Randy McGinnis

Doctoral Dissertation Approval

I give my approval to Michelle Harris Bondima to conduct research in my school under the aforementioned conditions during October, November, and December 2002 and January, February, and March 2003.

Principal's Name _____

Principal's Signature _____

Date _____

Student Pre-Survey

Students are to answer each question as thoroughly as possible. Each of the questions requires more than a *yes* or *no* answer. Answers can be in an essay form. If you have any questions, please feel free to ask for clarification.

1. Tell me something about your background. (Please feel free to talk about your family, friends, or community)
2. What are your career goals? (Do you want to go to college? Get a job? *etc.*?)
3. Do you feel you have a strong or weak understanding of science? Explain.
4. Before this class, how often did you think about science?
5. Before this class, how often did you go to the library?
6. So far, how do you feel you're doing in your science class?

Student Post-Survey

Students are to answer each question as thoroughly as possible. Each of the questions requires more than a *yes* or *no* answer. Answers can be in an essay form. If you have any questions, please feel free to ask for clarification. Students are not required to sign their names.

1. After completing this science unit, do you feel that information about your own culture helps you in science?
2. Do you still have the same career goals that you had three months ago?
3. Do you feel that you have a strong or weak understanding of science? Explain
4. How often do you think about science?
5. How often do you go to the library?
6. So far, how do you feel you're doing in your science class?

The Teacher Pre-Interview (by Ladson-Billings, 1994).

1. Tell me something about your background. When and where were you educated? When and where did you begin to teach?
2. What is the primary subject you are teaching?
3. What is your ethnicity?
4. How many years of teaching experience do you have?
5. What is your highest academic degree?
6. How would you describe your philosophy of teaching? What do you believe “works”?
7. Can you think of any characteristics that African American youngsters as a group bring to the classroom?
8. What kinds of things have you done in the *science* classroom that have facilitated the academic success of African American students?
9. How much of what you know about teaching African American students did you learn as a result of teacher training, either pre-service or in-service?
10. If you could revamp teacher education so that teachers would be more effective with African American students, what changes would you make?
11. If you could revamp teacher education so that teachers would be more effective with African American students in science, what changes would you make?
12. What kind of role do you believe parents play in the success of African American students? How would you describe the kinds of relationships you’ve had with parents of students you’ve taught?

13. How do you handle discipline? Are there special things that teachers of African American students should know about discipline?
14. How do you handle the possible mismatch between what you want to teach and what you have to teach (for example, materials or supplies)?
15. How do you handle the possible mismatch between what you want to teach and what the administration (building principal or district superintendent) wants (for example, curricular mandates, philosophies)?
16. How much professional staff development have you received on any topic relative to cultural pedagogy?
17. How do you manage to incorporate the culture of your students into your curriculum?
18. Are you a product of the community that you teach?
19. If not, how did you get to know your students' culture?
20. How do you think the schooling experience of the students you teach differs from that of white students in middle-class communities?
21. How do you want your students to view science by the end of the school year?
22. Why did you decide to teach middle school science in Baltimore? Did you have a choice?
23. What changes if any would you make in undergraduate education/pedagogy courses, if you could, to make the experience more meaningful?

Teacher's Post-Interview

1. Do you find teaching a culturally sensitive curriculum rewarding?
2. What sort of teaching methods need to be adapted to meet the needs of African American students?
3. Have you learned from your students? If so what have you learned?
4. Do you feel that you have created a learning environment that allows for various styles of learning?
5. Do you feel that you have provided sufficient activities that increased the self-esteem of your African American students?
6. Throughout the 8 months of this project, can you identify school practices that negatively/positively affect African American students in the science classroom?

**Teacher and Student Interviews, Surveys, Classroom Observations Schedule and
Science Unit**

Codes

BU= Beginning of science Unit

EU=End of science Unit

SPRS=Students Pre-survey

SPOS=Students Post-Survey

I= Open-ended interviews

PR-Pre-Interview

PO-Post-Interview

FU-Follow-up

COB=Classroom Observation

Unit = Astronomy

Participants	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May
Teacher #1 Mrs. Terri Thomas	PR	I, COB, BU	I, COB	I, COB, EU	I, EU	I, PO	I, PO	FU
Students #1 Mrs. Terri Thomas's	SPRS	COB	COB	COB	COB, SPOS	FU	FU	FU
Teacher #2 Mrs. Ann Adams	PR	I, COB, BU	I, COB	I, COB, EU1	I, EU	I, PO	I, PO	FU
Students #2 Mrs. Ann Adams's	SPRS	COB	COB	COB, SPOS	COB, SPOS	FU	FU	FU

Appendix C: Mrs. Ann Adams's Photographs of Classroom and Hallway

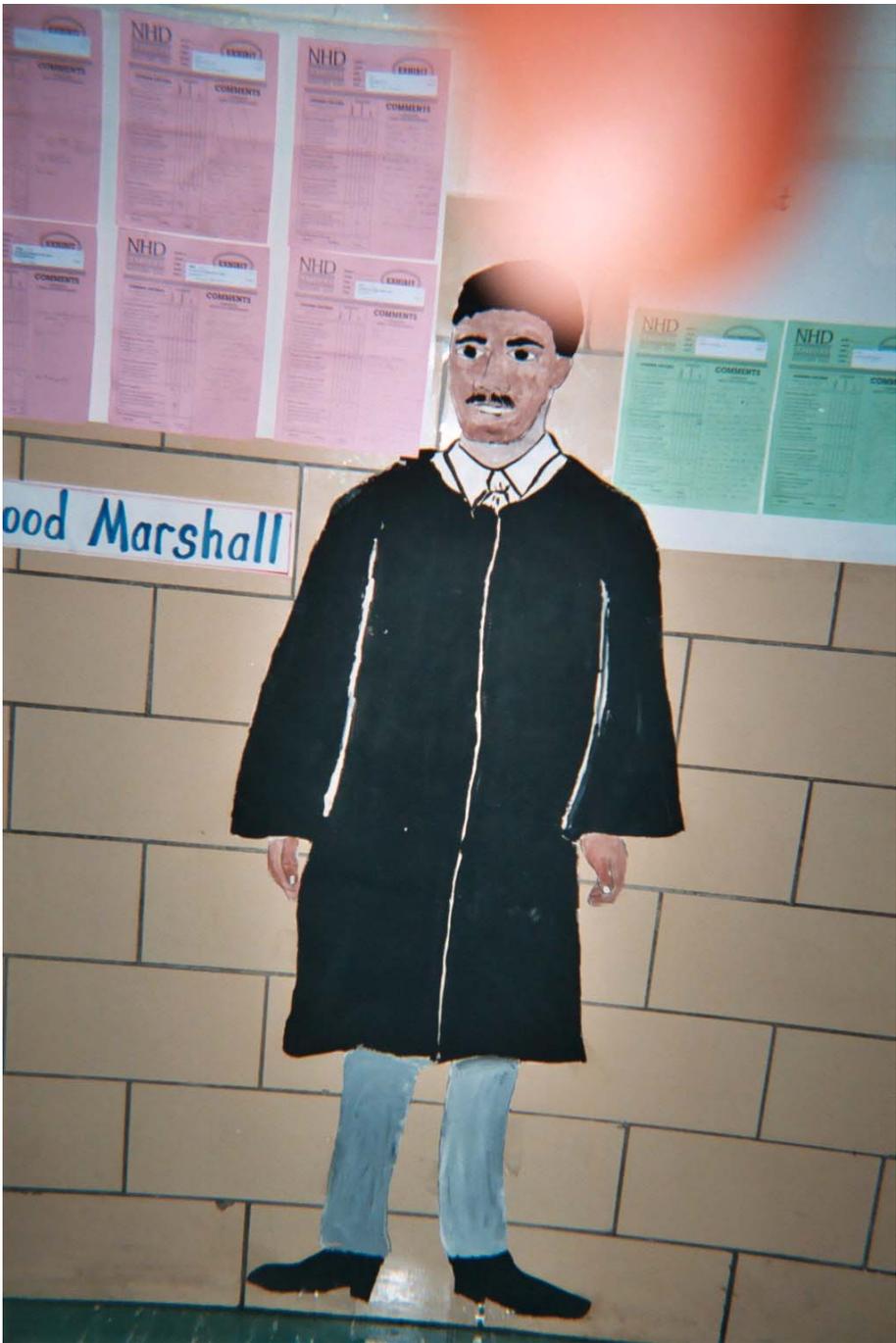




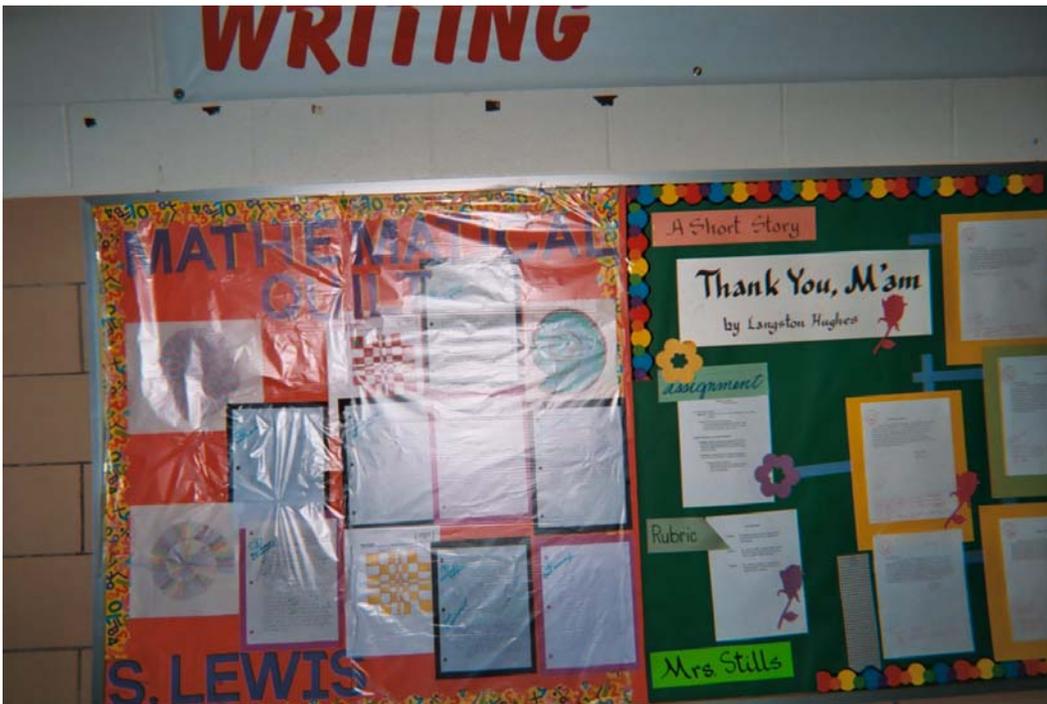












Appendix D: Coding and Activities Charts

Table 4.—Mrs. Thomas’ Research Schedule

DATE	CLASSES	TOPIC: Lesson plan, daily curriculum, daily activity	Researchers' Actions
10/28/02-Monday	12:05-2:30 p.m.	Researcher spent the class period developing a relationship with the students.	Speak to students about research and answer questions. Send Permission forms home to parents/legal guardian. Informal discussion with students and teacher
10/30/02-Wednesday	12:35-1:55 p.m.	Researcher spent the class period developing a relationship with the students.	Introduce myself to staff, Mrs. Thomas' Assistant Principals, cafeteria staff, and teachers whose classrooms are located close to Mrs. Thomas' classroom.
11/01/02	12:35-1:55 p.m.	No classroom observation	Attend class but don't take notes or ask questions. This is my "I'm here time."
11/04/02	noon-1:55 p.m.	No classroom observation	Get to know the Principal's secretary and staff
11/06/02	12:35-1:55 p.m.	No classroom observation	Take pictures of poster boards and designs in the school hallways
11/08/02	12:05-1:15 p.m.	No classroom observation	Take pictures of boards in school hallways
11/11/02	12:35-1:55 p.m.	No classroom observation	Having lunch with staff and teachers
11/13/02	12:35-1:55 p.m.	No classroom observation	Having lunch with staff and teachers
11/15/02	12:35-1:55 p.m.	No classroom observation	Professional Development Day-No school, teacher interview
11/20/02	12:05-1:15 p.m.	The students will access and process information from readings, investigations, and /or oral communications	All students who brought in Parent/Guardian forms were administered the survey. All students who brought in the parental forms signed the Student Assent Forms 1-Classroom observation
11/22/02	12:35-1:55 p.m.	The teacher explains that some changes in	2-Classroom observation Teacher interview

		the planet surface are due to slow process (i.e., landslides, tornadoes, hurricanes, volcanic eruptions, earthquakes, flooding and tsunamis.)	
11/25/02	12:35-1:55 p.m.	Continuation	3-Classroom observation
11/27/02	12:35-1:55 p.m.	Continuation	4-Classroom observation
11/15/02	12:35-1:55 p.m.	Continuation	Student surveys (entire class, approximately 40 minutes)
11/18/02	12:35-1:55 p.m.	Continuation	Student surveys (entire class approximately 15 minutes)
11/22/02	6:30-10:30 p.m.	The teacher explains how the earth's crustal plates are influenced by activity in the mantle and core to produce major geological events (i.e., mountain buildings, earthquakes, volcanic eruptions, ocean basin formation, sea floor spreading and subduction.)	Dinner interview with teacher
11/26/02	12:35-1:55 p.m.	Continuation	
11/27/02	8:30 a.m.-noon	Continuation	
12/4/02	12:35-1:55 p.m.	Continuation	
12/6/02	12:35-1:55 p.m.	Continuation	
12/11/02	12:35-1:55 p.m.	The teacher describes the cause of earthquakes, describes the damage caused by changes in the earth's crust. The students write to express their	5-Classroom observation

		opinions	
12/13/02	12:35-1:55 p.m.	Continuation	Picture taking of poster boards and designs of classrooms
12/16/02	12:05-1:15 p.m.	Continuation	6-Observation – in the computer center
12/18/02	12:35-1:55 p.m.	Continuation	7-Cont. ob. in the Ctr. (interviews with the 6 students that were selected by the teacher)
12/20/02	12:35-1:55 p.m.	The students analyzed and summarized data to identify trends and form a logical argument about a cause and effect relationship or a sequence of events	8-Classroom observation (pre-interviews with the 6 students that were selected by the teacher)
01/6/03	12:05-1:15 p.m.	The students interpreted and communicated findings (i.e., speaking, writing and drawing). The students will describe similarities and differences of objects, materials, concepts and actions.	9-Classroom observation
01/08/03	12:35-1:55 p.m.	Continuation	10-Classroom observation
01/10/03		Continuation	11-Classroom observations
01/13/03		Continuation	12-Classroom observations Teacher interview
01/17/03	12:35-1:55p.m.	The students will explain that a model has advantages and disadvantages and may need to be changed for different purposes.	13-Classroom observations
01/22/003		The teacher explained how scientists are employed in various	14-Classroom observations

		fields that are located in diverse places, ranging from laboratories to natural field settings and their findings become available to everyone in the world.	
01/24/03	12:35-1:55 p.m.	The students will investigate conditions that produce earthquakes. Apply knowledge in making decisions.	15-Classroom observations Teacher interview
01/27/03	12:35-1:55 p.m.	Continuation	16-Classroom observations
01/29/03	12:35-1:55 p.m.	Continuation	17-Classroom observations
02/6/03	12:35-1:55 p.m.	Continuation	18-Classroom observations interview with teacher
02/10/03	12:05-1:15 p.m.	The students interpreted and communicated findings (i.e., speaking, writing and drawing) in a form suited to the purpose and audience, using developmentally appropriate methods including technology tool and telecommunications.	
02/12/03		The students critique scientific information and identified possible sources of bias.	19-Classroom observations post-interviews with the 6 students selected by the teacher
02/14/03	12:35-1:55p.m.	Explained the physical processes that produced renewable and non-renewable natural resources. (e.g., fertile soils, fossils fuels and timber.)	20-Classroom observation interview with 3 students

02/19/03	12:35-1:55 p.m.	Continuation	
02/21/03		Continuation	21-Classroom observations
02/24/03		Continuation	
02/26/03		Continuation	22-Classroom observations
03/03/03		Designed models of earthquake-resistant buildings. Discussed ways of predicting changes in the earth's crust.	23-Classroom observations interview with 3 students
03/5/03	12:35-1:55 p.m.	Continuation	24-Classroom observations
03/07/03	12:35-1:55 p.m.	continuation	
03/10/03		The students explained how science and technology have strongly influence life under different technological circumstances in the past and continue to do so today.	25-Classroom observations Interview with the chairperson/academic coach
03/14/03	12:35-1:55 p.m.	continuation	26-Classroom observations
03/17/03	12:35-1:55 p.m.	The students worked with other students to solve. Students interpreted and communicate findings (i.e., speaking, writing, and drawing) in a form suited to the problems in class.	Interviews with 3 students
03/19/03	12:35-1:55 p.m.	Continuation	27-Classroom observations
04/16/03	12:35-1:55 p.m.	The students shared findings and ideas orally and in writing through models.	28-Classroom observations Teacher interview

		Learned how to use appropriate instruments and metric units when measuring and collecting data.	Interview with 3 students
04/18/03	12:35-1:55 p.m.	continuation	29-Classroom observations
04/23/03	12:35-1:55 p.m.	Constructed and used classification systems for grouping objects, materials, concepts, actions, organisms <i>etc.</i>	30-Classroom observations
04/28/03	12:35-1:55 p.m.	The teacher explained that African American scientists are employed in various fields that are located in diverse places, ranging from laboratories to natural field settings and their findings become available to everyone in the world.	31-Classroom observations
04/28/03	12:35-1:55 p.m.		Open-ended interview with teacher
04/30/03 -	12:35-1:55 p.m.		In class and in the school

Table 5.—Mrs. Thomas’ In-Class Data Coding

(Bondima, 2003)

TTC-Teacher talking to the class

TWB-Teacher writing on the blackboard

TAQ-Teacher asking questions
 TBAD-Teacher busy at her desk
 THNAC-Teacher have not arrived in class
 TTQC-The teacher is trying to quiet the class
 TT-Teacher teaching
 TTD-Teacher demonstrating and teaching
 TSWG-Teacher sitting with a group
 TTTG-Teacher talking to groups
 TTIS- Teacher talking to individual students
 TRTC-Teacher reading to class
 TLC-teacher left classroom
 SLT-Students listening to teacher
 SAQ-Students asking questions
 SAAQ-Students answering questions
 SRTC-Students reading to the class
 SQW-Students quietly writing
 SWG- Students working in groups
 SACSI-Students arriving to class and settling in
 SAPL- Students preparing to leave
 SHNAC-Students have not arrived in class
 SBT-Students busy talking
 SPIG- students playing in groups
 SVV-Students viewing videos
 SPIG-Students playing in groups
 SS-Students standing
 SSOOC-Students Sneaking out of class
 SRA-Student reading aloud
 DA-Discovery activity
 WU-Warm-up
 SS-Students standing
 SSOOC-Students sneaking out of the class
 CP-Chairperson of Science
 CT-Computer Technician (teacher)

Activities every 10 minutes (Mrs. Thomas) - Day 1

Participants	10	20	30	40	50	60	70	80
Teacher	TTIS	WU/TTIS TT	TTIS/TT	TTIS TT	TAQ/TT/ TTG	TTTG/TTIS/	TTTG/TTIS/	TTTG/TTIS/
Students	SBT/WU/ SACSI	WU/SWG/ SBT	SBT/WU/ SWG	SWG/SBT/ SPIG	SAAQ/SLT/ SPIG	SAAQ/SLT/ SPIG	SAAQ/SLT/ SPIG	SAAQ/SLT/ SPIG/SWG/ SBT/SSOOC
Other participants				CP	CP			

Warm-up question for the day: "How do magnetic strips form on the ocean floor? Why are these strips significant?"

Activities every 10 minutes (Teacher T.) - Day 2

Participants	10	20	30	40	50	60	70	80
Teacher	TTTG	TTTG/TTQ C TT	TWB/TTT G TT	TAQ/TT	TT/TAQ TT	TLC/TTIS/TTG/T T	/TTT G	TTQS/ C
Students	SACIS/S BT	SS/SSOS/ WU	WU/SQW	SAAQ/SQ W	SLT/SAA Q	SS/SLT	SLT	SBT/SSOO C

Other participants		CP						
--------------------	--	----	--	--	--	--	--	--

The students are viewing a video 'Planet Earth, the Living Machine,' A QUIZ
Activities every 10 minutes (Teacher T.) - Day 3

Participants	10	20	30	40	50	60	70	
Teacher	TTC	WU	TBAD	TBAD	TBAD	TAQ	TWB	
Students	SACSI/	WU	SVV	SVV	SVV	SAAQ	SQW	
Other participants								

Warm-up question: Explain the factors that affect the rate of weathering

Activities every 10 minutes (Teacher T.) - Day 4

Participants	10	20	30	40	50	60	70	80
Teacher	TTC	TWHS	TTC/TAQ TT	TTC/TAQ TT	TWHS/TT TAQ/TTC	TT/TTC	TWB	
Students	WU	SBT/WU	SLT/SAQ SAAQ	SLT/SAQ SAAQ/SWG	DA/SR/SRA SLT	SBT/SWG	SQW	
Other participants		VISITOR	CP	CP				

Activities every 10 minutes (Teacher T.) - Day 5: January 14, 2003

Participants	10	20	30	40	50	60	70	80
Teacher	TTC	TTC/TT	TTC/TT	TTC/TTD TWHS	TTC/TTD TWHS/ TT	TTC/TTD TWHS TT	TTC/TTD TWHS	
Students	SLT/GBT	DA/SWG	DA/SWG	DA/SWG	DA/SWG	DA/SWG	DA/SWG	
Other participants								

Activities every 10 minutes (Teacher T.) -Day 6

	10	20	30	40	50	60	70	
Teacher	TTC/WU	TAQ/TT	TT	TT/TAQ	TTQC/TTC	TWB/TT	TT/TWB/TT	
Students	SLT/WU	SAAQ/SLT	SLT/SQW	SAAQ/SQW	SBT/SLT	SQW	SLT/SQW	
Other participants								

Activities every 10 minutes (Teacher T.) - Day 7

Participants	10	20	30	40	50	60	70	80
Teacher	TTG	TWB/WU	WU	TTD/TWHS TT	TTD/TWHS TT	TTD/TWHS	TTD/TWHS	
Students	SACSI/GBT	SQW	WU	SWG	SWG	SWG	SWG	
Other participants								

Activities every 10 minutes (Teacher T.) - Day 8 (class held in computer center)

Participants	10	20	30	40	50	60	70	80
Teacher		TT/TTD TWHS	TWHS	TWHS	TWHS/TT TTD	TWHS/TTD	TWHS	
Students	SACSI	SACSI/CL	SWG	SWG	SWG/SLT	SWG/SL	SWG/SL	SWG/SL
Other participants	CT/CP	CP	CT	CT	CT	CT	CT	

Activities every 10 minutes (Teacher T.) - Day 9

Participants	10	20	30	40	50	60	70	80
Teacher	TTQC	TWB/WU/TAQ	TTD	TTD/TAQ	TTDTWHS	TTDTWHS	TTD/TWHS	TTQC
Students	SACSI	SQW SAAQ/SLT	SLT/SQW	SAAQ	SWG	SWG	SWG	SBT/SAPL
Other participants								

Activities every 10 minutes (Teacher T.) - Day 10

Participants	10	20	30	40	50	60	70	80
Teacher	TTQC	TWB/WUTAQ	TTC/TT	TAQ/TTD	TTQC/TTC	TT/TAQ	TWB	TTQC
Students	SACSI/SBT	SQW/SAAQ	SAQ/SQW	SAAQ/SQW	SBT	SQW/SAQ	SQW	SBT/SAPL
Other participants								

Activities every 10 minutes (Teacher T.) - Day 11

Participants	10	20	30	40	50	60	70	80
Teacher	TTQC	TWB	TTD/TAQ	TTQC/TTC	TWHS/TTD	TWHS/TTD	TWHS/TSWG	TWHS/TTD
Students	SACSI/SBT	SQW	SLT/SAAQ	SBT	SWG/SLT	SWG	SWG/SLT	SWG/SAPL
Other participants					CP		CP	

Activities every 10 minutes (Teacher T.) - Day 12

Participants	10	20	30	40	50	60	70	80
Teacher	TTQC	TWB/WU	TWHS	TTC/TT	TT/TRTC	TT/TAQ	TWB/TTC	TTQC
Students	SACSI/SBT	SQW/WU/SAAQ	SAQ/SLT	SLT/SAQ	SQW/SLT	SAAQ/SAQ	SQW/SLT	SBT/SAPL
Other participants								

Activities every 10 minutes (Teacher T.) Day 13 class held in the computer center

Participants	10	20	30	40	50	60	70	80
Teacher	TTQC	TTC/WU	TAQ	TTQC/TT	TTD/TTC	TTD/TAQ/TQC	TTD/TAQ	TTQC
Students	SACSI/SBT SWAC	SLT/SQW SWAC	SAAQ/SWAC SWAC	SBT/SLT/SQW SWAC	SLT/SAQ SWAC	SAAQ/SQW SWAC	SAAQ/SQW SWAC	SBT/SAPL SWAC
Other participants	CT	CT	CT	CT	CT	CT	CT	CT

Activities every 10 minutes (Teacher T.) - Day 14

Participants	10	20	30	40	50	60	70	80
Teacher	THAN	TTQC	TT/WU	TTQC/TT	TTD	TTD/TAQ	TTD/TAQ	TTQC
Students	SBT	SBT	SQW/WU	SLT/SQW	SLT/SAQ	SQW	SAAQ/SQW	SBT/SAPL
Other participants				CP				

Activities every 10 minutes (Teacher T.) - Day 15

Participants	10	20	30	40	50	60	70	80
Teacher	TTQC	WU/TAQ	TTD	TWB	TT/TTD/TAQ	TTQC/TTD	TWB	TTQC
Students	SACSI/STB	WU/SQW/SAQ	SLT/SQW	SQW	SLT/SAQ/SAQ	SBT/SAQ/SQW	SQW	SBT/SAPL
Other participants								

Activities every 10 minutes (Teacher T.) - Day 16

Participants	10	20	30	40	50	60	70	80
Teacher	TTC	TT/TTD TWHS	TWHS	TWHS	TWHS/TT TTD	TWHS/TTD	TWHS	TTTG
Students	SACSI	SACSI/CL	SWG	SWG	SWG/SLT	SWG/SLT	SWG/SLT	SWG/SLT
Other participants								

Activities every 10 minutes (Teacher T.) - Day 17

Participants	10	20	30	40	50	60	70	80
Teacher	THNA	TTQC/TTC	WU/TWHS	TTC/TBAD	TBAD	TAQ/TT	TWB	TTQC
Students	SBT	SBT	WU/SAQ	SLT/SR	SR	SAAQ/SAQ	SQW	SBT/SAPL
Other participants				CP				

Activities every 10 minutes (Teacher T.) - Day 18

Participants	10	20	30	40	50	60	70	80
Teacher	TTQC	TTC/WU	TT/TAQ	TT/TAQ	TT/TAQ	TTQC/TTD	TWB	TTQC
Students	SACSI/STB	SLT/WU	SLT/SQW/SAAQ	SLT/SQW/SAAQ	SLT/SQW/SAAQ	SBT/SLT	SQW	SBT/SAPL
Other participants		CP	CP					

Activities every 10 minutes (Teacher T.) - Day 19

Participants	10	20	30	40	50	60	70	80
Teacher	TTQC	WU/TAQ	TRTC	TAQ	TTQC/TTD	TT/TWB	TW	TTQC
Students	SACSI/STB	WU/SAAQ	SLT	SAAQ	SBT	SQW	SQW	SBT/SAPL
Other participants								

Activities every 10 minutes (Teacher T.) - Day 20

Participants	10	20	30	40	50	60	70	80
Teacher	TTQC	WU/TAQ	TRTC	TAQ	TTQC/TTD	TT/TWB	TW	TTQC
Students	SACSI/STB	WU/SAAQ	SLT	SAAQ	SBT	SQW	SQW	SBT/SAPL
Other participants								

Activities every 10 minutes (Teacher T.) - Day 21

Participants	10	20	30	40	50	60	70	80
Teacher	TTC/WU	TAQ	TTTG	TTTG	TTTG	TTTG	TTC	TTC
Students	WU	SAAQ/WU	SLT/SWG	SLT/SWG	SLT/SWG	SBT	SLT	SAPL
Other participants								

Activities every 10 minutes (Teacher T.) - Day 22

Participants	10	20	30	40	50	60	70	80
Teacher	TTQC	TWB	TAQ	TT/TTD	TT/TTD	TT/TTD	TRTC	TAQ/TTC
Students	SACSI/SBT	WU	WU/SAAQ	SLT/SQW	SLT/SQW	SLT/SQW	SLT/SAQ	SAPL
Other participants							CP	

Activities every 10 minutes (Teacher T.) - Day 23

Participants	10	20	30	40	50	60	70	
Teacher	TTQ/WU	WU	TAQ/TWB	TBAD	TLC	TTQC	TAQ	
Students	SBT/WU	WU	SAAQ/SQW	SVV/SBT	SVV/SBT	SBT/SVV	SAQ	
Other participants								

Activities every 10 minutes (Teacher T.) - Day 24

Participants	10	20	30	40	50	60	70	80
Teacher	TTC/WU	WU/TAQ	TT/TTD	TWB	TRTC		TTD	
Students	WU	WU/SAAQ	SLT/SQW	SQW	SLT	SRA	SAQ	
Other participants								

Activities every 10 minutes (Teacher T.) - Day 25

Participants	10	20	30	40	50	60	70	80
Teacher	WU	WU	TTIS	TTIS	TTIS	TTIS	TWB	
Students	WU	WU	DA	DA	DA	DA	SQW	
Other participants								

Activities every 10 minutes (Teacher T.) Day 26

Participants	10	20	30	40	50	60	70	80
Teacher	TTC	WU	TTIS	TTIS	TTIS	TTIS	TTIS	
Students	SACSI	WU	SWG/SPIG	SWG/SPIG	SWG/SPIG	SWG/SPIG	SWG/SPIG	
Other participants								

Activities every 10 minutes (Teacher T.) - Day 27

Participants	10	20	30	40	50	60	70	
Teacher	TTC	TBAD	TAQ	TTQC/TT	TTD/TAQ	TTD/TAQ	TTD/TAQ	
Students	SACSI/WU	WU	SAAQ/SQW	SBT	SLT/SQW	SLT/SQW	SLT/SQW	
Other participants								

Activities every 10 minutes (Teacher T.) - Day 28

Participants	10	20	30	40	50	60	70	80
Teacher	TTQC	TBAD	TWB	TTQC	TAQ	TTTWTB	TT/TWB	
Students	SACSI/WU	WU	SLT/SQW	SBT	SAAQ/SLT	SLT/SQW	SQW	
Other participants								

Activities every 10 minutes (Teacher T.) - Day 29

Participants	10	20	30	40	50	60	70	80
Teacher	TTQC	TBAD	TAQ/TT	TTD/TT	TTD/TWB	TT/TTQC	TWB	
Students	SACSI/WU	WU	SAAQ/SLT	SLT	SLT/SQW	SBT	SQW	
Other participants								

Activities every 10 minutes (Teacher T.) - Day 30

Participants	10	20	30	40	50	60	70	
Teacher	TTC	TBAD	TAQ/TWB	TTQC/TT	TTD/TWB	TT/TWB	TTC	
Students	SACSI	WU	SQW	SBT/SLT	SLT/SQW	SLT/SQW	SLT	
Other participants								

Activities every 10 minutes (Teacher T.) - Day 31

Participants	10	20	30	40	50	60	70	80
Teacher	TTC	TTTG	TTTG	TTTG/TTQC	TTTG/TSWG	TTTG/TTQC	TTC/TSWG	
Students	SACSI	SWG	SWG	SWG/SPIG	SWG	SWG	SWG/SPIG	
Other participants	CP							

Table 6.—Mrs. Adams’ Research Schedule

DATE	CLASSES	TOPIC	Researchers’ Actions
10/28/02	12:05-2:30 p.m.	Researcher spent the class period developing a relationship with the students.	Permission forms sent home to parents/legal guardian. Informal discussion with students and teacher
10/29/02	12:35-1:55 p.m.	Researcher continue talking and observing students. No data collecting occurred	No data collecting. Informal conversations with students. Students were given permission forms to have Parents/ Legal Guardian sign
10/30/02	12:35-1:55 p.m.	No classroom observations	No data collection
10/31/03	12:35-1:55 p.m.	No classroom observations	No data collection
11/01/02	12:35-1:55 p.m.	No classroom observations	Students returned signed permission forms. Undocumented observations.
11/04/02	12:05-1:15pm	No classroom observations	More students return signed permission forms
11/05/02	12:35-1:55 p.m.	No classroom observations	Pizza party for students who returned signed permission forms

			(students who didn't bring in signed forms were also allowed to participate in the pizza party)
11/06/02	12:35-1:55 p.m.	No observations	Students signed the Assent forms
11/07/02	12:35-1:55 p.m.	Lessons on what causes the phases of the moon	Students fill out survey forms. Take picture of poster boards and designs in the hallways
11/08/02	12:35pm-1:55pm	How does the moon move? Role playing, demonstrating the movement of the moon and the earth	Assist the teacher in the computer center
11/11/02	12:05pm-1:15p.m	Comparing and classifying celestial objects such as stars, planets, moons, asteroids, comets, and meteors according to size, composition and surface features.	Assist the teacher in the computer center Students are surfing the Internet
11/12/02	12:35-1:55 p.m	Continuation	1-Classroom observation
11/13/02	12:35-1:55 p.m.	Continuation	2-Classroom observation
11/14/02	12:35-1:55 p.m.	Continuation	3-Classroom observation
11/15/02	12:35-1:55 p.m.	Explaining the structure and energy production of the sun Describing some features of the sun Students are demonstrating the sun's interior Exploring Sun	Schools closed Professional Development Day

11/18/02	12:05-1:15 p.m.	Continuation	4-Classroom observation
11/20/02	12:35-1:55 p.m.	Continuation	5-Classroom observation
11/22/02	12:35-1:55 p.m.	Continuation	Teacher interview Take pictures classroom bulletin boards
11/25/02	12:05-1:15 p.m.	Continuation	6-Classroom observation
11/22/02	12:35-1:55 p.m.	How does Mars look like Earth? Comparing and classifying objects (i.e., stars, planets, moons, asteroids, comets, and meteors, according to size, composition, and surface features The Inner planets Looking at the motions of objects in the solar system	7-Classroom observation
11/27/02	12:35-1:55 p.m.	Continuation	Administer student surveys
11/25/02	12:35-1:55 p.m.	Continuation	Interview 3 students
12/02/02	12:05-1:15 p.m.	Continuation	Interview 3 students
12/04/02	12:35-1:55 p.m.	Continuation	8-Classroom observation
12/06/02	12:35-1:55 p.m.	Continuation	9-Classroom observation
12/09/02	12:05-1:15 p.m.	Identifying the effects of Earth's rotation and revolution Explaining the causes of seasons Students are demonstrating the Earth's rotation in circles and plays that are created by the students in	10-Classroom observation

		groups	
12/11/02	12:35-1:55 p.m.	Studying the main characteristics of the gas giant planets, Jupiter, Saturn, Uranus, Neptune, Pluto Explaining how Pluto differs from the other outer planets. Learning how to formulate a hypothesis concerning the revolution of a planet around the sun.	11-Classroom observation
12/13/02	12:35pm-1:55pm	Continuation	12-Classroom observation
12/16/02	12:05-1:15 p.m.	Continuation	Teacher interview
12/18/02	12:35-1:55 p.m.	Continuation	13-Classroom observation
12/20/02	12:35-1:55 p.m.	Continuation	3 Students interview
01/06/003	12:05-1:15 p.m.	Continuation	Shadowing teacher
01/08/03	12:35-1:55 p.m.		14-Classroom observation
01/10/03	12:35-1:55 p.m.		Teacher's interview
01/13/03	12:05-1:15 p.m.		15-Classroom observation
01/15/03	12:35-1:55 p.m.		16-Classroom observation
01/17/03	12:35-1:55 p.m.		17-Classroom observation
01/22/03	12:35-1:55 p.m.		18-Classroom observation
01/24/03	12:35-1:55 p.m.		19-Classroom observation
01/29/03	7:30 a.m.-2:30 p.m.		Shadowing the teacher
01/31/03	12:35-1:55 p.m.		Field trip

02/03/03	10 a.m.-2 p.m.		Shadowing the teacher
02/03/03	12:05-1:15 p.m.		Computer center
02/05/03	12:35-1:55 p.m.		20-classroom observation
02/07/03	12:35-1:55 p.m.		21-Classroom observation
02/10/03-	12:35-1:55 p.m.		Computer center
02/12/03	12:35-1:55 p.m.		22-classroom observation
02/14/03	12:35-1:55 p.m.		23—Classroom observation
02/19/03	12:35-1:55 p.m.		3 Students interview
02/21/03	12:35-1:55 p.m.		24-Classroom observation
02/24/03	12:05-1:15 p.m.		25-Classroom observation
02/25/03	12:35-1:55 p.m.		3 Students interview
02/26/03	12:35-1:55 p.m.		Video day
03/03/03	12:05-1:15 p.m.		26-Classroom observation
03/05/03	12:35-1:55 p.m.		27-Classroom observation
03/07/03	12:35-1:55 p.m.		28-Classroom observation
03/10/03	12:05-1:15 p.m.		29-Classroom observation
03/14/03	12:35-1:55 p.m.		Video day
03/17/03	12:35-1:55 p.m.		Teacher interview
03/19/03	12:35-1:55 p.m.		30- Classroom observation
04/16/03	12:35pm-1:55pm		31- Classroom observation
04/18/03	12:35-1:55 p.m.		3 Students interview
04/23/03	12:35-1:55 p.m.		3 Students interview
04/23/03	12:35-1:55 p.m.		Teacher interview

04/28/03	12:35-1:55 p.m.		Teacher interview
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Table 7.—Mrs. Adams’ In-Class Data Coding

(Bondima, 2003)

- TTC-Teacher talking to the class
- TWB-Teacher writing on the blackboard
- TAQ-Teacher asking questions
- TBAD-Teacher busy at her desk
- THNAC-Teacher have not arrived in class
- TTQC-The teacher is trying to quiet the class
- TT-Teacher teaching
- TTD-Teacher demonstrating and teaching
- TSWG-Teacher sitting with a group
- TTTG-Teacher talking to groups
- TTIS- Teacher talking to individual students
- TRTC-Teacher reading to class
- TLC-teacher left classroom
- SLT-Students listening to teacher
- SAQ-Students asking questions
- SAAQ-Students answering questions
- SRTC-Students reading to the class
- SQW-Students quietly writing
- SWG- Students working in groups
- SACSI-Students arriving to class and settling in
- SAPL- Students preparing to leave
- SHNAC-Students have not arrived in class
- SBT-Students busy talking
- SPIG- students playing in groups
- SVV-Students viewing videos
- SWG-students working in groups
- SPIG-Students playing in groups
- SS-Students standing
- SSOOC-Students Sneaking out of class
- SRA-Student reading aloud
- DA-Discovery activity
- WU-Warm-up
- SS-Students standing
- SSOOC-Students sneaking out of the class
- CP-Chairperson of Science
- Ct-Computer Technician (teacher)

Activities every 10 minutes (Teacher - Mrs. Ann Adams) - Day 1

Participants	10	20	30	40	50	60	70	80
Teacher	THNAC	TTIS/TTTG	TAQ/	TTIS	TAQ/TT/ TTTG	TTTG/TTIS/	TTTG/TTIS/	TSWG/TTIS/
Students	SHNAC	SACSI/WU	SBT/WU/	SWG/SBT/ SPIG	SAAQ/SLT/ SPIG	SAAQ/SLT/ SPIG	SAAQ/SLT/ SPIG	SBT/SLT/ SPIG/SWG/SAQ
Other participants	CP	CP						

Warm-up question for the day: "How do magnetic strips form on the ocean floor? Why are these strips significant?"

Activities every 10 minutes (Teacher A.) - Day 2

Participants	10	20	30	40	50	60	70	80
Teacher	TTC	TTC/WU	TT/TAQ	TTD/TTC	TT/TWB	TTD	TT/TAQ	
Students	SACSI	WU	SLT/SAAQ	SLT/SQW	SLT/SQW	SLT	SLT/SAAQ	
Other participants								

The students are viewing a video, Planet Earth the living Machine, A QUIZ

Activities every 10 minutes (Teacher A.) - Day 3

Participants	10	20	30	40	50	60	70	80
Teacher	TTC	WU/TTC	TBAD	TBAD	TBAD	TBAD/TTQC	TAQ/TTC	
Students	SACSI/	WU	SVV	SVV	SVV	SVV/SBT	SAAQ	
Other participants								

Warm-up question: "Explain the factors that affect the rate of weathering"

Activities every 10 minutes (Teacher A.) - Day 4

Participants	10	20	30	40	50	60	70	80
Teacher	TTC	TWHS	TTC/TAQ TT	TTC/TAQ TT	TWHS/TT TAQ/TTC	TT/TTC		
Students	WU	SBT/WU	SLT/SAQ SAAQ	SLT/SAQ SAAQ/SWG	DA/SR/SRA SLT	SBT/SWG		
Other participants		VISITOR	CP					

Activities every 10 minutes (Teacher A.) - Day 5: January 14, 2003 Class held in the computer center

Participants	10	20	30	40	50	60	70	80
Teacher	TTC	TTC	TTC	TTC/TTD TWHS	TTC/TTD TWHS	TTC/TTD TWHS	TTC/TTD TWHS	
Students	SLT/SBT/SWATC	DA/SWG/SWAC	DA/SWG SWAC	DA/SWG SWAC	DA/SWG SWAC	DA/SWG/ SWAC	DA/SWG/ SWAC	
Other participants	CT	CT	CT	CT	CT	CT	CT	

Activities every 10 minutes (Teacher A.) - Day 6

	10	20	30	40	50	60	70	80
Teacher	TTC	TTC/WU	TT/TAQ	TTD	TTD	TWB/TT	TWB	
Students	SACSI/SBT	WU	SAAQ/SQW	SLT	SLT	SQW/SLT	SQW	
Other participants								

Activities every 10 minutes (Teacher A.) - Day 7

Participants	10	20	30	40	50	60	70	80
Teacher	TTQC	WU	TAQ	TRTC	TRTC	TT/TAQ	TTD	
Students	SBT/SACSI	WU	SAAQ	SLT	SLT	SLT/SAAQ	SLT	
Other participants								

Activities every 10 minutes (Teacher A.) - Day 8

Participants	10	20	30	40	50	60	70	80
Teacher	TTC	WU	TAQ/TWB	TTD	TT/TTQC	TTD	TTD	
Students	SACSI	WU	SQW	SLT	SBT	SLT	SLT	
Other participants								

Activities every 10 minutes (Teacher A.) - Day 9

Participants	10	20	30	40	50	60	70	80
Teacher	TTQC	WU	TTD	TWB	TT/TTD/TAQ	TTQC/TTD	TWB	TTQC
Students	SACSI/SBT	WU/SAQ	SLT/SQW	SQW	SLT/SAQ	SBT/SLT	SQW	SBT/SAPL
Other participants				CP	CP			

Activities every 10 minutes (Teacher A.) - Day 10

Participants	10	20	30	40	50	60	70	80
Teacher	TTC	TTIS	TTG	TTG	TTG	TTG	TTQC	
Students	SACSI	WU	SWG	SWG/SPIG	SWG/SPIG	SWG/SPIG	SWG/SPIG	
Other participants								

Activities every 10 minutes (Teacher A.) - Day 11

Participants	10	20	30	40	50	60	70	80
Teacher	THAN	TTQC/TTC	WU	TTC/TBAD	TBAD	TAQ/TT	TWB	TTQC
Students	SBT	SBT	WU/SAQ	SLT/SR	SR	SAAQ/SAQ	SQW	SBT/SAPL
Other participants								

Activities every 10 minutes (Teacher A.) - Day 12

Participants	10	20	30	40	50	60	70	80
Teacher	TTC	WU	TT	TTQC/TT	TT	TWB	TT	
Students	SACSI	WU	SQW/SAAQ	SS/SLT	SLT	SQW	SLT	
Other participants								

Activities every 10 minutes (Teacher A.) - Day 13

Participants	10	20	30	40	50	60	70	80
Teacher	TTC	WU	TTD	TTD	TTD/TAQ	TRTC	TRTC	
Students	SACSI	WU	SLT	SLT/SQW	SLT/SQW	SLT/SAAQ	SLT	
Other participants							CP	

Activities every 10 minutes (Teacher A.) - Day 14

Participants	10	20	30	40	50	60	70	80
Teacher	TTC	WU	TAQ	TTIS	TTIS	TTTG	TTC	
Students	SACSI	WU	SAAQ/SQW	SWG	SWG	SWG/SPIG	SLT	
Other participants								

Activities every 10 minutes (Teacher A.) - Day 15

Participants	10	20	30	40	50	60	70	80
Teacher	TTC	TTG	TTG	TTQC/TTTG	TTTG	TTC	TWB	
Students	SACSI/SBT	SWG	SWG	SPIG/SWG	SWG	SLT	SQW	
Other participants								

Activities every 10 minutes (Teacher A.) - Day 16

Participants	10	20	30	40	50	60	70	80
Teacher	TTC/TWB	TBAD	TAQ	TTD	TTD/TWB	TTD/TWB	TTC	
Students	SACSI	WU	SAAQ/SAQ	SLT	SLT/SQW	SLT/SQW	SLT	
Other participants								

Activities every 10 minutes (Teacher A.) - Day 17

Participants	10	20	30	40	50	60	70	80
Teacher	TTC	TTQ/	WU	TAQ	TTD	TT/TWB	TTC	
Students	SACSI/SBT	WU	WU	SAAQ/SLT	SAQ/SLT	SAQ	SLT	
Other participants				CP				

Activities every 10 minutes (Teacher A.) - Day 18

Participants	10	20	30	40	50	60	70	80
Teacher	TTQC	TWB/WU	TTC/TTD	TAQ/TTD	TTD/TTQC	TT/TAQ	TWB	TTC
Students	SACSI/SBT	SQW/SAAQ	SAQ/SQW	SAAQ/SQW	SBT	SQW/SAAQ	SQW	SBT/SAPL
Other participants								

Activities every 10 minutes (Teacher A.) - Day 19

	10	20	30	40	50	60	70	80
Teacher	TTC	WU/TTIS	TTIS	TTIS	TAQ/TTTG	TTTG/TTIS	TTTG/TTIS	TTTG/TTIS
Students	SACSI	WU/SWG	SWG/SBT	SWG/SPIG	SAAQ/SLT/SPIG	SAAQ/SLT	SAAQ/SLT	SLT/SSOOC
Other participants								

Activities every 10 minutes (Teacher A.) - Day 20

Participants	10	20	30	40	50	60	70	80
Teacher	TTC	TTC	TTC	TTC/TTD	TTC/TTTG	TTTG	TTC	
Students	SLT/SBT	SWG	SWG	SWG/SPIG	SWG	SWG	SLT	
Other participants								

Activities every 10 minutes (Teacher A.) - Day 21

Participants	10	20	30	40	50	60	70	80
Teacher	TTQC/TTC	TBAD	TAQ	TTD/TWB	TTD	TWB	TT/TWB	
Students	SACSI/SBT	WU	WU/SAAQ	SLT/SQW	SLT/SAQ	SLT/SQW	SLT/SQW	
Other participants								

Activities every 10 minutes (Teacher A.) - Day 22

Participants	10	20	30	40	50	60	70	80
Teacher	TTQC	TWB/TBAD	TBAD	TTD/TWB	TTD	TWB	TT/TWB	
Students	SACSI	WU	SVV	SVV	SVV	SAAQ	AQW	

Other participants								
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Activities every 10 minutes (Teacher A.) - Day 23

Participants	10	20	30	40	50	60	70	80
Teacher	TTC	TWB	TAQ	TTQC	TRTC	TRTC	TT/TWB	
Students	SACSI	WU	WU/SAAQ	SBT	SLT/SRA	SLT/SRA	SLT/SQW	
Other participants			CP	CP				

Activities every 10 minutes (Teacher A.) - Day 24

Participants	10	20	30	40	50	60	70	80
Teacher	TTQC	TWB/WU	TT/TAQ	TTD	TTD	TTD	TTC	
Students	SACSI/SBT	WU	WU/SAAQ	SLT	SLT	SLT/SQW	SLT	
Other participants								

Activities every 10 minutes (Teacher A.) - Day 25

Participants	10	20	30	40	50	60	70	80
Teacher	WU	WU	TTIS	TTIS	TTIS	TTIS	TWB	
Students	SACSI/WU	WU	DA/SWG	DASWG	DA/SWG/SPIG	DA/SPIG	SQW	
Other participants								

Activities every 10 minutes (Teacher A.) - Day 26

Participants	10	20	30	40	50	60	70	80
Teacher	TTC/WU	TAQ	TTTG	TTTG	TTTG	TTTG	TTC	TTC
Students	SACSI/WU	SAAQ/WU	SLT/SWG	SLT/SWG	SLT/SWG	SBT/SWG	SLT	SAPL
Other participants								

Activities every 10 minutes (Teacher A.) - Day 27

Participants	10	20	30	40	50	60	70	80
Teacher	TTC	TWB/WU	TAAQ	TRTC	TTC	TTC	TTC/TWB	
Students	SACSI/SBT	WU	SAQ	SLT	SRTC	SLT	SLT/SQW	
Other participants								

Activities every 10 minutes (Teacher A.) - Day 28

Participants	10	20	30	40	50	60	70	80
Teacher	TTC	TWB/WU	TAQ/TT	TTQC/TTIS	TTIS	TTIS	TTC	TWB
Students	SACSI/SBT	SQW/WU	SAAQ/WU	SBT	SBT	SBT	SLT	SQW/SAPL
Other participants								

Activities every 10 minutes (Teacher A.) - Day 29

Participants	10	20	30	40	50	60	70	80
Teacher	TTQC	TBADTAQ	TWB	TTQC/TAQ	TAQ	TTTWTB	TT/TWB	
Students	SACSI/WU	WU	SLT/SQW	SBT	SAAQ/SLT	SLT/SQW	SQW	

Other participants								
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Activities every 10 minutes (Teacher A.) - Day 30

Participants	10	20	30	40	50	60	70	80
Teacher	TTC/TTQC	TWB/TTC	TLC	TTC	TTD/TWB	TTD/TWB	TTD	
Students	SACSI/ST	WU	SBT	SLT	SLT/SQW/SAQ	SLT/SQW/SAQ	SLT	
Other participants		CP						

Activities every 10 minutes (Teacher A.) - Day 31

Participants	10	20	30	40	50	60	70	80
Teacher	TTC	TT/TTD	TSWG	TSWG/TTTG	TTTG/TT TTD	TTTG/TTD	TTC	TTTG
Students	SACSI	SACSI/CL	SWG	SWG	SWG/SLT	SWG/SLT	SWG/SLT	SWG/SLT/SAPL
Other participants								

Appendix E: Books in Mrs. Thomas' Classroom

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