Teaching Social Justice Mathematics in a Privileged Setting

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TEACHING SOCIAL JUSTICE MATHEMATICS
IN A PRIVILEGED SETTING

A DISSERTATION

Submitted to the Faculty of
Montclair State University in partial fulfillment
of the requirements
for the degree of Doctor of Education

by
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TEACHING SOCIAL JUSTICE MATHEMATICS IN A PRIVILEGED SETTING

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ABSTRACT

TEACHING SOCIAL JUSTICE MATHEMATICS
IN A PRIVILEGED SETTING

by Rick McNamee

This practitioner action research using qualitative techniques of gathering data looks at the experiences of students in a mostly white, upper-middle class suburb who enrolled in a class that integrated mathematics with social justice issues. The researcher designed the curriculum and co-taught the one semester course. The data were collected from pre-interviews, beginning and end of class questionnaires, quick writes, field notes, and end of class focus group interviews with all the students. The author chose a practitioner action research design because he wanted to be an integral part of the study. The cyclical nature of action research allowed him to grow and learn by planning, acting, observing, and reflecting on his work.

The researcher uncovered and identified four categories that the students experienced as they progressed through the class. These categories are: Awareness, Struggle, Realization, and Growth. In the awareness category, the students’ sheltered upbringing is interrupted and their eyes are opened as they gain a new understanding of their worlds. As the students’ comfort zones are disrupted, many struggle with a number of the issues discussed in the class. In the realization category, the students take their newfound knowledge and internalize it, allowing them to realize things about
mathematics, minorities, and their worlds. In the final category of experience, the author
discusses the students and his own growth.

The study describes the experiences of students who participated in my
mathematics for social justice class taught in an economically privileged school setting.
The researcher explores how the students’ experiences impacted them and addresses the
following questions: Did their experience raise their level of social awareness? Did
participating in the study influence the students to become agents of change for social
justice? Were the students able to recognize their privilege and the cultural capital they
possess?
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Chapter 1
Introduction

“I am committed to students’ success in their individual lives and as citizens. Mathematics is a gatekeeper to higher education and a major obstacle to social equality for many” (Ruiz, 2002, p. 192).

As Ruiz explains, mathematics is a powerful tool that can be used to help us understand the world in which we live. As teachers in a democracy, one of our responsibilities is to educate our students to become active and productive citizens. As a critical pedagogue, I believe that our curriculum needs to be expanded to include social justice issues. My action research study explores the way in which an interdisciplinary high school mathematics class encouraged citizen participation to promote social justice. In this research, I describe my experiences and those of my students in a class that utilized real-life social contexts to demonstrate how specific mathematics teaching methods could enable students to interpret world events more perceptively. As the teacher of the class, I wanted to explore how to teach mathematics for social justice in a more privileged school setting.

Brooks and Thompson (2005) address the need to expand educational curricula to include social justice issues,

Curriculum bound to textbooks, curriculum guides aligned to high-stakes assessments, and large-scale multi-level curriculum adoptions are rarely concerned with the range of issues that students bring to the classroom… Focusing on the academic curriculum to the exclusion of the social curriculum constricts learning for all students. (p. 49)
A growing number of scholars (Frankenstein, 1997; Gutstein, 2003; Leonard et al., 2010; McCoy, 2008) believe that issues pertaining to social justice are culturally relevant for today’s students and belong in mathematics classrooms.

Using a social justice context for mathematics problems or projects is one way for students to gain a better understanding of these issues and in the process “read” the world. Expanding the curriculum to include teaching for social justice can foster a sense of citizenship in students (Parker, 1996; Ruiz, 2002), which should be an important goal of public education (Rothstein, Wilder, & Jacobsen, 2007). Historically, Thomas Jefferson stressed the importance of teaching citizenship in public educational curricula. His list of six goals for public education includes five that deal directly with citizenship:

1) To give citizens the information they need; 2) To enable citizens to calculate for themselves and to express their ideas and preserve their contracts and accounts in writing; 3) To understand their duties to their neighbors and country; 4) To know their rights; to choose with discretion their elected representatives and monitor their conduct with diligence, candor, and judgment; and 5) To observe their social relations with intelligence and faithfulness. (cited in Rothstein, Wilder, & Jacobsen, 2007, p. 9)

Based on these ideas, the lessons that I used in the class I taught for my project were designed to provide the type of citizenship education that Jefferson advocated.

I designed and co-taught a class entitled “Social Justice Mathematics” in the fall semester of 2008. The objectives of the class included the following: that students understand and experience how democracy works, that they are part of the process, that they can make a difference, and that they should/can act to transform their lives. Using feedback from my students, my research explored these goals as we continually reshaped
our experiences together. Being part of the class enabled me to learn and grow with my students.

This multi-disciplinary class was co-taught with a sociology teacher in a suburban high school in northern New Jersey. I had the support of the Principal, Vice-Principal, and Mathematics and Social Studies Supervisors for the content of the class. I built on ideas expressed by Sleeter (1997) among others, which suggest,

Teaching students to use mathematics as a tool for addressing social justice issues involves knowing enough about issues of concern to oppressed groups to connect such issues with mathematics. This, in turn, means being willing to use race, ethnicity, gender, and social class as lenses for examining issues, developing a critical consciousness toward such issues, and knowing mathematics well enough to connect it meaningfully with issues of concern to students. (p. 692)

Because I teach in a predominately white, wealthy, upper-middle class suburb, both the class and the students are unique. That is, privileged students such as these are not typically the targets of educational change. One of the challenges I faced in my research was encouraging my students to recognize the cultural capital that they possess. I wanted the students to be able to unpack the “invisible knapsack of white privilege” that McIntosh (1990) speaks of and to put their privileged status to good use.

In other words, teaching privileged students to question their privilege is a significant focus of my study. Becoming aware of and understanding their privileged status, should enable students to recognize the effects of their privilege on the oppressed in society. As Freire (1998) explains, oppression is dehumanizing for both the oppressed and the oppressor. The dehumanizing nature of oppression is more obvious for the oppressed; they have fewer freedoms, human rights violations, limited opportunities, and
are often treated as second-class citizens. According to Freire, oppression also
dehumanizes the oppressor. It is true that only the oppressed can restore humanity to the
oppressors by taking away their power to dominate and suppress. However, by
understanding how their privilege contributes to oppression, the oppressor is likely to
closely examine his or her own life, which allows the oppressors to act in solidarity with
the oppressed. In Freire’s opinion, both the oppressor and the oppressed move away
from relationships of domination and oppression and create a society based on more
equitable relationships. The oppressor must recognize the oppressed as persons who
have been treated unfairly and deprived of their freedom. The oppressors would become
better citizens in the sense of caring for others and working for change.

Throughout my class I worked to use a more critical approach to pedagogy; my
goal was for students to acquire tools to challenge their own dominant culture. Kincheloe
(2004) calls for a critical pedagogy “that promotes social justice, cultivates the intellect,
and expands the horizon of human possibility” (p. 45). By following Freire’s model of
“problem posing,” students were able to look at their world from different points of view.
Specifically, I looked at how a critical pedagogy and Freire’s approach can play out in a
multi-disciplinary mathematics classroom. The experience of the class was designed to
be different from a typical math classroom in which, as Ernest (2005) points out, “The
development of critical citizenship and empowerment for social change and equality
through mathematics has played no part in the National Curriculum (and is absent from
most other curriculum developments too)” (p. 4).
To define the term *social justice*, it is helpful to look at each word separately. The World English Dictionary’s (n.d.) definition of the word *social* is: “Of, relating to, or characteristic of the experience, behavior, and interaction of persons forming groups.” The same dictionary defines *justice* as, “The quality of being just; righteousness, equitableness, or moral rightness.” Taken together, social justice refers to the way people confront the moral issues of equity and righteousness in their lives. Specific topics of concern include discrimination, poverty, hunger, war, and the environment due to racism, classism, or sexism to name a few. Therefore, discussing these topics may help students discover ideas that are unacceptable, allow them to reconsider the status quo, and spur them into action to make changes in their environment. The only way to change aspects of society we find unacceptable, such as the social injustices of racism, sexism, or classism, is to take action and to act in unison within our community. Bigelow (1990) explains it this way, “Students also need to encounter individuals and organizations active in working for a more egalitarian society, and students need to be encouraged to see themselves as capable of joining together with others, in and out of school, to make needed changes” (p. 443). As teachers, we can be these individuals and model the actions that can be taken to make the world more just for our students.

In this dissertation I explain the purpose of my research in Chapter 1. In Chapter 2, I review the literature. Chapter 3 includes a detailed description of the type of methodology that I used. A presentation of the data analysis and findings follow in Chapter 4. Finally, Chapter 5 concludes with a summary of the significance of the study, its limitations, implications, and recommendations for future research. The Appendix
includes several sample lessons from the Social Justice Mathematics class, a copy of assent and consent forms, one of the pre-interview transcripts, one of the focus group transcripts, and the New Jersey Core Curriculum Content Standards used in the class.

Purpose

“Knowledge of basic mathematics and statistics is an important part of gaining real popular, democratic control over the economic, political, and social structures of our society. Libratory social change requires an understanding of the technical knowledge that is too often used to obscure economic and social realities” (Frankenstein, 1983, p. 315).

Frankenstein touches on several ideas that I have expanded on in my research. The mathematics classroom is a place in which discussions of issues pertaining to social justice can be held. Our curriculum should be expanded to include such issues. Educating our children to be critical and to question the status quo, will lead to citizen participation. Mathematics is a tool that can be used to help students better understand and visualize these issues and enable them to gain the agency needed to change their lives.

The purpose of this study was to describe the experiences of students who participated in my mathematics for social justice class taught in an economically privileged setting using action research. Mathematics and science are more challenging disciplines, which may make it more difficult for the teacher to incorporate social justice issues than in subjects such as English or social studies. Teaching mathematics for social justice is currently more prevalent in urban settings where the students have a greater stake in many of the social justice issues (Gutstein, 2003). My study is significant
because a review of the literature shows that using social justice in mathematics for a more privileged setting is often not pursued.

This research has explored my experiences as the teacher and my students’ experiences in a primarily white, upper-middle class, suburban school district from a class we co-created that linked social justice and mathematics. In addition, I discuss how these experiences influenced the students’ sense of themselves as agents of change for social justice. Did their experience in the class raise their level of social awareness? Did the class help to instill in the students a sense of agency to work for a more just society? How might students in this setting come to recognize their privilege and understand the cultural capital that they possess? In what ways did the students struggle with the class? How have we grown from our shared experiences? These are some of the guiding questions that I believe my research has addressed.

To answer these questions I have implemented practitioner action research. My ongoing engagement with one class of students over one semester has enabled me to better understand their experiences. This type of study has also allowed me to reflect on my own teaching practices, interact with my students, and learn from the experience.
Chapter 2  
Literature Review

“As Vivyan Adair states, ‘education is important to all citizens; it is absolutely essential to those who…have suffered lifetimes of oppression and marginalization’ (p.219).  Adair is only half right.  It is ‘absolutely essential’ that we increase access to quality education for members of historically privileged groups, too.  The reason is straightforward:  They hold the reigns (sic) of power and, therefore, whether politically, economically, or culturally, can do the most harm or good” (Parker, 2003, p. 155).

Social Justice and Mathematics

Although much of the current debate about mathematics education focuses on conceptual understanding at the expense of learning basic computational skills, there are a number of leading educators who would like to shift the focus of the debate (Cotton, 1999; Gutstein & Peterson, 2005; Leonard et al., 2010; Oakes & Rogers, 2006).  They are interested in having mathematics serve as the vehicle to deliver social justice.  They believe there should be a greater consideration for including social justice issues within the mathematics curriculum.  That is, in their view, a better understanding of mathematics might lead to a better understanding of the injustices in our society.

I concur with my colleagues that mathematics may be an ideal venue for incorporating social justice issues.  In the conceptual vs. computational debate context, however, the shift to conceptual understanding in mathematics serves our objectives.  By focusing on concepts as opposed to mere computation, students will learn to solve problems that arise in their everyday lives.  Working with real-life problems better equips students to use mathematics in the ways needed to tackle these issues of injustice.
Using a mathematics curriculum to promote social justice is not a new idea. However, most of the existing literature on this idea focuses on a specific population for promoting social justice (Frankenstein, 1990; Gutstein, 2003; Moses, 2001; Oakes & Rogers, 2006). The targeted population includes marginalized groups, such as Blacks, Latinos, women, and adults, who have not been successful at mathematics in the past. Obviously, these groups are also those who are frequently the victims of social injustices.

A discussion of research studies that illustrate examples of promoting social justice using mathematics concepts follows. These projects have several common characteristics regarding the use of mathematics to promote social justice. First, mathematics functions as a tool that students can use to gain a deeper understanding of almost any topic. For instance, a comprehensive understanding of large numbers, percentages, equations, ratios, graphs, and formulas allows students to grasp many intricacies of complex issues, which in turn, encourages students to raise questions when they encounter social issues that they feel are unjust. Another important common attribute of studies of teaching for social justice is instilling in students a belief that they can be part of the solution. When students who are members of marginalized groups recognize that they can actually do something about the unjust situation, they become empowered. These students become advocates for their causes and are more likely to challenge injustices in their personal lives (Frankenstein, 2005a; Gutstein, 2003).

The first study is Frankenstein’s (1990) experiences teaching working-class urban adults. Her critical mathematical literacy curriculum uses statistical data and methods to deepen students’ understanding of specific issues. This deeper understanding leads them
to question how society is structured and empowers them to act from a more informed position. Her research involved working-class urban adults who had not been on the college track. Her students, 70% of whom were women and 30% of whom were ethnic minorities, also lacked confidence in their ability to do mathematics. However, after having participated in her class, many of these same students gained mathematical confidence and became actively involved in organizing for social change.

According to Frankenstein (1997), most of her students had “internalized negative self-images about their knowledge and ability in mathematics” (p. 12). As part of her critical-mathematical literacy curriculum, students read and analyze mathematics education studies. In the process, students simultaneously learn the concepts of mathematics more deeply, and they learn about a variety of strategies they can apply to overcome their internal self-doubt about their mathematical abilities.

Gutstein (2003) incorporated Frankenstein’s work at a middle school. His qualitative study of a seventh and eighth grade mathematics class in an urban Latino school, examined how students confront difficult social issues involving justice and equity. Using real-world projects, he found that students gained mathematical power, which in turn, changed their attitudes toward the subject. He suggests that using social justice pedagogy may ultimately help foster a more just society because one of its principles is that students realize that they can be part of the solution to injustices.

The Algebra Project developed by Moses (2001) for inner-city blacks also utilizes mathematics as a tool to promote quality public education. Recognizing the increasing need for mathematics knowledge and skills in our technology-based society, he began a
grass roots organization whose members include students, parents, and schools. His nonprofit organization encourages individuals in the community to take responsibility for reforming mathematics education. The project that began in Cambridge, MA, now encompasses over 200 middle schools across the country that are working for community change.

At the collegiate level, UCLA’s Institute for Democracy, Education, and Access (IDEA) also focuses on ethnic minority students in low-income neighborhoods (Oakes & Rogers, 2006). Similar to the Algebra Project, IDEA organizes the community to improve public schooling and better prepare students for college. By empowering individuals and building relationships, IDEA encourages students to become advocates for social change. Inner city educators, parents, students, and community members work together to confront educational injustices originating from racism and classism.

In the United Kingdom, Cotton (1999) led a five-year project that worked with three different comprehensive schools. The main focus of the project was to investigate ways in which mathematics can affect how individuals lead their lives outside of school. He found that mathematics may lead students to challenge the status quo.

Mathematics is important because it offers both access to positions of power, and also a way of critically viewing the pronouncements of those who are involved in making decisions over which we have no control. This critical view allows us to challenge policy decisions that we feel are unjust (p. 6).

Zevenbergen (2000) agrees that all students should have the opportunity to succeed in mathematics, “We are acutely aware of the need for more students to have access to mathematics as it is a powerful tool for contemporary society – in terms of
employability as well as quality of life” (p. 8). Matthews (2005) points out that although an equity goal of mathematics for all has been present in recent educational reform documents, it has not been incorporated effectively into classrooms with minority students. He also feels that recent reforms in mathematics have lacked an emphasis on using teaching to promote social justice.

Another area of current debate in mathematics education focuses on the topic of multicultural education. As conceptualized by Banks (2006), multicultural education is not just curriculum reform, but includes other components. His five dimensions are: content integration, which uses examples and content from a variety of cultures in the curriculum; the knowledge construction process, in which teachers help students understand how knowledge is created and how it reflects the various racial, ethnic and social class characteristics of the learners; prejudice reduction, relates to how students develop democratic values along with more positive racial and ethnic attitudes; equity pedagogy, in which teachers facilitate academic achievement of students from diverse groups; and an empowering school culture and social structure, which is used to foster educational equity. He feels that there are opportunities for mathematics’ classrooms to integrate these dimensions into their curriculum; however, it is more difficult than for social studies or language arts teachers because mathematics teachers have not been adequately trained to teach such concepts.

Leonard et al. (2010) in their conceptual article about social justice and cultural relevance focus on ethnic minorities in the United States. They discuss the challenge of finding appropriate and rigorous examples of social justice issues for mathematics
teachers to tackle. They point to the inadequate amount of professional development that in-service teachers receive in this area. They recommend that educational methods courses provide pre-service teachers with social justice pedagogy models to practice in their field experiences. However, even when teachers do find appropriate examples, Matthews (2005) found that teachers were, “hesitant to incorporate a critical element because of strong, traditional indoctrination over the cultureless, infallible nature of mathematics” (p. 53).

The state of the field of teaching mathematics for social justice however, is alive and well. I attended the inaugural conference entitled *Creating Balance in an Unjust World* in April of 2007. There were workshops, panel discussions, literature, and the aforementioned Robert Moses as the keynote speaker. The conference has been held each year since. The field is concerned with improving mathematical literacy, gaining equity in mathematics education, and connecting social justice issues to the mathematics classroom.

The approach of professionals in this field relies on the use of statistical data to create mathematical problems that highlight issues of injustice in society. Leading educators (Frankenstein, 2005a; Gutstein, 2003; Moses, 2001) have found that within this tradition of delivering mathematics, students become inspired to act. Their actions stem from a deeper understanding of the issues, a greater appreciation of the subject, and a realization that their actions can help solve problems. By working with students, parents, and school officials, and using this approach, educators can help foster positive changes in the community and the public schools themselves.
Students in a Privileged Setting

A question not yet addressed by the above scholars is, “How would teaching mathematics for social justice in a privileged school setting differ from teaching the same course in an ethnically mixed lower class urban setting?” By privileged I am referring to upper-middle-class white students. Many students in this setting, who belong to the dominant culture, already perform well on standardized tests.

What added benefit do they gain from this type of social justice pedagogy? Although they may live in comfort, their conscience and sense of responsibility needs to be aroused. Freire (1998) mentions this comfortable group as follows,

Recently I heard a debate in which a young working man, speaking of life in a ghetto, said he no longer felt shame because of where he lived. ‘I am proud,’ he said, ‘of what we have achieved through our struggle and our organization. In fact, if we really had a clear awareness of our condition and its structural causes, we would see that it is not we who should be ashamed of where we live but those who live in comfort but do nothing to change the misery that surrounds them.’ (p.77)

Overwhelmed and Resistant

One way that teaching for social justice in a privileged setting differs from teaching in a multicultural urban setting is a typical reaction teachers might observe from their students. According to Haddad & Lieberman (2002), when discussing issues of oppression and domination, teachers may face student resistance, apathy, or rage. When discussing realities that have previously been taken for granted, students challenged the teacher’s authority as well as the validity of their information. These reactions may originate from the fact that students with privileged backgrounds lack personal experience with institutions of domination other than those that operate to their benefit,
(e.g. protect them), and are unaware of how domination functions in lower-income communities. Other negative reactions include guilt, anger, hostility, and a feeling of becoming overwhelmed by the size and scope of the problems they are presented with (Bohmer & Briggs, 1991; Seider, 2008 & 2009).

For example, Seider (2008, 2009) describes in his study how a course entitled “Literature and Justice” impacted a group of upper-middle-class suburban high school seniors. The setting of his study is very similar to that of “Pinewood,” the school in which my study took place; however, his course content did not include any mathematics. His study comprised of 83 students in one control and one experimental group. The experimental group included seniors who were enrolled in the “Literature and Justice” course in the fall semester. The control group of seniors was enrolled in the class for the spring semester. He interviewed groups of students from each group at the beginning of the semester in September and again at the end of the semester in January. Students from both groups also filled out surveys at the beginning and end of the semester. His study included both quantitative and qualitative aspects.

His results were unexpected. The surveys in the quantitative portion of his study revealed that the students enrolled in the “Literature and Justice” course in the fall semester experienced significant declines in their support for educational equity and humanitarian aid from the beginning to the end of the semester. The in-depth interviews of the qualitative portion of the study revealed the reasons for this apparent decrease in support. His findings indicated that students became overwhelmed by the extent and scope of poverty and hunger; that such problems are not readily solvable; and that
concerns and fears about their own possible future financial hardship were raised. He also found that the “Literature and Justice” course made the students aware of previously unconsidered world issues and that these students recognized for the first time the educational advantages they have growing up in their privileged community.

Although not a study, Staples (2005) writes about a mathematics lesson that investigates the distribution of wealth in the United States. She taught the lesson to her AP calculus class in a small private prestigious boarding school in central Massachusetts. She describes her experience of seeing her students become aware of their place in society and understanding that not everyone has the same opportunities. She hoped her students, “would use these understandings to change the world in ways that helped address some of the gross disparities that exist” (p. 106).

Although marginalized and privileged groups come from different social strata, both populations are working toward becoming active citizens. Nevertheless, the marginalized or oppressed students have a greater stake in creating a just society. As mentioned, working with students from the dominant culture to unmask and understand their privilege can be challenging (Bohmer & Briggs, 1991; Haddad & Lieberman, 2002). Bohmer & Briggs (1991) have experienced reactions of resistance, guilt, anger, and hostility from white middle-class students while teaching about race, class, and gender stratification. However, they believe that if material is organized in a specific manner, privileged students can come to accept and understand the existence of oppression in our society. One of the main keys is enabling them to distinguish between individual prejudice and discrimination at the institutional level.
Resistance from students can also be utilized as a means of empowerment. Gorlewski (2007) explains how she used her students’ resistance to co-construct the curriculum for her English Language Arts class. Since schools tend to value academic language at the expense of other social languages, students can become turned off. Teaching in a predominantly white suburban high school, she was sensitive to her students’ issues of identity and language. She was able to accept the students’ resistance as a part of the lived experiences of the class. Furthermore, she used the resistance as a way to connect with the students and construct new meanings for her lessons.

Although challenging, exposing privileged students to the concept of oppression can engender a greater appreciation of those who are socially and economically different (Bohmer & Briggs, 1991). Understanding the fact that the availability of choices and opportunities for the privileged directly limits the choices and opportunities for the oppressed is a first step in wanting to do something about it (McIntosh, 1990). Exposing privileged students to issues of oppression, recognizing the dichotomy of privilege and domination, should in fact make students uncomfortable and lead to self-reflection (McGough, 2006). Self-reflection can then result in genuine concern and even collaboration with marginalized others (Hytten, 2006).

**Developing a Healthy White Racial Identity**

Racial categories are not psychological because they are not formed by behavior, traits, or environmental conditions, but rather reflect sociopolitical constructs. Societies create such categories based on biological characteristics and attribute differential meaning to them. Therefore, “racial identity theories are intended to describe group-
specific development in particular sociopolitical contexts” (Helms, 2007, p. 235). As a result, White and Black Americans internalize their racial identities differently. Because of the way the racial categories are created and viewed, racism can affect racial identity development.

Racism is defined by the Merriam-Webster Dictionary (n.d.) as “a belief that race is the primary determinant of human traits and capacities and that racial differences produce an inherent superiority of a particular race.” Carter et al. (2004), suggest that today there are subtler forms of racism that are more difficult to detect. They contend that Whites cannot be considered either racist or not racist, but rather that White Americans have a variety of racial attitudes.

Collaborating and interacting with other groups affects students in a number of ways. Marshall (2002) claims that students express an increased interest and curiosity in others, which can result in a more positive racial identity. Marshall (2002) also suggests that students with a positive or healthy White racial identity can evolve into non-oppressive individuals who believe in the ideal of equality. She describes the importance of developing a healthy White racial identity while educating our students for cultural diversity. She discusses various stages through which students progress in order to achieve a non-racist White identity.

According to Marshall, the process begins with students being unaware of a hierarchy of racial classification in society. The students recognize the differences in the races superficially. Through interaction, the students’ naïve perception of race collapses and becomes more sophisticated. They can go in one of two directions. Some students
develop a genuine interest in diversity and want to learn more about it. These students are on the path to developing a healthy, positive White racial identity. They embrace the ideal of equity and reject racism. They no longer tolerate White superiority and reject their privileges on moral grounds. If they continue through the stages, they will attain a new desire to tackle racism and oppression. Finally in the last stage of this path, the students become involved in efforts to eliminate racism and oppression (Marshall, 2002).

Marshall explains that the other group of students can become fearful and anxious in the presence of Blacks or other non-Whites. They recognize and accept the existing structure of racial classification in our country. These students perceive the higher status of Whites as being due to their superiority and the lower status of non-Whites as being attributable to their inferiority. They believe that they are or will eventually become victims of reverse discrimination. They might also feel the U.S. is rapidly being taken over by foreigners who threaten their White Christian institutions. Students on this path resist future cross-cultural interactions and end up trying to preserve and defend their current way of life.

Some scholars, such as McIntosh (1990) have become interested in ending domination by race and sex. She claims that men and Whites are over privileged and many are unwilling to do anything about it. She explains how privileged groups are taught not to recognize their advantages and end up practicing subconscious oppression, which leads down the second path to an unhealthy White racial identity. As a result, the critical pedagogue in such a privileged setting must take steps to ensure that his or her
students become aware of the fact that they gain advantages from others’ disadvantages. This type of pedagogy leads to our next category.

**Critical Pedagogy**

One goal of *critical pedagogy* is to provide a way for the oppressed to begin to reflect on their socio-economic status and to take action to improve it (Johnson & Morris, 2010). Critical pedagogues focus on social issues of power, domination, and oppression. For instance, Young (2007) contends that critical pedagogy is overtly political with a goal of empowering students to confront and take action against injustices in their world. Banks & Banks (1995) suggest that it is not enough to teach students to read, write, and compute without also learning to question the dominant culture’s assumptions, paradigms, and hegemonic characteristics.

Tutak et al. (2011) agree that critical pedagogy is not *value neutral* and raises questions about, “the way things are and wonders how they might be done differently” (p. 66). The approach to teaching begins with a dialogue with the students to awaken their critical consciousness (Freire, 1970). Such a dialogue allows the students to bring their own realities and lived experiences into the classroom (Tutak et al., 2011). A central goal for critical pedagogues is *praxis*, which refers to the thoughtful reflection and examination of a person’s situation, followed by the actions she or he takes to work towards liberation (Freire, 1970; Johnson & Morris, 2010; Tutak et al., 2011).

Zyngier (2003) argues that schools should not train students for the sole purpose of providing for a nation’s industrial or economic needs. In the latter scenario, critical reasoning skills are often ignored; students become disempowered when what is taught in
the classroom is exclusively connected to improving the utility of the workforce. By responding to the market at the expense of social justice an opportunity is lost for both students and the community. Zyngier (2003) explains,

A socially just, connected education must enable students to have more control of their lives, learn about individual and collective rights and be connected [bold in original] to a more participatory social vision than that of providing the human capital needs of industry and business. Students must be empowered to inquire, act and reflect on the issues that are of concern to them and to positively transform situations where they see disadvantage or unfairness in their own or others’ lives. (p. 43)

**Political Engagement and Raised Consciousness**

Teaching is a political act (Ginsburg & Kamat, 1995). That is to say, teachers make decisions every day that affect what occurs in their classrooms. They decide what topics to discuss and select the information to be transmitted to their students. As a result, deciding not to talk about social justice issues is a political decision. The question, therefore, is not whether teachers are political, but to what ends, by what means, and in whose interest should teachers engage in political activity? In fact, teachers are making political decisions when they encourage their students to think critically about information they read in newspapers, view on the internet, or see on TV. Therefore, teachers, whose primary responsibility is to the students being taught, are morally obligated to make the decisions necessary to enhance the critical enculturation of our young in a political democracy (Goodlad, 1990).

Critical pedagogy encompasses the politics of education. According to Hackenberg & Mewborn (2004), education is political in the sense of how the schools are
structured, how curricula are chosen, how students and teachers are treated, and how school learning relates to local, national, and world events. Each of these aspects involves topics of power, culture, or ideology. A critical pedagogue strives to raise the awareness of these issues to empower students to make changes that lead to a more equitable, democratic society. Critical pedagogy also questions existing educational norms and promotes social justice in schools and in society.

As a result, critical pedagogues will allow students to investigate the justice and economic systems in our country. Rather than promoting the status quo, they encourage students to evaluate these institutions. Consequently, educators who advocate the status quo are themselves making a political statement. Critical pedagogues, on the other hand, want their students to weigh the evidence and make their own ideological decisions.

Kincheloe (2004) emphasizes the important aspects of critical pedagogy that support the aforementioned views. “To refuse to name the forces that produce human suffering and exploitation is to take a position that supports oppression and powers that perpetuate it” (p. 11). These forces are neoliberals and the dominant culture that keeps them in power. “A critical pedagogy is not only interested in social change, but also in cultivating the intellect of teachers, students, and members of the larger society” (p. 21). A cultivated intellect along with raising consciousness will give students the agency to transform their lives. “The struggle to resist the harmful effects of dominant power and the empowerment of marginalized and exploited people must include everything from engaging such individuals in a rigorous, empowering education to a more equitable distribution of wealth” (p. 34). By not accepting the capitalistic vision of the neoliberals
and acting on this impulse, social injustices can be rectified. “Understanding that education is always political as it supports the needs of the dominant culture while subverting the interest of marginalized cultures, critical pedagogy does not allow such omissions in the curricula it develops” (p. 14). These omissions may include the effects of globalization on society or the distribution of wealth in the United States.

I understand some of these statements seem radical in nature. Moving away from capitalism would be a difficult step in this country. However, with the ever increasing disparity between the rich and the poor, now may be an opportune time for this discussion (Foroohar, 2011). Including today’s youth in the discussion may lead to a more equitable way to distribute wealth in the future. Allowing the youth a “seat at the table” is the objective of the critical pedagogue.

**Read the World with Mathematics**

The idea of using mathematics to *read* the world is rooted in Paolo Freire’s (1970 & 1998) work with Brazilian peasants. However, rather than teaching mathematics in an industrialized country, Freire focused on promoting literacy in a developing country. He wanted the oppressed peasants in Brazil to understand the power of both the written and the spoken word. Having the ability to read and using Freire’s problem-posing approach, the peasants would better understand their world, raise their level of critical consciousness, and work for their liberation through transformative action.

Although Freire did not emphasize mathematical concepts in his work, many scholars in the mathematics field have adopted his approach (Higginson, 1997). Frankenstein (1990), Gutstein (2003), and others adopted his idea of a *generative theme*,
which is a cultural or political topic of concern or importance to learners and leads to class discussions, study, and projects that are built around that topic. By favoring dialogue and reflection as opposed to lecture or drills and practice, students utilize mathematics to help them better understand the social, political, and economic forces in their lives.

Frankenstein (2005b), Gellert, et al. (2001), and Gutstein (2003) discuss how mathematics can be used to “read” the world. Gutstein (2003) focuses on using mathematics to understand power relationships and the different opportunities available to various social groups. Mathematics can also enable students to better understand types of discrimination, whether it be racial, class, gender, language, sexual orientation, age, or other. Frankenstein (2005b) perceives mathematics as a type of knowledge that humans construct to better understand and learn about their world. Gellert, et al. (2001) suggest that mathematics may be characterized as a possible resource or toolbox. Such toolboxes can be opened and the tools utilized to help solve both individual or societal problems.

Gutstein (2003) incorporated a theme of racial profiling with the mathematical concepts of proportionality and expected value so that his students could better understand the racially disaggregated data on traffic stops. Frankenstein (1983) explains how she used themes related to the military budget and tax loopholes for the rich to learn about percentages, circle graphs, and the meaning of large numbers. One common link in their work is the use of mathematics as the tool that leads to a greater understanding of a topic that many do not necessarily see as being related to mathematics. Both of these
scholars are also making a political statement. They have purposely chosen provocative topics that they feel are important, that will arouse the students’ interest, but that are also not typically addressed in the mathematics classroom.

The National Council of Teachers of Mathematics (2000) supports using real-life social contexts that demonstrate how mathematics is used in reading the world. The connections standard states, “Recognize and apply mathematics in contexts outside of mathematics” (p. 65). The problem-solving standard also refers to other contexts: “Solve problems that arise in mathematics and in other contexts” (p. 53). Most of the teachers I have taught with over a 15 year period prefer using real-life contexts whenever possible, but do not necessarily take up politically sensitive topics. At the secondary level this becomes more difficult and happens less frequently due to the specific skills required for higher end mathematics courses such as Trigonometry and Calculus.

Johnston & Yasukawa (2001) have even introduced a new postgraduate subject, “Mathematics in Social Contexts.” Their focus is on a grand vision of numeracy which they define as, “the ability to situate, interpret, critique, use, and perhaps even create mathematics in context, taking into account all the mathematical as well as social and human complexities which come with the process” (p. 279). Frankenstein (1997) also claims that, “Mathematics occurs in contexts, integrated with other knowledge of the world” (p. 13). As Freire (1970) used his generative themes to advance literacy and help his students read the world, mathematics in social contexts can similarly be used to read the world. In the social justice field, teachers relate mathematics applications such as interpreting graphs, analyzing data, or understanding percentages to events in their
students’ lives. By centering projects on these events, students are able to discuss and study topics that give them a more well-rounded understanding of their world.

Roman (2004) argues that mathematics is a subject that often is unappreciated, and its importance overlooked. Many students and parents readily accept the fact that they are “not good at math.” Parents may feel that since they were not able to “do math,” it is not important for their children to be successful at mathematics either. Students also wonder and ask questions such as, “Why are we learning this?” or “When will I ever use this in real-life?” Ernest (2005) agrees with the need to address these issues. “The appreciation of mathematics as making a unique contribution to human culture with special concepts and a powerful aesthetic of its own, is an aim for school mathematics often neglected by mathematicians, and users of mathematics alike” (p. 7).

The use of real-life problems about social issues that students can relate to is one way students can understand how mathematics can be useful in their lives. Wittmann (1984) proclaims that, “Mathematics teaching is doing mathematics with students in order to cultivate their understanding of reality” (p. 29). When students see how mathematics can be used to read the world, their orientation toward the subject can change. Gutstein (2003) found this to be true of the Latino students in the urban school where he taught, “Not surprisingly, as students used mathematics to develop sociopolitical awareness and question the source and veracity of knowledge and developed mathematical power, their views on mathematics began to change” (p. 59). As students begin to understand how mathematics can help them better understand and interpret their world in addition to creating new opportunities for them in the future, they
recognize the importance of mathematics in their lives and gain a greater appreciation for the subject.

**The Critical Mathematics Classroom**

In order to bring issues of social justice into the mathematics classroom, the teacher needs to assume a more critical stance. One of the main purposes of encouraging our students to read the world with mathematics is to enable them to interpret the social, political, and economic complexities they face. Mathematics is one tool that can assist students in critiquing a world in which discrimination, poverty, hunger, war, and environmental damage affect their lives. Mukhopadhyay & Greer (2001) claim that we should have a politically defined goal for mathematics education to empower our students to be critical and ultimately to act to improve society as they see fit. As long as we accept the fact that all education is political, why not explicitly state our vision that students challenge and not merely accept the status quo?

To redirect our goal for mathematics education, we should first look at what the aim of the curriculum is today. In the most recently released Common Core State Standards for Mathematics (2011), the focus is on preparing our students for college and career. The new standards address the concern that curriculum in this country is too broad and not deep enough. These standards concentrate on making the mathematics practices and content clearer and more specific. Nowhere in the document are issues of equity or social justice addressed.

Expanding the curriculum to include social justice topics will expose students to the unjust issues not typically addressed in mathematics’ classrooms today. Exposure
can lead to a deeper understanding, which in turn can lead to critique, and finally a realization that they can do something about these injustices to make their world a better place. Frankenstein’s (2005a) critical-mathematical literacy curriculum does just that. Her program, “involves both the ability to ask basic statistical questions in order to deepen one’s appreciation of particular issues and the ability to present data to change people’s perceptions of those issues” (Frankenstein, 1997, p. 12).

The critical use of quantitative data can help students better understand any number of complex issues such as the distribution of wealth, racial profiling, inner city gun violence, or teenage pregnancy. The critical pedagogue can transform this better understanding into raising the conscience and then to a desire to act. Frankenstein (1983) found that using statistical information critically, “can open hegemonic ideologies and students do become angry and intellectually committed to social change” (p. 335).

Developing a social justice philosophy for teachers is crucial. Duncan-Andrade (2005) proposed a teacher inquiry group to support the development of student-empowering social justice themes in teachers’ practice. Speaking of three successful teachers in the group, he claimed that they “design[ed] their pedagogy to empower students with tools for recognizing, naming, analyzing, and confronting the most acute social conditions facing them: poverty, racism, violence and inequality” (p. 71).

Education that is critical in nature can lead to active citizenship. By teaching our students the importance of investigating, studying, and questioning issues that they find unjust empowers them. As students who are critical become empowered they begin to
feel that they should work to rectify the societal injustices they see. Beyond a desire to do something, they realize that their actions can actually make a difference.

Dias (1999) views education as having two functions in society. She acknowledges that education plays a role in the reproduction of present social structures. However, she suggests that education also has a role in transforming these structures. In other words, if students find current structures unacceptable, and are critically educated, they will understand that they have the power to work to improve the structure. This leads into a discussion on educating our youth for citizenship and agency.

**Education for Citizenship and Agency**

“To be fully empowered, students must be connected with the outside world and learn how to use their voices in becoming active participants beyond the classroom. The why in the classroom needs to lead to the why in the world” (Poduska, 1996, p. 120).

As Poduska (1996) points out students must become active participants in their society. In order to be a “good” citizen in a democracy, individuals must participate in an informed manner. To become better informed, they can read newspapers, look at data, watch political debates, listen to politicians’ speeches, and learn to critique. To participate actively, they can attend rallies or protests, write letters or send emails to politicians, sign petitions, participate in boycotts, attend town hall meetings, and vote. Banks (2004) agrees that citizens in a democracy should be reflective, moral, and active. He contends that, “They should have the knowledge, skills, and commitment needed to change the world to make it more just and democratic” (p. 291).
Participation in the democratic process is a problem in the United States. According to a *Statistical Abstract of the United States and Federal Election Commission*, since 1930, the voting-age population that actually voted for a U.S. Representative to Congress ranged from 32.5% to 58.5%. During the years when there was a presidential election, the percentages of those who voted for a U.S. Representative to Congress trended slightly higher than the years in which there was no presidential election, ranging from 44.9% to 58.5% compared to the years with no presidential election when the range was from 32.5% to 45.4%. This means that most of the time less than half of the citizens eligible to vote for a U.S. Representative to Congress actually voted. Furthermore, the trend shows that the percentages are dropping, since only three times since 1970 did the percentage exceed 50% (1972, 1992, & 2004). In a democratic society, voting is one of the most important means of participation.

By incorporating social justice issues with critical pedagogy students become aware that it is acceptable to be critical of the political process. They need to understand that they can act and do things that can change or improve their lives or the lives of those around them. Without this insight, students live in what Quigley & Holsinger (1993) refer to as “happy consciousness” or a state of acritical, naïve realism wherein one believes that the prevailing hegemony and technology are entirely appropriate. The other option is that the students do not question the status quo or see that they can do anything to change it, should they want to.

Mathematics class lessons that incorporate real-life circumstances can reinforce how a democracy works and lead students to action. Skovsmose (1990) identifies three
features of the teacher-learning material that complies with the social argument of democratization.

1. The material has to do with a real mathematical model. 2. The model has to do with important social activities in society. 3. The material does in fact develop an understanding of the mathematical content of the model, but this, more technical knowledge is not the goal. It is to develop an insight into the assumptions integrated into the model, and by this to develop an understanding of processes (for instance processes of decisions) in society. (p. 113)

Using mathematics lessons to reinforce democracy is another way students can be encouraged to read and react to their world.

As mentioned previously, Gutstein (2003) discusses the importance of agency and how students themselves can ultimately be part of the solution to injustices in their worlds today and in the future. His study suggests a social justice pedagogy in a mathematics classroom can expand the concept of equity. Openly discussing issues such as the unequal relations of power in society, can further the struggle for equity. Stern (2000) agrees with the need to face injustices and to act on them, “The richest and most useful education we can give our students is one that provides them with tools and opportunities to confront inequities in their lives, one that will help them improve their own psychological and material conditions” (p. 122). One of the tools we can provide our students with is the ability to apply mathematics to their everyday lives. Using a social justice pedagogy provides our students with the opportunities to become aware of, investigate, and confront injustices in their world.

Privileged students tend not to be harmed by the inequities they see in their world. Exposing these students to a social justice pedagogy provides them with a better lens with
which to see the problems facing those less fortunate and how these problems are linked to their own privilege. As Parker (2003), pointed out in the beginning of this chapter, it is essential to reach these students as well as those who are marginalized. The reason should be obvious: because of their power and prestige, it is the students of the dominant culture who can do the most harm or the most good.

By applying mathematical concepts and techniques, all students can improve their lives and the lives of others by helping them to more accurately read their world. Incorporating the topics of social justice pedagogy into the mathematics curriculum can deepen one’s understanding of the particular topic and of the mathematics (Frankenstein, 1997). Using a more critical pedagogy can lead students to action, which in turn makes them better citizens. D’Ambrosio (1997) explains the philosophy of teaching mathematics for social justice quite eloquently,

No one will disclaim that as mathematics educators we must teach mathematics. But we must also join the forces of those who are struggling to end domination by race and sex and consequently to end violence and war. Peace in all its dimensions, that is, not only military peace but also interior peace, social peace, and environmental peace, is intrinsically associated with nondiscrimination by sex, race, and culture. To achieve peace means to live with dignity, which implies an atmosphere of diversity and equity. (p. 243)

The foregoing review of the literature suggests that mathematics can be used as a vehicle to promote social justice. In fact, social justice mathematics is currently being implemented in several urban settings. Numerous scholars have suggested that a better understanding of mathematics can lead to a better understanding of society (Cotton, 1999; Gutstein & Peterson, 2005; Leonard et al., 2010; Oakes & Rogers, 2006).
Mathematics concepts lead to a better understanding of the particular social justice issue as well as to a realization that students can become part of the solution.

However, we know much less about addressing issues of social justice in mathematics classrooms educating students of privilege. From the literature we do know that teachers attempting to introduce such topics have often faced resistance and hostility (Bohmer & Briggs, 1991; Haddad & Lieberman, 2002). We also understand the need to be cautious with this approach because students can become frustrated and overwhelmed (Seider, 2008 & 2009). It is also important to provide such students with the opportunities to not only recognize and acknowledge the advantages they have, but to realize how those advantages affect those who are less fortunate (McIntosh, 1990).

Freire (1998) in Brazil has also explicitly stated that it is these privileged students that we want to reach to raise their consciousness and sense of responsibility.

The idea of using mathematics to read the world is rooted in Freire’s (1970) approach to teaching literacy to peasants. Several educators (Frankenstein, 2005b; Gellert, et. al., 2001; Gutstein, 2003; Higginson, 1997) have taken Freire’s approach and applied it to mathematics. They suggest that mathematics can be used to read the world by better understanding power relationships and discrimination, and can also lead to solving societal problems.

In order to properly implement Freire’s approach, educators must incorporate a pedagogy that is critical in nature. A critical pedagogy (Hackenberg & Mewborn, 2004; Kincheloe, 2004) raises issues of power, culture, and ideology. Critical pedagogues teach their students to question existing educational norms and the status quo of structures in
society. Including social justice issues in the mathematics classroom would mean expanding the existing curriculum beyond the current aims of college preparation and career paths.

Finally, the literature illustrates the fact that teaching is political in nature (Ginsburg & Kamat, 1995; Hackenberg & Mewborn, 2004). Promoting social justice in the mathematics classroom and following Freire’s approach are political choices teachers can make. A number of scholars (Frankenstein, 1997; Gutstein, 2003; Skovsmose, 1990; Stern, 2000) suggest that using mathematics lessons related to real-life circumstances that reveal injustices can lead students to act. Whenever students take action, they become better citizens. Citizenship should become an important goal of public education (Rothstein, Wilder, & Jacobsen, 2007). Expanding the curriculum to include teaching for social justice can foster a sense of citizenship in students (Parker, 1996; Ruiz, 2002).
Chapter 3  
Methodology

“We see action research not merely as individual practitioners trying to improve their practice but as part of a larger social movement that challenges dominant research and development approaches that emphasize an outside-in, top-down approach to educational change. In other words, we believe that empowerment begins with a group of educational practitioners who view themselves not merely as consumers of someone else’s knowledge but as knowledge creators in their own right” (Anderson, Herr, & Nihlen, 2007, p. 7).

Practitioner Action Research

As stated earlier, the purpose of this study is to describe the experiences of students who participated in my mathematics for social justice class taught in an economically privileged setting. Using action research, I was specifically interested in the following questions: How did the experience of enrolling in this class influence the students’ sense of themselves as agents of change for social justice? Did their experience raise their level of social awareness? Did the class instill in the students a sense of agency to work for a more just society? How did students in this setting come to recognize their privilege and understand the cultural capital that they possess? In what ways did the students struggle with the class? How have the students and I grown from our shared experiences? These are only some of the research questions that my research has addressed.

The methodology for my study is based on practitioner action research. In practitioner action research a teacher or other school professional conducts the research at his or her own site. The site might be the teacher’s classroom, school, or the community
where he/she works. Anderson, Herr, and Nihlen (2007) explain that practitioner action research is, “a reflective process but is different from isolated, spontaneous reflection in that it is deliberately and systematically undertaken and generally requires that some form of evidence be presented to support assertions” (p. 2).

This type of study is qualitative rather than quantitative in nature. A qualitative study does not rely on numerical data and the analysis is not based on objective statistics alone. Instead, the data I have collected originate from my own observations of my students. I have used questionnaires, anonymous responses, transcribed individual and focus group interviews, and my own field notes as my data. The evidence to support my assertions emerges from my analysis of these data.

Action research is cyclical in nature. The cycles involve planning, acting, observing, and reflecting on one’s observations (Anderson, Herr, & Nihlen, 2007). After reflecting the researcher returns to the beginning of the cycle and can alter the planning and repeat the cycle. The narrative style of action research allows the practitioner to reflect on both the research process and the findings. As an actor at the research site, the researcher is an integral part of the study. Herr and Anderson (2005) point out that, “Action research is inherently interdisciplinary and seldom fits neatly into the norms of a particular discipline or field” (p. 2). Leading scholars in the field (Brydon-Miller & Magure, 2009; Cochran-Smith & Lytle, 2009) contend that action research is also frequently aligned with the goals of social justice and equity.

I selected practitioner action research as my methodology because I wanted to be an integral part of the research. I wanted to be a participant in the study because it was
my idea to create the Social Justice Mathematics class and I wanted to teach it. I also
realized I had never designed a new class before, and I wanted to learn along with my
students. I wanted to be able to reflect on the process as I went along in order to
continually improve the students’ and my own experiences. Similar to Anderson, et al., I
intended my new class to be creating new knowledge. Since I would be teaching the
class where I currently work, I could conduct the research as part of my regular teaching
job.

I also liked the idea of establishing personal relationships with my students. As
an active participant, I was able to get to know many of my students on a number of
different levels. Since I was interested in continuing to “fine tune” the Social Justice
Mathematics class, an action research study allowed me to reflect, learn and improve on
the curriculum and pedagogy for future classes. The interdisciplinary nature of the Social
Justice Mathematics class was another reason that practitioner action research seemed to
be an ideal fit for my teaching situation.

**Description of the Study Site**

I mentioned above that I teach in a suburban high school hereinafter referred to as
Pinewood High School in northern New Jersey. The name of the school and all of the
students’ names in the study are pseudonyms. The school enrolls approximately 1,600
students and is located on a sprawling campus. The school sponsors more than twenty
varsity sports teams that compete in Group 4 large school athletic leagues. Students
participate in dozens of clubs, organizations, and extra-curricular activities. The average
SAT scores in 2007-08 were 604 in mathematics, 567 for verbal, and 573 on essays.
Over 92% of the graduating seniors in 2008 intended to pursue a four-year college/university and approximately 6% planned to attend a two-year college (State of New Jersey Department of Education, n.d.). The racial profile of the school district is approximately 78% White, 17% Asian, 4% Hispanic, and 1% Black (Local School Directory.com).

The school was originally built in the 1920s; however, there have been numerous additions and renovations over the years. The most recent new construction occurred in the late 1990s. The new additions included a three-story science wing and new gymnasium with an attached fitness center. Throughout the school, the rooms are well equipped with the latest state of the art technology. From the outside, the school maintains its original appearance from the front with a red brick facade, a clock tower rising into the sky, and a gold-plated dome on the roof. The original dome or cupola was recently replaced with a new one in 2010. On the side of the building and visible from the street as you drive by is the school’s motto: “A Tradition of Excellence.”

The town of Pinewood had a median household income of $104,286 according to the 2000 census. The racial profile of the town in 2000 was 87.8% White, 8.7% Asian, 3.8% Latino or Hispanic, and 1.6% African American. Downtown Pinewood has many stores and shops, a variety of places to eat, and a movie theatre. Beyond the downtown area is a large park with a pond and a bike trail. There are various baseball, softball, soccer, and lacrosse fields located throughout the town.

The Social Justice Mathematics class was comprised of 21 students, 14 girls and 7 boys. Two of the students were juniors; the remainders were seniors. One of the students
was classified and had an individual education plan (IEP). Most of the students (13) were on a regular college track in mathematics and had completed Algebra II in their junior year. Three students, the two juniors and the classified student, were enrolled in Algebra II at the beginning of the semester. There were four students who had completed Algebra I in 8th grade and therefore had completed Algebra II as sophomores. Two students were on an accelerated track - one was in Math Analysis and the other was in Calculus Honors. Five of the students considered themselves to be part Hispanic or Latino, one was Asian; the others were White.

Most adolescent high school students are in the process of establishing their own sense of identity. They are growing into and becoming the person who they will be. It is a period of real growth and development that includes the development of their own sense of morality. This is an ideal time for them to consider political issues of concern, recognize how society is structured, understand their place in the world, and assess what they can do to make their lives better. The Social Justice Mathematics class was designed to address these needs through classroom discussions and assignments. Some of the assignments allowed the students to reflect on issues of power, domination, and oppression.

As a critical pedagogue who designed the lessons, I made a political decision. I was the one who decided to teach my students about the injustices in society. I wanted the course to raise the students’ awareness about how society functions. As the classroom teacher, I wanted to encourage the students to question the justice and economic systems in our country. I wanted to empower my students, as Young (2007)
suggested, to confront and take action against the injustices in their world. As the researcher and a participant observer in the study, I wanted to undertake this investigation with the students.

The course content was aligned with the New Jersey Core Curriculum Content Standards (2002) for both Social Studies and Mathematics. Three main Social Studies Standards were used in designing the lessons for the class. One of the Social Study Skills was to, “apply problem-solving skills to national, state, or local issues and propose reasoned solutions” (p. 196). Under the Civics section, teachers are advised to, “discuss how participation in civic and political life can contribute to the attainment of individual and public good” (p. 201). The Economics section suggests to, “analyze the connections and potential effects of the widening gap between the rich and the poor in the United States” (p. 222).

There are several Mathematics Standards that apply to the class as well. One standard under the category Patterns and Algebra says to, “use functions to model real-world phenomena and solve problems that involve varying quantities” (p. 35). The Data Analysis section suggests evaluating, “the use of data in real-world contexts” (p. 43). Included in the Mathematical Processes section is a standard that states, “Recognize that mathematics is used in a variety of contexts outside of mathematics” (p. 46). Many of the lessons, which will be discussed in more detail below, incorporate some or all of these standards. A complete list of the standards and strands used in the class appear in Appendix H.

I co-taught the class with a sociology teacher who was in her sixth year at
Pinewood High School. I broke the class down into several projects or inquiries that relate to the overarching themes of discrimination, poverty, hunger, war, and environmental change. Each exploratory lesson involved some mathematical concept that was used to help expose an unjust social issue. These lessons were intended to foster the students’ critical consciousness, as recommended by Freire and others.

**Researcher’s Background**

I became interested in incorporating social justice and mathematics through readings and class discussions that occurred during my course work for the doctoral program at Montclair State University. It was at this time that “Nancy Nicholas,” the sociology teacher at Pinewood, had hall duty outside the mathematics office during one of my preparation periods. As I would pass her in the hall, she would occasionally ask me math questions about something she was teaching in her sociology class. Explaining that math was not her strongest subject, she asked me questions about how to read and interpret a graph, how to analyze a set of data, or how to interpret some statistic. I began to think if I ever had the opportunity, it would be a great idea to create a class that would combine these two disciplines.

I have taught high school mathematics at Pinewood for ten years. Prior to that, I taught mathematics in a multicultural suburban district in northern New Jersey for five years. I am a White male, who grew up in a middle class family in rural upstate New York. My political views have always leaned towards liberalism, however, they have moved more in that direction since I began my doctoral program. For example, I firmly believe in following Affirmative Action policies for hiring and for college admissions.
my opinion, wealth in this country needs to be less concentrated with the wealthy and distributed more evenly. I also believe that the government should provide a safety net for those who are economically less fortunate.

My teaching style has evolved over the years. Early in my career, I followed a more traditional approach and taught mathematics the way I had learned mathematics. The more I learned through the process of teaching, the more I changed my philosophy and methods. In my mathematics classes, I usually organize the class into pairs of students. Occasionally, students work in groups of four. I always strive to relate our topics in mathematics to real-world applications. In my opinion, my students should understand the importance of asking questions. There is often a lot of dialogue back and forth between the students and me. They know that they should be able to explain their reasoning, ask questions when they do not understand a concept, and demonstrate their work to the class.

My philosophy of teaching is to provide all students with meaningful opportunities to learn. I consider education to be the means by which students become empowered. Educated and empowered students can become active participants in society. As a critical pedagogue, I feel it is important to teach students to ask questions and not automatically assume that everything they see, hear, and read is fact. To become productive members of society, students must understand the importance of considering the source of information and what ulterior motivations the source may have to convey that information. I believe that educators should attempt to relate their lessons to their students’ current and future lives. That is, schooling should not only prepare students to
participate in society, but also prepare them to work for the betterment of society.

**The Social Justice Mathematics Class**

“We need a curriculum in history, literature and geography which will make the different racial elements in this country aware of what each has contributed and will create a mental attitude towards other people which will make it more difficult for the flames of hatred and suspicion to sweep over this country in the future, which indeed will make this impossible, because when children’s minds are in the formative period we shall have fixed in them through the medium of the schools, feelings of respect and friendliness for the other nations and peoples of the world” (Dewey, 1923, p. 516).

Although Dewey’s quote was written over 85 years ago, the ideas are as true today as they were then. I designed the Social Justice Mathematics course to be one medium through which multicultural feelings are conveyed. Using inquiry and dialogue, I wanted to challenge the students’ uncritically accepted beliefs. Oakes and Rogers (2006) refer to this concept as “disruptive knowledge.” They claim that, “disruptive knowledge overturns complacency and makes it more likely that the listener will be moved to moral action” (p. 41). When confronted with disruptive knowledge, facts that students have taken for granted are challenged, and they are no longer able to hold onto prior conceptions. I will now explain the experience of bringing this course to life.

The first step in the process of teaching a new class is getting approval for the class. I began to take the necessary steps at Pinewood in September, 2007 that would allow me to teach a new class entitled “Social Justice Mathematics.” I found out in early 2008 that I would be allowed to teach my curriculum with Nancy in one of her Honors Sociology classes. I had considered teaching the class on my own rather than co-teaching
an interdisciplinary class. However, the principal at the high school urged me to choose this route because he felt the approval process would be easier. He thought it would be more likely that the Board of Education would allow me to teach in an existing class, than to get the approval for an entirely new and different class.

I began recruiting students for the new class immediately. I was looking for juniors who were taking Algebra II (which meant that they were on the regular track of taking Algebra I as freshman and Geometry as sophomores); and who I felt would contribute to class discussions in meaningful ways. I was seeking students who were curious, asked thoughtful questions, and had an appropriate level of class participation. These selection criteria were important because I envisioned class discussions as being central to the class. I needed students who would be willing to voice personal opinions and not be afraid to speak up. I also considered students who were not “math superstars,” but who might benefit from having mathematics concepts presented differently.

I taught three Algebra II classes at the time and began by talking in general terms in these classes about the “new” class I would be teaching the next year. I reviewed the rosters of my three classes and began approaching certain students before and after class. By the end of May, 2008, I had recruited 19 of my former students who fit the description of the type I was looking for. The administration at Pinewood informed me that there might be additional students whom I did not recruit who might end up in the class. Due to scheduling conflicts, 11 of the 19 students I originally recruited enrolled in the class, while 10 other students were added by the administration.

I had already designed a number of lesson plans that I believed would work well
in the class. Over the summer I met with Nancy on several occasions to plan the class. We integrated my lessons with her Honors Sociology curriculum. We got along well in these early meetings, because Nancy’s teaching style encouraged critical thinking similar to my own. We also developed a few new ideas for the class. Nancy was eager to use some mathematics applications with some of the lessons she had taught in the past.

The lessons for the course dealt with current or historically unjust social issues. The main themes of the course included discrimination, poverty, hunger, war, and environment change. Our goal was for the students to explore these topics and to utilize a variety of mathematical applications to gain a better understanding of each issue. During class discussions, Nancy and I encouraged students to ask questions about topics they read in the newspaper, heard on TV, or viewed on the internet.

For the most part, the level of mathematics concepts in the class did not exceed those in Algebra II. All of the students were simultaneously enrolled in a regular math class. A majority of the students in this study did not consider math to be their favorite subject. In order to recruit these students, I felt I needed to let them know that the mathematics would not be more than they could handle. I promised them that the mathematics would primarily be material they had already studied, but that we would approach math from a different perspective with the hope of gaining a better understanding.

One topic that went beyond the Algebra II curriculum was the introduction of statistics. I introduced students to the five-number summary, standard deviation, box and whisker plots, and outliers because these concepts fit in so well with what we were trying
to do. We wanted the curriculum to connect a mathematics topic with a societal issue. Our goal in formulating the lessons was for the students to use the mathematics concepts to understand the issue more comprehensively.

In Appendix D, I present some of the lessons and projects we used in the class, but I want to briefly mention a few here. The following three lesson plans were designed to promote social justice, use mathematics, and get students to consider and discuss topics that would ordinarily not be discussed in a regular mathematics class. Some of the data in the lessons were obtained online. Some of the ideas and other parts of the data were taken from the book *Rethinking Mathematics: Teaching Social Justice by the Numbers*. This book, edited by Eric Gutstein and Bob Peterson (2005), includes many lesson plan ideas, political cartoons, web sites, and other resources that I found intriguing.

The first lesson I will discuss focused on the unequal distribution of wealth in the United States. This assignment could also be used in any Algebra or Geometry class that deals with reading tables and graphs. It also offers an excellent example of using large numbers. The students began by completing a table that involved the use of percentages and very large numbers. Next, the students were asked to imagine that they were stranded on a deserted island with 100 people. They had to distribute $100,000 among the inhabitants and complete two more tables: one that had the same ratios as in the first table and one where they had to make up their own distribution. Then, the students constructed two pie graphs showing both distributions.
As part of the assignment, the class needed to answer some questions that generated some lively conversation. The students also needed to explain in writing why they distributed the money the way they did in their own version of the table. Finally, as a homework assignment, the students had to investigate some other country’s distribution of wealth in order to compare it to that of the United States and report back to the class. Some variations of this lesson might be to look at the world’s distribution of wealth or the world’s emissions of greenhouse gases.

The next project involved graphing a line. Instead of the typical population, profit, or car rental models that are found in most algebra textbooks, this linear model dealt with data on the war in Iraq. Students were informed about the amount of money spent so far on the war, and an estimate on how much would be spent per month for the next two years. Their assignment was to write an equation and sketch a graph of this model. Then, they were asked to calculate the total amount spent through January 2008 and January 2009.

For the remainder of the project, the students worked under the pretense that they were going to Washington, DC to participate in a protest rally against the war. They were to design a brochure to bring with them to hand out at the rally. The brochure had to include: the graph and equation of the linear model; facts, statistics, and graphics pertaining to the war; and information about some other global issue they had researched that they would have preferred to see the money used for. If they felt the war was a just cause, they had to research how the money could have better been spent to reduce the
number of casualties. As usual the students were to give reasons for their decisions and be ready to discuss and defend them.

The third lesson was the students’ final culminating activity. It was a group project and the class divided themselves into groups of three or four students. The assignment began with a linear programming problem. However, in contrast to a typical algebra textbook problem, the context for these problems included sweat shops, AIDS/HIV, clean energy, military spending, hunger, and ethanol. The groups solved the linear programming problem, conducted research on their specific topic, and made a PowerPoint presentation of their solution and findings to the class.

The approach to this latter assignment was based on Paolo Freire’s (1970/1998) inquiry method of problem-posing discussed in Chapter 2. I presented the students with several current issues and allowed them to choose one or pick another topic in which they were interested in learning about. The topic they chose served as a theme to investigate and learn more about. Not only did they apply the mathematics methods using linear programming, but they also presented their findings about the topic to the class.

Nancy and I both taught the class. We used a variety of teaching methods throughout the semester including lectures, collaborative group work, videos, and class discussions based on readings. On some of the days, Nancy led the discussions; sometimes I led the discussions, and on other days, we led the discussions together. The desks were arranged in a horseshoe type pattern with the opening facing a teacher’s desk and a screen for PowerPoint presentations was located behind the teacher’s desk. For a diagram of the classroom configuration see Figure 1 on page 49. The teacher’s desk was
Figure 1. Classroom Configuration
seldom used, since we both enjoyed walking around the room. Students often worked in
groups of two, three, or four on class assignments. Approximately fifteen of our classes
were held in the computer lab so that students could work on some of the longer
assignments that required internet research. The lab was located downstairs from our
regular classroom and contained enough computers for the students to work
independently.

The Research Question

As I stated previously, the purpose of this study was to describe the experiences
of students who participated in my mathematics for social justice class taught in an
economically privileged setting using action research. A description of their experiences
was based on an analysis of my observations and my students’ responses to the class I
designed and co-taught called Social Justice Mathematics. In my analysis, I have also
used the data I collected along the way to further inform the teaching and development
process. The suburban school district in Northern New Jersey where I teach has
predominately white upper-middle class students. The class incorporated issues of social
justice with applications of mathematics. One idea of the class was that the use of
mathematics could lead to a better understanding of the socially unjust issue.

This research has explored both my experiences as a teacher and my students’
experiences in the Social Justice Mathematics class described above. In addition, I have
addressed the following sub-questions: How did the students’ experiences impact them?
Did the students’ experiences raise their level of social awareness? Did the class impact
their sense of themselves as change agents? Did the students become aware of or
question their privilege? Did the students gain confidence in mathematics from taking the class? What lasting impressions will the students take with them from the class?

**Data Collection**

I taught and observed the class for one semester, which is approximately 70 one-hour sessions, from September 2008 until January 2009. I collected data throughout the semester that I taught the class. Following practitioner action research guidelines, I sought feedback from my students throughout the semester. Besides taking field notes of my observations, I designed questionnaires, allowed students to respond to *quick writes*, interviewed some students prior to the beginning of the class, and interviewed all the students five months after the end of the class in focus groups. I will discuss each method of data collection below.

**Field Notes**

Pinewood uses a rotating schedule, which means our class met for three days in a row and then did not meet for one day per four-day period. I made entries in a journal for my field notes, which included my day-to-day observations of the class. I included excerpts from class discussions, observed classroom behaviors, and any other observations I thought to be relevant. Typically the notes were made on the day we did not meet. I made approximately twenty entries, which were between one and two pages long and hand written. Occasionally, if something memorable happened, I would make an entry that day after the class or when I returned home. I have included an example of my field notes in Appendix I.
Questionnaires

On the first day of class I handed out a questionnaire, which asked students about previous experiences in mathematics and prior knowledge of social justice. The students answered several open-ended questions anonymously. The students put the completed questionnaire in a sealed envelope and signed over the seal. I collected those and kept them unopened until the end of the class. On one of the final times we met, I handed out Part II of the questionnaire. Again, the students were asked to answer the questions anonymously. When they finished, I handed back Part I and asked them to staple the two surveys together. This time they put them in a sealed envelope without their name on it.

The questionnaire asked students to describe themselves as math students, tell how math is used in real-life, discuss their understanding of social justice, and explain how their views or understandings of mathematics and social justice changed since taking the class. I wanted the questionnaires to remain anonymous because I felt the students would be more honest with their responses if their names were withheld. I retained Part I of the questionnaire until the end of the class so I could compare the student responses at the beginning and end of the class. Using the questionnaire enabled me to reach all the students and obtain a broad range of responses.

Collecting the data in this matter is not typically done in action research because it does not allow the researcher to have access to the information to inform their thinking about the class. However, I felt it was a greater advantage to be able to compare the students’ responses from beginning to end and for their responses to honest. I intended the questionnaire to serve as a pretest/posttest. Other forms of data collection were used
for reflection and helped inform my teaching process. I have included copies of both the beginning and ending questionnaires in Appendix E.

**Quick Writes**

*Quick writes* refer to opportunities for the students to respond to a specific aspect of the class. They were given about five minutes at the beginning of a class to anonymously answer a question I posed in writing. I encouraged the students to write honestly about what they were thinking and feeling about the class at that moment. The questions were usually related to a current event, something the students might have read, something we discussed in a previous class, or what they liked, did not like, or learned from an assignment. The written responses I received ranged from one to several paragraphs in length. There were five such opportunities to provide such written feedback during the semester; all 21 students responded to each quick write. I was able to read, reflect, and react to the student responses in order to inform my teaching practice. When reading the responses, I looked for the topics, conversations, or lessons that engendered the most emotional feedback and tried to replicate those situations.

**Pre-Interviews**

I chose five students and interviewed them over the summer prior to the beginning of the class. I selected these students because I was most familiar and comfortable with them; they were all outgoing, none were math superstars, and I felt they would have interesting things to say. These students were interviewed individually and included three females and two males. The three females had taken both my Algebra I
and Algebra II classes. One of the males was in my Algebra I class; the other was in my
Algebra II class. I also coached both of the males in baseball, so I had an opportunity to
get to know them at a different level and in a different context.

The questions in the semi-structured interviews were similar in nature to those on
the questionnaires. The questions probed the students’ feelings toward mathematics,
their understanding of social justice, and their perceptions of themselves as math
students. The interviews provided me with greater detail and an opportunity to delve
deeper into some of the student responses. I used the interviews as a way to better
understand and describe the type of students who had been recruited for the class. The
interviews were recorded and transcribed. I included one of the transcriptions in
Appendix F.

**Focus Group Interviews**

I also conducted focus groups with all the students from the class approximately
five months after the final day we met as a class. I wanted an opportunity to speak to the
students about our shared experiences. Basically, I wanted to know first-hand what they
thought about and learned from the class. I felt that by the end of the semester I had
established a rapport with the students so that they trusted me enough to be honest in
expressing their feelings. They were also no longer my students, so I no longer had
authority over them.

Each focus group consisted of three or four students. I choose to include all
twenty-one students in the groups because I wanted the widest range of responses and I
wanted to obtain differing views. I decided to include three or four students at a time in
the focus groups because I believed they would be more comfortable talking in groups, particularly since they would be talking about my class. I made sure to remind students that whatever they said would not affect their grades. I also encouraged them to speak freely and honestly.

The sessions were tape recorded and transcribed. I have included a sample focus group interview in Appendix G. The focus group interviews took place in the classroom next to our regular meeting room during our regular class time. Nancy, the co-teacher for the class, agreed to allow three or four students at a time to participate in the group sessions. Each focus group interview lasted up to one hour.

The focus groups provided me with the opportunity not only to gather more data, but also to serve as a means of member checking. For example, in one of my fieldnotes (Fieldnotes, 1/16/09), I noted that I suspected that Lacey had gained confidence in mathematics from the one of the lessons. I made sure to include a question about confidence in the focus groups interviews. I was not only able to ask Lacey’s group about confidence, but I asked all of the other groups as well. I was able to confirm what I had thought and to gain a better perspective about why students had become more confident.

I was also able to follow up on some of the anonymous responses from the questionnaires and quick writes. As previously mentioned, the focus groups took place about five months after the class had ended. This strategy proved to be beneficial because I was interested in finding out if there were any lasting impressions the students had of the class. That is, were students still thinking about some of the issues raised in
the class? Had any of the class discussions affected their actions since the class? What life lessons did they take with them from their experience in the class?

I decided to ask four main questions for the focus groups. Each question was accompanied by some follow-up questions. The questions were designed to lead the discussions in the direction of the purposes of the study. The questions allowed the students to describe their experiences in the class and the freedom to take their answers where they wanted to go. The following is a list of the semi-structured focus group questions:

- A number of assignments in class incorporated mathematics with some world issue or injustice. As you think back now, what was that experience like for you?
  - What kinds of issues did the class make you think about?
  - How about you personally – how did the class make you think about your own roles and responsibilities in the world? At school?

- Many of the discussions in class focused on marginalized groups; as you think about those groups now, how do you think your role/responsibility to such groups has changed?
  - Who would you identify as marginalized groups in our school?
  - What do you think is your role/responsibility in relation to them?
  - (If they have not already named custodians and security guards, prompt the students about these groups.)

- A number of you mentioned that you are more confident about math than you were before the class; help me understand that or tell me more about that.
How have the assignments in class affected your attitudes toward mathematics?

• If I were trying to incorporate social justice issues into my Algebra II course, what suggestions would you have for me?

• How do you think students would react to a class like that here at Pinewood?

The most recent data I gathered from the focus groups were compared to the earlier data I had already gathered and analyzed from the pre-interviews, questionnaires, and quick writes. I was looking for some emerging patterns to continue the process of analysis. According to Anderson, Herr, & Nihlen (2007), “it is here that you begin to match, contrast, and compare the patterns or constructs in the data in earnest” (p. 215). In analyzing my data, I was looking for recurring themes or trends, areas of struggle, lasting impressions, and whether those changed over time as indicated by their reflections in the focus group interviews. I was able to paint a detailed picture of my students’ experiences. I uncovered what they learned and how they have grown from the class. I was able to describe aspects of our journey that they liked, what they did not like, and what they will carry with them as they continue their own journey through life. I was also able to explain what can be learned by teaching and studying mathematics for social justice in a privileged setting. With respect to myself, I tracked my own growth and learning through my field notes and my reflections. I reflected on my experiences both during the semester the class was taught, and after the class ended as I began analyzing the data.
Because of the cyclical nature of practitioner action research, I used the constant comparative method (Glaser & Strauss, 1967) of data analysis. As I continued to code and compare the data, I was looking to combine various events into categories of analysis. As new data continued to be coded, compared and combined, properties of each category begin to take shape. As the analysis continued, these different properties began to become integrated. As a result, the constant comparative method enabled me to generate the categories of experiences through which the students passed.

The analysis started with open coding (Merriam, 2009). I assigned initial identifiers to each line of the focus group and pre-interviews, the quick writes, the questionnaires, and my field notes. There were over 50 initial identifiers, many of which had similar properties or were overlapping and interrelated. (See Appendices F and G for an illustration of my initial open coding.)

My first attempt at organizing and creating broader categories left me with eight distinct headings: background, lessons, mathematics, social justice issue, real-life, Pinewood bubble, change, and minorities. I was able to place all the other items into one or more of these general headings. Working with the data, I began to realize that what I was really doing was describing the elements of the overall process that the students were involved in. As I continued to analyze the data to determine what the students were saying, I noticed that each of these headings (except background) included the items of awareness, struggle, realization, and growth. I then recognized that these four items should be the main categories and all other areas could be subsumed into these. I decided
to include a brief section on the students’ background and then re-organize all remaining items under these four main headings.

I was able to essentially complete one spiral of the action research cycle. If I were to teach the class again, reflecting on this spiral will better inform my process of designing the curriculum for the class. Although the cycle may not have altered my curriculum for this class, it did affect my teaching in minor ways. For example, once I recognized the extent to which the students’ emotions were affected by some of the lessons, I made sure to ask the students how the issues we were discussing made them feel. By anticipating what to expect from the students, I was able to inform my work continually.

I enjoyed writing a rich narrative that detailed what it was like to be a participant in this class. My narrative began in this chapter with in-depth descriptions of the students in the class, the classroom, the study site, and some of the lessons. The narrative continues in the next chapter where I present my findings and analyses of the data that discusses the students’ and my own experiences. I was attempting to uncover any lasting impressions the students would take with them from the class. I was able to discover recurring themes, discuss what the students liked, what they did not like, and what they may have learned from their experiences. I have also discussed what I learned from my experiences in teaching the class.

My discoveries enabled me to reflect on the class and the research process. What did I learn from the class? How can my experiences help improve the class in the future? What did I learn from the process for later research? What can I take from our journey
that can make me a better teacher down the road? Finally, how successful was I in creating a class that disrupted my students’ sense of privilege?

**Trustworthiness of the Study**

Herr & Anderson (2005) suggest using five criteria for establishing validity in action research. The five criteria are linked to the following action research goals:

(a) the generation of new knowledge,
(b) the achievement of action-oriented outcomes,
(c) the education of both researcher and participants,
(d) results that are relevant to the local setting, and
(e) a sound and appropriate research methodology (p. 54).

The first criterion, *outcome validity*, relates to achieving action-oriented outcomes. The researcher wants his or her actions to lead to a resolution of the problem that led to the study. The purpose of my study was to describe the experiences of students who participated in my mathematics for social justice class taught in an economically privileged setting. I was able to produce a rich narrative of my students’ experiences and discuss what everyone learned. I was able to pursue a resolution to my problem as far as possible with my prolonged engagement. As I explained earlier, I observed the class for an entire semester, approximately 70 one-hour sessions.

The next criterion, *process validity*, relates to both generating new knowledge and the research methodology. Since the outcome is dependent on the process, the process cannot be superficial or flawed. What counts as evidence is important and can be established through the use of triangulation, which I used to collect my data. Not only did I observe my class and take field notes, I used questionnaires, quick writes, one-on-
one pre-interviews, as well as the focus group interviews. These various methods of data collection offered me different lenses through which to view and corroborate my data.

_Democratic validity_ has to do with the goal of the results being relevant to the local setting. This criterion refers to the level of collaboration throughout the study with every individual who has a stake in the problem. I continually collaborated with my co-teacher, and used input from my students throughout the process. The quick writes, questionnaires, and focus group interviews were designed to attain multiple perspectives from all my students. The student reactions, comments, and discussions helped guide my actions and decisions in teaching the class.

The _catalytic validity_ criterion is related to the education of both the researcher and participants. All parties involved in action research should gain a better understanding of social reality in order to transform it. One of the goals of the study was to describe how the class influenced the students’ sense of themselves as potential agents of change for social justice. As the researcher and teacher, I was also able to gain a better understanding of the way minorities were treated at Pinewood. My new understanding will help guide the future activities I undertake at the site.

The final criterion, _dialogic validity_, is linked to the generation of new knowledge. In action research, as in any academic research, the process should be monitored through some form of peer review. I knew the perfect person to select for peer debriefing. One of the former students in the doctoral program also taught at my high school, and she had agreed to be my _devil’s advocate_. She understood my research questions and the nature of the site. She was able to assess if my research made sense
and to offer alternative possibilities. I frequently communicated with her about insights, questions, concerns, and ideas. She was my “critical friend” – pushing me to clarify how it is I know what I came to know.

Significance of the Study

Finally, the significance of using practitioner action research for this study was the fact that I was able to gain an insider’s point of view. Having already taught in the district for 8 years at the time of the study, I knew the site intimately. I knew the town and students well, was familiar with the types of families, recognized their goals, and understood their expectations. I knew several of the students from other contexts prior to the study. By actually participating in the class, I was able to monitor the students’ experiences as well as my own. As mentioned earlier in this section, practitioner action research was also congruent with the social justice aims of the study.

I will next turn to an analysis of the data and my findings. I will begin the next section with a general overview of the students in the class. I will then discuss the four categories of experience. These categories that the students experience are Awareness, Struggle, Realization, and Growth.
In this chapter I will present the analysis of my data. Using the *constant comparative* method (Glaser & Strauss, 1967), I coded each type of data as I gathered it. As I received new data, I compared it with the existing data I had already analyzed. The analysis uncovered recurring themes, areas of struggle, and lasting impressions. I have included much of what the students communicated as a means of painting a detailed picture of their experiences in the class.

I will first describe the students in the class. To better understand the students’ feelings about mathematics and their pre-conceived understanding of social justice, I used pre-interviews and questionnaires at the beginning of class. Next, I will describe the categories of experiences or processes the students encountered as they participated in the class. Each category is a complex construct comprised of two or more component parts.

**The Students**

As mentioned, 21 students enrolled in the class – 14 girls and 7 boys. There were 2 juniors and 19 seniors, one of the seniors had a learning disability. The students arrived in the class with varied mathematical backgrounds, but a majority (13) was on a regular college track in mathematics and had completed Algebra II in their junior year. Three of the girls and two of the boys considered themselves to be part Hispanic or Latino, one boy was Asian; the other students were White. Pinewood is a wealthy upper-middle class suburb; as a result the school is located in a high-income neighborhood.
I used the pre-interview and beginning of class anonymous questionnaire to ascertain some background information about the students. I was interested in their feelings and experiences from the mathematics’ classes they had taken thus far. I was also interested in their pre-existing worldviews and attitudes about working for change. I ultimately wanted to assess if their worldview changed after taking the class.

Asked to describe themselves as math students, only four of the students used positive words such as strong, good, and even excellent. Three other students mentioned that they worked hard because math did not come easily to them or that it “took them a while” to grasp concepts. Two more students described themselves as average. The remaining twelve students all expressed negative images of themselves as math students. They used words or expressions such as bad, lazy, not good, not great, not strong, I often struggle, and math is hard for me. Despite the negative feelings many of the students had about mathematics, I was able to recruit eleven of the twenty-one students prior to the class. These students along with the ten I did not recruit ahead of time were willing to try the class.

There were a number of reasons I believe the students were interested in staying in the class. I chose students to recruit based on two criteria. First, I picked students with whom I felt I had established a good rapport from previous classes. I had enjoyed having these students in my class, and they, in turn, liked having me as a teacher. Several of the students I recruited had taken both my Algebra I and Algebra II classes, two of the boys played baseball on the JV team which I coached, and one of the girls was the scorekeeper for that team. Three of the students I did not recruit had also been pervious students of
mine, who were familiar with me as a teacher, and felt comfortable in my class. Seven of the students in the class had asked me to write college letters of recommendation for them. My second consideration was selecting students who had participated actively in my math classes, asked insightful questions, and seemed to be curious young adults. I wanted to include students who were able to speak up and carry on serious intelligent conversations.

There were a total of seven students whom I did not know before the class started. I encouraged these students to stay in the class. On the first day the class met, I explained my study, I talked about some of the topics we would be discussing, and I suggested to these students that they should talk to some of the other students in the class. I presented and effectively “sold” the class in an honest and straightforward way and these students “bought” it.

In terms of understanding the students’ attitudes toward math, four of the five students initially interviewed referred to their previous teachers as the reasons for their struggles with or lack of confidence in mathematics. These students identified teachers from second grade through eighth grade who had impacted them negatively. The reasons the students thought their previous teachers were behind their struggles included: the teacher’s lack of concern; the teacher becoming easily frustrated; the teacher belittling the student; and the teacher being boring, out of touch, or not relating to them. In contrast, one student who remembered having had a positive experience with a good teacher was Steve. He remembered how his teacher made learning fun, how everything in the class
was interactive, and how the teacher had a great attitude and enthusiasm about what he was teaching.

Lacey, who initially said she was *not good* when asked to describe herself as a math student, was the first to identify a poor previous teacher. After telling me she did not like math, I asked her if she remembered when that started.

L – Sixth grade. [...] I just had a bad teacher. I didn’t learn anything from her. And if you don’t learn anything one year, then you fall behind the next year.

I – OK. Why do you think she was a bad teacher?

L – She never took the time to explain things and when students did not understand she just got frustrated and did not help. She also smelled like cigarettes, so getting help and being in close quarters was not pleasant.

The next student was Vanessa, who claimed that her second grade teacher traumatized her. She had said that as a math student she worked hard, but that it always takes her a while to get it and that she often doubts herself. I asked her why she doubted herself.

V – I don’t know… Seriously? I was traumatized when I was little. My second grade teacher, she stood… made me come in early to class. Told me I was the worst math student. I did not like her.

I – Really?

V – Traumatized. Yeah, I remember she said, I was the 19th worse student at math. And there were 19 students in the class. She would have me come in every morning and practice.
Teaching and learning involves an interaction between the teacher and the students. There needs to be a certain amount of give and take both from the teacher to the student and vice versa. These students were saying they were unable to build a positive relationship with certain teachers, and, therefore, did not get to develop the proper give-and-take needed to learn.

During the pre-interview and the questionnaire at the beginning of class, I also tried to assess the students’ worldviews prior to the class. Some of the students recognized, prior to the class, that where they grew up and lived was a kind of protected space. I was interested in what they already knew and thought about issues of hunger, poverty, discrimination, and environmental damage as well as if they had any inclinations to work for a change in the injustices they observed. I hoped the class would inspire the students to care about how these issues affected their world and ultimately, themselves. I identified three basic responses or themes in these interviews. These themes include the effect the injustice has on the student; the influence of the student’s family; and the way in which the student becomes informed about the injustices.

**How does the injustice affect me?**

The first type of response was that the injustices would have to have a direct impact on the students in order for them to want to change anything. They would have to have a personal stake in the injustice or as Vanessa said, “Something would have to be getting done to me or a loved one.” In the focus group interviews after the class, several students looked back and explained that going into the class they were not necessarily selfish, but they were more concerned about what was going on with them personally.
Many of the students admitted they did not often think about minorities and had yet to establish sympathetic feelings toward them.

Lacey provided an example of the injustice having a direct impact on her. She explained how likely she thought it would be for her to work for social change in her lifetime.

L – I want to say a lot, but probably not.

I – Probably not, why? Well actually first why do you want to say a lot?

L – Because it would help other people and it would probably be the right thing to do in some cases. But I feel that if something doesn’t directly impact me or if something wouldn’t make that big of a difference then I wouldn’t go through all the trouble of trying to change it.

How has my family impacted my perceptions of injustice?

Another type of response was related to the student’s upbringing. I found that his/her family’s views had influenced some students’ ideas about social justice. The students’ concern for others in some cases modeled their parents’ behavior. In the focus group interviews following the class, I also uncovered a surprising finding. Not only were the students influenced by their families, but also several students had shared the content of the class discussions and assignments with members of their families. For example, Isabella shared how she went home and talked to her mom about how shocking she found the topics we had discussed in class. Zoe talked to her mom and grandmother about the unit on racism and wanted to find out how families approached racial issues in her grandmother’s neighborhood when she grew up.
While discussing his upbringing, Steve explained how his mom instilled in him a sense of caring and compassion for his fellow human beings. His mother had been born in Cuba and moved to this country when she was 7 years old. She learned at a young age what it was like to grow up without many luxuries. She was able to teach Steve to appreciate what he had and understand that not everyone had the same opportunities that he did. This influenced Steve’s feelings about social justice. When I asked him how likely he was to work for social change, he focused on fairness.

S – Well, I think it’s essential that everything is fair in life, but obviously it is not going to be that way. So, you are going to work towards the highest point it could be. So, I mean even if it works against me, if you think about it, it’s the right thing to do.

I – You would be willing to do something? […]

S – Yeah. Something that I’m gaining. But it would be fair to give it away. I am not the kind of person who is selfish.

These first two questions indicated that the students were not necessarily too cognizant of the issues in the larger world, but were more concerned about their immediate family and their own lives. I even questioned whether some of the students felt the need to become informed. My task as their teacher was to find ways to enable the students to see and care about the “big picture.”

**How do I become informed?**

Some of the students indicated that they did feel the need to become informed. In the final response category, a few students spoke about how they had become informed about these issues. They discussed what it was like growing up in Pinewood. Their
sheltered upbringing is a recurring theme that will be discussed in more detail when I explain the process the students pass through as they participate in the class. The growth I refer to has to do with the students becoming better rounded and more knowledgeable. Rachel and Dominick talked about how they became informed about issues, even though they grew up in an area where they did not see much poverty, hunger, or discrimination. Rachel stated that she reads the newspaper; Dominick has been actively involved with his church and has volunteered at shelters in the past.

R – Actually, I try to be as aware as I can. Because I know Pinewood is in a little tiny bubble. And like, I lived here my whole life. So really I have not been exposed to anything. Which I think in the long run is going to be a problem for me. So, I try to make myself aware… like I read the newspaper every day.

D – Well, even though you know, we live in Pinewood and everything and you don’t see that sort of stuff when you walk outside obviously, um, I guess it makes an even bigger impact when you first hear about it because you are not used to it. So I guess living in Pinewood and then you know you hear about these people starving you know on the other side of the world, it’s more of a shock to a… you know people who live in an area like this than someone who lives in a worse area. And I felt like it is our obligation as human beings to help each other. So even though you live in Pinewood and you don’t get to see it every day, maybe that is more of a reason why you should try and reach out and help because we obviously have the resources to help and like we could make a difference.

An analysis of the pre-interview and beginning of class anonymous questionnaire painted a picture of the students’ mindset entering the class. The students had different amounts of math experience and different experiences with math. Despite the fact that the majority of the students did not view themselves as strong math students or consider math to be their favorite subject, they all agreed to take the class. As their teacher, I
considered how they felt about mathematics as I designed and fine-tuned the lessons. I wanted the mathematics to be challenging, but not too difficult to the point that I might lose some of the students who had less confidence or less ability.

Two of the girls mentioned that they would be more likely to become involved in social change if the change affected them personally. One boy’s opinion of fairness was positively influenced by his mother. Two of the students mentioned how growing up in Pinewood impacted their worldview. I recognized that I could use the social justice issue to peak their interest. The lessons were intended to serve as a means of pushing against what the students referred to as the “Pinewood Bubble.” Growing up in this bubble leads us to the discussion of the categories of experiences the students passed through during the class.

**Categories of Experiences**

There are certain aspects of these categories that are similar to some of Banks’ (2006) dimensions of multicultural education. I classified the experiences of the students participating in the Social Justice Mathematics class into four different categories: *Awareness, Struggle, Realization,* and *Growth.* Each of these categories with its component parts will be discussed in detail below. I will first describe the similarities of my categories with Banks’ dimensions. Next, I will identify and explain each category and then describe its subcategories.

In order to make students aware of injustices in their world, I used examples from cultures other than their own as Banks (2006) suggested a *content integration* dimension. Based on the interviews and questionnaire, two areas with which my students struggled
were *white privilege* and *racial identity*. As they struggled with these concepts, I encouraged them to develop more positive racial attitudes as Banks (2006) recommended with his *prejudice reduction* dimension. In my *growth* category I discuss how students began to develop the skills to become effective agents for social change as Banks & Banks (1995) encouraged using the *equity pedagogy* component.

My students’ experiences were not linear, nor were their experiences exactly the same. Although a common starting point was the students’ emerging awareness of society, the economy, and our justice system, not all students started there. Some of the students started by struggling, and then moved on to awareness or realization. Some of the students also repeated some of the categories. Some students proceeded from struggle to realization, and then back to struggle then returned to realization. It was also possible for students to experience more than one category simultaneously. The pathways the students traveled were all different, and within each category, the students experienced some type of growth. By the time the students had completed the course, their growth was evident. I considered the students’ experiences to be a type of *cumulative growth* and, as a result, created a new category. The categories are a recursive, nonlinear trajectory that the students experienced or passed through as they took the course.

In the process of rereading and analyzing the data described in Chapter 3, the students’ stories began to emerge. I recognized the various journeys the students had traveled as they completed the class. It was then that I identified and formed the four primary categories of experience: *Awareness, Struggle, Realization, and Growth*. These
CATEGORIES OF EXPERIENCE

Awareness

Struggle

Realization

Growth

Figure 2
**CATEGORIES & SUBCATEGORIES**

- Awareness
  - Pinewood Bubble
  - Connecting Math and Social Justice Issue
  - Visualization enabled by Real-life application

- Struggle
  - White Privilege
  - Racial Identity
  - Emotional Response

- Realization
  - Math Easier – more confident
  - The world they live in
  - Greater awareness of minorities

- Growth
  - Change
  - Less willing to act

- My own growth

**Figure 3**
categories and their relationship to each other are presented in Figure 2 on page 73. Figure 3 on page 74 illustrates the subcategories within each category. I will now discuss each category and subcategory in detail.

**Awareness**

In this section, I will examine the students’ growing awareness of their world. As discussed in Chapter 3, this is a period during which students grow and become more aware of their place in the world and their surroundings. They develop an emerging curiosity and appear to be on the edge of awareness. For several of the students, this was the second or third time they had been in one of my classes. When describing what the class would be like on the first day of the school year, the students asked many questions. I noticed at the time how some had already become more politically knowledgeable than they were the last time they had been in my class; some had acknowledged the privileges they have, whereas others had been affected by outside influences, such as the media, friends, and school.

Because the students had been raised in a privileged environment, their childhoods might be considered to be sheltered. As a result, I designed the lessons in the class to open their eyes to situations to which they would probably not have otherwise been exposed. I wanted the students to become aware of and acknowledge issues of injustice in the world. Many of the lesson ideas were based on readings (Frankenstein, 1990; Gutstein & Peterson, 2005) from my classes in the doctoral program at Montclair State University. As discussed in Chapter 3, these lessons needed to be tweaked to fit into the curriculum of the high school sociology class at Pinewood.
I consulted with Nancy, my co-teacher over the summer, and we designed other lesson ideas. Nancy’s Honors Sociology class had five major units: Culture, Socialization, Deviance, Social Class, and Race & Gender. I introduced several math topic ideas, such as lines of best fit, linear programming, the five-number summary, pie charts, and percentages that I thought could be used to assist in better understanding areas within these units. We discussed how best to connect the math topic with the social justice topics within her units. For example, within the unit on Social Class, Nancy included a discussion of the concepts of a minimum wage and inflation, which could be related to the mathematics concepts of the lines of best fit.

In analyzing the various data sources within the study, I noted that students often mentioned becoming aware of concepts they had not known before. I recognized Awareness as one step the students passed through as they completed the class. I labeled the category awareness because the students described it as an awakening. By awareness, I mean that the students gained a new understanding of their world. I was able to cultivate this awareness by introducing new knowledge to the students and encouraging them to talk about it. As the students became more aware, they in turn expanded their worldview.

As their teacher, I considered the community in which the students lived, their sheltered upbringing, and the fact that they were relatively uninformed. I deliberately tried to provoke them into thinking critically. My intention was for the class to serve as the type of disruptive knowledge to which Oakes and Rogers (2006) refer. I wanted the new data I introduced into their world to interrupt their comfort zones and add a new
layer that would aid in stimulating more acute awareness. As mentioned, I designed the lessons with the objective of opening their eyes to new ways of thinking.

One of these assignments was the Distribution of Wealth Project. For this assignment, the students determined the percentages of wealth that were allotted to four different United States population groups. For example, the top 1% of the population owns 32.7% of the wealth, whereas the bottom 50% of the population owns 2.8% of the wealth. This lesson provided one example of how the class cultivated the students’ awareness and how the students responded with shock and surprise. While completing the assignment in class, I noted in my field notes that the students asked numerous insightful questions. I remember several of the students expressing near disbelief. I recall many of the students started out by saying, “I never knew that,” or “I never realized that,” or “How can that be?” Rachel even questioned if my data were accurate. Vanessa wanted to know how it was possible to get to that stage. The students supported each other and expressed an overwhelming feeling of how unfair it all seemed.

This assignment was right on target. It truly raised their awareness of an issue unfamiliar to them. The discussion in class was lively, but not confrontational. Many of the questions the students asked were insightful and showed their sincere interest about the issue. I must continue to create assignments like this. (My Fieldnotes, 11/10/08)

Throughout the data collection, the students referred to the lessons and the class as “eye-opening.” I took this expression to mean that the students were seeing things that they had not even considered before taking the class. Many of the students said they were shocked or surprised to learn about some of the topics. Reading the quick writes
and participating in the class discussions helped me to realize that the students were
becoming consciously aware of social issues for the first time. As the students talked
about how they had become aware, I was able to identify the category’s key components.
These subcategories include *The Pinewood Bubble*, *Connecting Mathematics and the
Social Justice Issue*, and *Visualization Enabled by a Real-life Application*.

**The Pinewood bubble**

Prior to taking the class, some of the students had already recognized that they
lived in what they referred to as the “Pinewood bubble.” Living in a bubble or being
sheltered growing up was mentioned numerous times throughout the data. Living in a
predominately white upper-middle class suburb, the students grew up at a distance from
some of the harsh realities of the inner cities and poor rural areas. They did not have
first-hand knowledge of hunger, poverty, or crime. Some felt that these problems did not
have anything to do with them; they felt no sense of responsibility or obligation. The
area in which they lived as they grew up was protected from such injustices. This
protective covering functioned like a bubble. In many ways, my lessons, our discussions,
and the class enabled the students to puncture or see through this bubble.

Greg explained how much of what we discussed in the class came as a shock to
him because, “Pinewood itself is kind of sheltered off.” As mentioned, Rachel and
Dominick both talked about living in the Pinewood bubble prior to taking the class.
When Rachel’s group was talking about minorities, I asked her to explain to her group
what she had told me prior to the class. Rachel explained how the class was incongruent
with what she had learned as she grew up. The class introduced her to material that she
did not encounter on a day-to-day basis or in any of her other classes.

R – Well, I never… it was that it never crossed my mind. Like I had
always… I had known about minorities and stuff, but I never truly
like understood how much of a privilege that we really had and how
hard they have it. And that all of the hardships that they are going
through that we just never even see in our everyday lives because of
where we live.

In the anonymous written responses that the students provided, they claimed that
the Distribution of Wealth assignment in fact opened their eyes and allowed them to “see
beyond the bubble.” They used words such as “astonished,” “amazed,” “absurd,”
“crazy,” and “surprised” in describing their reactions to the assignment. More than half
of the students commented on how unfair it is that wealth is distributed in this manner. It
was interesting to note that several of the students used the word “shocked” in their
responses. One student even noted that the project, “Gave me chills to see how little
money the lower classes have to share.” A typical student response follows:

After analyzing the distribution of wealth activity, I was shocked! I
found it extremely absurd that the bottom 50% of the population
shared only around 2% of the entire American wealth. It was also
very interesting to see that the top 2% of the population shared
around 32% of the American wealth. There are people in the U. S.
that have so much money which would never run out, top 2%, yet at
the same time the bottom 50% barely has $8000. $8000 is not a lot
of money. It seems that the distribution of wealth is completely unfair.
The distribution should be more equal!

Our unit on Race relations allowed the students to examine an issue that they
thought they understood more closely. At the beginning of the class, many of the
students did not consider racism to be that much of an issue in our country any longer. Some of their comments indicate how they were struggling with their own racial identity as Marshall (2002) suggested they would. Many of the students were surprised to learn about white privilege (McIntosh, 1990). Although racial identity and white privilege will be discussed in more detail in a subsequent section and the students already knew some facts about race relations, this was the first time that the students were becoming aware of either racial identity or white privilege. This insight emerged well into the semester in early December after multiple lessons because engendering this awareness was an ongoing process. I commented in my fieldnotes (12/05/08) at the time that I should follow up on this line of questioning during the final focus group interviews.

This unit also served as a real eye-opener for many of the students. In fact, a number of different students actually used the words “eye-opener” or “eye-opening” when asked to describe their reactions to the unit. Other students explained how shocked they were to learn that racism still exists. Some students explained that the unit was upsetting to them, while others said it caused them to have more sympathy or empathy for Blacks. The following are two examples of students’ anonymous responses to the unit on race relations. These responses illustrate how the class, the lessons I chose to use and the discussions we had provided the students with information that allowed them to grow beyond the bubble.

This topic has been a particularly confusing one. Basically everything I have ever been taught about race and racism has been thrown out the window. I never thought of race as an illusion before this unit. Also, I never really thought there was a difference between prejudice and discrimination, but now I know that prejudice is an attitude and
discrimination is the actual action. When talking about how racism still exists in the country, I was confused because I have always been taught that people are not racist anymore. From reading the articles about how blacks and whites don’t have equal opportunities, my eyes were opened. Seeing the video about the boy who turned himself black, also shocked me. He couldn’t even last a week as a black man. I guess I never really realized just how much race still affects the country.

I think the topic of racism that we are studying right now is the most interesting that we have studied yet. We read this really interesting article about white privilege which put racism into a whole new perspective for me. It more or less discussed racism today and how white people are ignorant to their benefits. I also really enjoyed the video about the kid who took pills to make himself black because as a white person, I was unaware of how prevalent racism still is today. Living in a town like Pinewood, I think we can be really sheltered and this unit opened my eyes a lot.

In these examples, the students are just beginning to internalize this new information. They were still using language such as “the country” and “white people.” They appeared to distance themselves from the subject about which they were learning. The second response illustrates how that student was beginning to make connections between himself/herself, racism, and living in Pinewood.

After the class was over, I asked the students to reflect and discuss the issues the classes made them think about. Many of them expressed the fact that they grew up in Pinewood and how uninformed they were as a result. For instance, Kim explained how unaware she was about social issues prior to the class because of where she grew up. She discussed how the class provided her with background information on topics she had known nothing about previously. “There’s so much I did not know anything about, growing up here in Pinewood. And bringing it up here and now I know more about it. I
knew nothing.” In his interview, Jon explained how facts and issues that we discussed shocked him. As he said, “Yeah, ‘cause a lot of things that we went over, I just had no clue what was going on in the world.” However, I think that Haley’s response best demonstrated the connection between the Pinewood bubble and the class serving as an eye-opening experience that allowed her to escape the bubble.

H – I think it [the class] kind of like… it kind of gave a little reality check I guess. You know, we are like in Pinewood and it’s obviously very affluent and stuff. But it just shows you what else is out there. And how people are living. And how you should like, what you should do to kind of be prepared, I guess, in the world.

*Connecting mathematics and the social justice issue*

The second component of the *Awareness* category is connecting mathematics and the social justice issue. In their interviews and written responses, the students mentioned how they appreciated the interdisciplinary nature of connecting the mathematics they were working on with a topic pertaining to social justice. Some of the students expressed the fact that this connection gave them a better appreciation of mathematics. Other students explained how the use of mathematics helped them better understand the topic we were studying. Furthermore, the students described how this connection enabled them to better understand both the math and the issue.

Interdisciplinary classes are not new to Pinewood, although this was the only one involving mathematics. There are three such interdisciplinary programs currently running, all of which have been offered since I began at the district. There is a team taught American Studies program that incorporates American Literature and U.S. History
into a two-year program. The Pinewood Academy for Health Professions (PAHP) is a three-year program that includes Science, Health, and English classes over a three-year period. There is also a two-year program called AHLISA, which stands for American History and Literature with an Integrated Study in the Arts. AHLISA incorporates music, dance, performing, and practical arts with History and English.

For my part, connecting mathematics and social justice issues, meant creating lessons that used mathematics and were related to topics in Nancy’s Honors Sociology class. As mentioned earlier, I designed some of the lessons such as the Distribution of Wealth, the Iraq War Brochure, and the Linear Programming assignment prior to the class. Nancy and I collaborated on other assignments, and we were able to incorporate mathematics into what she was teaching to enhance her lessons. Examples of this collaboration include using the five-number summary with a lesson on gun violence, using lines of best fit for a discussion of the minimum wage and inflation, and using pie graphs and percentages while studying prison populations.

Throughout the class, I had students respond anonymously in writing to questions pertaining to the topics we were discussing or about the nature of the class. Early in the semester I asked the students to write about their impression of the class so far. Generally, the students appreciated having the interdisciplinary lens of using mathematics to highlight aspects of social justice issues. One student mentioned that we used math to investigate social justice topics and not just to fulfill a curriculum requirement. She commented that she was able to see how people use math and that it
was, “not purely a medieval torture device.” Several students stated that they appreciated how the math helped them better understand the issue we were discussing.

So far I think this class is very interesting and I am enjoying the math twist. I like how we take sociology subjects and then analyze the topic using graphs. I think it helps to understand certain topics further.

This class is really awesome. Sociology and math go hand and hand and helps give a better understanding for each subject.

As Felicia and Barbara reflected on the class, they discussed how connecting the mathematics and social justice actually made the math easier for them. As evidenced by the responses above, it was encouraging to hear how the girls viewed the work we were doing. In our class, we were not doing problems just for the sake of doing problems. Solving the problems had meaning behind them. Even though the girls did not have a positive view of their math ability, they recognized how a meaningful math problem made solving the problem easier.

F – I know some of the formulas that we used in the beginning actually went over to my math class. And the difference between the sociology and math was in the math class it was just problems. You didn’t see any realistic like uses and in sociology it was actually applied. [...] When it was in math I always knew the background and I actually knew it better than most of the people in my class.

B – I did better with sociology, because I am horrible at math. And (laughing) but like I don’t know… having something to base it on, like made it meaning something, then it’s just easier. I don’t know for some reason it is just easier for me.
Besides providing a better understanding of each subject, throughout the data collection process, the students used the word *perspective* to describe the connection of mathematics and social justice. The class enabled the students to look at social and economic situations from a new point of view. The mathematics helped them discover realities about poverty, crime, or environmental damage that, prior to the class, they did not fully understand. The students trusted the mathematics as a scientific tool. In other words, they viewed mathematics as fact, whereas Sociology without the support of mathematics was viewed as merely opinion. That is, the mathematics made the issues more concrete for the students.

Recall that for the Iraq War project, students read several articles about the cost of the war. Next, they researched a social justice issue of their choice. They were asked how they would prefer to see the money spent or to explain how the money could be spent more efficiently to better serve our troops. Then they created a brochure about the war and their issue to bring to a protest rally in Washington. In discussing the Iraq War project, Adam mentioned how the class helped him put issues into perspective. “It kind of put into perspective how much we like put into the war when there is all the other stuff going on. Like poverty, unfair distribution of wealth, or cutting down trees.”

When I asked Jon, Martin, and Tom’s group to describe their experience in the class, all three mentioned gaining a better perspective. The use of statistics enabled the students to better assess the issues. With this clearer understanding, they were able to compare, rank order, and decide which topics meant the most to them. From their new vantage point, they were able to make connections between areas they had not understood
before. The students were also able to comprehend the usefulness of mathematics and how the math made their learning experience more powerful.

J – I thought it made it more interesting, because it brought a new perspective to it. And it was like… it gave you exact statistics. […]

M – When we were doing statistics and especially when we were doing things with the poor and stuff like that. I thought that that was helpful because it really helped put things into perspective. […]

T – I agree with that completely. I think you sort of needed to see the stats to actually get what was going on.

In this final example of student responses connecting math and social justice, Lacey explained that seeing how mathematics was used helped her to better understand the associated mathematics. Later in the same interview, Dominick explained how the connection helped him understand the social justice issue better. Their exchange exemplified the strength of using an interdisciplinary approach in the class. Lacey and Dominick each benefited in their own way from this approach.

L – I just think that like a lot of times you learn things in math class and you just like you know you are never going to use them. So I just feel like doing that was a way to incorporate math and a way that we could see how it is actually used. So it was a way to kind of learn the material better, because you felt like you could use it in real-life. Instead of just learning something…

I – Learn the math material better?

L – Yeah.

D – I think sociology and social injustice and stuff like that, when you learn about it, you need something like math to back it up to get a grasp of what those numbers really mean. You know when you hear numbers like I mean, a certain amount of percentage or a certain amount
of people died because of this, or money, whatever it is. You get an understanding of how drastic or not drastic it is.

I – So you get a better understanding of the issue itself.

D – Yeah. […]

L – I guess it just made me think about like how I would take like all the things I learned in high school and kind of combine them. And like use them later. […] ‘Cause it’s like you can see how you can make something you learned in math class and something you learned in sociology class, like two subjects that are usually unrelatable, and tie them together. It is interesting.

As their teacher I hoped that students would see how math was used and to show them that they would have a need to use math in the future. Dominick explained the way math supported his understanding and validated the social issue. They both touched on the next closely related component of Awareness, which deals with real-life applications.

Visualization enabled by real-life applications

The use of real-life applications in math class is certainly not an earth-shattering idea. Based on the student responses, however, having a math class based solely on real-life situations taken from the world in which the students live, was actually a new idea to Pinewood students. Although this subcategory is closely related to the last, the manner in which the students explained how the real-life perspective enabled them to visualize problems sets it apart. Besides being able to better “see” the mathematics, the students described the class as being different from other math classes. They were eager to attend the class, felt the real-life nature of the class gave meaning to what they were learning, and actually wanted to learn the math so they could comprehend the real-life topic better.
Using real-life situations for math first arose when I was investigating students’ mathematical backgrounds prior to enrolling in the class. I asked the students if any of their teachers had used a specific approach that helped them learn math. Four of the five students I asked mentioned connecting mathematics to real-life situations. However, not all the students were completely “sold” on these types of examples. As she explained in her response, Vanessa was unsure.

Lacey – If they can relate it [math] to something I would actually use, then that would help. Other than that then there’s no use in learning stuff for no reason.

Steve – I think it is more interesting to learn [math] when you put it in real-life situations, instead of just talking about numbers on the board.

Vanessa – Yeah, like word problems sometimes I like… actually I’m not sure. Sometimes, some things can go a little over my head. But if some things are applied to real-life, then I am more interested. And then I can think of them [issues] that way instead of seeing numbers.

Because of these student responses, I included a real-life situation question in the Beginning of Class Anonymous Questionnaire. I asked students if they felt that they understood math better if it was connected to some real-life problem. The responses were mixed. Three students said specifically that they did not understand the math better; in fact, they found it to be more confusing. Most of the students’ responses indicated that real-life situations did help them understand the concepts better. These students’ explanations included the following:
- “the connection makes the math more interesting”
- “I can visualize the mathematic problem much better”
- “I can actually use math and there is a reason I’m learning it”
- “the math seems more important to me”
- “it makes more sense and makes me feel like I am learning it for a reason”
- “it is easier to comprehend when it is explained in a way that is real”
- “I can relate to it better and it is easier for me to comprehend.”

There is ample evidence in the data of how the real-life problems enabled the students to visualize the mathematics. In many of their responses, the students used the words *visualize* or *see* numerous times. In the following conversation, Christina and Zoe discussed how the real-life situations enabled them to better *see* the numbers; and Paige pointed out how she now *sees* math in everything. The real-life problems increased the students’ awareness of the usefulness of mathematics and its relevance in the world.

C – Well, I think it was interesting putting the numbers to the situation. [...] You got to look at it differently and you could really put it together in your head, or *see* the numbers.

Z – Yeah and the math was never too difficult. And most of the time you went over it really well, like what you needed to know for it. And I distinctly remember the one where we did the count of the men in jail. And I thought that was a good activity to do with including the mathematics part in it, because you really got to *see* how many more... I mean there were a lot more Black people than White people and it just it explained a lot. When you learn it in sociology, like you don’t really... Ms. Nicholas doesn’t put the numbers in that aspect and you don’t graph it out and *see* like, oh my God, look how high up this is compared to this.

P – Well, it definitely helped me to *see* how math is in everything, because I would go to like my Psychology class where there would be statistics, and then I’d go to like this class and there would be like statistics, and then I’d go to like Anatomy and they’d have that kind of math. And they’d also use like Sociology and then you’d go to my Statistics class and obviously they’d have statistics. And so it kind of
like helps you to see how everything is really like intertwined together and you need to know all of it to understand it.

Later Christina added how excited students would be in the future to take the class. She explained how the real world makes the problems more tangible, better able to comprehend, and the students would appreciate that.

C – I think people will be more excited about doing it, and participating in something that they can apply into the real world. It’s something that they can see; this is more tangible than how long will it take you in terms of miles per hour to get to this place? You know what I mean? I think they would like it. I think they would all appreciate it.

Many of the students commented on how this class was different from other math classes they had taken. In these anonymous responses, the students mentioned how they were able to relate to the class and how the class had a purpose.

I like the class. It is a good way to see how math applies to real-life, which does not usually happen in a high school math class. My first thought about the class was that it would just be basic textbook facts, but all the articles we read and clips we saw made the facts relatable to my own values and thoughts.

This class is so extremely interesting and brings math into totally different real-life situations that I can actually understand and feel like there is a purpose behind.

In the focus groups, each group discussed how this class was different. There was agreement that the real-life approach was helpful, but each group had a slightly different take as to why. Olivia and Dominick talked about the class not being the same old thing and the fact that there is no point in learning something if it has nothing to do
with real-life. Jon mentioned how the students appear more engaged in this type of class. Isabella and Eva explained how they were more interested in the class because of the inclusion of real-life situations in the discussions. Finally, Paige reiterated that the class was not the “same old thing” because it was more interesting.

O – It’s a good change, also to do like something different than you do every day in math. A lot of times it’s like the same old thing.

D – Well I mean I think there’s you know, really no point in learning something if it doesn’t have anything to do with real-life. So I mean, math is fun. I mean it’s a lot of fun to solve problems and stuff like that, and I mean I personally liked it when I took it, but I think it’s even cooler when you can solve those problems and learn about something in real-life.

J – I think it would be a good idea. I mean like in generic math classes you’re given a set of numbers to deal with. And the numbers don’t mean anything. But if you bring in a social science aspect of it and the numbers are actually representative of something, and like it would be actually a lot more engaging for the students.

Is – So if you like incorporate poverty or the war in one of the things, they’ll remember it more because they can relate to it. Like it is a real-life situation.

E – Yeah, I think like any real-life situation that you can add to math, helps you understand it more.

P – I think it would definitely help. Like if you made it so kids didn’t come in, sit down, and like just do the same thing every day. And you made it more interesting in like you like could connect it to things that are real, instead of just like numbers.

In my opinion, the real-life nature of the class allowed me as the teacher the opportunity to deliver the mathematics material in a different way. Instead of introducing
a math topic, such as linear programming, with simple number examples from a book, I was able to take a subject and ask, “How can we learn more about this topic?” So I used topics such as HIV, ethanol, hunger, sweat shops, or military spending as a context for learning about linear programming. Linear programming became a tool to discover more facets about these topics. In a final focus group exchange with Paige and Zoe, Paige picked right up on the difference. The girls explained in their own words how this class was different, and how that difference helped them learn.

P – No, I remember when you like, I think it was you, taught us like this was like in Algebra II. Taught us a graph, you know that graph that we learned at the end of the semester, that was like, oh if you do this and then you do that and you have to like find…

Z – It was that one! That graph (points to the bulletin board).

I – Oh, yeah the linear programming.

P – And I was thinking to myself, ‘Why am I doing all these steps? Why do I have to do all this? This makes no sense. Like when will this ever be used?’ And then like, we went to this class and it was almost like the opposite way. Where you would give us a problem and we had to figure out how to use the graph to help us. Instead of like using the graph and like oh what is this? So it definitely helped.

Z – I find that I can apply myself and learn the math. But I feel like in math classes even, if we learn like interesting things that kind of connected to like the math we were learning, we would do much better because it wouldn’t be like so course.

With my help, the students experienced a new sense of awareness. They came to this awareness because I was able to disrupt their comfort zone. The students were comfortable, in part, because of where they grew up, in this self-described bubble. They were also comfortable with me as their teacher, and we established a growing sense of
community. The class, the lessons, and our discussions served as “eye-openers” for the students and they responded to the class discussion topics with shock and surprise. The students also became aware of new connections between mathematics and social justice. Understanding this new connection was aided by visualizing real-life problems. The interdisciplinary nature of the class and the real-life problems made the students excited about learning and coming to class.

Although shocked and surprised, the students in this phase had not yet fully internalized what they were learning. They were simply aware of how “unfair it all seemed.” They had yet to understand how they could affect the world around them. For many of the students this was a starting point. However some of these students were not sure what to do with this new information. This uncertainty leads to our next category.

**Struggle**

The next category of experience I will discuss is *struggle*. As a math teacher for 15 years and a teacher in this district for 10 years, I have seen students struggle. However, this type of struggle was different. The students’ struggle was not with learning new material as it often is in math classes. The students struggled with understanding the privileges they possessed because of who they were and where they lived; they struggled with their own racial identity, and they struggled with the many feelings that the class conjured up in them.

As the students’ emotions emerged, some expressed a sense of “why bother?” They seemed to feel, “I am only one person; can I really make a difference?” All of these areas with which the students struggled could have been stopping points. Nevertheless
my task was to get them through these struggles. I needed to help them recognize their privilege, identify with their race, confront their emotions, and understand that they can, indeed, make a difference.

Identifying this struggle category was fairly straightforward, despite the fact that the students never actually stated, “I am struggling with this” or “I am having difficulty understanding that.” The students’ struggle was apparent in their written responses, in the group interviews, and in the class discussions. In order to gain a better understanding of difficult ideas such as white privilege and racial identity, I felt that it was necessary for the students to struggle intellectually. As both their teacher and a participant in the study, it was easy to draw them into the struggle and I encouraged it. During our class discussions I would simply ask questions such as, “What do you think about that?” or “How does that make you feel?” or “What if you were in their shoes?”

Asking the students how they felt led them to reveal a wide range of emotions. In many cases, the students expressed how they felt without prompting. I think the students’ willingness to be so honest was due, in part, to the type of students I had recruited. Remember I had looked for students with whom I was comfortable and who appeared to feel a high level of comfort with me. These students were willing to speak up and able to carry on deep, meaningful conversations. Another reason the students were honest was due to the classroom environment of trust and community. This reciprocal comfort level served as a form of encouragement for the other students to enter into the conversation. The range of emotions that the students demonstrated included, but were not limited to: shock, surprise, frustration, concern, empathy, sympathy, and sadness. I will now turn to
a discussion of the three subcategories within this category; *White Privilege, Racial Identity, and Emotional Response.*

**White Privilege**

A majority of the students in the class recognized that they had economic and social advantages growing up. This was evident in the way they spoke about the Pinewood bubble described in an earlier subcategory. The students understood and talked about how lucky they were because of the town in which they grew up. Paige explained how the class made her reflect on how fortunate she was.

P – The class also kind of made me think about how… how much you really are in like the Pinewood bubble. You know they always talk about it and you almost don’t realize how fortunate you are until you see like the average person in America makes like for the family was like it was like $40,000 a year. […] And it makes you realize like how much life you actually have and how many people in the world there are less fortunate.

What they did not fully understand and what they struggled with was how their advantages affected others. In one of the classes, we read the article about white privilege by McIntosh, (1990) and “unpacked the invisible knapsack.” As their teacher, I needed them to understand that indeed they had certain advantages, but what did these advantages mean to other individuals who did not possess them? This activity made a lasting impression on many of the students. In one of the group interviews, Rachel and Vanessa brought up the topic of white privilege.

R – Yeah white privilege, that is what I meant. How prevalent that is. I didn’t realize how that was such a big thing. And that the minorities
have such a tough time. [...] And the thing with the Black guys in jail.

V – That was sad.

Our class discussions about white privilege encouraged the girls to view minorities in a different way. I followed up and asked about how the students perceived their own roles and responsibilities in the world. Rachel mentioned how she was affected by the issue we talked about and Vanessa ends up explaining her frustration.

R – I think that it was like before this class we were like kind of just concerned, not with being selfish, but more with just what is going on with us. Like I have always been... like known more about the world and stuff with all the news. I know we talked about that.

I – Yes, in the summer interview. I remember.

R – Yeah. But I never took it to heart. I never realized how I am affected by it. And then all the stuff we did and all the studies we would look at, made you realize how you personally were involved with it. Like with the white privilege stuff and how that directly affects us. [...] 

V – I guess the basic thing I walked away with most was probably the white privilege also. I think it is very frustrating and also being a minority as a woman, but I think it is very frustrating that you can acknowledge that you have white privilege, but you can’t do anything about it. I find that very annoying. [...] I never noticed... remember we got that article? There were bullet points of certain things? Like one of them was, ‘I can be fairly certain that if I get pulled over, it is not because of my race.’ Things like that, which you would never have... which I had never noticed before the article. Really what the thing is, is that I just find it frustrating that I can’t do anything about it.

As Vanessa explained why she was frustrated, one recognizes evidence of her inner struggle with the concept of white privilege. She understood that she has advantages, but at this point this insight just causes frustration. The only thing she can
think of is that she cannot change her race. She has not yet made the connection that recognizing privilege might be the first step in working against racism.

Christina, Zoe, and Paige are another group of three girls who all identify themselves as being white. I pick up on this conversation after I asked the girls how their roles or responsibilities might have changed toward marginalized groups. Christina explained how our discussions about white privilege changed her views. She now sees minorities in a new light and is able to think about how they feel. As Zoe struggled with the white privilege concept, you can hear how she was still processing the idea. She was able to work it out in her head with dynamic thinking and by relating it to something else we had learned earlier.

C – I never think that any of us thought we were racist before. […] But we learned that being white, you are like automatically racist. The white privilege thing.

I – The backpack?

C – Yeah. So I don’t know. That has kind of changed the way I look at things and um the way I view other people. Now I kind of feel like other people are judging me more. So, like if I see a minority, I don’t know, it’s probably just me but…

Z – No, yeah it makes you think of it. And I can relate socialization to it.

I – Ok.

Z – We learned like the socialization part of like growing… like socialization is why kind of like who you are. And that relates to like why being a minority compared to being like makes like being judged on being the stereotypical white girl from Pinewood. It’s kind of like how can you change like, because it’s such a huge issue, like the minority… it’s not even like the minority problem, but like for some people I guess it is a problem with like the lower class issue. And it sounds like into so much like the family – how they are raised, the media – which is
portraying a negative image of what they should be. […]

I – One thing you said, you know just going back to walking down the street and a minority sees you, did that have a negative impact? I am not sure what your answer… or if now you look at them differently, do you think they are judging you more? Is that, would you say, a negative impact on you?

P – I don’t think it is negative or positive.

C – Well, I don’t know. I think um… thinking about it… like I think about it more when I see somebody. But before I would kind of be like whatever…

I – Hm. Hmm.

C – But now I kind of think about how they are feeling. […] And now I am just more aware.

As the class wrestled with the concept of white privilege and some in the class felt frustrated by it, many of the students gained a better understanding of the topic from our discussions. Although they struggled, some of the students were beginning to see how the issues we talked about in class related to their own world. Some students clearly understood how fortunate they were prior to the class, whereas for others, the white privilege topic was a way to get them to recognize how lucky they were. We were also able to explore how their advantages affected themselves and others. I encouraged the students to think about the less fortunate, and Christina admitted that she was now able to consider others’ feelings.

I recognized that individual students were at different places in their own process of understanding. The most recent exchange above demonstrated that the girls had been newly exposed to many issues. They were beginning learners and had not yet totally grasped a complete understanding of the relationship between white privilege and
minorities. This partial knowledge was expected since they had only experienced a one-semester course. Some of the students “got it,” while others were still “working at it.” I understood that as their teacher, I needed to aid some of the students in connecting the dots. With the new information I was presenting to the students and through probing and encouragement, I was able to help them view their own position differently.

**Racial Identity**

The next issue the students struggled was with their own racial identity as Marshall (2002) suggested they would. For the White students in the class, the idea of white privilege was a starting point in the racial identity struggle. The junior and senior years of high school are a time when students begin to understand who they are and to gain a sense of self. As students learn more about the world through school courses and the media, they start to form impressions of themselves. They begin to recognize and study politics, morals, economics, social class, and racism. As discussed in a previous category, several of the students recognized and spoke about the advantages they have living in Pinewood. The Social Justice Mathematics class, with some of the lessons we worked on and the discussions we had, led many of the students to wrestle with their racial identity.

As mentioned in Chapter 3, the class was predominately White although there was one Asian boy, and three girls and two boys identified themselves as being Hispanic or part Hispanic. There is evidence of this struggle in each focus group, whether the group was all White or had one or more of the minorities in it. The struggle with racial identity arose when the students talked about white privilege, when they talked about
minorities in general, and when they talked about how the class had influenced their views of the world. The following example involves Haley, Eva, and Isabella. The three girls all identify themselves as White, although one of Isabella’s parents is from Columbia. In this example Isabella was making the connection between the advantage and disadvantage dichotomy. Haley, on the other hand, was primarily talking about “the others” not herself and suggested, “That’s just how it is.”

E – I never really thought about minorities and like what it is like to be a minority until I learned all about it. And like… talked about it.

Is – And you don’t see their disadvantages, right? You don’t see them as your advantages. You don’t even see that just… until like we learned about it.

H – It’s like with the white privilege thing we just like everyone else notices it, but we can’t even see it. And it’s kind of unfortunate I guess, but like that’s just how it is.

The following example was one of the more interesting conversations regarding racial identity and involved Barbara and Felicia. They were in a group of four girls, the other two – Kim and Nancy – are both White. Barbara and Felicia are both second-generation Hispanic. They offered some insights into what it was like for a minority to attend school in a primarily White, upper-middle class, suburban district. While both seem comfortable living and growing up in Pinewood, they seem unsure of how to classify themselves. The girls were obviously conflicted. On the one hand, they were advantaged in being a part of the Pinewood culture (their class), but, on the other hand, they were part of an overall group (their race) that was not advantaged. I will relate the conversation with Felicia talking about affirmative action.
F – It’s not a win-win situation. But it’s just like… so I think we should be like… I personally think that my race should get helped out, but I don’t think we should be specialized. Like they should be based on average like everybody else.

I – Okay.

F – Instead of grouped in like being special, and get extra points just because they’re a different culture or different race.

I – Hm. Hmm.

B – Yeah. It’s kind of weird, because I don’t know, I never looked at myself as being a minority. And it’s like, oh wait I am kind of like part of that group. But like I guess it’s because I live in Pinewood and stuff you don’t really see it as much. But um, I agree, like yeah minorities in some cases do need help. […]

F – Just because you are a minority doesn’t mean you should get special treatment.

B – It’s true. Like I know… they take advantage of it and it’s not fair to the rest of them. And then like because of that, like I feel like because I’m Hispanic, I get stereotyped for that. Because people don’t realize it’s not just like one… we’re not just like all Hispanic and we are all from the same place. So you just say like, oh she is Hispanic, she is probably going to have like a gazillion babies so that the government can take care of her. And like to me that’s offensive.

While talking about minorities, the girls were keeping their stereotypes about Hispanics at an arm’s length. In their struggle, they were confusing class and race; the idea of having many children seems more related to class than to race. They were also using stereotypes of “the other” or those who are not the same. It appears that they were unsure exactly where they fit in. Barbara sounded as though she was comfortable with her more privileged social class, but did not “fit” into the perception that she had of her own race. At one point, Felicia said she thinks her race should receive assistance, and yet
later she said minorities do not necessarily deserve special treatment. In the same interview, Felicia was talking about minorities. She explained how she could easily switch between being a member of the minority group or being a member of the dominant group and acting White. One aspect of her racial identity struggle was a new awareness that sometimes she fits in and sometimes she does not.

F – Like with me, I’ve been in that group. But I am also one that can get outside the group. [...] And I’m not the minority. Yeah, I’m a crossover. In a sense… I’m not trying to… I am trying to… like the slight term is… I’ve been considered White. Saying that the way I act and how I perceive myself to others, I’m not like the stereotypical Hispanic. Like that goes out and party or has the weird lingo or anything like weird like that.

When a person first hears the term racial identity, it would be typical to think about how Blacks struggle in a predominantly White world. Our class was raised in an upper class suburban world, yet the students still had difficulty with the concept. The few minorities in the class struggled with how to classify themselves. These students were unsure of what to think about their own minority group and whether to include themselves in that group. The students from the dominant culture struggled as well. Their struggle was most apparent when they tried to understand how their advantages affected those who were less fortunate than themselves.

**Emotional Response**

The final subcategory under the heading of Struggle has to do with how the students responded emotionally to the course. As mentioned, the students experienced a wide range of feelings throughout the class. These unexpected emotions appeared as the
students were exposed to situations or topics that were unfamiliar to them. Although the students may not have anticipated their own reactions, they did not surprise me. In fact, I designed the lessons to evoke my students’ emotions and to get a reaction from them. I thought that encouraging the students to respond on an emotional level would help them proceed with their processes of understanding.

The lessons served as “eye-openers” for the students. Perhaps the most commonly expressed emotions were shock or surprise. Throughout the data collection, the students stated they were shocked by our discussions or how they were surprised to learn facts about an issue. One student even expressed the fact that the Distribution of Wealth activity, “gave me chills to see how little money the lower classes have to share.”

The following anonymous responses provide two other examples.

I was really surprised at the number of people that were in the lowest level of wealth. I was also shocked at how unevenly the wealth in the U.S. was distributed. I liked how we made the pie chart because it gave me a visual perspective on the distribution.

This unit was very interesting and the topics we discussed made me aware of things I never really thought about. I was shocked to learn that through internalized oppression Black males accept and recycle negative messages regarding their abilities and societal place. They begin to believe in their own inferiority both individually and collectively. This unit was really eye-opening.

In these examples, the students’ expressions of shock and surprise were evident. However, their shock and surprise were on behalf of “the other.” The students had not yet made the connection to themselves. Their own sense of self had not been disrupted.
The shock and surprise had not caused them to feel any discomfort with their own position in society.

On the other hand, discussing social justice issues in the class caused some of the students to feel frustrated. Seider (2008 & 2009) suggests that the frustration can come from the students becoming overwhelmed by the size and scope of the problem. The students felt like, what can I do, I am only one person? Some form of frustration was evident in every group. When I asked their group about their roles and responsibilities to marginalized groups, Vanessa and Rachel appeared to be empathetic, but also talked about their frustration.

V – I don’t know… Well, it’s the same as before, I don’t know what you can do. It’s so frustrating.

R – I think it’s hard to… when you’re… it’s hard to go down to… not go down but like… go to I don’t know, a minority group and do anything for them. You can always try and help them, but in the long run it’s not like you can influence the opinions of the entire world.

V – Well, I remember when we were talking about this once, how you view racism and discrimination. Like some people say like the mere addressing of racism means that like there is still racism around. So like I think that if you say to a group of minorities or if non-minorities preaching about how they should respect minorities more, that could actually hurt them because it’s just bringing up the differences more.

I – Hmm. Hm.

V – So that’s why I think it is so frustrating is because you can preach about how they should respect minorities more or you can’t do anything. And which one is more harmful and which one is more beneficial?
Zoe also expressed empathy, recognized her growing awareness, but was obviously frustrated by the size of the problem. Like Vanessa and Rachel, she was not sure what to do and seemed to be overwhelmed.

Z – So, there is like… it is such a big problem, that I don’t think there’s one thing that I could specifically do. You know, it would help to join like a group at school or something, but like really I think it just helps to be more aware that it is not a particular person’s fault, there is just so much going into it.

In other responses, students mentioned becoming upset or saddened when they learned about issues of racism and discrimination in our country. One student described the discrimination that occurs in our banking, health care, and criminal justice system as “appalling.” In the beginning of her interview, Vanessa mentioned how she had more sympathy for the impoverished. Later, in that interview she mentioned sympathy again.

V – I think before the class, I didn’t have a lot of sympathy for poor people. I was like, ‘Go get a job.’ You know what I mean? I never really thought about it before. And then once you have seen those movies and did those charts, I realized how many people it is an actual possibility for them to struggle.

I – That’s interesting that you said that. I think that is the second time that you said you felt sympathy.

V – Yeah.

I – And you said you hadn’t before.

V – I feel bad for saying that I didn’t before, but I mean I just didn’t. Because you know… America… land of the opportunity. I thought that many people could just go out and deal with it.
Vanessa mentioned above the possibility for “them” to struggle. She was still holding marginalized groups at an arm’s length. I noticed how some students struggled with connecting the components of this category. She has still not put together the effects of her own advantages to those who were less advantaged. Her emotions have allowed her to feel sorry for any inequities that exist, but she has still not reached the point of feeling any responsibility for these inequities.

As their teacher, I worked on helping the students to understand the relationships between white privilege, racial identity, and their own emotions. I encouraged the students to consider the consequences that being a member of the dominant culture has on other groups in our society. Using class discussions and probing, I wanted the students to recognize (without being told) that some of the advantages they enjoyed were causing some of the inequities we were learning about.

As the students talked about their experiences, they explained feeling overwhelmed and frustrated. At this point, there was a fine line that I needed to walk here. I designed lessons to evoke a reaction; in some cases, these lessons made them feel frustrated. Still, I did not want them to become too frustrated to the point of giving up. There was also that feeling of “What difference can one person make?” I needed to constantly use simple reminders to assure them that working together we can overcome these obstacles. I encouraged them by reiterating, “I understand how you feel,” “I know you must be frustrated,” “It’s okay that you are upset,” and “You can make a difference.”

As I attempted to disrupt their comfort zones, the students had difficulty making sense of their new view of the world. In some of the examples above, the students were
demonstrating how they are going back and forth in their head, trying to work things out. As they worked things out, lights began to go on in their head. Some students began to gain insight for the first time, which leads to our next category of experience.

**Realization**

Some students began to realize facts about social and economic disparity in the U.S. after having been made aware of it for the first time in the class. Other students did not come to a specific realization until they first struggled with some of the issues we discussed. For a few other students, they may have been aware of certain issues prior to enrolling in the class, but did not realize some of the consequences or have a deep understanding of the issue until we studied the topics in more detail. As I requested students to ponder these issues, they gained insights that some admitted they would not even have considered were it not for my prompting.

I decided to call this category *Realization*, because of the sheer number of times the students responded by saying, “I realized that,” or “I came to the realization,” or “This class made me realize.” Although closely related to the *Awareness* category, this category is different in that the students’ awareness experience was somewhat superficial. As I explained in discussing that category, they were not quite sure what to do with this new-found awareness. It was not until they experienced *realization* that they began to internalize and integrate this new information and more fully understand some of its implications. As the students came to this realization, the new information they were presented with allowed them to make more connections and begin to “connect the dots.”
One way to distinguish between the *Awareness* and *Realization* categories is to consider the level of thinking required for each type of experience. For instance, when the students become aware of something, they have a simple and basic understanding of a new piece of information. On the other hand, when they realize something, they are analyzing the information to determine how it affects their pre-existing knowledge. The information they are analyzing might be newly acquired or pre-existing. As a result, realization requires a higher level of thinking than does awareness.

There were many things that the class, the lessons, and our discussions led the students to realize. I have divided these realizations into three subcategories. The students realized that math could be made easier, and they gained confidence in the subject. They came to realize a great deal more about the world they lived in. Finally, the students realized a number of characteristics about themselves and about minorities; some of which were enlightening, whereas other insights were unsettling.

*Math is easier – more confidence*

As the students described how during the class, they learned to appreciate the connection between math and social justice and they learned more about each subject, they realized something along the way. They realized that learning math using the real-life applications made learning the mathematical concepts easier. Other students discussed how the class affected their confidence in mathematics.

While completing an assignment in January of 2009 in class, I overheard Lacey mention to her group that, “Math seems so much easier now.” (Fieldnotes, 1/16/09) The assignment was to make two lines of best fit from data about the minimum wage. I had
previously had Lacey in both my Algebra I and Algebra II classes and recruited her for the Social Justice Mathematics class. When asked in the pre-interview what type of math student she was, Lacey described herself as *not good*. I remembered her in my algebra class as someone who was a good student, but struggled with her confidence in mathematics. On the other hand, this comment sounded as though her confidence had grown from the class. I indicated in my fieldnotes on this day to follow up with this line of questioning in the focus group interviews. While questioning her group, Lacey explained how the class had affected her feelings about math.

L – I don’t know, like I said before I guess it just showed me how I could use math in real-life. So maybe I like *wanted* to understand the material better. […] Then just like knowing that like I’m going to use it on the test, and then not have to ever use it again.

Later in that same interview, I told the group that I was considering trying to incorporate social justice issues into my Algebra II course and asked if they had any suggestions. Lacey again spoke up and mentioned how the class had positively affected her confidence.

L – Do it!

I – (Laughing) Well as far as making it as successful as possible.

L – I think that would be good with the kids who like necessarily don’t like math. […] But like I know me like I’m better at history and like English and stuff like that, and not as good at math; so I feel like that would be a way for me to incorporate things that I know that I’m better at. And math… so maybe it would give students like me, like more confidence like in the math class.
So Lacey confirmed what I had suspected; the class had positively affected her confidence. By actually applying math, Lacey found that she wanted to learn more about the material. Although she still does not like math, she seems to have a new appreciation for the subject. In her opinion, the class would be beneficial for students like her.

When I asked Christina’s group how the class had affected their confidence in math, she brought up one of the most frequently asked questions I have heard in math classes: When are we going to use this?

C – Um, I think a lot of people in this school especially I heard in math classes say, ‘Where are we going to use this in the real world?’ Or like, ‘Why is this important to me? I’m not going to study math in college.’ This class kind of showed where you do use math and that you use it a lot. And you can figure out certain things. And help yourself like… prosper I guess. After this class a lot of people would be more confident in math because they would be able to find ways to use it.

Christina posed the questions and explained how her answer affects student confidence. Like Lacey, she feels that other students would benefit from the class once they understood how often math is used in other fields. In my fieldnotes in October, I wrote down a comment Rachel made to me. The students were working on the Iraq War Brochure and she said, “I understand now what graphing a line is all about.” (Fieldnotes, 10/20/08) Part of the assignment was for the students to graph a line showing how much money was being spent on the war each month. It seemed that Rachel also benefited from seeing how the math was used to solve this problem.

Greg and Tom were the only two juniors in the class. Both boys were taking Algebra II, which is the regular track for math. They described how the class affected
their confidence. Greg explained how learning material ahead of his classmates in his Algebra II class was good for his self-esteem. Tom mentioned how the class helped him with problem solving.

G – Well all of those skills that we learned with all the statistics, it was all new to me so… I mean we haven’t covered any of it in my Algebra II class yet. So I mean it’s always a little interesting to me to learn new math skills, so it was kind of like… it was kind of eye-opening and you know oh this is really cool stuff, and you know still learning about the statistics of whatever topic we were covering it was still really… I mean yes, I gained confidence because I can learn something that’s above the skill level of my class right now, so that’s really cool for me. […]

T – I think it might of helped like with problem solving. Like you might have had to read a paragraph or something and then figure out the math problem from that or something like that. That could have helped it [his confidence] there.

In the group of Kim, Nancy, Barbara, and Felicia, all four of the girls confessed that they did not like the idea of the class at first. None of the girls mentioned confidence, each girl did, however, explain that over time, the math became easier. They pointed out how having the math connected to some issue made the lessons meaningful. Even though Kim still prefers math taught in a more traditional way, she admitted that it became easier at the end. Nancy, who is the girl with an IEP, started the conversation.

N – When we got the first assignment, it looked really complicated, but once you actually did it, it wasn’t as complicated. […] Going in I thought, ‘This is going to be really crazy and hard, but it turned out if you just do it slowly and look at everything it can be easier.’

B – Yeah, it like… it just became easier because of the idea of having meaning to it.
Later in the same interview Felicia and Kim explained their confusion and frustration in the beginning. Both girls agreed that the class became easier for them.

F – But it was like, at first the assignments were hard and I just had too much trouble with it and I just got so confused. But then after a while, like I came in for help and then it started getting easier and at one point it actually did help that I had math right after it. Just because there was one unit that actually overlapped. So I had that and that, so that actually helped me out.

K – I was really frustrated at first. I know I was really frustrated because it was something I wasn’t used to. I’ve always been like take the numbers and plug them into a problem and that type of thing. […] So just trying to figure out how to do it like taking numbers from like giant word things…

I – Right.

K – And that was just like, I was like, ‘NO! I can’t do it.’ It got easier toward the end. I still prefer math just like math.

B – Like I guess it was easier for me, because it is easier for me to connect like two things with math, rather than just plugging math numbers in. Like I don’t know if that makes any sense.

F – It’s just easier because you know there is a meaning to it.

In this final example Eva, Haley, and Isabella were able to sum up this section nicely. They explained how connecting the math to the social justice issue not only enabled them to understand the issue better, but made the math easier and affected their confidence positively. The girls explained how the mathematics revealed something of significance, how the cohesiveness of the class made the mathematics concepts easier to learn, and how knowing the reason they were solving the mathematics problems led to deeper understanding of the subject matter. In their opinion, it was like they were not
even doing math at all. They were just studying sociological topics and happened to be using and learning math in the process.

Is – Yeah, with graphing this year I know we did a lot of graphing in Sociology class. And um I also was in Advanced Algebra and Trigonometry. So we also used a lot of the same formulas and I had already had like the practice of it. So it was easier when it came to stuff like that. […] Like normally you wouldn’t understand one of those graphs, but because we actually did them and went through the process of finding the data and plotting them or what not… we understood it better.

I – Okay, good. Eva, anything?

E – Um, yeah it made me more confident in like ways of understanding it. […] I guess it helped me with like pie charts. I never knew how to do those before. And I don’t know, I mean I understand what I was doing more than I would in Algebra class and like why I was doing it.

I – Okay. Haley how about you?

H – Um probably, I guess with the way they like connected with things that we were learning about, it was more cohesive I guess. And in the way that like it wasn’t just a math problem. It was like an actual thing that we had to find like all the stuff on our own and we had to go through all the steps; that helped out. […]

E – It’s just like I felt like the math… I’m trying to think of how to word it. Like I felt like it wasn’t math.

H – Like a worksheet you would do in sociology.

E – Yeah. Like to teach us about what we were learning. That it wasn’t necessarily like…

Is – More interesting because we… it was… rather than just numbers and like an answer, it was revealing something.

E – It was like an answer at the end with significance.

Is – Yeah with significance. Like the one with the money distribution. […] Like we discovered how the money is distributed. It wasn’t just a bunch of numbers. There was something of significance behind it.
In all of the above examples, the students revealed that “doing math this way” was easier and aided in building their confidence. The reasons vary and the students each explained it in a different way, but they were all making similar observations. Lacey claimed that she wanted to understand the material better, while Christina mentioned how she appreciated math more because the class showed how it can be used. The four girls described how their attitudes about the class changed over time as they went from not wanting to be in the class to realizing that it became easier. Eva and Isabella explained answers that are significant and that reveal insight. The students all stated that when they are able to make meaning out of a math problem, it is easier and it builds their confidence. When the math is connected to something real, it becomes meaningful and there is a reason to solve the problem.

The world in which the students live

Because of the Pinewood bubble that the students grew up in, I designed the class to provide them with the opportunity to realize the advantages the bubble provided as well as to recognize what lay beyond the bubble. Some of the students were “seeing” what the world realistically looked like for the first time. One of my goals was to cultivate this new awareness so that the students could begin to see themselves as agents of change. Many of these students admitted that the class, the lessons, and our discussions made them realize how “unfair” society could be. While some of the students mentioned how the class made them realize how lucky they were, still others said they began to notice issues now that they had not noticed in the past. As their teacher, I wanted them to think about their own situations and the situations of others.
One of my assignments that forced the students to look at the injustices in their world was the Iraq War project. Recall that for this assignment, the students read several articles about the costs of the war. Next, they needed to research an issue of their choice; where they would rather see the money spent or explain how the money could be spent more efficiently to better serve our troops. They then designed a brochure about the war and their issue to bring to a protest rally in Washington. Allowing the students to select their own issue enabled them to research and learn about something they were interested in and connect it to some form of action. They also realized facts about their world and how the U.S. government spends our money. Here are two anonymous responses regarding this project.

The brochure project was very interesting. I learned that we, America spend 5.5 billion dollars a month on the war in Iraq. That is such a ridiculous amount of money that could be used in so many different and more beneficial ways. One of them being helping the hungry.

I learned that America is spending way too much on the war when there are many other more important things that we could be spending on to make the world a better place.

The students were weighing in on their opinions about the amount of money the government was spending on the war. They were considering other things the money could be spent on. They were trying to make adult decisions about important issues of the day. They were also able to realize that participating in a protest rally was something they could do – a form of action they could take that might ultimately make a difference.

In the anonymous questionnaire at the end of the class, the students answered a question about their new understanding of social justice. In their comments, they talked
about how individuals are treated unfairly and how they realized that there are more serious problems in their world than they had originally thought. One student said he knew so much more about society and, “My eyes have been opened to the world around me.” In the following two examples, the students assert that the class led them to realize important facts about justice, racism, and poverty. The students also demonstrated how their comfort zones were disrupted.

My understanding of the definition of social justice may not have changed, however, now I realize how unfair some people are treated and how justice is not always served.

I’ve realized that even though things may have changed; poverty and racism are more serious problems than I thought.

As mentioned, I encouraged the students to consider how they live compared to how other people live. In the following examples, Christina discussed ideas the class made her think about and Greg explained how the lessons helped him compare Pinewood to the rest of the world. In each case, the students were expressing ideas that they would not even have considered if not for the class. They were also thinking about ideas that made them somewhat uncomfortable, and if not for the class, would rather not think about at all.

C – I started thinking about all the people and how everybody is on so many different levels. And how spread out everybody kind of is. And how un-proportional everything is.

G – ‘Cause there’s… it’s pretty much, well not pretty much, it is a very wealthy town. And there’s not really… there’s not really too much in terms of poverty or anything else that really a lot of kids get
to see. [...] So seeing those numbers and seeing exactly like the rest of the world isn’t like Pinewood. It really is eye-opening.

In the interviews after the class, I asked Barbara’s group about their personal roles and responsibilities in the world. For her, the class served as a kind of political “wake-up call.” She realized how society is structured and the importance of knowing what is going on and of getting involved. As their teacher, I continually encouraged the students to become involved. I designed some of the lessons, for example the Iraq War project mentioned above, as models for becoming involved. Throughout the class, Nancy and I spoke of things the students could do, such as protests, boycotts, and letter writing as ways to participate in a democratic society. As mentioned in the previous category, I needed to remind students throughout the class that they could make a difference.

B – I think it kind of makes you realize that you have to be more aware. Like we are at a point where we are old enough to understand things; so we have to like kind of take charge in our own situation.

I – Hm. Hmm.

B – Like those who are better off than others, should be more kind of like compassionate and I guess try to help out more. [...] It kind of just makes you realize that you have to be more involved with like society and like government or like whatever. ‘Cause it’s going to benefit you in the long run.

Barbara was speaking and thinking like an adult. She recognized the need for compassion. She understood that she was responsible for and had some control over her world. She also realized that actively participating more would end up benefiting her down the road.
While discussing the effects of living in the Pinewood Bubble and White Privilege above, Paige mentioned how the class made her realize how fortunate she is and how many people there are in the world that are less fortunate. In the following exchange, her group elaborated on what they realized from the class. They mentioned many of the ways I hoped the class would touch them. Paige realized how unfair life is, Christina wanted to see the situation changed, and Zoe described how the other half live.

P – It was just like it helped you realize how unfair or whatever everything is. The numbers help you understand in a more concrete way than just learning about the history.

I – Good Paige. One follow up. How did the class make you feel about your own roles and responsibilities in the world?

C – I don’t know; it was kind of humbling. Because you see, I feel like everybody sees all these people that are like… poverty stricken, but nothing really changes. So I don’t know, it’s kind of upsetting because even if you want, if you feel strongly about something and you want to see a change… um the chance of one person really making that big of a difference… it doesn’t really affect that much.

P – The thing was that I knew… I knew it, but I feel like the class really helped to see, like to understand it and to feel it, and to realize how much I was like living in… like never actually thinking about how much I had actually had. Like I never knew like how much of a difference it really was. […] So it kind of just hit me.

Z – I think one of things that changed my views a lot from the class was like in the beginning like I always had the mindset like people that were in the lowest class… or like you know, how Paterson has such a heavy like Black population that nothing changes. Or like Little Rock Central High School.

I – Hmm. Hm.

Z – We watched the video on that. Yeah, and I never knew about the red lining or anything. Kind of like they did that to African Americans to keep them in the bad areas. And that is kind of like how that will
happen. Because you know it’s so easy to say, when you grow up in Pinewood, like, ‘Oh well, they should try really hard in their classes.’ And like they’ll make it to the top and like I had that mindset for a really long time. And then you look at it and you see like the kids who are trying really hard, and what they have to go home to everyday. […] And it was like norm for the town. And like across the street is a crack house and like…

P – And then there was the one boy who had just gotten thrown out of his house. And he had nowhere to go.

Z – Yeah. And then like here we are not like stellar students you know. We are average students and like we are saying we’re going to college fine, but look at how much we have. Imagine if we were in that setting, we wouldn’t be any better off. You have to be really motivated to do really well.

P – Well, I think what Zoe started to say, maybe was like I would appreciate how much we have. Like in our homes, but also like in school. And then we would watch like the Little Rock Central, and I feel like a lot of people don’t even have a chance to do well in school. And like so if we… like we have so much more chances and a lot of people don’t have the chance to go to college. Or like a lot of people, I don’t remember what the percentage was exactly but, a lot of people don’t graduate high school. I never even like knew that because maybe like one or two people have ever dropped out of here. So it just makes me realize like how much you have going for you. […] You are always thinking, ‘Ah man, I have to go to school.’ But it’s kind of like then you start to realize, wow I am so privileged to have this.

Paige said that she knew certain things prior to the class, but that the class really helped her see, understand, feel, and realize how much she had and how much of a difference it was. The video on Little Rock Central was one of the methods I used to encourage the students to consider what life was like outside the bubble. It was satisfying to hear the girls not only describe the less fortunate, but also to be moved by the description, and to recognize how lucky they were in comparison. It was also interesting to hear that Zoe considered what would happen if they (at Pinewood) had been in “that
setting.” She admitted that they would not be any better off. The girls also demonstrated how they were beginning to internalize their feelings about these social and economic issues. They were “thinking outside of the bubble” and thinking about how they would feel and react if they were in a different situation.

**Greater awareness of minorities**

As we studied and talked about minorities in the class, the students became more aware of their existence. There was also a subtle difference in the depth of the students’ awareness. Comments the students made in this subcategory revealed that they had moved beyond a simple awareness and demonstrated that they were more open to learning about and becoming more empathetic toward minorities. Students shared how their new-found awareness led them to realize facts about minorities for the first time. They recognized many of the struggles that disenfranchised minorities face in this country today. The students were able to think of minorities as individuals and put themselves in their shoes. Many of the students also discussed the classification of minorities in our school.

When I designed the lessons for the class, one of my tasks was to find ways to encourage the students to become more concerned with marginalized groups. The lessons and our discussions helped students to see minorities in a new light. Several students mentioned that prior to the class they never even thought about minorities. They had a kind of “out of sight,” “out of mind” attitude. The class enabled the students to realize facts about disenfranchised minorities that they had not known before and to gain
a deeper understanding of their plight. In an anonymous response, one student commented on how the class made him/her more open to learning about these groups.

So far I am enjoying the class. It is different from other classes I have taken. It is definitely more edgy, which makes it more interesting. The concepts that I’ve learned in this class have made me more open to other cultures and other people that may be different than me.

As the students learned more about minorities from our discussions, many of them became empathetic toward these groups. Several students mentioned that they now realized why and how some minorities ended up where they did. The groups shared their feelings of empathy when we talked about the custodians and security guards at Pinewood during the end of class interviews. The students seemed to have a new understanding of the underlying reasons why people from marginalized groups might end up in these positions. Although Dominick claimed that the class did not influence him, Lacey and Olivia explained how the class helped them form deeper understanding.

D – Well I think the reason they are in those roles is a lack of education. And you know maybe they weren’t able to afford an education or they didn’t have the means to you know be put in a position where they could be a teacher.

I – Do you think that opinion that you have now, you would have had the same opinion prior to the class? Or do you think the class influenced that opinion?

D – No, I don’t think the class did.

L – I do. I don’t think that I would have thought about that before.

I – Okay, but do you think that… something similar to that now?
L – Like now… now it’s like you can think they didn’t have enough money to go to school, or maybe they didn’t have the opportunities that like some of the teachers here have. But like before I think it would have been like not… like they were just lazy, they didn’t go to college, or they weren’t smart enough. Or like… but now I feel like I can’t generalize like that.

O – I think, like I agree with Lacey. Like I wouldn’t have… like we learned so much about the distribution of wealth. And then we talked about white privilege and stuff and like all the stuff you don’t see. Like I didn’t use to notice that. I guess I never really thought about it.

L – Like I never really thought about why they were janitors. Like I never looked at them and thought, ‘Why did they choose that job?’ But like now looking back, it’s like I doubt that their childhood dream was to be a high school custodian.

D – But I mean I think if you wanted to think about it you would realize that they didn’t have the same opportunities that White people had.

L – Yeah, and now we know like why, that’s what we’re saying.

O – Yeah, I think like I just have a larger understanding. Like I think I knew before why, like they were probably in poverty when they were younger and they like didn’t have the opportunities. But I think this class just brought it out… like my understanding of it.

L – Like just before I never thought about it. And if I were to think about it now, I just think I would have like a greater basis of things I would know.

This was an important exchange. Not only were the girls showing their empathy but they were also beginning to analyze how society works. The conversation turned to the relationship between money, education, and opportunities. Lacey stated that she could no longer make generalizations. Olivia pointed out that in the past she never thought about the reasons why minorities were in the position they were in. Both girls
explained to Dominick that although they may have understood that minorities have fewer opportunities, now they understand the reasons why.

In another group, Martin described what he thought about the custodians in a similar way to Lacey. Like Lacey, he had a better understanding of why some ended up as they did. He realized that they are not to blame for the positions they are in and in fact deserve credit for making progress. Martin’s comment was also an example of how he began thinking about ideas that he had not had prior to the class and how his new knowledge helped to correct old misunderstandings and misinterpretations.

M – It kind of came to me as somewhat of a prevelation [revelation?] the other day. But before there’s you know people, especially around here, who have a conception that the janitors are janitors because they were lazy in high school and didn’t get good grades and stuff like that. But now we learned in Sociology the things about like you know ghettoization and how terrible the schools are in inner city areas, that you realize that it’s most likely not these people’s fault that they have that job. And if anything that job, being a custodian, is probably a lot better job than a lot of the other people he went to high school with. […] I kind of view those people now, not as people who were lazy, but people who made it out and made a stride.

While talking about the custodians and security guards, Rachel explained to Vanessa and Adam an enlightening realization she had. In the following exchange Rachel’s new awareness allowed her to think of the custodians and security guards as individuals and not just as people who are there to serve her in important, but lower level occupations. I had asked the group whether their impressions or views of the minorities who worked at Pinewood had changed since taking the class.

R – Yeah, I thought about it once. It was so funny. We had just done a
study on white privilege and how African Americans, the… obviously the white privilege… whatever, that whole thing. And then I thought it must be hard for them, because most of them are African Americans like and then see this whole school of little white rich kids kind of. And then they’re working… not working for us, but like…

I – Hmm. Hm.

R – Like being our security like… you know what I mean? So it must be hard for them… not hard for them but I don’t know… it might seem frustrating to them. That… and then, I got really deep kinda.

I – Okay.

R – So then I was thinking about how we don’t have any idea like what they go through when they go home and stuff. Like nobody… I don’t think anybody really thinks about that. I mean but I think that they… like if they may have a prejudice… like maybe, oh these rich kids are going home to their big mansion. […]

A – You just kind of start to realize that after taking the class, and then kinda thinking about how all the security guards and all the janitors are African Americans, you kinda realize like those are the only jobs they can get.

R – Yeah.

A – It’s not like they made a choice to be a janitor or security guard. It’s just like that is all they could… that is the best job they could get to support their family.

So the class led Rachel to think about how minorities feel and to consider what their life is like. She was internalizing what she feels, putting herself “in their shoes.” As Christina, Zoe, and Paige’s group was talking about the security guards and custodians, the girls commented on the plight of minorities in this country in general. Paige pointed out how that to her, these groups were “out of sight” “out of mind.” The conversation
began when I asked them to think about whether their roles and responsibilities to marginalized groups had changed since taking the class.

P – I never even thought about this. The security guards, well no I never like… unless I see a custodian, I’m not thinking of them at all.

C – I feel like the custodians… like people will look at them and just be like, oh they weren’t smart enough or they are Black. Like they have nothing else to do. But I was talking to one of my friends and she, this is a Black girl, and she like knows a lot of them for some reason. And she told me that a lot of them come over from Jamaica.

I – Hmm. Hm.

C – And that like they… most of them have like college level education, but Jamaican college diplomas don’t work over here. So they have to start all over. And like if they wanted to get a job, they’d have to go all through college again, just to get a job here. And that kind of really opened my eyes. […] It just kind of shows, there’s nowhere if you’re a minority in this country that like… your life kinda sucks.

Z – Well, I don’t know. Actually I look at the security guards as kind of like authority. Because they can tow your car and they can get you in a lot of trouble. But like, I think a lot of the students have generally a lot of disrespect actually for the custodians and…

P – I feel like a lot of people like stereotype with the custodians. Like they’re like, ‘Oh the custodians like smoke pot, they do drugs.’ Like they say, like… would you be saying the same thing if there was a bunch of White custodians? Like that’s what I think.

I – And what do you think is the answer to your question? […]

P – I think it is just because they are a minority group.

Paige pointed out, like Olivia, that if she does not see custodians, she does not think about them. Christina expressed empathy as she described the situation of the custodians from Jamaica; she also explained that people have misconceptions about
minorities. It seems that she realized that not all minorities are the same. The conception of the custodians as college educated sounded more like someone she could relate to. Although Zoe looked up to the security guards as authority figures, she recognized that other students showed these groups disrespect. Finally, Paige mentioned the way people stereotype and treat different groups differently. In this exchange, the girls demonstrated how their awareness led them to a better understanding of the struggles facing disenfranchised minorities in this country.

Besides talking about the minority employees, I wanted to understand what the students thought about the minority students at our school. As they thought about how their roles and responsibilities toward marginalized groups had changed, the students discussed how minorities are classified at Pinewood High School. The students first pointed out that there are groups in the school by discussing how the cafeteria is arranged. Each group mentioned how students sit in the cafeteria. Recognizing that there are different groups allowed the students to speak freely about each minority in the school. Although this was not a topic I had anticipated in my study, the students revealed some very interesting ideas about Asians and the way they are perceived and treated in Pinewood.

In several of the interviews, the students referred to the cafeteria setting. Felicia and Barbara explained how the cafeteria was arranged in groups. The students all agreed that there are three basic groups of students in Pinewood: Caucasians, Asians, with Blacks and Hispanics lumped together as one group.

B – Well I just… in the cafeteria you realize it a lot. There is a huge
section of like all the Asians. [...] And then like all the White kids over here, and all the Asians in like a strip, like next to the windows.

F – And then in the back corner it’s the minorities.

B – The really, really minorities. The minority and then like there is like the small minority. The ones you can pick out easily.

The students did not seem to consider the Asians to be minorities. They realized that there are societal distinctions between Asians and then Blacks and Latinos. They understood that there are differences between historically under-represented minority groups and others who are minority by race but do not experience the same historical legacy. They believed that Asians are the stereotypical “model” minority and place a high priority on education. However, as Lee (2006) points outs, despite their educational success, Asian Americans exhibit significant variation across the various Asian ethnic groups.

The students were being asked to discuss and think about minorities in ways that they had not prior to the class. They were trying to interpret what they saw in the cafeteria and in Pinewood in general. They were making strides arriving at a deeper understanding, but were still unable to fully unpack and explain what they saw. Thus, this group of students was unable to carry their analysis far enough to recognize why Asians are considered to be a minority.

Christina, Zoe, and Paige talked about how they try to mingle with minorities at Pinewood. Once again they discussed the situation in the cafeteria. I had asked them who they identified as marginalized groups in our school.
Z – People on West Main Street. [A downtown area of Pinewood where many of the Blacks and Latinos live.]

C – Yeah, well I don’t know, I’ve gone down to the cafeteria and gone to talk to some of my friends that sit at the first table there.

I – Hm. Hmm.

C – And I’ve had people tell me that this is the Black table, what are you doing here?

P – And not even Black, but just like… ghetto. […]

Z – I think it’s just like a stereotype that people go in on races. It’s not as big a deal as like a lot of people say it is in Pinewood. Because I mean I’m personally friends with a lot of the people in like that situation.

C – Yeah, I don’t think they feel segregated.

In their discussion the girls were adding the concept of social class when Paige used the term “ghetto.” As Felicia did earlier when she spoke about Hispanics having many children, Paige appeared to be either confusing race and class or noting an important intersection of identities. She pointed out that there is a difference between poor Black and affluent Black. Christina’s comment at the end of the exchange that, ‘she does not think they feel segregated’ sounded like wishful thinking. It was also an interesting contradiction; she identified the group as a minority, yet still claimed that they do not feel segregated. In their minds, the girls were doing what they could; doing what they thought was right, and hoping that it was enough.

In a number of examples, the students made distinctions among the various minority groups. It was when the students began talking about Asians at Pinewood that the discussions sometimes became unsettling. The first interesting point I noticed was
that many of the students thought that there were significantly more Asians in our school than there actually are. Many of the groups were surprised when I mentioned that Asians represent approximately 17% of our school population. The first group that discussed this topic was Vanessa, Rachel, and Adam.

V – There are more women, and like you can think of the Asian population in our school are the minorities, but I think there is more.

R – Yeah.

V – Yeah, I think there are more Asians than there are Caucasians.

A – Nohhhh!

I – No, Adam is right. There are 17% Asian, 4% Hispanic, 1% Black, and the rest are Caucasian in our school.

V – It seems like there are more.

Isabella and Haley were not sure whether they consider Asians a minority because there were so many at our school. They noticed that there are differences, but were not clear about the proper distinctions among minorities. When Lacey, Olivia, Dominick, and Steve began talking about Asians, they also could not agree whether or not Asians should be considered a minority in Pinewood. I asked them whom they considered to be *marginalized groups* in our school.

S – Black people, African Americans.

L – Yeah, or Hispanics.

D – Asians.

I – Okay.
S – I don’t know about that.

L – You think so?

D – Why not?

S – There is a *lot* of Asians in our school.

L – I don’t know.

D – What does that mean? What do you mean marginalized?

L & S – Minorities.

D – They *are* a minority.

O – I mean they are a minority, but not as much as Blacks or Hispanics.

S – But you wouldn’t think… I wouldn’t think Asians are as much of a minority as Black people.

I – Because there is more of them, or because of the way they are treated?

S – No… ah… yeah kind of both.

Dominick correctly identified Asians as minorities; Steve, Lacey, and Olivia agreed that they are, but not as “much.” This example demonstrated the students trying to analyze their awareness and their recognition that there are distinctions among the minority groups. While talking about minorities in the group interviews, many of the students elaborated on their perceptions of the Asian group. In the same interview as above, the group explained how they perceive Asians in Pinewood.

D – But I think that as far as peers, like White kids they will reach out more to Black students than they do to Asians. I mean I think that not a lot of people in our grade even know all their names. So but…

I – All the Asian names?
D – Yeah, and I think that they just kind of... they don’t reach out to us and we don’t really reach out to them. And they kind of isolate themselves so... I think they look at... I think they seem like more of a minority because we don’t even know who they are and they are in our school.

I – Hm. Hmm. What were you going to say, Olivia?

O – I was just going to say that yeah, they’re really isolated. And like the African American students, like there is many less of them, like I think they assimilate more with us. [...] 

L – I don’t know like any Asian kids that really associate themselves with any of the White students.

I – Okay.

L – Like in the cafeteria or in the hallway if you walk pass them, and like I’d be more likely to say hi to one of the Black kids than one of the Asian kids. Just ‘cause I know who they are and to really talk.

D – I think they send the vibe like; we don’t really want to be friends with you.

Dominick claimed that Caucasians in Pinewood reach out more to Blacks than to Asians. Lacey explained that she is more comfortable around Blacks than Asians. This exchange highlighted another aspect of how the students were analyzing their awareness. The students were basing their classification on how foreign the Asians seem to be; they have different-sounding names, speak different languages, and have different interests. Zoe and Paige had a similar conversation about how the Asians stay in their own groups. Zoe explained that she doesn’t really reach out to Asians, and Paige countered by telling what happened when she did. Although the girls understood that the Asians belong to sub-groups, they were unable to distinguish among these groups.

P – I feel like a lot of the like Asian kids feel like they have to... like I
don’t feel like they are the minority, but I feel like they stay like really in their own groups. […]

I – Do you think language might be an issue for that or not?

P – Maybe, but it’s not just like they are all from South Korea, they’re from different areas so...

Z – I couldn’t even tell you, I don’t know if it is just ignorance on my part, if I like looked at a student who is of Asian descent. I couldn’t tell you if they were from China, Japan, or Korea. And then when they are like talking I couldn’t tell you what they were speaking.

I – The languages sound the same to us.

Z – And it is not like I have made any effort to reach out and make like… I mean if I was sitting next to somebody, a lot of times you could just kind of become friends. But besides that, I’ve never made like an effort to reach out.

P – So like I’m like friends with a couple like Asian kids and they were like, oh you are like the coolest like White girl. Like you’re the only one that tries to talk to us. I was like, oh okay.

I was disappointed to hear my students’ opinions about the Asians at our school. They demonstrated that they had an increased awareness of minorities, but there was still a lot of confusion. It seemed that some of the students resented the fact that the Asians have a different culture and want to maintain that culture. Perhaps the students from the dominant culture expected others to want to become more like them, more “Americanized.” The students considered the Asians to be isolated and suggested that they want to be left alone. Because the Asian culture is so different than our own, the students claimed that the Asians did not want to join in and become part of our society. Paige’s comment at the end was encouraging, however, suggesting that perhaps if students from the dominant culture tried to reach out, they would get a different reaction.
Dominick claimed that Blacks are treated better than Asians at Pinewood. He had some
difficulty trying to explain to his group why this is the case.

D – I think Black people are treated better than the Asian people.

L – Maybe socially, but I don’t know about like…

S – How are they treated better?

D – I think at this school, they’re taken more considerably. […]
Um… I think that… I think that teachers… that teachers expect a
lot from them and I think they…

I – From the Asians?

D – Yeah. And I think they don’t really voice their opinion and they’re
kind of… um I don’t want to say not taken seriously, but not taken
seriously by their peers. And they kind of just have a role and they’re
very constant and never changing.

While talking about how Asians are perceived in Pinewood, the group of Tom,
Greg, Martin, and Jon discussed how they are treated. Martin, who identifies himself as
Hispanic, revealed some disturbing insights into the treatment of Asians in Pinewood.

Tom and Greg, who both identify themselves as White, supported what Martin says. Jon,
who is the only Asian in the class, offered a possible reason why the Asians are treated in
this manner. While not condoning the treatment, Jon explained that he is speaking from
experience.

Another possible reason for this treatment could be the fact that the students felt
threatened by the Asians scholastically. At Pinewood, the Asians dominate the upper
level mathematics courses. The highest-level mathematics course offered at Pinewood is
Calculus CD, which follows Calculus AB. Pinewood does not offer the “typical”
Calculus BC class, although students take the BC AP Exam. The material covered in Calculus CD is Calculus II and Calculus III. The calculus teachers at Pinewood felt that there was too much overlapping material in Calculus AB and BC; therefore, they created the CD class.

The course is offered to seniors who took Algebra II Honors as freshmen and stayed in the most accelerated track offered for all four years of high school. There are roughly 18 students each year who take the class. Over the past 6 years more than 65% of the students in the class have been of Asian descent. Recall that the Asian population is only about 17% in the Pinewood district. If the students believe in the Asian model minority stereotype, it is the Asians who most challenge their white privilege.

M – I feel like that um… I feel like that today in Pinewood HS, that people you know see for the most part, Hispanics or Blacks; they see them as you know clear cut minorities. And they are kind of careful with the way they talk or like interact with them, but with the Asian students, it’s kind of… I hear all the time how people are always ripping on Asians or making fun of them. And it’s kind of like… since they’re new and everything, that people don’t … do the things like you grew up saying, ‘don’t be racist, don’t be racist,’ but like in Pinewood it doesn’t seem to apply to the Asian group.

J – Yeah, I’ve lived in nine different towns in NJ. Um … all the towns that I lived in and where I went to school, I’ve pretty much been the only Asian student. […] Until I came to Pinewood. So this is kind of like… it was weird to me at first.

I – Right.

J – So I kind of understand what he is saying, like the Black and the Hispanic students are definitely like the type of minorities, while the Asians kind of have like their own like…
I – What about what he said, because I never heard that before Martin, but that he said people may tiptoe around the issues with Back or Hispanics, but they rip [make fun of] Asians? Has that been your experience here?

M – I mean I’m sure he probably… not to his face. I’m just saying…

I – Or is it like behind their back?

M – Yeah, it is really behind their back. Like what I am saying, like at least with my friends, I will hear them rip on Asians but not so much Hispanics or Blacks.

J – Like it’s never to your face, it’s always like sugar coated racism.

I – Okay.

J – Like when you are around them and when you’re not, it’s probably like… they’ll more open up. Like I wouldn’t know obviously.

I – Right. And I’m just curious, and you don’t have to answer this, but in what ways? I mean is it just stereotyping that…?

T – Well I think one thing is like in terms of racial slurs at least, you hear that from Asians, or you hear that like toward Asians sometimes. Not to their face obviously, but people might refer to them as that [racial slur], but then if you say that about a Black or Hispanic, it’s really like, people will really look down on you. It’s not something terrible to say… which it is. […]

G – Yeah… like… you can… I mean… you can… it’s almost accepted as being okay to use… I mean politically incorrect terms towards Asians as opposed to like Black people or Hispanic people. It’s almost like. […] It freaks you out.

J – I think that’s just because of the sheer number of Asians though. Like at the other schools that I’ve been to, like discriminating against Asians would be on par with discriminating against Black and Hispanic students.
Martin was struggling to make sense of the way Asians are treated. As upsetting as his comments were, I was grateful that he felt comfortable sharing them with the group and me. I did not want to put Jon on the spot, since he was the only Asian in the class, but his insights were helpful and appreciated. I had no idea students at Pinewood thought, felt, or behaved in this way. This time I was shocked and surprised. I addressed how I felt in the final entry of my fieldnotes (6/2/09).

There was one thing that disturbed me from the focus group interviews. I could not believe what I was hearing about the way the students treated Asians in our school. No one mentioned anything like that in our discussions and class activities throughout the class. I wish I had known about their views earlier. Next time I teach the class, I need to address this situation. I need to come up with some activity that will enable the students to better understand the Asian population.

Upon reflection, the students also needed a better grasp of the distinction among minorities, those who have been historically underrepresented versus other groups. Again, it seems as though the students were on the verge of growth. They recognized the differences, but were unsure of how to apply their new knowledge. They were trying, for example, to determine what is and what is not politically correct. Beyond that, they were trying to understand why certain expressions are appropriate or inappropriate and biased.

The students in future classes need to understand the fact that Asians are disparate. Despite the stereotype of high-achieving model minorities, Asian students are a diverse group, from distinctive cultures. Although many of the Asians that attended Pinewood were successful in school, this was not always the case. A closer look reveals
variations across ethnic groups (Lee, 2006). In some areas of the world, Asians live in poverty and struggle in school just like other minorities.

Lee (2006) also emphasizes that Asian Americans are marginalized as permanent outsiders. My students interpreted this marginalization results because Asians do not look the same, their names sound funny, they do not understand their languages, and they have different priorities. Therefore, they will always be associated with their country of origin. The feelings my students expressed about Asians wanting to be left alone and not wanting to become a part of society seemed to be rooted in this stereotype.

By disrupting the students’ comfort zones, they not only became aware of and struggled with their new knowledge, but also gained certain insights. The class activities and assignments allowed the students to view mathematics differently. Some of the students explained that learning math in context made the process easier for them and they gained confidence in mastering the subject. The class discussions and additional probing by Nancy and me helped lead the students to realize things about the world they lived in that they would otherwise not have considered. Finally, they recognized the importance of looking at their own situation versus the situation of others who are less fortunate.

As the students moved in and out of the categories of Awareness, Struggle, and Realization, they attained a basic knowledge of the issues. Their newly acquired knowledge and their experiences from the class have enabled the students to begin a journey. They have gotten as far as they can intellectually in one semester. Along the
way they have shown signs of growth and insight. The specific ways in which the students have grown will be discussed in the final category.

**Growth**

When I first imagined creating a class like this, one of my desires was that I would inspire my students. I wanted to see my students leave their “bubble” and learn about the injustices in the world. I hoped that they would feel as I do and want to do something about how “unfair it all seems.” I chose to disrupt their comfort zones and see what happened. What I found was that the social justice mathematics class motivated the students to grow. I fostered the students’ growth by guiding them into and out of the categories of *Awareness, Struggle, and Realization*.

I chose to call this category *Growth* because of the way it affected each student and me. In my opinion, it would have been difficult to participate in the class and not feel anything. The students’ reactions to the class facilitated their intellectual growth in a variety of ways. Each student’s path to knowledge was not the same, but each student demonstrated some form of growth at some point in their journey. The students grew as they acquired new knowledge, as they learned what it was like to participate in a democratic society; and, in the process, they gained a better understanding of themselves and their position in the world.

I have divided the *Growth* category into three subcategories. The first is called *Change*. I used this subcategory to explore the various ways in which the students’ lives were changed by their class experiences. I have named the second subcategory *Less willing to act*. In this section, I will examine why some students considered themselves
less likely to do something about the injustices in their world. The final subcategory is called *My own growth* in which I will discuss what I learned and insights I gained from the class.

**Change**

There is ample evidence throughout the data that the class, our discussions, and the assignments changed the students in many ways. Some students commented that their opinions, attitudes, and understandings of certain issues were changed. Others mentioned being more proactive and that they now wanted to make a difference. There was a new sense of agency and responsibility. The class also allowed the students to have a new outlook on society and become better citizens. The students were now able to consider and contemplate alternative ways that their world could be better. They had an expanded view of what is meant by justice and social justice. A few students explained that the class created in them a desire to see these changes take place.

The following anonymous response, submitted after we completed our unit on racism, exemplifies much of this subcategory. This student mentioned his or her new outlook of minorities and his/her desire to see things in our country change.

I’ve always been aware of discrimination and white privilege, however I never knew how much of an issue it truly is. White privilege affects me personally every day and I never noticed how prevalent it is, which upsets me. I feel much more sympathetic with the minorities, and the struggles they must go through every day. To know what they have to go through every day because of their race in America today is shocking to me, and I hope that can change.
While discussing topics the class made her think about, Kim explained how the new knowledge she gained helped change her opinions. She said that prior to the class she had an opinion, but it was unfounded. The class made the issue real for Kim and the concrete numbers or statistics supported her new opinions.

K – Yeah, and just like the cost of war, and stuff like that. I knew nothing. I just like… I had an opinion, but it was based on nothing. [...] And through this class you kind of get that whole background on things and I learned more about all that stuff.

I – Do you think the math at all or the numbers helped you learn about that stuff?

K – I think the numbers helped change like opinions that I have on stuff.

Later in the same interview Barbara, Kim, and Nancy elaborated on ways in which they had changed. Each girl touched on how the class had motivated them to change. Barbara mentioned the need to participate, to become involved, and ultimately become a better citizen. Kim claimed that she recognized the need to act and is more proactive now than she was before the class. Nancy pointed out that even though she knew about some of the problems we discussed, now she recognized that there is more that could be done to address them in a concrete way.

B – And like it kind of just makes you realize that you have to be more involved with like society and like government or like whatever. ‘Cause it’s going to benefit you in the long run.

I – Good.

K – Yeah, I agree with that. Just… I never did anything. And now seeing like just how bad things could get like you need to get out there and do something. So I guess I feel more proactive now. Like
involved in things.

I – Has there been any specific things that you became involved in since the class?

K – Just like volunteering like at the food pantry. Like giving out food to people who need it. Like stuff like that.

I – Well that’s great! Anyone have anything else?

N – I agree with them. I remember making the brochure for AIDS. […] About how it was a really big problem. And I always knew it was. But it kind of made me realize even more how bad it is, and how there could be more that you could do.

The group above described ways in which they had changed and become better citizens. I also wanted to ascertain if the students’ understanding of social justice had changed since they had enrolled in the class. The initial questionnaire revealed that some students had a vague understanding of what social justice meant, whereas others admitted that they had no idea. Some of the students mentioned concepts such as equality, fairness, morals, and rights. The following anonymous responses demonstrated how these students’ concepts of social justice had changed since taking the class and how their eyes have been opened to these issues.

My understanding of social justice has changed because I am so much more aware of current issues which affect a huge amount of people, while others lay untouched and have no clue of what’s going on. Social justice is something our world has to work on.

I am now aware of so many different things in society and have become really interested in social justice issues. My eyes have been opened to the world around me.
Haley, Eva, and Isabella responded by explaining what their experiences in the class were like, discussing some of the ways their outlooks have changed. They pointed out how unfair the world is, but also questioned what alternative approaches might exist. Now, they recognized that situations do not have to remain that way. Society and its institutions could be improved to be more beneficial to all. The girls were demonstrating their new, refined definition of justice.

Is – Well one lesson in particular I remember we did was about the distribution of wealth. […] I really enjoyed that. I was really shocked by it too. How unfair it really is in our country to see how there is so much wealth with like a small minority of the people and so little wealth with like 50% of the population.

E – Yeah.

I – Why did you find it interesting?

E – Like the same reasons, how there is such a big gap. And how like even if the top 1% like spread out their money to the bottom, they would still be millionaires and billionaires. And everyone could be better off.

I – Okay.

H – And I remember doing the… I think we did a brochure right? […] It was interesting to see like how much we are spending on Iraq. And even like how just a small percentage of that could help so much like if it was put into a different thing. It would be so much more beneficial.

I – Okay, good.

E – A lot of things had to do with like how money is spent. In like what ways, and the mistakes I think we are making, and like ways that we could better the country by distributing the money better.

The girls all mentioned that society could be more beneficial to more people. They suggested that the situation could be improved if money were distributed more
equally and our priorities were different. Another nuance of this subcategory is evident when the students translated their new-found outlook into a desire to do something to bring about that change so they could make a difference. When I asked her group if they thought their role or responsibility toward minorities had changed, Kim again brought up working at a food pantry.

K – I should… help (laughs). Basically that’s what it comes down to and I say that I will help and I’m like helping now I am trying to help. But I hope that in the long run I’m going to stick with it and try to help minority groups.

Kim understood that she was doing the right thing. She claimed that she hopes to continue to help in the future. She feels a sense of agency and responsibility. I asked Eva’s group the same question about their roles and responsibilities toward minority groups. She explained how her feelings about minorities had changed during the class.

E – I guess to just not make them feel like, um, minorities. […] And to try and make them feel equal if that’s even like possible.

I – Would you think that you felt that way before the class, too?

E – Like I never really thought that I was like ever being prejudiced or discriminating against… but I mean I still don’t think I am. But like I feel like I should go like out of my way to make them feel more equal to everyone.

One of the conversations with Zoe’s group turned to politics. Zoe explained that the class had affected how she felt about her political affiliations. Although still holding conservative views on some of the social issues, she admitted that the class changed how she felt about the economic issues. Zoe was demonstrating a new outlook on society.
Z – It doesn’t mean that you have to let go and say that it would be a great thing if everybody was like you know, it’s just like an idea if everyone was like completely liberal. And like left back and equality it’s like almost to the point where it was almost socialism. Like equality for everyone. You know I think actually because I considered myself a heavy conservative before coming into this class, and like when it comes to the economy I don’t know. It’s just like it [the class] changed my views a lot.

Lacey, Steve, Dominick, and Olivia all talked about how the class had changed their outlook on the world.

L – I think like after learning about the jails, we talked about what happened during Hurricane Katrina and like all those things. It’s just like we say that it is fair here, but like just a lot of times it seems like it’s not. And then like things that we need to do to change that.

I – When you say fair here, do you mean in this country or at Pinewood?

L – Yeah, in this country.

I – Ok.

S – I don’t think your roles have changed, I think if you…

D – Your responsibility.

S – Yeah, your views on certain things have changed. […] Like you wouldn’t even think twice about it [jails] or it wouldn’t have crossed your mind.

I – Before the class?

S – Yeah, before the class. But after and when you think about it, it’s just… it is a different mindset.

I – Ok.

O – ‘Cause like living in Pinewood, we are not exposed to stuff like that. Like to think about learning about jail and stuff. It is interesting like
how it is unfair.

I was delighted to hear Lacey take responsibility and state that we need to change conditions. Like Kim and the food pantry, Lacey feels a sense of agency. Steve’s new mindset allowed him to consider issues that before the class he would not even have thought about. A final example of how the class led the students to change the way they felt toward minorities comes from Greg. He had an interesting and important new outlook about racial jokes.

G – Well I kind of feel like I am more in defense of minority groups now. Like I’ll… where I might have heard a racist joke and blown it off in the past, now I kind of feel more like that’s not really funny.

I – Hm. Hmm.

G – Or it’s not really… I mean I don’t understand why people think that those jokes are funny. […] So it’s… I mean it’s changed in that way. So I feel like I am more in defense of minorities.

Although certainly not something I would have considered when I designed the class, I do think what Greg was saying was important. The way Greg thought about minorities has changed. He was no longer willing to sit idly by when he heard forms of hatred. He was more compelled to say something and to defend those groups who are different from him. This simple comment demonstrated how Greg had changed and grown because of the class. It is this type of growth that I envisioned my students would experience by participating in the class. However, not all of the students’ reactions were the same, as indicated in the next subcategory.
Less willing to act

As I have discussed above, many of the students in the class expressed new outlooks about society and its institutions. They stated that their attitudes and opinions had changed. They expressed a desire to see the situation change for the betterment of society. Some mentioned that they became proactive and wanted to make a difference. I hoped that the class inspired the students to take the next step and try to join groups that sought to bring about positive change. The data, however, revealed different attitudes than I had expected to find.

By comparing the beginning and end of class questionnaires, I wanted to ascertain whether any of the students’ attitudes regarding joining groups had changed. I did this by asking the same question on both questionnaires: Describe yourself in terms of how likely you would be to join a group working to stop discrimination, poverty, hunger, war, or environmental damage.

Recall from the discussions in Chapter 3 that even though the questionnaires were anonymous, I was able to match the beginning and end of class questionnaires with the appropriate students. Out of the 21 students in the class, 15 students’ attitudes about joining a group did not change. Twelve of the students began the course saying they were likely, very likely, or that they would definitely join a group that sought positive change and ended the course with the same feelings. Three of the students began the course stating that they were not likely or highly unlikely to join a group that sought positive change and similarly ended the class with the same opinion.
There were six students whose attitudes about joining a group did appear to change. This data contradicts what I had expected to find. These students began the class with a positive outlook about joining a group and ended the course stating that they were less likely to join than prior to the class. This contradictory result is explained by Seider (2008 & 2009) in his study with a similar demographic. He found that although the students’ awareness of unjust issues is raised; they can become overwhelmed by the size and scope of the problem or can become fearful that one day, they personally will experience hardship. The following examples demonstrate how some of the students’ attitudes had changed.

**Beginning** – I would like to work to stop any of these especially environmental damage.

**End** – I would probably not be that likely, but I do believe in stopping some of these things.

**Beginning** – If the group shows me just how much I can help someone by joining the group, I’ll probably join it.

**End** – Probably not very likely.

**Beginning** – Very likely.

**End** – I would be 40% likely to join one of these groups. I would like to be able to and start getting more involved with them because they are very important issues, but I am not sure how much it will help.

In the third example above, the student goes from very likely to what she/he describes as “40% likely.” This response shows the difficulty I faced in walking that fine line I mentioned in the *Struggle* category. I disrupted this student’s comfort zone, but it
appears the student became too frustrated. The student had become overwhelmed by the issues and was not sure how much of a difference it would make if she/he joined one of these groups. It is also possible that the student was just doubtful about this form of working for change (joining a group). No matter how many times I reassured the students and encouraged them to take some form of action, I could not inspire each one of them to want to act. Many of the students were also unable to apply their analysis on a larger societal scale, but could bring it down to their own microcosm.

The class discussions, the interviews, the quick writes, the questionnaires, and my fieldnotes, however, did reveal that I was able to reach and inspire most all of my students to some extent. The students recognized that the world beyond their bubble was not perfect. Many of them struggled when confronted with the unjust situations presented in the lessons and activities. Although frustrated at times, their eyes were opened and they understood that they could make a difference. My careful questioning and reassuring encouragement enabled the students to grow and begin becoming more enlightened individuals and better citizens.

My own growth

The nature of practitioner action research, allowed me to benefit from the experience of teaching the class. My role was not only as a researcher who designed the study, but also one of the two teachers who taught the class. The role of the teacher in this type of research is also one of a co-leaner with the students. There are a number of ways in which I believe I have grown or learned from my experiences in conducting this project.
I learned, very early on, how difficult this research task was going to be. Merely getting approval for the class was a long, arduous process. I wanted to start the class in the fall of 2008 and, therefore, started the approval process in early October, 2007. Nearly five months later, after many emails, letters, forms, phone calls, and meetings I finally received written permission for the class from the Superintendent. The importance of establishing positive relationships with the administration at the high school and the personnel in the Education Center cannot be overstated.

Having never co-taught a class or taught an interdisciplinary class before, I learned how to meld Nancy’s and my ideas into coherent lesson plans. Although difficult, Nancy’s easygoing nature and her willingness to be flexible with the material she wanted to teach made co-teaching the class easier. We worked well together and were able to integrate my mathematics concepts into her sociology curriculum.

Prior to working with Nancy, I had not taken any sociology classes during my undergraduate or graduate studies. As a result, my knowledge of society and human behavior originated primarily from my experiences as a teacher. Participating in and co-teaching the class allowed me to acquire a more detailed scientific understanding of sociology. I learned more about culture, deviance, class, and racism than I would have by simply reading articles on my own. Using the Teacher’s Edition of our textbook, reading the chapters ahead of the students, and planning the lessons and activities with Nancy, allowed me to develop expertise on the subject.

One of the more interesting ways in which I believe I have grown from this experience, is that I got to know the students in this class better than any of my previous
students in my “math only” classes. I noticed this near the beginning of the semester. I commented in my fieldnotes on September 15, just two weeks into the class, how our discussions allowed me to learn more about my students than regular math classes did.

Our lesson today was on gun-related teenage murders. Nancy had some statistics regarding violence and teenage murders that she had used in her previous classes. We decided to include the use of the 5 number summary as a way of including mathematics and better analyzing the data. During our discussions in class I discovered something about Dominick.

I had Dominick as a student in my Algebra I class and he was on the JV Baseball team when I was the coach. I also recruited him for the class and conducted a pre-interview with him over the summer. I thought I knew him pretty well. I would not have guessed how knowledgeable he was about recent and current events.

Dominick had great insights. He spoke intelligently about the crack epidemic and the rise of gangs. These are topics that do not normally come up in Algebra class or on the baseball field. I can see that teaching this class allows you to see a different side of your students. (Fieldnotes, 9/15/08)

A couple of weeks later, I had a similar comment in my fieldnotes about another student named Alyssa. I did not recruit her for the class, but she had been a student in my Algebra II course the previous year.

I remember Alyssa from last year. In Algebra II she did not pay attention very well and seemed to be easily distracted. I would not have thought this class was a good “fit” for her. I could not have been more wrong. I was delightfully surprised to find how fully aware she is of many social issues. She is also more engaged in the material and willing to contribute her thoughts and feelings. You really are able to learn more about the personalities of your students in classes that are not math only. (Fieldnotes, 10/03/08)
Finally, the experience of conducting this research improved my teaching practices. In the process of reflecting on the class, I was able to identify lessons that worked well with students, lessons that did not, and topics to consider for future classes. For example, in my opinion, one of the most influential lessons was the “Distribution of Wealth” activity discussed in the Awareness category. On the other hand, my students’ general perception of Asians told me that I needed to incorporate a lesson that involves misconceptions of this minority group. Throughout the research process, I asked for a lot of student input. By carefully tracking their experiences and progress throughout the course, I was able to consider their input and learn from it as I moved along.

As the teacher and researcher, my experiences were similar to those of my students. I have already discussed the various ways in which I have grown from my participation in the class. Like my students, I have also experienced the three other categories of Awareness, Struggle, and Realization.

I have a newfound awareness of teaching an interdisciplinary class using social justice issues. I was aware from early on that this type of class was different than a typical mathematics class. The class was less structured than my other classes. There were times when I was unsure how the students would react and where the discussions might end up. In my mathematics classes, I have set goals and certain concepts to teach that I need to attain each day. This was not the case for the Social Justice Mathematics class. It was a new kind of teaching for me that provided a new opportunity, but was a little unnerving.
There were also areas where I struggled. Because the class was combined with the existing Honors Sociology class, I had difficulty matching math concepts with every topic that was part of Nancy’s curriculum. This meant that there were some classes that did not have a math component. Due to my limited prior knowledge of sociology, it was also a challenge for me to stay one step ahead of the students.

My participation in the class enabled me to realize things about my students that I would not otherwise have known from a typical mathematics class. I found out more about the character of my students and how they felt about discrimination, poverty, hunger, war, and environmental damage. The class enabled me to realize that students in this setting can demonstrate compassion. There was evidence that students felt sympathy or empathy for those individuals less fortunate, showed concern for environmental issues, and raised questions about the Iraq War.

Having analyzed the data, in Chapter 5, I will restate the purpose of the research and examine the guiding research questions. I will summarize the findings and review the description of the experiences of my students. I will also discuss the significance of the study, its limitations and implications. Finally, I make recommendations for future research.
Chapter 5
Conclusions

Purpose

The purpose of this study was to describe the experiences of students who participated in my mathematics for social justice class taught in an economically privileged setting using action research methods. In this chapter, I summarize my findings to address this objective and to answer the research questions. Due to the fact that the course lasted one semester, the results will primarily be subtle changes rather than dramatic. I will first discuss what my students learned and then, at the end of the chapter, reflect on what I learned co-teaching social justice mathematics in an interdisciplinary classroom for the first time.

Following my analysis of my students’ classroom experiences in Chapter 4, I will review these experiences and discuss what the students learned from the class. For instance, have their experiences influenced their sense of themselves as agents of change for social justice? The summary answers the following research questions: (1) Did the students’ experiences in the class raise their level of social awareness? (2) Did the class help instill in the students a sense of agency to work for a more just society? (3) How did students in this setting come to recognize and acknowledge their privilege and understand the cultural capital they possess? (4) In what ways did the students struggle with concepts and issues presented in the class? (5) How have my students and I grown from our shared experiences?
After summarizing my findings, I look at this study’s links to the larger body of interdisciplinary literature and discuss my contributions to the literature. Next, I discuss the significance and limitations of my research. Then, I will describe the implications of my study for teaching as well as my recommendations for future research that will build on my work of incorporating mathematics and social justice in a privileged setting. Finally, I present some closing reflections on my experience.

**Summary**

I will begin by briefly describing the students in the class. I will then discuss the categories of experience that emerged from the research method of continually comparing the data as they were analyzed rather than waiting until the conclusion of the study to perform the analysis. For my analysis, I utilized triangulation because my data originated from a variety of sources, including pre and focus group interviews, preliminary and final class questionnaires, quick writes and other student work, as well as my fieldnotes. I will also explore some of the more important subcategories that emerged from the data. I also answer the aforementioned research questions posed above.

**The Students in the Class**

I was able to use the pre-interview and the beginning of class questionnaire to obtain information about and gain a general sense of the backgrounds and views of students in the class, including information about their previous mathematics experiences. Although some students had positive self-images of themselves as math students, a majority of the students had negative self-images. Many students did not consider
themselves to be strong in mathematics, whereas others expressed a lack of confidence in their ability to master the subject. It became evident in the pre-interviews that previous teachers had affected the students’ positive or negative attitudes toward mathematics and how they felt about themselves as math students.

I specifically intended to recruit students for the class who did not love math or who lacked confidence in the subject to ascertain how a different class focus might affect their attitudes towards mathematics. I accomplished this goal by first “selling” the class to my Algebra II students at that time. I described the upcoming new class that I would be teaching; and then approached students with whom I felt I had previously established a good rapport. I was looking for outgoing, but mature, students who were not afraid to speak up, express themselves, and ask questions in class. I knew the importance of discussions in the Social Justice Mathematics class and wanted to encourage inquisitive students, whom I could count on to participate to enroll in the class.

Most of the students I recruited for the study recognized that the privileged area in which they had been raised had sheltered them from the harsh realities of the inner cities and poor rural areas. Many admitted to not being very cognizant of political, economic, and social issues prevalent in the larger world around them. They were not necessarily naïve, because they did understand that they lived in a protected space. These students typically had become informed about the world by their families, the church, or the media.

To address the Pinewood students’ lack of knowledge about current social and economic issues, I purposely chose to teach lessons that I thought might penetrate what
they referred to as the Pinewood bubble. To do so, I wanted to present them with the type of disruptive knowledge that Oakes and Rogers (2006) referred to as being essential to disturb their comfort zones. As a result, the students described their reactions to the topics we discussed as shocking, upsetting, and eye-opening. The lessons stirred up a variety of emotions in the students. They described feelings of sympathy, empathy, frustration, and concern.

**What did we learn?**

As the researcher, one of the teachers, and one of the participants in the study, I was in a unique position of witnessing and tabulating what was learned. My study shows what I learned about the reactions and experiences of my students. In analyzing the data, I categorized the students’ experiences of the class as follows: Awareness, Struggle, Realization, and Growth. Obviously, each student’s experience was unique, but there were also some shared insights that led to the creation of these categories. The students’ progression into and out of these categories was not linear in nature. Students entered the categories in different sequences; some students repeated some of the categories. A major claim of my study is that as privileged students experience these categories, they become shocked, surprised, and frustrated when they learn about social justice issues. I will now discuss each category and summarize my findings.

In the Awareness category, I found that students were becoming consciously aware of situations that were new to them. Many of the students used the word “eye-opening” to describe how they felt when they were confronted with issues that they were
learning about for the first time. Other students said they were “surprised” and even “shocked” by what they learned from some of our lessons.

Because the students grew up in their self-described bubble, they had no first-hand knowledge of or experience with the actual effects of poverty, hunger, and crime. Prior to enrolling in the class, they did have some basic preconceived notions about the economy, racism, and justice issues. From the class they learned much more. In addition, several students indicated that the class did, in fact, make them more acutely aware of and informed about societal issues. Due to their sheltered upbringing, they were unaware of what else was out there. So in this sense, the class helped to raise the students’ level of social awareness.

The students became aware of and appreciated how the class linked the mathematics concepts with social justice. The students expressed the fact that they better understood both the mathematics and the social issue when they were presented together. The students explained that one of the reasons they were better able to more deeply comprehend specific topics was that they were able to “see” the numbers. The numbers gave the students a new, more concrete perspective, enabling them to view the problems more holistically and extrapolate beyond the numbers. Students felt the real-life focus of the class infused added meaning to what we were learning. They appreciated the usefulness of mathematics in interpreting social issues as they were presented with various applications.

I found it interesting that prior to enrolling in this class, many of the students did not consider their education to have been very real-life oriented. On numerous occasions
the students commented that this class was different than any of their other math classes because of the real-life aspects to the problems we solved. The real-life nature of the class enabled the students to answer two of the more common questions that math teachers hear; which are: Why are we learning this? When will I ever use this in real-life? In contrast, in this class the students knew exactly why we were learning certain mathematics concepts and learned how they could be used in their lives.

Going into the study, I suspected that privileged students would feel uncomfortable when confronted with difficult abstract topics, such as racism, crime, poverty, or environmental damage. The data analysis indicated that my suspicion was indeed true. Because the students were uncomfortable and uninformed about the issues, they struggled, which led to another category. In the *Struggle* category, I found that the students had exceptional difficulty in dealing with the topics of White Privilege and Racial Identity. Their struggles were manifested in their range of emotional responses to some of our lessons.

While discussing White Privilege, some of the students recognized how fortunate they were in fact. Some explained that the class caused them to reflect on the Pinewood *bubble* and how lucky they were to live in it. Others mentioned that the class made them think about those who are less fortunate than themselves. Although the bubble sheltered them, it also protected them.

However, although some of the students recognized their privilege, they did not completely comprehend its consequences. Many struggled with understanding how their advantages affected other individuals who are economically less fortunate. Perhaps due
to the fact that the class lasted only one semester, the students may not have been able to fully comprehend the cultural capital they possess. Some students discussed their frustration with White Privilege, but yet were unable to extend their thinking to recognize how to use their privilege to help others.

The students also struggled with their own Racial Identity. The struggle was most apparent with two second-generation Hispanic girls in the class. The girls were not sure which category they fit in. On the one hand, their social class placed them in an advantageous position, yet they recognized that they were different because of their Hispanic heritage. They were not sure how to reconcile their feelings toward their own racial group. One girl admitted to considering herself to be a *crossover*; whereas other Hispanics, using it as a derisive term, considered her to be *White*.

I was able to recognize the fact that the students were struggling with a number of topics that we discussed throughout the course by the content of their freely expressed feelings. The most common emotional responses I heard from many students included *shock, surprise, and frustration*. The wide range of emotions from others ranged from feeling *upset, saddened, or appalled* to being more *sympathetic*. However, while describing their shock and surprise several students related how the class was also an *eye-opening* experience for them.

Throughout the data, I noticed that the students repeatedly suggested that the class made them realize something. Although similar to the *Awareness* category, the *Realization* category comprises much deeper knowledge. In this experience category the students were not merely superficially aware of something, but were also able to
internalize and integrate what they had discovered and more fully grasp their consequences. The students’ realization enabled them and me to learn more about the way they learned, facts about the world they lived in, and the way they felt toward minorities.

As the students became aware of the objective of the class, linking mathematics and social justice, they had two insights: the math became easier and their confidence in mastering the subject increased. Prior to commencing the study, I hypothesized that students might find the mathematics easier if math concepts were tied to real-life issues with which they could identify. A number of student responses and my fieldnotes confirmed my hypothesis. Students explained how they were able to make the lessons meaningful. They experienced the math concepts as being easier because they understood the reason they were doing it, and the answers they calculated revealed significant information to them.

To reiterate, I specifically recruited students who did not love math to ascertain whether the class might affect the way they ultimately felt about the subject. My hope was that the class would help change the way they perceived the subject. There was ample evidence throughout the data that suggested that the class positively affected the students’ confidence in mathematics.

Because I understood the students’ sheltered upbringing, I designed the class to show the students what life was like outside of their “bubble.” I wanted them to study and discuss issues, such as poverty, racism, discrimination, and environmental damage. I
hoped that as they learned more about society, they would want to act to improve it. I found that I was able to open my students’ eyes to the world around them.

As their personal comfort zones were disrupted by the social justice information presented in the class, they began to realize that in most of the rest of the world, the social and economic situation was not like Pinewood. It was uncomfortable for the students to think and talk about some of the class topics. One student explained how the class enabled her to realize the need to become more actively involved in society. Several students mentioned how some of the lessons gave them insight into the inequities in society’s institutions. Others mentioned that they would like to see things changed and society improved.

As we investigated and discussed issues surrounding marginalized groups, the students realized facts about minority issues for the first time. Students shared how the class influenced them to view minorities more sympathetically. Other students explained that prior to this class they had not even thought about such topics. The students expressed that they now have a better understanding of why these groups might have been relegated to lower social strata.

To analyze my students’ feelings toward marginalized groups, I questioned them more extensively in the focus group interviews after the class. The students spoke freely about minorities and mentioned the way the students at Pinewood sat in the cafeteria. They identified three major groups in our school: Caucasiants, Asians, with Blacks and Hispanics lumped together as one group. I was shocked to hear how the students in Pinewood viewed the Asian Americans in our community.
It surprised me to learn that several students thought that there were considerably more Asians in our school than there actually are. One student even stated that she thought there were more Asians than Caucasians in our school whereas the school’s population is actually comprised of 17% Asians. Students even discussed whether to consider Asians to be minorities or not.

I was also troubled by my students’ perceptions of the Asian Americans in our school. A few students mentioned that they felt Asians in our school were isolated because they did not try to assimilate with their peers. This indicates that although the students demonstrated a raised awareness of the Asian community, they were still confused. They did not appear to understand that the Asian students had their own culture and that that was alright. They wanted the Asians to be more like them instead of accepting them as individuals.

Specifically, one conversation with two boys touched on the relationships and perceptions of the groups of students at the school. Although this is just one small example, I found it upsetting when one Hispanic boy and the only Asian in the class discussed their observations. The Hispanic boy explained how he had observed students at our school make fun of Asians, but that it would be taboo to make fun of Blacks. The Asian boy, who had lived in nine towns other than Pinewood, understood what was being said and tried to explain his interpretation. He was able to let it go and forget about it because the insults were not made face-to-face; he referred to these situations as sugar-coated racism.
There are a number of reasons the students may have had this impression about Asians. One reason may be that the two cultures are so unique. They speak different languages; have unfamiliar names, and diverse priorities and interests. Another reason might come from the fact that the Asian population is considered to be the *model minority* and they dominate the upper level mathematics classes at the high school. The Anglo students’ feelings could have been exacerbated by the fear that the Asians most threaten their privilege.

The remaining category of experience to discuss is *Growth*. The students and I have both grown throughout this class. Evidence of our growth was documented by data about what we had learned and how we had changed as a result of what we had learned. First, I will discuss how my students changed because of the class. Next, I will look at why some students considered themselves less likely to act against an injustice after completing the course. Finally, I will explore my personal growth.

As a researcher and teacher, I felt very proud when my students expressed how they had changed after participating in the study and taking the class for one semester. In some cases, students explained how their preconceived ideas of specific controversial economic and social issues had changed, which led to a deeper understanding. A new sense of agency arose among the students. In interviews and quick writes, some students even mentioned seeing themselves as *change agents*. Many others were able to imagine a better and more just world.

For instance, a student discussed how his prior understanding of discrimination had changed. The student further explained how the new understanding caused him to
become upset, which changed his feelings toward minorities, and led to a desire to help to change the situation. Other examples of perceiving themselves as potential change agents, included students discussing the need to become more involved in society and becoming more proactive after finishing the class.

To be able to imagine a more just world, the students first had to come to the realization that the world they lived in was, in fact, unjust. As mentioned, the class discussions helped to penetrate the students’ protective bubble and open their eyes to injustices – income disparities, unequal opportunities for education and job advancement. Once they had a more profound and realistic understanding of social justice, the students learned that injustice was something we as a society need to continually work on. As students became aware of current issues, they also realized that others in our society were as naïve as they had been prior to the class, e.g. mostly unaware of current social, economic, and political issues.

There was one area of my study that did not turn out as I had hoped. Although some students expressed an interest in seeing or making a change in society, and others suggested that they had become more proactive; there were some students who did not want to take, what I would consider to be, the next step. I had hoped that the class would inspire all of the students to want to join groups that sought change. However, this was not the case.

Several students stated that they were less likely to join a group working for change after the class than they were prior to the class. It may be that the students became frustrated and overwhelmed or even worried that they personally may one day
experience similar hardships (Seider, 2008 & 2009). The size and scope of the social justice issues may have been more than the students could comfortably grasp.

As one focus of the discussion of the growth category, I have described the various ways in which I feel I have grown personally and what I have learned from teaching the class and participating in the study. First, I completed the process of designing the class syllabus and obtaining approval to teach it from the Board of Education. Integrating my mathematics lessons with the sociology teacher’s lessons improved my ability to collaborate in planning and teaching an interdisciplinary class. I learned a great deal more about sociology by co-teaching the subject than I would have by just reading the literature on my own. The approval process took longer than I had expected, but the process was facilitated by the positive relationships I established with fellow school and district employees.

One positive aspect of the study was that I definitely learned more about my students in a class that incorporates social justice issues than would be possible in a typical mathematics class. Even though I thought I knew several of the students well prior to the class, our discussions revealed deeper levels of their personalities that had not been apparent in previous math classes or on the athletic fields. I learned that teaching a math curriculum that includes social justice topics allows the teacher to discover how high school students feel and what they think about discrimination and poverty, minorities, and preserving the environment. Teaching for social justice reveals the character, morals, and disposition of students in ways that pure mathematics classes do not.
The study also improved my teaching methods as well as my ability to teach this class the next time. By delivering mathematics in an interdisciplinary manner, I grew professionally and expanded my teaching skills. I now feel comfortable incorporating some of the lessons developed for the Social Justice Mathematics class into the regular mathematics classes that I teach. Because of the positive ways in which the students related to the inclusion of real-life issues, I will also look for additional ways to explore more of these topics whenever possible in all my classes.

This was the first research study I ever conducted. Therefore, I learned a great deal about the research process. I learned how to organize, code, and analyze data. I found out how difficult the writing component of research can be. I also experienced feelings of great relief and accomplishment to finally finish the project.

**Research Links to the Existing Literature**

My research findings reinforce some of the existing literature on similar topics reviewed in Chapter 2. However, my work also differs subtly from previously published research. I feel that my research adds to the conversation in ways that, more often than not, have less typically been addressed. In these subsequent two sections, I will first discuss the study’s similarities from the findings of other leading educators. Then, I will explain some of the subtle differences of my findings. Finally, I will discuss the contributions of my research to the field.

One of the primary ways my study reinforces the existing literature is that it demonstrates that mathematics can be one way to make students aware of the injustices in society. Similar to other leading scholars (Brooks and Thompson, 2005; Frankenstein,
1997; Gutstein, 2003; Leonard et al., 2010; McCoy, 2008), I believe that our curriculum should be expanded to include social justice issues. My study has revealed that the mathematics classroom is an ideal place to discuss some of these politically sensitive issues, similarly to other educators in the field (Cotton, 1999; Gutstein & Peterson, 2005; Oakes & Rogers, 2006).

As Ginsburg & Kamat (1995) point out, teaching is political in nature. For instance, my use of provocative sociological topics could be viewed as a political decision. My study reinforced the finding that education is political because of the type of curriculum I selected, as Hackenberg & Mewborn (2004) have reported. As the teacher and a participant in the study, I was following my moral obligation to prepare my students to participate in a democracy, in a manner in which Goodlad (1990) suggested. I chose to include global issues, such as discrimination and the economy, as opposed to local Pinewood issues so that the students could focus on life outside the “bubble.”

The real-life aspect of the class syllabus proved to be engaging. Teaching research reveals that students who are actively engaged want to learn more about the topics that they are studying. During this class, my students saw that the mathematics they were using resulted in significant insights into social and economic issues. The students acknowledged the importance of mastering mathematics concepts and came away with a greater appreciation for the subject. Ernest (2005) and Roman (2004) suggested that recognizing the beauty of mathematics and its unique contribution to civilization is an objective of teaching mathematics that is often overlooked or ignored.
The use of mathematics enabled my students to gain a deeper understanding of the complex issues involving social justice that we studied. My students were taught to “read the world using mathematics” just as Frankenstein (2005b), Gellert, et al. (2001), and Gutstein (2003) suggested. Through mathematics, students learned facts about the distribution of wealth, the Iraq War, gun violence, the minimum wage, and hunger in a manner similar to how Gutstein’s (2003) middle school students learned about racism based on housing data or how Frankenstein’s (2005b) adult students learned about the government’s fiscal priorities by examining the government’s military and domestic expenditures. All these examples demonstrate how mathematics is a resource that can gain insight into and help solve individual and societal problems in a way that Gellert, et al. (2001) suggested.

The students’ deeper understanding of mathematical concepts led them to reflect and question aspects of the unjust issues we studied. The study demonstrated how this class appeared to awaken the students’ critical consciousness. We studied topics such as racism, ethnicity, gender, and social class, connecting these topics to mathematics concepts so that my students would develop a critical consciousness in a manner that Sleeter (1997) described. Like Freire (1970 & 1998), my approach began with dialogue to stir the students’ critical consciousness and then led to thoughtful reflection of the situation, with the goal of wanting to take some type of action to remedy the problem.

Not only did the students gain a deeper understanding of the topics we studied, but the students also found that learning the mathematics concepts actually became easier when they were connected to an issue students felt was relevant. Several students
reported that the class had positively impacted their mathematics confidence level. These results reinforced the findings from other scholars regarding students’ perceptions of mathematics. Gutstein (2003) reported that his students gained mathematical power and recognized the importance of mathematics in their lives, which led to their changed orientation toward the subject. Frankenstein (1997) suggested that the working-class urban adults she worked with lacked confidence at the beginning. Her students were able to gain confidence in math and even became involved in organizing for social change.

As students gained confidence and used mathematics to learn more about a particular topic, some became inspired and wanted to see injustices in society addressed in other ways. My findings support the concept of praxis, whereby students thoughtfully reflect on their lessons and then decide to take action (Freire, 1970; Johnson & Morris, 2010; Tutak et al., 2011). Since our lessons involved different types of injustice, their agency to act was out of concern to remedy the injustice and improve their world.

One final way in which my findings support the existing literature is the reactions I received from my students when I disrupted their comfort zones. The students in the class were predominately upper-middle class Whites who had admitted to having had a sheltered upbringing. I designed the class in an attempt to penetrate their self-identified bubble. Similar to other scholars, (Bohmer & Briggs, 1991; Haddad & Lieberman, 2002; Seider, 2008 & 2009) I observed a wide range of emotions in response to discussions of injustice from my students. Such reactions included resistance, disbelief, guilt, frustration, and a sense of being overwhelmed by the extent and scope of the specific economic and social problems we were discussing. This disruption also caused some of
the students to begin to struggle with the concept of White Privilege (McIntosh, 1990) and their own Racial Identity (Helms, 2007; Marshall, 2002).

**Contribution to the Literature**

Obviously, there were several subtle distinctions between my study and some of the previously published research. These differences occurred primarily in two areas: the specific populations of the studies and the type of class in which the social justice issues were presented. The subjects in the literature studies I found either did not match my primarily White upper-middle class students in high school or the social justice issues were not incorporated into a mathematics class.

For example, Frankenstein’s (1990 & 2005a) research focused on working class urban adults, while Gutstein’s (2003) population comprised urban Latinos in middle school. Other scholars (Moses, 2001; Oakes & Rogers, 2006) concentrated on low income and inner city ethnic minority students. In all of these examples, the students had a greater stake in acting to remedy the injustice(s). These students were learning about injustices that affected them directly and personally. My students, on the other hand, would not necessarily see their own lives improved by addressing or acting on these injustices. My challenge was to inspire them to want to work for change, to strive for equality, and to improve society because it was the ethical thing to do.

The closest example I found that involved teaching mathematics and social justice was not an actual research study, but merely a teacher describing a favorite lesson in her AP Calculus class. In this example, Staples (2005) taught at a small private prestigious boarding school. Although some families from Pinewood could have easily sent their
children to this type of school, the experience of studying at a large public school is much different from that of a small private school. Larger schools can be impersonal; they have less of a community feel, and some students can end up feeling lost.

In another study in which the population did seem very similar, Seider (2008, 2009) taught a class entitled “Literature and Justice.” His population was upper-middle class suburban high school seniors, very much like my class, except he was teaching literature. I found other scholars (Bohmer & Briggs, 1991; Gorlewski, 2007; Haddad & Lieberman, 2002) who taught social justice to the dominant culture, but they also did not incorporate mathematics.

Teaching about social justice issues seems to be a more natural fit with social studies or literature classes. Social studies classes focus on issues such as civil rights, economics, racism, discrimination, and environmental damage anyway; it is part of their curriculum. Similarly in literature, the teacher can choose books that relate to these topics and discuss them in class. In mathematics, the connection is not always that simple. Not only do you need to know a great deal about the social justice issue, but also you need to know the mathematics concepts well enough to figure out what applications can be used to interpret individual or societal problems.

There is a very small body of literature that studies the elite end of the population. Students in economically privileged settings typically do well on standardized tests and are not targets for educational change. My study is located within this small but growing area of study. This is an important population because the power elites control much of the resources. Having a positive influence on their outlook can have a great impact.
There is one major way in which my study adds to the conversation. I feel my main contribution lies in delineating the categories of student experiences I identified and described above. Although some aspects of each category draw on or support previously published work, my categories are unique.

A practitioner attempting to teach this type of class in a similar setting can anticipate their students experiencing states of *Awareness, Struggle, Realization,* and *Growth.* In the *Awareness* category, the students’ eyes become more open to the world around them, and they are both shocked and surprised at what they learned. As the students’ comfort zones are disrupted they begin to struggle intellectually. For instance, they have difficulty dealing with issues of White Privilege and their own Racial Identity. Students can also be expected to experience *Realization.* In this category, as students realize the connection between mathematics and social justice, they find the math is easier and they gain confidence in mastering the subject. They also learn more about their world and develop a greater awareness of minority issues.

An educator teaching this type of class can also expect for his students and himself to grow or mature from the experience. The *Growth* category was manifested in several ways. The students’ growth was observed based on the way they changed from their participation in the class. They gained new knowledge, developed an expanded worldview, and gained a deeper understanding of existing political concepts. My own growth was evident by what I learned in the process of teaching and designing the class, the new and deeper understandings I have of my students, and by the improvement of my teaching and research practices.
Significance of the Study

“I am a teacher who stands up for what is right against what is indecent, who is in favor of freedom against authoritarianism, who is a supporter of authority against freedom with no limits, and who is a defender of democracy against the dictatorship of right or left. I am a teacher who favors the permanent struggle against every form of bigotry and against the economic domination of individuals and social classes. I am a teacher who rejects the present system of capitalism, responsible for the aberration of misery in the midst of plenty” (Freire, 1998, p. 94).

I believe that I am the type of teacher that Freire describes. If I am, indeed that type of teacher, I also believe it is my moral responsibility to expose my students to the social injustices in their lives. It is especially important, because as Parker (2003) pointed out above, students of privilege are the ones that hold the reins of power. Engaging students in critical pedagogy will give them the opportunity to raise their consciousness in confronting their own dominant culture. In the mathematics classroom, this means designing lessons that engage the students in discussing real-life issues and inspiring them to take action.

My study is significant because it adds to the critical mathematics literature regarding how it could impact the dominant culture. It was my desire to create critical mathematics lessons, which raise the level of these students’ consciousness and lead to critical action. The lessons I used in my Social Justice Mathematics class provided my students with the opportunity to think critically about the world. By exposing them to issues many had not been aware of previously, they were able to see what action is needed to make society a more just place.
Limitations

The study suffers from several limitations. Because the data are specific to one school, the results are not generalizable to other settings. The site is very homogeneous with primarily White, upper-middle class, students who live in suburbia. I provide an extensive description of the site, including the students, the classroom, the high school, the district, and the town itself. Therefore, the reader should be able to determine if the results will transfer to his or her own setting.

There are limitations based on the fact that the class was integrated with an Honors Sociology course. Therefore, to get the approval to teach the social justice mathematics curriculum that I developed, I had to agree to co-teach the class. Some of the sociology topics provided the students with necessary knowledge about sociology, but did not lend themselves to my curriculum. In other words, I was not able to limit the instruction to strictly mathematical and social justice topics.

There was also a time limitation due to the fact that I was able to teach the class for only one semester. Again, this was based on my agreement with the Pinewood administration to approve the class. Although a one-semester class is considered prolonged engagement, ideally, I would have liked for the class to continue for one full year. A full-year class would have allowed me to further develop and extend the curriculum.

Implications

Despite the limitations discussed above, the study does have several important implications for teaching and research. First, my own teaching practices have improved.
In the process of reflecting on each lesson, I was able to identify elements of lessons that worked well with students and elements that did not. In this way I was able to fine-tune many of my lessons for future use. My improved teaching practices will definitely benefit my future students.

There were implications for the field of mathematics education. Although not unanimous, there was an overwhelming consensus implied from the data about how the use of real-life situations in mathematics affected the students’ attitudes toward the subject. Using mathematics in context enabled the students to better visualize the numbers in the problem. The numbers, in turn, made the problem more concrete for the students. The more the students become interested in the subject matter of a problem, the greater is their desire to try to solve the problem. Students enjoyed working with meaningful problems that revealed a new insight, and whose answers had significance. Having students understand how mathematics is used in everyday situations demonstrated its usefulness and increased the students’ appreciation of the subject as a tool.

Incorporating mathematics in an Honors Sociology class also has implications for teaching social justice and critical pedagogy. Nowhere did I find a class that was designed exactly like mine. Designing an interdisciplinary class is another way for researchers to deliver this type of curriculum. It is also important to recognize that bringing social justice and critical pedagogy to the dominant culture can inspire these students to want to act to improve their world.
The inclusion of the focus group interviews not only allowed me to question and probe the students about the class, the assignments, and our discussions, but also provided them with the opportunity to question me about the study. The students were able to view me as their teacher, as a co-participant in the study, as a doctoral student, and as a researcher. The students were genuinely interested in my work and asked many questions. I was happy to model for them what it is like to be a lifelong learner.

**Recommendations for Future Research**

In the process of gathering and analyzing the data from the study, I uncovered two related, but unexpected, topics that I think deserve additional research in the future. The first area was discovered in the pre-interview. Four out of the five students talked about how a bad experience with a previous teacher had affected both their ability and confidence in mathematics. It would be interesting to explore in greater detail how prior teachers affect students’ self-images. What type of experiences have students had in the past? How long ago did they have the experience? Do students recognize the effects that the experience still has on them? Is there anything that teachers or administrators can do to address these students’ needs?

The next issue arose during the focus group interview as we were discussing minorities. It upset me to hear the students speak about how they perceive and treat Asians. Is this an isolated case due to the ethnic make-up of the district? Is it merely isolated to the students in my class at this school? Are Asians perceived and treated this way in other demographic settings? Why do some of the students at Pinewood feel it is
acceptable to treat Asians poorly, but not Blacks? Is it perhaps due to the fact that students from the dominant culture view the Asian students as competition?

In my study, I tried to determine how my students were affected by taking the social justice mathematics class. The focus group interviews were conducted about five months after the course ended to ascertain if there were any lasting impressions from the class. The study could be enhanced in the future by following up with the students through college and beyond. It would be interesting to find out if the class influenced the students in college or into adulthood. Did the class influence their choice of courses in college, their college major, or their career path?

At the time I designed the study, I did not consider having students actually take action to confront injustices. Nancy and I continually spoke about different activities students could participate in, such as boycotts, protests, or writing letters to politicians. However, we never actually did any of them. We did design one lesson that required the students to design a brochure to be used at a protest rally in Washington. I think it would be interesting to see how the students would react to actually participating in some community engagement project that involved social justice and mathematics.

In their article about these types of projects, Fehrman & Schutz (2011) discuss some of the obstacles students and teachers may face while actually conducting these projects. They refer to a Catch-22 situation in dealing with the realities of power while designing social action programs. On the one hand, you can eliminate barriers to success, but that misleads students about what they actually may face in dealing with power. On the other hand, you can bring students face-to-face with these barriers, which may reduce
their likelihood of engaging in such efforts in the future. Any future research involving social justice, mathematics, and community engagement should adhere to this pragmatic approach. They suggest designing doable projects that bring students into contact with power in some minimal, but interesting way.

It would also be interesting to consider a longer engagement for any future research. As mentioned above, my time was limited due to the agreement with the administration. If the study could be expanded, there are a number of areas where the curriculum could lead. Whether following the students through college or participating in some community engagement project, the length of the study could be extended.

Closing Remarks

Due to the political nature of teaching, mathematics teachers have choices to make. They can empower their students to be critical by exposing them to issues of injustice that they would not generally discuss in a typical mathematics classroom. Critical students grow up to become better citizens who participate in a democracy and are more likely to question the status quo. Active citizenship and participation leads to agency and for “privileged” students, a means for recognizing the advantages in their lives. Students, whether from marginalized groups or the dominant culture, can gain the agency to act and work toward a more just society.

How wonderful it would be if, through the process of learning mathematics, students were inspired to make the world a better place to live. As mentioned, math problems should be presented in a context that highlights the injustices in society. The students would then recognize the usefulness of employing mathematics concepts to
understand such injustices. They would also become aware of specific economic or social situations in the world that they otherwise might not have known about. Finally, class discussions and activities will engender the desire to act to find solutions to these unjust situations and improve the world.

There is evidence that the study has shown that a curriculum designed for Social Justice Mathematics, can inspire students to grow and hopefully to act in the future. Students of the dominant culture need to work alongside students from marginalized cultures to help improve everyone’s lives. A final word from Freire (1970) follows:

If what characterizes the oppressed is their subordination to the consciousness of the master, true solidarity with the oppressed means fighting at their side to transform the objective reality which has made them these ‘beings for another’. The oppressor is solidary with the oppressed only when he stops regarding the oppressed as an abstract category and sees them as persons who have been unjustly dealt with, deprived of their voice, cheated in the sale of their labor – when he stops making pious, sentimental and individualistic gestures and risks an act of love. True solidarity is found only in the plentitude of this act of love, in its existentiality, in its praxis. To affirm that men and women are persons and as persons should be free and yet to do nothing tangible to make this affirmation a reality, is a farce. (p. 49)
References


New Jersey Core Curriculum Content Standards (2002). New Jersey Department of Education.


APPENDIX A (CONSENT FORM)

Study’s Title: Social Justice Mathematics

Why is this study being done? The purpose of the study is to observe how students react to a class that combines mathematics with real life social justice issues.

What will happen while you are in the study? You will co-teach the class with me. I will take notes on my observations of the class.

Time: The study will last for one semester.

Risks: The risks are no greater than those in any other mathematics class.

Benefits: There are no benefits to you being in this study.

Who will know that you are in this study? You will not be linked to any presentations. We will keep who you are confidential according to the law. All references to classroom discussions will use pseudonyms.

Do you have to be in the study? You do not have to be in this study. You are a volunteer! It is okay if you want to stop at any time and not be in the study. You do not have to answer any questions that you do not want to answer. Nothing will happen to you.

Do you have any questions about this study? If you have any questions contact Rick McNamee at Ridgewood High School by phone at (201) 670-2643 or by email at rmcnamee@ridgewood.k12.nj.us.

Do you have any questions about your rights? If you have any questions about your rights phone or email IRB Chair, Joan Besing (besingj@mail.montclair.edu, 973-655-3182) or the IRB Administrator, Fitzgerald Edwards (edwardsf@mail.montclair.edu, 973-655-7781).
It is okay to use my data in other studies:
Please initial: ______ Yes ______ No

I would like to get a summary of this study:
Please initial: ______ Yes ______ No

The copy of this consent form is for you to keep.

If you choose to be in this study, please fill in your lines below.

<table>
<thead>
<tr>
<th>Print your name here</th>
<th>Sign your name here</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of Principal Investigator</td>
<td>Signature</td>
<td>Date</td>
</tr>
<tr>
<td>Name of Faculty Sponsor</td>
<td>Signature</td>
<td>Date</td>
</tr>
</tbody>
</table>
Please read below with care. You can ask questions at any time, now or later. You can talk to other people before you fill in this form.

**Study’s Title:** Social Justice Mathematics

**Why is this study being done?** The purpose of the study is to observe how students react to a class that combines mathematics with real life social justice issues.

**What will happen while your child or dependent is in the study?** Students will be asked to be interviewed before the class begins and after the class ends. Those interviews will be audiotaped. During the first and last class, students will be asked to fill out a questionnaire. Throughout the remaining classes I will be making notes about what I observe in the class.

**Time:** The study will last for one semester.

**Risks:** The risks are no greater than those in any other mathematics class.

**Benefits:** Your child or dependent may benefit from this study by gaining more confidence in and a greater appreciation for mathematics.

**Who will know that your child or dependent is in this study?** Your child or dependent will not be linked to any presentations. We will keep who your child or dependent is confidential. All interviews and references to classroom discussions will use pseudonyms.

**Does your child or dependent have to be in the study?** Your child or dependent does not have to be in this study. She/he is a volunteer! It is okay if she/he wants to stop at any time and not be in the study. She/he does not have to answer any questions that she/he does not want to answer. Nothing will happen to your child or dependent. Their grade for the course will not be affected.

**Do you have any questions about this study?** If you have any questions contact Rick McNamee at Ridgewood High School by phone at (201) 670-2643 or by email at rmcnamee@ridgewood.k12.nj.us.
**Do you have any questions about your rights?** If you have any questions about your rights phone or email IRB Chair, Joan Besing (besingj@mail.montclair.edu, 973-655-3182) or the IRB Administrator, Fitzgerald Edwards (edwardsf@mail.montclair.edu, 973-655-7781).

It is okay to use her/his data in other studies:
Please initial: ______ Yes ______ No

I would like to get a summary of this study:
Please initial: ______ Yes ______ No

It is okay to audiotape him/her while in this study:
Please initial: ______ Yes ______ No

It is not okay to audiotape him/her while in this study:
Please initial: ______ Yea ______ No

The copy of this consent form is for you to keep.

If you choose to have your child or dependent in this study, please fill in the lines below.

<table>
<thead>
<tr>
<th>Name of Parent/Guardian</th>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of Parent/Guardian</td>
<td>Signature</td>
<td>Date</td>
</tr>
</tbody>
</table>

If you choose to be in this study, please fill in your lines below.

<table>
<thead>
<tr>
<th>Print your name here</th>
<th>Sign your name here</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of Principal Investigator</td>
<td>Signature</td>
<td>Date</td>
</tr>
</tbody>
</table>

(if applicable) Name of Faculty Sponsor | Signature | Date
Who am I?  I am Rick McNamee. I am a mathematics teacher at RHS. I am also a doctoral student at Montclair State University.

Why is this study being done?  I want to observe how students react to a class that combines mathematics with real life social justice issues.

What will happen while you are in the study?  Students will be asked to be interviewed before the class begins and after the class ends. Those interviews will be audiotaped. During the first and last class, students will be asked to fill out a questionnaire. Throughout the remaining classes I will be making notes about what I observe in the class. (The audiotapes will be used for transcribing the interviews.)

Time:  The study will last for one semester.

Risks:  The risks are no greater than those in any other mathematics class.

Benefits:  You may benefit from this study by gaining more confidence in and a greater appreciation for mathematics.

Who will know that you might be in this study?  You and your parents will know that you are in the study. I will know that you are here, but we won’t tell anyone else.

Do you have to be in this study?  You do not have to be in this study. We won’t get mad with you if you say no. It is okay if you change your mind at any time and leave the study. You do not have to answer any questions you do not want to answer. Nothing will happen to you. Your grade for the course will not be affected.

Do you have any questions about this study?  If you have any questions contact Rick McNamee at Ridgewood High School by phone at (201) 670-2643 or by email at rmcnamee@ridgewood.k12.nj.us.
Do you have any questions about your rights? If you have any questions about your rights phone or email IRB Chair, Joan Besing (besingj@mail.montclair.edu, 973-655-3182) or the IRB Administrator, Fitzgerald Edwards (edwardsf@mail.montclair.edu, 973-655-7781).

It is okay to use my data in other studies:
Please initial: ______ Yes ______ No

I would like to get a summary of this study:
Please initial: ______ Yes ______ No

It is okay to audiotape me while in this study:
Please initial: ______ Yes ______ No

It is not okay to audiotape me while in this study:
Please initial: ______ Yes ______ No

<table>
<thead>
<tr>
<th>Name of Research Participant</th>
<th>Signature</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td>Name of Witness</td>
<td>Signature</td>
<td>Date</td>
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<tr>
<td>Name of Principal Investigator</td>
<td>Signature</td>
<td>Date</td>
</tr>
<tr>
<td>(if applicable) Name of Faculty Sponsor</td>
<td>Signature</td>
<td>Date</td>
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</tbody>
</table>
1) Enter the data for your region into your graphing calculator.

2) Make a quick approximate sketch of your graph on another sheet of paper.

3) Describe in as much detail as possible the trend of your graph.

4) Find the rate of change from 1976 to the year your region peaked.

5) Find the rate of change from the peak year to 2004.

6) Find the mean, median, and mode.

7) Find the 5 number summary.

8) Test for outliers (show work).
In January 2005 various observers had put the cost of the war in Iraq to that point at about $155 billion. They estimated that the cost would continue to rise by about $5.5 billion per month.

Part 1:

Let $t = 0$ represent January 2005 and sketch a graph that shows the total cost, $c$ in billions of dollars for the war over the next 48 month period. Write the equation for that graph. Use the graph or the equation and find the total cost of the war by January 2008 and January 2009.

Part 2:

A nonprofit group called the Borgen Project has estimated what it would cost to end certain global problems. Here are a few of their estimates for the annual spending needed, based on a projection of 10 years of spending at these levels:

- Provide shelter for everyone $\$21$ billion
- Provide clean, safe water $10$ billion
- Provide health care and AIDS control $21$ billion
- Stop deforestation $7$ billion

Compare the total cost of the war in Iraq by January 2009 with the estimates of how much it would cost to solve some major global issue. You may choose an issue from the list or research and find an issue that you feel is important. If it was up to you and you chose to spend the money differently, what global issue would you like to see the money used for. If you would like to continue to spend the money on the military, explain some ways that the money can be used to better serve the US military, or US interests, or the people of Iraq.
You are planning to go to an anti-war rally in Washington. Create a brochure to bring with you that will include all the answers to Part 1 and Part 2 of this assignment. The brochure should also include the graph, pictures, and information (data) about the issue you choose to support or the other way you would spend the money. Some suggested web sites to visit are:  www.borgenproject.org, www.nationalpriorities.org, www.earthjustice.org, www.worldhungeryear.org, and www.stopglobalwarming.org.
This lesson looks at the unequal distribution of wealth in the United States.

Wealth is different from income. Wealth is the dollar value of assets, minus any debts or liabilities, held by a household at any one time. Income, on the other hand, refers to the amount of money earned over a period of time, usually one year.

Complete the following table, based on a US population of 300,000,000 and total US wealth of $42.3892 trillion (42,389,200,000,000).

<table>
<thead>
<tr>
<th>% of US Population</th>
<th>% of Wealth Owned</th>
<th>Number of People</th>
<th>Total Amount of Wealth</th>
<th>Average Wealth per Person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top 1%</td>
<td>32.7%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Next 9%</td>
<td>37.1%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Next 40%</td>
<td>27.4%</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Bottom 50%</td>
<td>2.8%</td>
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</table>
Questions: Answer on back.

1) Do you feel this distribution is fair? Why or Why not?

2) Why do you think wealth is distributed in this way?

3) What might be done to distribute the wealth more equally?

Assignment: Imagine that you are one of 100 people who will be settling on an uninhabited island. There is $100,000 available to be split between the 100 inhabitants. Create two tables: one with the similar breakdown of percentages in the completed table and one that you consider more equitable. (4) Explain how you arrived at the second table and (5) why you distributed the money the way you did. (What criteria did you use?)

Geometry Extension: Using the compass and protractor provided, make a pie graph that shows the distribution of wealth in the United States based on your originally completed table.

Table

<table>
<thead>
<tr>
<th>% of Island Population</th>
<th>% of Wealth Owned</th>
<th>Number of People</th>
<th>Total Amount of Wealth</th>
<th>Average Wealth per Person</th>
</tr>
</thead>
<tbody>
<tr>
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<td>32.7%</td>
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<td>27.4%</td>
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<td>Bottom 50%</td>
<td>2.8%</td>
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Table

<table>
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<tr>
<th>% of US Population</th>
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<th>Number of People</th>
<th>Total Amount of Wealth</th>
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Answers to questions.

1. _________________________________________________________________________
_________________________________________________________________________

2. _________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________

3. _________________________________________________________________________

_________________________________________________________________________

_________________________________________________________________________
1) Using graph paper and a ruler make two lines of best fit from the data in the table. One line will show the minimum wage since 1960, the other line will show the minimum wage adjusted for inflation in 2005 dollars. (Make sure to use different colors for each graph.)

Equation for minimum wage

Equation for minimum wage adjusted for inflation

2) Based on the data what does it look like has been happening to the minimum wage since 1960?

3) What does it mean to have data “adjusted for inflation”? 
4) Using both equations from your lines of best fit, predict what the minimum wage will be in 2010 and in 2020.

2010 minimum wage                                    _____________________________
2010 minimum wage adjusted for inflation ______________________________
2020 minimum wage                                   ______________________________
2020 minimum wage adjusted for inflation ______________________________

<table>
<thead>
<tr>
<th>Year</th>
<th>Minimum Wage</th>
<th>Minimum Wage (2005 Dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>1.00</td>
<td>6.58</td>
</tr>
<tr>
<td>1965</td>
<td>1.25</td>
<td>7.76</td>
</tr>
<tr>
<td>1970</td>
<td>1.60</td>
<td>8.04</td>
</tr>
<tr>
<td>1975</td>
<td>2.10</td>
<td>7.64</td>
</tr>
<tr>
<td>1980</td>
<td>3.10</td>
<td>7.35</td>
</tr>
<tr>
<td>1985</td>
<td>3.35</td>
<td>6.08</td>
</tr>
<tr>
<td>1990</td>
<td>3.80</td>
<td>5.68</td>
</tr>
<tr>
<td>1995</td>
<td>4.25</td>
<td>5.45</td>
</tr>
<tr>
<td>2000</td>
<td>5.15</td>
<td>5.84</td>
</tr>
<tr>
<td>2005</td>
<td>5.15</td>
<td>5.15</td>
</tr>
</tbody>
</table>

Source: [www.epinet.org](http://www.epinet.org), [http://oregonstate.edu/dept/pol_sci/fac/sahr/sahr.htm](http://oregonstate.edu/dept/pol_sci/fac/sahr/sahr.htm)
A Linear Programming Problem: Hunger

Background:
A food bank in New Jersey has been hired to provide free breakfast bars for needy school children throughout the state. They hired a nutritionist to devise a formula for a base for these breakfast bars.

The problem:
Each breakfast bar must contain at least 12g of protein and 8g of carbohydrates. A tablespoon of protein powder made from soybeans has 5g of protein and 2g of carbohydrates. A tablespoon of protein powder made from milk solids has 2g of protein and 4g of carbohydrates. Soybean protein powder costs $0.70 per tablespoon, whereas milk protein powder cost $0.30 per tablespoon. Find the number of tablespoons for each type of protein powder that should be used as the base for this breakfast bar to meet the given requirements and minimize the cost. What is the minimum cost?

Research:
Investigate hunger in the United States. What percentage and how many children in the US go to school hungry? Of these children what percentage and how many are Black, White, or Hispanic? How have these percentages changed since 1980? What role does the government take in American schools to combat hunger? Could and should the government take further action?
**PowerPoint:**

Your PowerPoint presentation will include slides for each of the following:

- **Background** – Discussion of problem
- **Let statements and Objective Quantity**
- **Constraints**
- **Graph (Can be done on graph paper)**
- **Calculations for optimization**
- **Investigation of research (5 to 10 slides)**
  - General background of topic
  - Statistics with references
  - Graphs
  - Pictures
APPENDIX E

Anonymous Questionnaire
(Beginning of class)

1) How would you describe yourself as a math student?___________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

2) What do you like about mathematics?_______________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

3) What don’t you like about mathematics?____________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

4) Do you understand math better when it is connected to real-life problems? Why or why not?________________________________________________________________
________________________________________________________________________
________________________________________________________________________

5) How is mathematics used in everyday life?__________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

6) Explain what you think social justice means._________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

7) Describe yourself in terms of how likely you would be to join a group that was working to stop discrimination, poverty, hunger, war, or environmental damage._______
________________________________________________________________________
________________________________________________________________________
8) What informs your decision in question 7 to participate or not?
________________________________________________________________________
________________________________________________________________________

Anonymous Questionnaire
(End of class)

1) How would you describe yourself as a math student?___________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

2) What do you like about mathematics?_______________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

3) What don’t you like about mathematics?____________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

4) Do you understand math better when it is connected to real-life problems? Why or
why not?________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

5) How is mathematics used in everyday life?__________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

6) Explain what you think social justice means.________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

7) Describe yourself in terms of how likely you would be to join a group that was
working to stop discrimination, poverty, hunger, war, or environmental damage._______
8) What informs your decision in question 7 to participate or not?

9) How was this class different from other mathematics classes you have taken in the past?

10) In what ways has your views of mathematics changed since taking the class?

11) In what ways has your understanding of social justice changed since taking the class?

12) What was your favorite assignment and why?
APPENDIX F

Interview with Vanessa (A) on July 31, 2008 at RHS.

I – Ok Vanessa thanks for meeting with me and taking time out of you summer schedule to answer some questions. As you know this is a totally anonymous report I will be writing so I want you to feel comfortable answering any question. If you are not comfortable with any question, you can just say that you don’t want to answer. (Thank you)

A – OK.

I – Even if after we finish there are things that you want to retract you can tell me and I will take them out. My first question that I would like to ask is, how would you describe yourself as a math student? (Question)

A – Um… that is interesting. I always work hard, but it always takes me a while. Never get it the first time. I hate mental math. (Math – negative)

I – OK.

A – I usually understand the whole concept and why we are doing things, but the actual going about doing things, that I (inaudible). So I guess I am not a mental math person. (Math – negative)

I – OK

A – But I understand it on paper. (Math – understand)

I – OK. Is there anything you like about math? (Question)
A – Mmm… what do I like about math? I like that there is always an answer. Well in algebra, actually with most things, when you finally get the answer it will all make sense. You can plug it back in. I just like when it makes sense. *(Math – positive)*

I – Umhm.

A – I hate when it doesn’t (laughs). *(Math – negative)*

I – (laughing) All right. Are there more things you don’t like about math? Or what don’t you like about math? *(Question)*

A – Um… How you make tiny little errors. I hate that. *(Math – negative)*

I – OK.

A – OK. You can’t really like go back. Well you could go back, but you are just wasting time. What else… I hate mental math. *(Math – negative)*

I – So like times tables, adding and subtracting integers, or working with fractions? *(Question)*

A – I hate all that stuff. Even like very simple stuff, I have to think about for a minute. I guess like I know it, but I just doubt myself. I always know it, but I just doubt myself. *(Math – negative)*

I – Why do you think you doubt yourself? *(Question)*

A – I don’t know.

I – Especially if you say you always know it.

A – I don’t know. Seriously, I was traumatized when I was little. My second grade teacher, she stood… made me come in early to class. Told me I was the worst math student. I did not like her. *(Prior teacher)*
I – Really?  (Question)

A – Miss xxxx  (Prior teacher)

I – I do not know her. In Ridgewood?  (Prior teacher)

A – Traumatized. Yeah, at Willard. I don’t know why.  (Prior teacher)

I – So you think it really goes back to second grade?  (Question)

A – No. Well… kind of. (laughs).  (Prior teacher)

I – Well, you are going to be a senior in September and you remember the experience.  
(Prior teacher)

A – Um… Yeah, that is true. That is true, I don’t know. I always just like… English,  
like writing, like that comes naturally. But I always hesitated in math. Actually, yeah I  
guess it has been since I was little.  (Prior teacher)

I – Well, she was probably not only your math teacher in second grade. (Prior teacher)

A – She was everything else. Hmm hmm.  (Prior teacher)

I – So she did not have that effect on you for English.  (Question)

A – No. That is true. Well I don’t really… Well oh, actually that is kinda true. We were  
learning verbs. And I didn’t know what a verb was and I cheated off a kid next to me.  
And he didn’t know what a verb was either (laughs). So we both did it wrong. Um, also  
I remember the next year, we had a multiplication master. And you got a sticker every  
time you got it. And mine was like empty. Well actually I got it the last day of school.  
(laughs).  (Prior teacher)

I – (Laughing). Oh, well good.  (Prior teacher)
A – I just stood and I waited. I don’t know. That’s true. I don’t know why she did not affect English the same way. (Prior teacher)

I – Is there anything else that stands out from her. You said she traumatized you. (Prior teacher)

A – Oh, yeah. Um. Well R. Jxxxx was in my class. You know the Jxxx’s. And he had glasses. So I pretended I needed glasses because I thought that made you look smart. She made fun of me because I could not tie my shoes. I couldn’t ride a bike. (Prior teacher)

I – So how about the math part. How did she traumatize you? (Prior teacher)

A – Well just because I had to… she like announced… (Prior teacher)

I – Because you didn’t know your math facts? (Prior teacher)

A – Yeah, actually I remember she said, I was the 19th worse student at math. And there were 19 students in the class. She would have me come in every morning and practice. (Prior teacher)

I – She said that to the whole class? (Prior teacher)

A – Yeah. I would have to explain to the other kids why I had to come in early in the morning. And she would have me look through flash cards. See, like that I would always hate. Even stuff like that was easy… like okay 2 + 2 is? And I’m like… And even though I knew it, I would be nervous to say it. (Prior teacher)

I – Hmm. Hmm.

A – So I would hate when people would just read it to me. I’m like mmmmm… I don’t like that. (laughs) (Prior teacher)
I – (Laughing) All right. When you are in math class are you comfortable in math
classes when you got to the high school? (Question)

A – Hmm. Hmm. Well I always had you as a teacher. (Prior teacher)

I – Well not in Geometry. (Prior teacher)

A – Well I really liked my geometry teacher. I think in math I actually try harder than I
do in other classes. Just because I know I have to. Yeah, I have always been comfortable
in my classes. Well kinda comfortable. (Math – positive)

I – How about your confidence? You mentioned before… What is your confidence? Do
you have a confidence… Are you confident when you sit down to take a test, for
example, in math? (Question)

A – Mmm… If I… mmm I’m not sure. I know if you give me something and it’s no
calculator, I have no…I mean I could totally know it, but I have no confidence and I
know I don’t do well. Because I am a big believer, if you have confidence you can do it.
(Math – confidence)

I – Hmm. Hmm.

A – Um… That depends. If I know my stuff, if I had my tutors, if I went to you or
another teacher for extra help after school, then it’s different. But usually I get freaked
out if it’s a math test. (Math – confidence)

I – Okay.

A – Pretty much.

I – Are you happy with the grades you get in math? (Question)
A – Yeah. Yes, I am. I pretty much get straight B’s. I wish I did better, but it’s like a major struggle to get the B’s so it’s fine. (Math)

I – And you work hard to get it. (Math)

A – Yeah. (Math)

I – So you can feel good about it. (Math)

A – Yeah… right. (Math)

I – Because a B is good. (Math)

A – Yeah. (Math)

I – How much would you study for a math test? (Question)

A – See… um… I’m not sure because usually I think of studying, like being with my tutor…or if I go after school… um… I’m not sure. It depends like if I’m…like right before a test I would go to see a tutor for an hour or so. But I’m… I can’t really… (Math)

I – Do you study on your own ever? (Question)

A – Um… I’ll go and I’ll do the practice problems, but sometimes it’s… I need to see the work. I can’t just be given an answer, so that’s always hard. So pretty much I just study with tutors. (Math)

I – Okay. How about homework. How much time do you spend on homework? (Question)

A – Well it depends. Like every year it’s been more. But…um… (Math)

I – Geometry was more homework than Algebra I? (Question)
A – I am trying to think. Well, no. Every year I have definitely gotten more and more. I don’t really remember the amount I got last year. But I definitely spend a lot of time on my math homework. (Math)

I – Okay. I want you to think about math classes you have been in. Has any particular approach helped you learn math? When you are in the class, like what the teacher used. (Question)

A – I am trying to think…Any sort of… what do they call it… what’s it called systems…um… where it’s like Mr. Mac ate something and those first letters meant something… what’s it called… (Math)

I – Oh yeah… (Math)

A - Mnemonic devices! (Math)

I – Yes. (Math)

A – Any sort of mnemonic devices, those always click… PEMDAS even that sort of stuff. (Math)

I – Hmm. Hmm. (Math)

A – Um… I am trying to think of what else. Everything, I need to have everything drawn out for me. Like it needs to be in front of my face. I can’t have anything said to me. Like Mrs. Txxx was my tutor in middle school, she would literally draw me pictures to understand. (Math)

I – So you are a visual learner. (Math)

A – Yeah, it has to be visual. Like if a teacher explains something to me um… just explained it verbally. Nothing. My SAT tutor, when I first started with him, he did that
all the time. Or he would try to show me… like he would just do something and show me the answer. And I didn’t get that, I need to go step by step. (Math)

I – Okay. Um… do you know what manipulatives are? Did you ever use them in middle school? Manipulatives are things that you can touch and use your hands with.

(Question)

A – Hmm. Hmmm. (Math)

I – Like in 6th, 7th, or 8th grade math a lot of times you use manipulatives. Different types of peg boards, algebra tiles, fraction bars, things like that. Did you guys ever use things like that? (Question)

A – I don’t think so. (Math)

I – Nothing hands on? (Math)

A – No I don’t think so. (Math)

I – Okay. Um… How about, do you understand math better if it is connected to some real-life problems. Has that ever… (Question)

A – Yeah, like word problems like sometimes I like… actually I’m not sure. Sometimes, some things can go a little over my head. But if some things are applied to real-life that I am more interested. And then I can think of them that way instead of seeing numbers.

(Math / Context)

I – Hmm. Hmm. (Math / Context)

A – But if it’s like a word problem then sometimes it just like hard to mentally visualize it. So I’m not too sure. (Math / Context)
I – But maybe if the real-life context you could visualize it since you are a visual learner… (Math / Context)

A – Mmm. (Math / Context)

I – Or do you actually have to see the picture? (Math / Context)

A – I am trying to think… (Math / Context)

I – Is it harder for you to visualize it in your mind? (Question)

A – I’m thinking about if you are talking about like surface area of a house or something. I would be… I would have to draw it. (Math / Context)

I – Okay. (Math / Context)

A – Like on my SAT’s there are drawings all over. (Math / Context)

I – And that’s good though. (Math / Context)

A – Yeah. I could never think about. (Math / Context)

I – All right. How do you think math is used in everyday life? (Question)

A – Well… Well… I think that it’s like only basic math is used in everyday life. I’m sure like if you go to a specific field that it is. But I think that it is more of besides like fractions or something… it’s more like simple. Very simple math that is used. Like how many apples should I buy in the store? Like simple things like that. (Math / Context)

I – How about in your life? Do you see any place where math is used in your life? (Question)

A – You are going to make fun of me… but in lacrosse. I am the stat girl. (Math / Context)

I – Oh yeah, that’s a good example. (Math / Context)
A – I have to do a lot of that. I am trying to think. Um… in math class things like that…
I have to count my little kids so none of them drown. Things like that, but I have never
had to really… besides school oriented and lacrosse I mean everything else is really
simple. (Math / Context)

I – How about you mentioned, in specific jobs, what type of work do you think math is
used in? (Question)

A – What do you mean like… (Question)

I – Besides like a math teacher… (Question)

A – Right. I don’t know like a… um… my dad is like a lawyer, but with insurance and
things like that and taxes… (Math / Context)

I – Hmm. Hmm. (Math / Context)

A – Um… well actually I have to deal with math now, because I have my paychecks and
things like that, paying for college. You have to deal with those things, scholarships.
That’s what my brother is trying to do. I feel like in every job you have to use math.
(Math / Context)

I – Okay. What do you want to study when you are in school? (Question)

A – English. I want to be an English teacher. (Interests)

I – Oh. Do you want to come back here and teach? (Question)

A – I want to actually. (Interests)

I – Oh. (Interests)

A – Well, I want to write. I want to write books and things like that. And I would like to
teach. (Interests)
I – Okay, very nice. The other parts that I want to ask you about is the social justice end.

(Question)

A – Hmm. Hmm.

I – And just to start, what do you think social justice means? Let’s start with that, what do you think that term means? (Question)

A – Well, it seems like social and justice, those don’t really work I don’t think as one term. Because I think there are certain like social and moral codes that you have and they’re not like justice and it’s not like the law. Like it’s not like right, but sometimes it’s just like the social norm. It’s not like justified or it’s not like really right. Like that, but it’s kind of what I think of. (Society)

I – Okay. I think when I am describing social justice in the class we are going to be talking about issues in society that may not be fair to certain groups of the society. (Society)

A – Like third world versus first world country kind of things? (Society)

I – Right. So that’s like it could be instead of social justice, social injustice. You know there are certain injustices like racism, or discrimination against women or whatever the discrimination is against. But they are the socially unjust issues that we will be exploring. (Society)

A – Hmm. Hmm. (Society)

I – How likely might you be to work for social change, to change things that are socially unjust? Did you ever have experience with that in the past? (Question)

A – Well I would love to be a social worker. If that counts. (Interests)
I – Sure. (Interests)

A – Um… I’m trying to think… well I want to work with mentally disabled kids. I think in Ridgewood it is hard to find things like that. Just because I have been pretty… I don’t know, I am born and raised here and people generally have the same kind of mind set. So that’s hard for me to say to achieve. But I definitely want to do something. I want to work with younger kids. But I am not too sure about rallying the troops. (Interests)

I – Okay. So why wouldn’t you or why would you? What would make you… is there anything that would make you want to or not want to? (Question)

A – I guess if there was something that had to do with… like if it was more personal to me. Like if I was personally being… or something was personally being done to me or a loved one or something… then I guess I would get more involved or something. (Change)

I – Okay. How about if you were to join a group that was already established. That was working to stop something, like to stop environmental damage, that might affect you. (Question)

A – Hmm. Hmm.

I – That might be considered a social injustice in a way. Or other things that might not affect you like poverty or hunger or discrimination. (Question)

A – I would need to like be personally involved in a way. I wouldn’t be able to… like if I don’t understand something or if I haven’t personally experienced it, I feel like something, like it is not pointless, but if I don’t really understand. Like if I was to go to a
discrimination to like a certain ethnic group. Like I don’t think I would ever truly get it. You know what I mean? (Society)

I – Like you were educated enough about the topic? (Society)

A – Right. I think I have to be experienced with something before I could really… like I could donate money or help out with things, but for me to actually change or start something and really be important and try to change… I think I would have to have personally experienced something. (Change)

I – Okay. So you have grown up in a world where you know there is poverty, hunger, and you know there is environmental damage. Do you ever think about things like that? (Question)

A – Mostly I see it with the little kids I have now and when I teach CCD is that the little kids, they don’t understand poverty. They don’t know what it like to not have food on their table. And I have participated in food drives before. But that is really it. I do not really think about it that much. (Sheltered)

I – Okay. Well thank you so much Vanessa. Thanks for taking time out of your summer to meet with me. You have been a great help in getting me to understand a lot about how students think and feel about math. (Thank you)

A – Oh. You’re welcome.

I – I will see you in class.
APPENDIX G

Focus group interview with Eva, Haley, Isabella on May 21, 2009.

I – Well, just to let you know, I wanted to ask you a few questions now that the class is over. I would like you to ask me questions if you do not understand what I was trying to do with the class, I would like to talk about that. If you remember in the beginning of the year, I had you fill out that sheet which said I was going to record interviews. I just want you to answer as honestly as you can. I thought you would be more comfortable talking in a group than just one on one. So that is why we are doing the group interviews. Basically I have just four main questions and some follow up questions with those. Please feel free to answer as honestly as you can. If there is anything that you don’t want me to include, you can let me know and I will take it out. So does anyone have any questions before I start? (Thank you)

E – Are you almost done? (Ice-breaker)

I – I am almost done with all the interviews. What I have left to do… I did my dissertation proposal, which was the last thing I did. Now I am going to have to write this. Put together all the information I got from the class and everything and write like a 200 page paper. Hopefully I will be done by the end of next summer. That is how long I am anticipating it will take. But I don’t have any more classes to go to. All right, so my first question is, a number of the assignments in class incorporated mathematics with some world issue or injustice, as you think back now what was that experience like for you? (Question)

E – What ones did we do? (Lessons)
IS – Well one in particular I remember we did was about the distribution of wealth.

(Lessons)

E – Oh yeah.

IS – Yeah, I really enjoyed that. I was really shocked by it too. How unfair it really is in our country to see how there is so much wealth with like a small majority of the people and so little wealth with like 50% of the population. (Awareness)

E – Yeah.

I – Why did you find it interesting?

E – Like the same reasons, how there is such a big gap. And how like even if the top 1% like spread out their money to the bottom, they would still be millionaires and billionaires. And everyone could be better off. (Equality)

I – Okay.

H – And I remember doing the… I think we did a brochure right? (Lesson)

I – Yeah that was another thing about the war in Iraq and what other thing you would like to spend money on. (Lesson)

H – Yeah and I did poverty I think. (Poverty)

I – Okay.

H – And it was interesting to see like how much we are spending on Iraq. And even like how just a small percentage of that could help so much like if it was put into a different thing. It would be more beneficial. (Justice)

I – Okay, good. What kinds of things did the class make you think about? (Question)
E – A lot of things that had to do with like how money is spent. In like what ways, and the mistakes I think we are making, and like ways that we could better the country by distributing the money better. And… (Equality)

IS – Poverty a lot. (Poverty)

E – Yeah, poverty. (Poverty)

IS – Yeah and definitely the war thing and how much money like… first of all I don’t know if I really agree with the war, but it’s just… it seems like such a waste of money when there is so many other things before that should be done. (Lesson, War)

I – That seem more important to you.

IS – Yeah.

I – How about for you, yourself how did the class make you think about your own roles and responsibilities in the world? (Question)

H – I think it kind of like… It kind of gave you a little reality check I guess. You know, we are like in Pinewood and it’s obviously very affluent and stuff. But it just shows you what else is out there. And how people are living. And how you should like, what you should do to kind of be prepared I guess in the world. (Awareness, Pinewood Bubble)

I – What things do you think you learned that you should do? Is there anything you can think of? (Question)

H – I don’t know, just like with the stuff that is happening right now with the economy. How important it is to be like really smart and save. (Economy)

I – Okay.

H – Be like prepared. (Awareness)
E – And like when we did that thing. Remember when we watched that movie, the 30 days, where they lived as like poor… (Poverty)

I – The poor? I think they had like a minimum wage job.

E – Yeah. And we saw what it would be like to live on minimum wage and stuff. Like that’s an eye-opener. (Awareness)

I – Did you see that one? (Lesson)

IS – No.

I – Did you see the one when the guy lived in the Muslim community? (Lesson)

IS – Yeah I saw that one. (Lesson)

I – It was the same guy and his girlfriend who does the show. They had a minimum wage job and they had to save money and they had to go to the hospital because she got sick and they didn’t have enough money for the hospital… (Lesson)

IS – Oh my God.

I – How about, how did the class make you think about your own roles and responsibilities in the school… instead of in the world? (Question)

(Long silence)

E – I mean not really.

I – Okay. All right question two. Many of the questions in class were about marginalized groups or minorities, as you think these groups now, how do you think your role or responsibility to those groups has changed. (Question)

E – What was the question?
I – Many of the discussions in class were about marginalized groups, minorities. So as you think about those groups now, the minorities, how do you think your role or responsibility to those groups has changed? (Questions)

IS – I don’t know… I um… I guess you don’t … for me I’ve never like really seen like a difference in minorities. Just like a general like certain population. But um… I think it must be like a lot harder for minorities to be in our school. (Minorities)

I – Hmm. Hm.

IS – And like to put in or even be in a classroom and do the same work as us. (Minorities)

I – So you think the class may have helped you understand that? (Question)

IS & H – Yeah.

E – I never really thought about minorities and like what it is like to be a minority until I learned all about it. And like… talked about it. (Minorities, Realization)

IS – And you don’t see their disadvantages, right? You don’t see them as your advantages. You don’t even see that just… until like (inaudible)

(White Racial Identity / WRI)

H – It’s like with the white privilege thing we just like everyone else notices it, but we can’t even see it. And it’s kind of unfortunate I guess, but like that’s just how it is. I guess they could give us more like reason to respect them and understand rather than like… I don’t know not really like the journey thing but just like know the differences that… (Privilege)

IS – Yeah.

I – Good. Who would you identify as marginalized groups in our school? (Question)
H – In our school? Um, there are Asians and African Americans. (Minorities)

E – The like African Americans and Hispanics kind of stay together. (Minorities)

I – Hmm. Hm. The Asians are kind of separate. (Minorities)

E & IS – Yeah. (Minorities)

IS – They kind of are all together. (Minorities)

H – There is a lot of Asians also. (Minorities)

IS – Yeah, and I don’t know if they are considered are a minority because there are a lot. But more so than Hispanic and Black. (Minorities)

I – Actually when I told it to another group because they asked, if there’s… the district is 78% white, 17% Asian, and it’s like 2% and 1% Hispanic and Black. (Minorities)

IS – I think that’s (inaudible).

I – They were surprised that there was, although they knew there was more whites, they didn’t think there was that many more. (Minorities)

E – Yeah.

IS – Yeah, I wouldn’t have thought that either. I don’t know, I thought it was more balanced. Because we have a pretty diverse school I think. For like, not as like a whole, but we do have a bit of like everything. (Minorities)

I – Pockets. (Minorities)

IS – Yeah.

I – It is not considered a diverse school though compared to other schools in the country or even in New Jersey. (Minorities)

IS – Compared to other schools, yeah. (Minorities)
I – I mean I worked at M. which is about 40 or 45% white.  (Minorities)

IS – Wow.  (Minorities)

I – So that’s diverse.  (Minorities)

IS – Yeah.

I – How about what do you think about your role or responsibility in relation to minorities?  (Question)

E – I guess to just not make them feel like um minorities.  (Minorities)

IS – Yeah.

E – And to try and make them feel equal if that’s even like possible.  (Minorities, Equality)

I – Good. How about, think about the people who work here, besides teachers, can you think of minority groups?  (Question)

IS – Yeah, the security guards.  (Minorities)

I – How about, do you think about them any differently or how do you think of them differently than before you took the class?  (Question)

IS – Well, maybe it makes think that, since we don’t really have… it’s mostly those jobs that aren’t teachers are minorities… so maybe it’s like maybe they didn’t have the same
opportunities that we did to go out and do something different. You know? (Minorities, Opportunities)

I – Hmm. Hm.

IS – Maybe become a teacher or a lawyer or whatever. Do what they wanted to do. (Minorities, Opportunities)

H – Yeah, I guess they can… like help you to… like I wouldn’t personally say that I would judge their job or anything. (Minorities)

IS – Yeah.

H – But I guess it could help you understand why maybe they had that job, instead of some other job. (Realization)

E – Like a teacher or staff member or nurse or something. (Minorities)

I – The third area of questioning is different from these. But in reading some of the responses that you wrote or in the questionnaires or even in the other interviews; a number of you mentioned that you were more confident in math than you were before you took the class. I don’t know if any of you had any experiences from that or could help me understand or tell me more about that. You said definitely? (Question)

IS – Yeah, with graphing this year I know we did a lot of graphing in Sociology class. And um I also was in Advanced Algebra and Trigonometry so we also used a lot of the same formulas and I had already had like the practice of it. So it was a lot easier when it came to that stuff. And also understanding the graphs. (Lessons, Math Easier)

I – Hmm. Hm.
IS – Like normally you wouldn’t understand one of those graphs but because we actually did them and went through the process of finding the data and plotting them or what not… we understood it better. (Lesson, Context)

I – Okay, good. TE, anything?

E – Um, yeah it made me more confident in like ways of understanding it. But I mean the formulas were still like hard and I needed to get used to them. (Confidence)

I – Sure.

E – And practice like any other math class. But I guess it helped me with like pie charts; I never knew how to do those before. And I don’t know, I mean I understand what I was doing more than I would in Algebra class and like why I was doing it. (Context)

I – Okay.

E – I guess it was still difficult. (Lessons)

I – Okay, H how about you?

H – Um probably, I guess with the way they like connected with things that we were learning about, it was more cohesive I guess. And in the way that like it wasn’t just a math problem. It was like an actual thing that we had to find like all the stuff on our own and we had to go through all the steps; that helped out. (Context)

I – Good. Can you think of how the assignments in class affected your attitudes toward mathematics? If there are any particular ones that you might remember? (Question)

E – Like I felt like the math was like the same thing as doing a worksheet and answering questions. (Context)

I – Like a worksheet in a regular math class?
E – No. It’s just like I felt like the math… I’m trying to think of how to word it. Like I felt like it wasn’t math. (Context)

I – Okay.

E – Like it was just like…

H – Like a worksheet you would do in sociology. (Context)

E – Yeah. Like to teach us about what we were learning. That it wasn’t necessarily like… (Context)

IS – More interesting because we… it was… rather than just numbers and like an answer, it was revealing something… (Context)

E – It was like an answer at the end with significance. (Context)

IS – Yeah with significance. Like the one with the money distribution. (Context)

I – Hmm. Hm.

IS – Like we discovered how the money is distributed. It wasn’t just a bunch of numbers. There was something of significance behind it. (Context)

I – And it wasn’t just the issue too, like did the numbers help you then, or did the math part help you understand the issue? Not only did the issue maybe help you find more interest in the math, but did that happen? (Question)

E – Right.

IS – Well you could have just given us a chart already with all the numbers. But we did the work you know, and in the end I guess it is better when you find it yourself. (Context)

H – Yeah.
I – Okay, the last thing I have here is, I am thinking about incorporating social justice
issues into my Algebra II class next year. What suggestions would you have for me?
Like the same Algebra II class that you each had. (Question)
E – Is that with like graphing and stuff? (Lessons)
I – The stuff you had in my class in this room with IS last year.
E – Yeah.
I – That class, but with a social justice theme. (Question)
IS – So like the class that we have taken like the first half of the year, but with more
math? (Lessons)
I – Well like that, but with the Algebra II curriculum and using problems that have social
justice issues, like the ones we talked about in class. (Question)
E – Well like the distribution of wealth, that would work right? (Lessons)
I – Hmm. Hm.
E – That would definitely be something you should do. (Lessons)
I – Okay.
IS – I think it would just… for the students I know that um… for me it is a lot easier to
remember something when there is something like a something that they can be
interested in behind it. So if you like incorporate poverty or the war in one of the things,
they’ll remember it more because they can relate to it. Like it is a real life situation.
(Context, Poverty)
E – Yeah, I think like any real life situation that you can add to math, helps you
understand it more. (Context)
I – Okay.

H – Yeah, because those little like word problems from the book are not real interesting and you’re like, oh my God. So I know sometimes like if it’s something that’s really happening and you’re like more interested in it, even though you might not be that interested in it, it would be like easier to learn. (Context)

I – How do you think students here at Pinewood though would react to those materials; you know those issues in an Algebra II class? Like you said even if it is a little interesting, you think they… it would be something that an Algebra II class would find interesting? (Question)

IS – Yeah, I mean they might not… like not testing them on that… (Context)

I – Topic?

IS – Yeah, topic too. Because that might just add like an extra pressure to them. It would make it easier for them to understand, but if they had to be tested on it as well as the math. It would just… they might not like that. (Context)

I – Okay. TE?

E – Um… what was the question?

I – How do you think students would react to a class like that here in Pinewood? (Question)

E – Okay. Yeah, I think they would like it. Like they would like meaning behind their math and stuff. They would find most of the topics interesting, like most people do. (Context, Social Justice Mathematics Class / SJMC)

I – Okay.
H – Yeah, I think like most of the kids in our class like you could even tell with the discussions. Like everyone was like… had something to contribute or say. So kind of like, it is good because… there is always like an activity that chases it so…

(Interdisciplinary)

E – So even if some people like didn’t want to do the math, like they could still chime in with their opinions. (Interdisciplinary)

I – And be involved in the conversation? (Question)

E – Yeah, part of the class. (Interdisciplinary)

I – Good. They are all the questions. Basically the reason that I did the study, I was reading about the social justice / mathematics tie in. It is used a lot in inner cities where minority students have a great deal to gain by becoming educated in math, but they aren’t always interested in becoming educated in math. So they became interested in math, because they were learning about issues that pertain to themselves. So my idea, which was different, was to try and do that type of teaching and learning in a community, that like H said, is more affluent. (SJMC)

E & H – Yeah.

I – And to see the reaction to it. That’s kind of like it, trying to find out your guys reaction because that’s really just what I am going to be writing about: your experience. (SJMC)

E – Yeah, it definitely gives people like a reality check. (SJMC)

IS – Yeah, in this community. (Pinewood Bubble)
I – That’s what a lot of the other, almost every group had something to say about opening your eyes, or as you said a reality check, or you live in a bubble here in Pinewood. I mean that’s the most common thing I have heard. (Pinewood Bubble)

E – Yeah.

I – One of my ideas… that is what I thought in a community like this… a lot of times you are just not exposed to that stuff and they don’t know about it. (Pinewood Bubble)

IS – And they need to know. They should know, because I don’t know…it is only going to benefit them. You know, and later in life they might have to deal with something like that and they’re not going to know anything about it. Or how to react towards it. (White Racial Identity)

I – Right.

E – Like I would never think of like how a person lives on like a minimum wage. Like money or whatever, I would just never really think about that kind of stuff. But now like it opens your eyes. (Economy, Realization)

I – Right. And my other thought was that, yeah it will also get you more interested in doing the math if it has some meaning behind it. It is like a kind of two pronged approach. So that is what is was all about. Well I thank you for taking the time to talk with me and for taking the class. I appreciate all your input. Do any of you have any questions for me? (Thank you)

IS – How are you going to do that next year? Like are you… is it going to be like a special? Like a class that people elect to do or for all your Algebra II classes? (SJMC)
I – It would probably… I would probably pilot it in one of the classes to see the reaction. (SJMC)

IS – And then if it goes well? (Question)

I – Yeah, and if it goes well with the administration and everything else I would be able to maybe incorporate it on a more permanent basis. That would be the idea. (SJMC)

E – Are you gonna do this again? Like with Miss R? (SJMC)

I – No. Well not in the immediate future. I think I will be spending a lot of time writing this. After that we’ll see. What I would like is to have my own class, not Algebra II, but just a class like that and not co-teach it, just teach it myself. And just have math and social justice all the time. (SJMC)

IS – As an elective? (SJMC)

I – Yeah, as an elective. (SJMC)

IS – That would be interesting. (SJMC)

I – That was initially how I was going to do it and they wouldn’t give me the approval. The only way I could get approval was co-teaching with Ms. R. That was why I recruited. Originally I had 17 students that wanted to take the class, but then only 10 of you ended up in the class. (SJMC)

IS – Really?

I – Yeah.

E – Where did the other seven go? (SJMC)

I – Some of them didn’t fit with their schedule. And a couple, for whatever reason, changed their mind. (SJMC)
IS – We were lucky we got in that class, we didn’t have to do the poor project.  (SJMC)

I – It was hard to recruit people because I was only going to be there for half a year. And you didn’t know what you were going to get the other half. But I think it was an interesting class.  (SJMC)

E – Yeah, I’m glad I took it.  (SJMC)

IS – Yeah, I took psych last year and it was my favorite class.  (SJMC)

I – And that was with Ms. R. too?

IS – No that was with Miss C. But I thought sociology would be similar so I was going to take it anyway.

I – So anyway that meant there were 11 people in there in the beginning of the year that didn’t know anything about what was going to happen. They had to design whether to stay or transfer into another class.  (SJMC)

IS – I enjoyed it though. I can’t… I wish… I mean… maybe we should have done… I can’t remember a lot of the stuff we talked about.  (SJMC)

I – One of the things I liked being able to do was using the computers and exploring the topics on your own. I don’t remember what topics you guys had.  (SJMC)

E – I remember H had smoking.  (SJMC)

I – Well that was the debate.  (SJMC)

IS – Oh yeah, remember we had… we did the big chart.  (SJMC)

I – Yeah that thing there on the wall.  (SJMC)

IS – Yeah.  (SJMC)
I – One was clean energy, one was HIV, one was ethanol, one was sweat shops…

(SJMC)

IS – Yeah, we had sweat shops.  (SJMC)

I – Is that what you did?  So you learn something about sweat shops too.  (SJMC)

E – Yeah, that was so interesting.  (SJMC)

IS – See I forgot about that.  (SJMC)

I – Well the other thing why my professors suggested I not do the interviews right away but wait, was to see if any of the impressions you had stayed with you.  (SJMC)

E – Yeah, I always think about sweat shops.   (SJMC)

I – You do?

E – I think why is it so cheap?  Sweat shops, that is the first thing that comes to my head.

(SJMC, Realization)

IS – Yeah, like at Forever 21. (SJMC, Realization)

I – Where?  Oh is that a store?  (Question)

IS – Everything is so cheap.

I – So they probably make the stuff in some other place.  So that was the idea to open your eyes to stuff and hopefully have the math part of it help you understand the issue more.  Like did the math part help you understand more about sweat shops?

(Realization)

E & IS – Yeah.

I – Or more about the distribution of wealth or the war in Iraq?  (Lessons)

E – And we did the stuff about crime?  (Lessons)
I – Yeah, that was one of the units.  *(Lessons)*

IS – I remember going home like a lot and telling my mom like all this stuff, that I was always so shocked.  It was like stuff that we learned. *(Sharing with Home)*

I – In some of the readings that I had, it said that when you try and teach about discrimination and white privilege, some of the privileged students don’t believe you. Not only are they shocked, but sometimes they can be hostile or angry. *(White Privilege)*

E – Yeah.

I – I mean I didn’t sense that a lot, but… *(SJMC)*

IS – Sometimes I get… bored. *(SJMC)*

I – I didn’t notice anyone, did you notice anyone in the class like that? *(SJMC)*

E – I think we had a good class.  I mean we all are very down to earth people.  Like I feel like you can add some people in there and they’ll be like… yeah. *(SJMC)*

IS – There’s some people in our grade who would have like fought you on some things. *(SJMC)*

E – There in their own little world. *(SJMC)*

I – Well I’m sure.  And that’s it, I only had 21 students to look at, and my data may be different from the data that the other people who talked about that setting may have experienced. *(SJMC)*

E – Yeah.

I – Alright.  You guys have anything else to ask or add? *(Question)*

H – I’m good.

I – If we think of anything.
I – Okay. Well, thank you all again for taking the time to sit and talk with me. You were all a great help. (Thank You)
APPENDIX H

New Jersey Core Curriculum Content Standards used:

6.1 Social Studies Skills

A6 – Apply problem-solving skills to national, state, or local issues and propose reasoned solutions.

6.2 Civics

A5 – Discuss how participation in civic and political life can contribute to the attainment of individual and public good.

B3 – Describe historic and contemporary efforts to reduce discrepancies between ideals and reality in American public life, including Amendments 13-15, the Civil Rights Act of 1866 and 1875, the Abolitionist movement, the Civil War, and the end of slavery in the United States.

D5 – Discuss how citizens can participate in the political process at the local, state, or national level and analyze how these forms of political participation influence public policy.

E6 – Investigate a global challenge in depth and over time, predict the impact if the current situation does not change, and offer possible solutions.

E14 – Connect the concept of universal human rights to world events and issues.

6.3 World History

H1 – Analyze global political, economic, and social changes in the 20th century.
H3 – Evaluate the paradoxes and promises of the 21st century, including economic imbalance and social inequalities among the world’s people.

6.4 United States / New Jersey History

L4 – Analyze United States domestic policies, including the civil rights movement, affirmative action, the labor and women’s movements, conservatism vs. liberalism, the post-industrial economy, free trade, and international trade agreements.

L7 – Discuss major contemporary social issues, such as the evolution of governmental rights for individuals with disabilities, multiculturalism, bilingual education, gay rights, free expression in the media, and the modern feminist movement.

6.5 Economics

B6 – Analyze the connections and potential effects of the widening gap between the rich and the poor in the United States, the decline in labor union membership since 1950, rapidly advancing technology, globalization, and problems of public schools.

B7 – Compare and contrast the causes and consequences of discrimination in markets, employment, housing, business, and financial transactions.

6.6 Geography

C2 – Analyze the effects of both physical and human changes in ecosystems, such as acid rain, ozone layer, carbon-dioxide levels, and clean water issues.
E3 – Analyze examples of changes in the physical environment that have altered the capacity of the environment to support human activity, including pollution, sanitation, deforestation, species extinction, population growth, and natural disasters.

4.1 Number and Number Operations

B1 – Extend understanding and use of operations to real numbers and algebraic procedures.

4.2 Geometry and Measurement

A1 – Use Geometric Models to represent real-world situations and objects and to solve problems using those models.

4.3 Patterns and Algebra

B1 – Understand relations and functions and select, convert flexibly among, and use various representations for them, including equations, or inequalities, tables, and graphs.

C1 – Use functions to model real-world phenomena and solve problems that involve varying quantities.

4.4 Data Analysis, Probability, and Discrete Mathematics

A2 – Evaluate the use of data in real-world contexts.

A5 – Analyze data using technology, and use statistical terminology to describe conclusions.

4.5 Mathematical Processes

A2 – Solve problems that arise in mathematics and in other contexts.

B1 – Use communication to organize and clarify their mathematical thinking.

B2 – Communicate their mathematical thinking coherently and clearly to peers, teachers, and others, both orally and in writing.

C3 – Recognize that mathematics is used in a variety of contexts outside of mathematics.

C4 – Apply mathematics in practical situations and in other disciplines.

D1 – Recognize that mathematical facts, procedures, and claims must be justified.

E2 – Select, apply, and translate among mathematical representations to solve problems.

E3 – Use representations to model and interpret physical, social, and mathematical phenomena.

F1 – Use technology to gather, analyze, and communicate mathematical information.
APPENDIX I

Field Notes

Friday October 3, 2008

We continued our unit on culture. Nicole led the lecture and discussions with the students although I made contributions. The PowerPoint presentation used to stimulate class discussions was entitled “How Does Culture Create Reality?” We explained how reality is a social construction and how that can lead to ethnocentrism. We discussed the Thomas Theorem, which states that if people perceive a situation as real it is real in its consequences.

I noticed something about teaching this type of class as opposed to a strictly mathematics class. The class discussions allow you to learn more about your students than you would in a regular mathematics class. The in depth nature and type of topics we discuss enables the students to reveal their feelings, moral attitudes, and political views. I am beginning to gain another perspective of some of the students that I have known for over three years.

One student in particular has impressed me. Lisa was not recruited for this class; however she was in my Algebra II class as a sophomore so I knew her prior to the class. I did not think of recruiting her because she was quiet, did not contribute much to class discussions in math, and did not seem to be curious about anything in general. I was wrong on all three of those assumptions. In this class she often leads discussions, asks insightful questions, and seems extremely interested in all the topics to date. I am
especially impressed by her grasp of many of the current social issues we have discussed. It is not only her awareness of many of the issues, but her desire to learn more about the issues she may not be aware of.