INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps.

Photographs included in the original manuscript have been reproduced xerographically in this copy. Higher quality 6" x 9" black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.

Bell & Howell Information and Learning
300 North Zeeb Road, Ann Arbor, MI 48106-1346 USA

UMI®
800-521-0600

THE UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

IMPACT OF CULTURE CIRCLES ON MINORITY HIGH SCHOOL STUDENTS IN MATHEMATICS

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE

DEGREE OF

DOCTOR OF PHILOSOPHY

BY

GHOLAM H. AHMADIFAR

NORMAN, OKLAHOMA

2000

IMPACT OF CULTURE CIRCLES ON MINORITY HIGH SCHOOL STUDENTS IN MATHEMATICS

A DISSERTATION

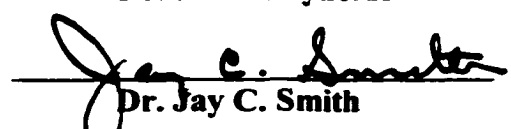
APPROVED FOR THE DEPARTMENT OF

INSTRUCTIONAL LEADERSHP AND ACADEMIC CURRICULUM

BY

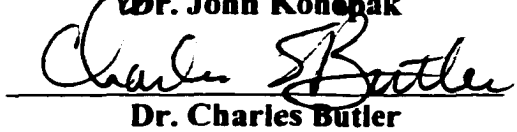
Dr. Jayne Fleener

Dr. Anne Reynolds



Dr. Jay C. Smith

Dr. John Konopak



Dr. Charles Butler

ACKNOWLEDGMENTS

I wish to express my sincere gratitude to Dr. Jayne Fleener. Her sensitivity, insight, patience and faith provided the guidance and support I needed to complete this dissertation.

I would like to express my appreciation to my Committee Members, Dr. Anne Reynolds, Dr. John Konopak, Dr. Jay Smith, and Dr. Charles Butler. They offered me their thoughtful suggestions and their many insights throughout this study.

Next, I would like to thank the eight participating students and their teacher in this study.

Finally, I would like to express my appreciation to my family for their support during this endeavor.

TABLE OF CONTENTS

LIST OF TABLES

Page

ABSTRACT

This study is an attempt to understand the impact of culture circles on African American high school students in mathematics. Particular attention was given to the view of the male African American students, age sixteen to eighteen.

Eight students volunteered to participate in this study in the fall semester of 1999. The guiding questions were:

1. How do these minority students perceive themselves as learners and doers of mathematics?
2. How do minority students feel about themselves and negative group stereotype pertaining to their mathematics learning?
3. What is the impact of culture circles focused on mathematics values, meaning, and goals?

The data collection process occurred in two phases. The purpose of the first phase of the study, which included the researcher attending the Algebra II class three times a week for six weeks, was to gather background information. During the second phase, which lasted approximately ten weeks, the researcher observed the participants in the classroom and interviewed them individually every week for approximately one hour to discuss their beliefs and actions related to their learning mathematics and confidence.

There were weekly culture group meetings lasting approximately two hours in which the participants discussed ideas about mathematics frustration, stereotype threat, and anxiety. Also, the group discussed experiences in mathematics classes. These sessions were tape-recorded.

The intensity of the interactions during the second phase of the data collection process contributed to the establishment of a foundation for the data collection process. Data from transcripts of classroom observations, individual interviews, culture circle meetings, interviews with the teacher, and the students' responses to survey questions

were analyzed using a constant comparative method (Lincoln & Guba, 1985) and Freire's Circle of Culture Method (Shor, 1987).

Especially important to the findings of the study was the establishment, through the culture circle meetings, of an environment for positive change in the students' performances in mathematics classes. The culture circle affected the participants beliefs about and strategies associated with their individual mathematics learning and preparation. Unfortunately for several participants, prior poor study habits and lack of value for mathematical achievement prevented them from achieving high levels of competence in their Algebra II class. Individual and group reflection contributed greatly to the participants' understanding and belief about themselves as mathematics learners. The use of culture circles clearly needs further investigation and implications of this research include the need to explore the impact cultural and power relations on solving and confidence in mathematics learning.

CHAPTER ONE

INTRODUCTION

When students come, of course, they bring with them, in their bodies, in their lives, they bring their hopes, despair, expectations, knowledge which they got by living, by fighting, by becoming frustrated. Undoubtedly they don't come empty. They arrive full of things. In most of the cases, they bring with them opinions about the world, about life. (Horton &Freire, 1991)

Background of the Problem

Over the past few decades, a major educational concern in the United States has been with the performance gap between certain minorities such as African Americans, American Indians, Latinos, and White students. According to educational research, African American students, when compared to White students, have shown a pattern of lower grades in school (Osborne, 1997; Steele, 1997) and lower scores on standardized tests measuring intellectual ability; and they have a higher school drop-out rate and show a substantially lower grade point average when graduating from college (Nettles, 1988). By the time these minority students reach the sixth grade, the performance gap between them and White students has widened by two grade levels (Valencia, 1997). In conclusion, evidence demonstrates that minority students show poorer results at almost every level in school when compared to White students.

Statement of the Problem

The difference in achievement levels between African American and White students starts in kindergarten and persists through college. African Americans do not get the same early start on education as White students, because they are less likely to attend preschool (USDE, 1995). At age nine, African American students, when compared to White students, show they are at lower levels of academic proficiency in reading, mathematics, and science. And, by the age of thirteen, they are more likely to fall below the modal grade for their age (USDE, 1995). Furthermore, on standardized intelligence tests,

African Americans score one standard deviation below the average scores for White students (Jenson, 1980).

Some researchers have suggested, and found evidence, that negative group stereotype may be a factor in the underachievement of minorities. The logic of self-fulfilling prophecies and feelings of disengagement from the goals and values of the White majority may contribute to the difference in achievement levels.

With the continued growth in the high school minority student population, there is a need to re-evaluate the minority students in high school and the impact of culture circles on their performance in the classroom. This information is needed to help determine how best to assist these students so that they benefit from their education.

Research about the impact of culture circles on minority high school students in mathematics is very limited in both quantity and quality. More research on the effects of culture circles on minority students in the area of mathematics is needed before we can know how best to help minority students succeed in this subject.

Purpose of the Study and Research Questions

This study investigates the impact of culture circles on African American students in their learning of mathematics. Questions related to the issue included the following:

1. How do these minority students perceive themselves as learners and doers of mathematics?
2. How do minority students feel about themselves and negative group stereotype pertaining to their mathematics learning?
3. What is the impact of culture circles focused on mathematics values, meaning, and goals?

Definition of Terms

Culture Circle: A gathering of people of a common cultural background who have come together in order to achieve similar goals, to aspire to do better, to know more, to succeed in life. The culture circle allows participants to learn from each other

without fear of rejection due to the negative stereotype threat present when others are around. The stronger students help the weaker students find their problems and overcome them. Students learn to trust someone other than themselves, since they all come from similar backgrounds.

Code: A concrete physical representation of a special critical issue; it can take different forms—a story, a photograph, a song, or a written dialog of some nature. A code represents the students' reality to the group and allows them to project their emotional and social responses. One student gives a sentence, another one adds to the thought, and soon all of them have contributed to a story they will feel honored to share for generations. Alone they would not be able to write the story, but together they are able to express it so others can learn more efficiently in the future.

Stereotype Threat: A situational threat effect that, in general form, can affect the behavior and beliefs of members of any group about which a negative stereotype exists (*e.g.*, skateboarders, older adults).

Theory of Stereotype Threat: All students experience anxiety in certain school situations; however, students who are members of minority groups for which there are negative stereotypes concerning academic ability (*e.g.*, African Americans and women in mathematics and sciences) tend to suffer from additional anxiety. For these individuals, poor performance in school is not only damaging to their self-esteem but also serves to confirm the negative group stereotype (Osborne, 1997).

Involuntary Minorities: African Americans, as well as Native Americans and some Latino groups, could be categorized as involuntary minorities (Ogbu, 1992). These are groups that did not come to the country or into American society of their own free will.

Voluntary Minorities: Groups that have joined American culture of their own free will and in order to improve their condition (*e.g.*, Cuban, Italian, German immigrants).

Significance of the Study

With the underachievement of academic performance of minority students and higher drop out rates, our knowledge of these students and the causes of their underperformance are limited. In particular, more research is needed on the impact culture circles have on the mathematics performance of minority students.

The results from this praxis research will show that culture circles provided an opportunity for minority students to find effective means of combating mathematics anxiety and stereotype threat. This was to be accomplished by encouraging them to look inward and to gain a deeper understanding of their situation. It also gave them the opportunity to change the situation in which they found themselves.

Limitations of the Study

1. The participants included only students who volunteered for the project.
2. The focus of the study was restricted to students in mathematics class at the level of Algebra II.

Organization of the Remaining Chapters

In Chapter Two, the literature concerning minority students, both in general and in regard to mathematics performance, will be discussed. Chapter Three will address the methodology used to investigate the research question. Chapter Four will present the findings. The analysis of the data, the conclusions of the study along with suggestions for future research, and the implications of the findings will be presented in Chapter Five.

CHAPTER TWO

LITERATURE REVIEW:
GENERAL RESEARCH LITERATURE ON MINORITY STUDENTS' PERFORMANCE

A Review of Literature on Paulo Freire's View of Education

> **A cultural circle is a live and creative dialog in which every one knows some things and does not know others, in which all seek together to know more. This is why you, as the coordinator of a cultural circle, must be humble, so that you can grow with the group instead of losing your humility and claiming to direct the group, once it is animated. (Freire, 1971)**

The life, the ideas, and the entire thought process of Paulo Freire were nontraditional and dynamic. Freire's native country was Brazil. In April of 1964 there was a change of government in Brazil—the military overthrew civilian control, ending cultural democracy and optimism for positive change and growth. At the time of the overthrow, Freire, a successful educator, was focused on the establishment of literacy programs throughout the country. He was training literacy teams to set up "cultural circles" throughout Brazil, where the "dialogic" method of teaching encouraged peasants and common workers in reading, writing, and social awareness.

During the military takeover Freire was arrested, imprisoned for over two months, and then forced into exile with his wife and five children. He went to Bolivia, then to Chile, then to Massachusetts, and on to Switzerland. In 1980, with democratic ways returning to Brazil, Freire and his family returned to his native country. During his absence from Brazil, he communicated with various groups interested in critical teaching about his ideas of problem-posing and critical consciousness. Freire had a fresh and interesting approach to teaching. In place of the dull texts, required tests, rote memorizing, and basic skills approach that everyone then used, Freire offered a more creative, personal, and practical approach to teaching. When teaching and learning, the subject became more personal and, thus, more valuable and rewarding.

In the United States today most states are concerned with the large numbers of students who are failing, who cannot read, who cannot comprehend, who do not do well in mathematics, who are afraid to enroll in advanced mathematics courses, and who shy away from science courses. In Oklahoma alone, a reported 9,700 high school juniors cannot read "at a satisfactory level" (Plumberg, 1999). In the spring of 1999, Oklahoma eleventh graders took the Oklahoma Core Curriculum Test, and 25 percent (9,732) showed unsatisfactory results. These were among the highest test scores the juniors received: in areas such as mathematics and science, their scores were often much lower.

In the United States, educators generally assumed that the cause of such poor scores was an inadequate grasp of the mechanics of reading and writing. Courses were structured to correct these shortcomings, but further testing and observation indicated that concentration on the mechanics of reading and writing was often ineffective.

Followers of Paul Freire suggest that learning problems are not rooted in mechanical deficiencies, but are instead the result of attitudinal and cultural factors. Freire and his followers therefore suggest that educators place more emphasis on discussing personal values, meaning, and human purpose in education.

Paulos Gerdes, a Mozambican mathematician and mathematics educator, is noted as being a leading researcher in uncovering mathematical ideas enmeshed in African cultural practices and artifacts. He comments on the ideas presented by Freire in *Pedagogy of the Oppressed* (1993), and *Education for Critical Consciousness* (1987). Gerdes cites Mellin-Olson's statement that "If knowledge is related to culture by the processes which constitute knowledge—as Freire expressed it—this must have some implication for how we treat knowledge in the didactic processes of education" (Powell and Frankenstein, 1999). Those who see value in Freire's approach point out that when an educational subject such as mathematics is developed with direct reference to the culture of the people, the teaching and learning that follow will have more meaning and significance.

Associated with the particular culture of a region is a particular politics. Thus, the suggestion is made that education has overtones of politics. When a teacher realizes that s/he is something of a politician in the classroom, s/he is led to ask: Just what kind of politics am I doing in the classroom? Politically, one works for one thing and against another. A Freire supporter might say that teachers subconsciously teach in favor of some students and against others. However, it might also be the case that many teachers would say that they teach to increase knowledge and capability as opposed to ignorance and illiteracy, while unintentionally disregarding the unique cultural differences among students.

Problem-Posing, Illiteracy and Alienation, and Mathematics Education

Problem-posing and problem-solving are two of Freire's most important educational ideas. Problem-posing originated with Freire's concern with his low-income students' fatalistic outlook. In response to these attitudes, Freire began culture circles that used pictures to challenge students to think critically about their lives, about their situations, and about taking control of their own destinies. His culture circles soon evolved into literacy classes where carefully chosen words represented emotionally and socially problematic issues in the lives of the students. Dialog helped to increase students' understanding of the root social causes of problems and how they might bring about change for themselves. Education thus took on a direct personal meaning for the students. Freire's programs motivated students to read and write better in order to gain the vote and participate in the political process. Freire had a vision of "education for transformation" (Shor, 1987).

Another of Freire's main ideas is that education is not neutral, not static, not about "inert ideas." To Freire, the interaction of teacher and student is alive and variable from one student to another. All students bring with them their own unique cultural expectations, their own unique experiences of social discrimination and social pressures, and their own strengths in surviving and progressing those experiences. Thus, education

in Freire's view, starts with the unique experiences of people, and these experiences may either reinforce or challenge the social pressures that tend to keep students passive and harboring fatalistic attitudes. The essential purpose of education, in Freire's view, should be human liberation. Education should liberate people from believing they are locked into poverty and stagnation. Education should liberate people and help them reflect upon the relationship they have with the life around them and what they can do to better their destiny in life. Through human reason and communication with others, people can become more than what they now are. Students should not be empty sacks, sitting at a desk waiting to be filled with tidbits of information dispensed by a teacher.

In Freire's view, education should be a dialogical process where everyone—the teacher, the student, the administrator—gains from the process itself. The goal of dialog is critical thinking toward "conscientization." Society, including both an individual's parents, grandparents, and siblings, as well as the larger population of people outside the family, exerts pressures that can undermine students' confidence and expectations. When students begin to realize the root causes of their positions in society, critical thinking can begin. The group process that utilizes personal experiences to realize social/cultural interrelatedness is what Freire calls "problem-posing" (Shor, 1987). In problem-posing, much of the content comes from the lives of the students, which can help motivate them as they acquire language, set goals, and undertake job responsibilities. Problem-posing is especially applicable to immigrant, refugee, and/or ESL (English as a Second Language) students who have limited control over their lives due to a language barrier, low socio-economic status, or racial distinction.

Listening is a necessary skill, and good listening skills are important for the teacher as well as for the students. It is a simple matter to hear things and not truly grasp the full meaning of what is being said. Likewise, it is possible to ask questions without fully grasping what is being asked. For example, asking young children what their fathers do for a living might send some children into a panic; some fathers might be in

jail, or unemployed, or even absent. Sensitivity when posing questions and listening to personal statements made by students, young or old, is crucial.

In connection to problem-posing, Freire speaks of "codes." A "code" is a concrete physical representation of a special critical issue; it can take different forms—a story, a photograph, a song, or a written dialog—but it should be open-ended, should result in group discussion, should not be overwhelming, and should offer possibilities for action toward change.A code represents the students' reality to the group and allows them to project their emotional and social responses. Journal writing, which is now commonly used in the United States, may be interpreted as a type of code. Student journal entries often present concerns with particular social issues.

Codes can lead toward positive action when they are used to prompt discussions of situations and problems. Solutions might take time, however, which is why Freire named the process problem-posing and not problem-solving. As time and situations evolve, problems change. Problem-posing is a more open and dynamic process than problem-solving. However, problem-solving tasks can also take a long time, can also be open-ended, and can result in more than one correct solution.

The teacher is instrumental in the discussion process of a culture circle. In the United States, especially, there may be a wide variety of backgrounds represented—American Indian, English, German, African, Mexican, Chinese, Iranian, to name but a few. Freire states that "the coordinator of a cultural circle must be humble, so that you grew with the group instead of losing your humility and claiming to direct the group, once it was animated" (Shor, 1987). Young students have few opportunities to take control of their learning. Freire thought they were often conditioned in school or at jobs to respond to orders or to other people's initiatives. However, as people begin to feel comfortable sharing experiences through codes, the classroom will gradually change. More questions will be asked and more responses will be given on a problem. The physical arrangement of the room is important; circles and small groups reinforce co-learning and

co-teaching. The use of codes can encourage all students to participate in a classroom topic.

Action, the follow-up to group expressions and reflections, is necessary in the Freirean approach and is an essential component of conscientization. Actions can take many forms: one student might practice addition by adding the total number of people riding in cars as s/he walked home; another might question family members about ways in which they practice responsible consciousness in relation to their environment. An approach other than the typical teaching methods of lecture, workbook assignments, and teacher-assigned articles is needed when evaluating the progress made by individuals in a problem-posing curriculum. The problem-posing approach of listening, dialog, and action creates an education that is based on students' needs for language, self-expression, and control over their own lives.

One of Freire's major concerns is the motivation of students. In *Freire for the Classroom* (1987), Shor describes an attempt by Finlay and Faith to design a course that would improve the language skills of upper-middle class American college students based on Freire's philosophy and methodology. Finlay and Faith's course also incorporates the developmental psychology of Lev Vygotsky, who states that "good writing is related to abstract thinking" (Shor, 1987). Both Freire and Vygotsky emphasize the importance of the interaction between persons and cultural elements in moving from inner speech to written language; there must be a connection between awareness of oneself in social relations and the critical use of language.

Finlay and Faith decided to approach language instruction by drawing on their students' understanding of the relationship between language and society. There were 27 students involved in their study, representing a variety of classes and majors. Nineteen had significant linguistic inadequacies, and several were on academic probation because they were either unwilling or unable to adequately complete written course work. Finlay and Faith observed that these students had difficulty following a logical sequence of rea-

soning, "and had used language as if words had no objective relationship to particular ideas, objects, or experiences" (Shor, 1987).

A crucial part of social life is language, because the relation between the individual and the social world is carried out by what Freire terms a "thought-language" and what Vygotsky calls "the units of verbal thought." Freire revealed students' forms of consciousness by showing them pictures of their usual activities and then reflecting with them on the thought-language they used to describe the pictures. This focus on their thought-language forced Freire's students to concentrate on their oral and written language. Finlay and Faith used thought-language strategies with the 27 students in their study. The first assignment they gave the students was to bring in a list of words that seemed to be areas of knowledge or life that the students wanted to open up; then the students were told to group the words in any ways they seemed to fit together.

As the students attempted to exercise control over language, they began to distinguish in themselves and in the comments of other students the differences between objective and subjective positions. In general, the students experienced feelings of powerlessness and realized that their social understanding was overinflated.

The students' writing revealed a lack of critical skills and a failure to develop their own authentic voices. The students appeared afraid of taking the steps necessary to develop their own critical voices and think their own thoughts. The students appeared reluctant to take responsibility for acting in accordance with their own beliefs, which was the main reason they disliked writing assignments so much. They were unable to express themselves in writing the way they wanted, and they were also unable to think critically the way they wanted. Writing, for these students, was in Freire's term a "limit situation" (Shor, 1987). Writing became their limit task, because in a writing situation they were confronted with their inability to express their thoughts in a free and authentic voice. The students became aware of the gap between their own thoughts and the language taught to

them by their culture, especially the academic-type language that was rewarded by and correlated with success in school.

Group discussion of key words showed Finlay and Faith that what really concerned the students more than anything was their relationship to the world as they conceived it. There was a need to feel safe in the classroom, and students were concerned with how they fit into the scheme of things. A change occurred when the students began to see the importance of language skills in relation to their own voices and places in the world. Finlay and Faith also found that their students needed to understand the flaws in their writing, as well as the personal and social importance of their inability to write clearly. This accords with Freire's view that adults learn to read and write only when they are simultaneously learning the relevant skills and reflecting on the personal and social aspects of their learning (Shor, 1987). Dialog, through which individuals gain meaning and direction, is a prerequisite for the formation of shared meaning.

Toward the end of the study one student's statement was used to encapsulate the class experience. The student expressed his feelings by saying that he

> ... was suffering not only a lack of cultural awareness but also a lack of self-awareness. I feel now that developing one's understanding of self and developing one's understanding of culture go hand-in-hand. I further feel that the means of this development is an ability to use language, to communicate clearly, and from a position of self-worth. With this understanding I can begin the task of understanding the world. I was fatalistic and hopeless. This has passed. I have a goal now, understanding the world, and a tool, language. I can go to work. (Finlay and Faith, 1987, p. 28)

Freire insists that no subject is neutral or static. Even mathematics might be inherently unjust and oppressive (Fleener, 1999). In Freire's view, knowledge is continually created and re-created as people reflect and act on the world; the world and knowledge are giving instead of given. Knowledge is not fixed permanently, but is a continuous process of producing new knowledge and reproducing existing knowledge—"two moments in the same cycle" (Shor, 1987). Thus, action, the moments in the cycle, must be critically analyzed or there cannot be progressive change.

Mathematics is alive and natural. To illustrate this claim, one can turn to statistics. Statistics may appear dull, lifeless, and static to many people, but in Freire's view they help explain how statistical knowledge arises naturally from the conditions of our society. When society changes, so do statistics. For example, in sixteenth century London, the growth of markets created a climate for epidemics out of which came the first collections of mortality statistics. As these statistics were refined, they became more useful.

One of the issues in mathematics that Freire addresses is that of mathematics anxiety. The immediate pedagogical causes of mathematics anxiety are approaches such as rote drill, excessive memorization, excessive paper-and-pencil work, and other unmotivating applications. Freire argues that those who are not aware of why they feel mathematics anxiety will simply accept the situation and assume that they are mathematically backward or inept. Thus, Freire insists that educators must develop critical mathematics education.

Freire thinks thought group process should be used more, since students often feel they can contribute to a group. Working in a group could actually help individuals work better independently. Another misconception is the idea that a "wrong answer was totally wrong, [and that] nothing could be learned from analyzing it" (Shor, 1987, p.194, quoting Frankenstein, 1973). Because different groups are affected by societal attitudes in different ways, understanding the deeper causes of mathematics anxiety involves an examination of the particular attitudes and thought processes associated with a group's social position. To some extent, people of different cultures or races participate in their own mathematical anxiety and fears (Shor, 1987).

Differences between the accomplishments of males and females in mathematics education are often the result familial and cultural differences. The restrictions, stereotypes, parent-teacher attitudes, teacher-student attitudes, and differing sex and gender roles assigned to boys and girls in the family and in society are all factors to be

considered. Society places certain unspoken restrictions on many academic activities. These restrictions generally operate below the level of consciousness, where they remain unanalyzeable until people drag them up, take a good look at them, and begin to talk about them in order to understand what it is that prevents people from learning and achieving.

Using approaches in line with Freire's methodology (such as group sharing and group discussion of math problems), individual change can occur. When learning occurs and individual attitudes change, students slowly overcome their mathematics anxiety. They begin to feel that they "can do it" and that "things can change." Perhaps the most critical ingredient in teaching students, especially the oppressed and disadvantaged, is to subtly change the learning climate so that students can feel positive about their potential and ability.

Summary

One of the most beneficial factors of Freire's pedagogy is the attempt to make education a personal experience for people regardless of age, economic status, race, or nationality. When dialog and discussion in education—whether in science, mathematics, history, home economics, or language class—is encouraged and applauded students expressed their own desires, fears, strengths, weaknesses, and thus better planning could be made and student motivation could increase. When motivation was higher, learning was greater.

Freire's philosophy, when simplified, is not simply directed at teaching Third World populations how to read and write, but is also helpful for learning about other cultures, the human purpose, and how these two are related. Freire's focus is on developing learning programs that include the nature of culture and the roles of language and discussion, vocabulary, and personal meaning. Freire's ideas on education can be applied to any educational field.

It is Freire's basic belief that people need to develop their own critical consciousness and that this can be accomplished through dialog with others and a problem-posing education. In the United States, education could lead to a critical consciousness by overcoming a massified consciousness. That is, the average person believes that humans change and control the world and that individuals act of their own free will rather than in response to a complex interplay of choice and manipulation. To Freire, most human behavior is superficial, because individuals tend to behave within the scope offered to them by their culture.

Freire feels strongly that searching with students for the ideas and experiences that bear directly on the meaning of their personal lives will suggest specific educational directions for those students. The meanings and valuations that evolve through the participation in culture circles and the growth of critical consciousness can eventually contribute to fundamental change by aiding both the general fight against social inequalities and the specific goal of removing the deleterious effects of negative group stereotypes.

Research by Finlay and Faith suggests these strategies have relevance for the American classrooms and could be used effectively in these settings. The underlying rationale for using culture circles and emphasizing discourse, problem-posing, and personal meaning is the potential for empowerment that is associated with increased conscientization.

The Minority Factor

> **By the year 2000, one-third of all students will be "minority." Children growing up in these families and communities often differ from children of the dominant culture in their learning styles. Many of these "minority" students attend schools that are poorly serviced, score lowest in the all-important standardized "achievement" tests, and drop out of school at higher rates. Numbers of these students are placed in the lowest track from the earliest grades, where they are presented with a limited, outdated curriculum, taught by rote memorization methods, and tested by standardized paper-and –pencil, multiple choice tests (Zaslavsky, 1991).**

Women and non-Asian minorities are underrepresented in the sciences, mathematics, and technology work forces (Cazden, 1990). In the 1980s, African Americans contributed 10% of all employed workers and 7% of professional workers; Hispanics made up 5% of all employed workers and 3% of professional workers. However, African Americans and Hispanics represented only 2% of the scientific work force. This can be interpreted in many ways. In contrast to positive trends for women at the time, African Americans and Hispanics had made little progress. Their lower, constant rates of participation may be explained by their lower rates of degree attainment, their precollege experiences, and their lower rates of choosing scientific majors among those graduating from college. Data suggested that women's underrepresentation was likely to continue into the near future, although the gender gap in the sciences might continue to narrow. But there was little to suggest a significant increase in African American and Hispanic participation in the sciences in the near future (Cazden, 1990).

According to Oakes (1992), the most striking findings regarding minority students are those from national statistics showing that of all groups African Americans had the most positive attitudes to the sciences. However, their lower levels of participation and achievement in science cast doubt on the proposition that positive attitudes lead to higher achievement or more opportunities to participate. In Oakes' view, a more plausible hypothesis suggests that for positive attitudes to affect minority students' behaviors, they need to be expressed in the context of actual science experience. For instance, with African Americans, an early interest in science projects and participation in science clubs

in high school has been correlated with the choice of science as a college major and with making this decision before entering college (Thomas, 1984). Experience and cultural expectations might be more directly related to participation than positive attitudes.

In other studies the findings were similar. African Americans and Latinos demonstrate more positive attitudes towards the sciences than do Whites, but they have lower participation and achievement levels in those areas (James and Smith, 1985; Rakow, 1985). Thus, it seemed clear that there were other factors affecting the achievement and participation levels of students. However, studies of the relationship of attitudes to achievement in science also revealed that men have more positive attitudes toward science and also achieve and participate at higher levels in the scientific fields (Rakow, 1985; Schibecci, 1990). Sex, rather than ethnicity or achievement, seemed to be a better predictor of science attitudes; both African American and White women students showed less positive attitudes than their male counterparts.

An important finding of Gross's research (Gross, 1988) suggested that once students fell below the standard level of performance for a grade level, it was unlikely that they would ever catch up. This was especially true for African Americans and Latino students. By age nine, African American students performed well below the national average on national mathematics assessments, and the difference increased with age. African American students had made recent gains in mathematics—often greater than the gains by White students—according to analyses of national tests. But African American and Hispanic students' scores were still well below the national average (Clewell, Anderson, and Thorpe, 1989).

In 1985, Lockheed and colleagues investigated mathematics achievement during the middle school years. They found that Asian-American students outperformed White students. They also found that Asian-Americans and White students performed better than Hispanic students, but that Hispanic students outperformed African Americans on a variety of measures—Iowa Test of Basic Skills, California Test of Basic Skills, and dis-

trict achievement tests (Lockheed, et al., 1985). Other studies have also supported Lockheed's, including those by Gross and Holmes (Clewell, Anderson, and Thorpe, 1989). Their studies showed that Asian-Americans and White students outperformed African Americans and Latinos, a pattern that appeared as early as the third grade.

In a study by Thomas, it was found that African American interest in mathematics was often influenced by encouragement from "significant others" (Thomas, 1984). Thomas reported that even though Mexican-American parents supported their children's study of mathematics, Mexican-American girls were more likely to be discouraged by parents from pursuing nontraditional careers as compared to either Mexican-American boys or White girls.

Summary

Research on minority factors in the areas of mathematics interest, motivation, achievement, and success has found that the Asians seems to be doing very well in comparison to other minorities—Hispanics and African Americans in particular. Research has also shown that socio-economic level within racial and/or ethnic groups should be considered. Hispanics, African Americans, Native Americans, and Anglo-Americans from poor families tended to do worse on achievement tests than did students from upper class families with similar racial and/or ethnic backgrounds.

Generalizations can be made about race, but to do so is to risk creating misleading impressions. It is interesting to note, however, that even Asians from poorer socio-economic classes often do very well in mathematics achievement. Their success may be attributed to their generally different outlook on academics and their belief in the success that comes from an ethic of "hard work."

Cultural factors, group norms, and, especially, racial differences, might be significant aspects of students' success or lack of success in mathematics. These components of a student's environment are in need of further study.

Stereotype Threat Factor

> **When I go to the ATM machine and a woman is making a transaction, I think about whether she will fear I may rob her. Since I have no such intention, how do I put her at ease? Maybe I can't ... and maybe she has no such expectation. But it goes through my mind. (Jones, 1997)**

The theory of stereotype threat suggests that a student's identification with school and its subdomains can lead to success, but that pressures of society frustrate this identification. Furthermore, those groups that have been negatively stereotyped face the barrier of stereotype threat, "the threat that others' judgments or their own actions will negatively stereotype them in the domain" (Steele, 1997).

The theory assumes that to achieve success in school, a student must be identified with school achievement in the sense of its being "a part of one's self-definition a personal identity to which one was self-evaluatively accountable" (Steele, 1997). This accountability, the positive self-feelings based in part upon good achievement, helps to sustain achievement motivation. For such an identification to form, according to Steele's theory, a person must perceive that s/he has good prospects. In other words, a person must find areas where s/he has definite interests, skills, resources, and opportunities to prosper, belong, and be accepted. If these areas are not found or become threatened, achievement may suffer.

In the attempt to understand what causes a lack of achievement among women and African Americans, the investigators of stereotype threat ask what in the experience of nonachieving groups might frustrate their identification with all or certain aspects of school achievement. Another question arises when one considers a boy and a girl in a mathematics or science classroom or an African American student and a White student in any classroom that appears to be the same (same books, same desks, same teacher, same treatment, and so on): Is it possible that given these equivalencies some students capable of performing and achieving success may still experience the classroom so differently as

to affect their performance and achievement levels? This is actually the central question asked by those who think that a stereotype threat exists and that it affects performance.

To elaborate, when a person is confronted by a situation where a negative stereotype about his/her group applies, it is a social-psychological threat. Such a situation threatens the person with the possibility of being negatively stereotyped or with being judged stereotypically or with the prospect of conforming to the stereotype. It is a situational threat that can affect the members of any group about which a negative stereotype exists (African American academic performance, gang member morality, elderly women, women drivers, etc.). Where negative stereotypes are applied to a group, members of the group fear being reduced to those stereotypes. And, for those who identify with the situation where the stereotype is present, the situation can be seen as a threat.

Two common approaches for remedying lagging achievement and achieving overall school reform are the "core curriculum" and "multicultural education." Ogbu argues that neither of these approaches adequately solves the problem of minority groups who have traditionally done poorly in public schools. In Ogbu's reasoning these two approaches are not based on a sound understanding of the nature of the cultural diversity or cultural differences of minority groups, including the impact of negative group stereotypes (Ogbu, 1992).

According to Ogbu, United States educators desire a core curriculum because successful countries like Germany, Japan, Taiwan, and South Korea have core curriculums. The question is: Will core curriculums improve performance of minorities who have not traditionally done well in school? Ogbu and others feel that core curriculums are limited because they do not take into account the nature of minority cultural diversity. What children bring to school—their cultural diversities, their family backgrounds, their communities, and their cultural models—are typically not taken into account with core curriculums.

The other frequently proposed solution, multicultural education, has also been criticized. Multicultural education fosters pride in minority cultures, helps minority students develop new insights into their cultures, reduces prejudice and stereotyping, and promotes intercultural understanding. However, this approach is felt to be inadequate because while it appears to help some groups of students, it has not been successful with groups whose members have traditionally performed poorly. According to those who support the theory of stereotype threat, "the problem was not merely one of cultural and language differences" even though these were important differences. To stereotype threat advocates, the most significant, largely unrecognized factor "was the nature of the relationship between minority cultures/languages and the culture and language of the dominant White Americans and the public schools they controlled. The relationship between the minority cultures/languages and the mainstream culture and language was different for different minorities" (Ogbu, 1998).

A paper by Aronson, Quinn, and Spencer (1998) describes stereotype threat as the discomfort victims feel when they are at risk of fulfilling a negative stereotype concerning their group. It also describes their fear that they might behave in such a way as to confirm the stereotype in the eyes of others or in their own eyes. If the stereotype threat is strong, it can interfere with social interaction and academic performance. An article by Steele and Aronson focuses on the social and psychological factors that can arise from a negative attitude about a particular group. Steele and Aronson feel that when a negative stereotype exists, anything that a member of the targeted group does that conforms to the stereotype becomes personal and internalized. Once internalized, it then becomes a threat (Steele and Aronson, 1995).

Investigations of Stereotype Threat

A number of formal research studies have investigated "stereotype threat." In one, a study was designed involving male and female students who were both good in mathematics and strongly identified themselves as being good in mathematics. The stu-

dents were given a very difficult mathematics test. The items were taken from the advanced mathematics General Records Examination (GRE). Results showed that the women significantly underperformed in relation to the equally qualified men on this difficult test. However, on a parallel test of advanced literature, where participants had been selected for their strong literature skills, the women performed just as well as the men. According to the investigators, this happened because women were not stereotype threatened in this area (Steele, 1997).

A second experiment conducted by the same investigator utilized easier test items and found that women did as well as men. The lack of performance frustration on this easier test, according to the investigator, reduced women's stereotype threat by making the stereotype less relevant as an interpretation of their performance. These two individual investigations suggest that there might be a possible limitation in the women's perceived mathematics ability in this case. A stereotype threat might exist, but mathematics ability or capability might be a factor.

A third experiment was done. Here the women were told that the test would indicate gender differences. Result: the women performed worse than the men, replicating the underperformance observed in the first experiment.

In a study by Steele and Aronson (1995), the authors asked whether underachievement to some degree reflected the stereotype threat that seemed to be a chronic part of some students' educational environments. In their study of 114 African American and White Stanford undergraduates, there were three groups: a diagnostic, a nondiagnostic, and a challenge group. Students in the diagnostic group were told that their performance would evaluate reading and verbal reasoning ability; the nondiagnostic group was told that the task was to familiarize them with a type of problem; the challenge group was told to try to do their best since it was only a challenge. Results of these tests indicated that African Americans completed fewer test items in the diagnostic group and that accuracy among the African American participants was much lower. In the nondiag-

nostic group, African Americans did as well as White students. The authors concluded, on the basis of this study and others, that stereotype threat might have detrimental effects on the performance of African Americans when a threat had been established. In this particular case, the threat was established when academic ability was the focus.

The goal in a study involving 24,599 eighth-grade students from 1,052 schools across the United States was to determine if (1) African American boys remained disidentified through twelfth grade; (2) African American girls disidentified; (3) other disadvantaged minority groups (Hispanics) showed evidence of disidentification; and (4) disidentification was global across all academic domains or specific to some content areas. Content areas included mathematics, science, English, and history (Osborne, 1997). This study was longitudinal in scope and very involved. Socioeconomic status was measured as a composite of parental income and educational level along a scale created by the National Center for Education Statistics (NCES, which initiated the study). A base year composite score (1988) was used in the analyses. The GPA was measured using four self-report items where students were asked to rate their grades in mathematics, English, history, and science. Grades were rated by the students on a scale of 1 to 8. In all testing sessions, self-esteem was measured using seven items from the Rosenberg Self View Inventory.

Results indicated that scores for self-esteem were highest among African Americans across all three timepoints. The self-esteem of White students remained stable across time, while African Americans' self-esteem increased from eighth to tenth grade and then decreased by twelfth grade. Hispanics, who showed the lowest self-esteem at the eighth grade level, had higher self-esteem than Whites by the twelfth grade. Interestingly, although the self-esteem of African Americans remained much higher than that of Whites, their grades and achievement scores dropped over time. The same was true of Hispanics. Osborne concluded that these trends suggest that within minority groups there

is a potential dissociation between academics and one's self. Could it also suggest another dissociation or psychosocial dynamic?

In Osborne's study, all groups except Hispanic girls—who showed some of the strongest increases in correlations across time—showed decreasing correlations between the tenth and twelfth grades. Hispanic boys showed evidence of disidentification in the domain of reading. This was the same content area for which African American boys disidentified most strongly. In fact, African American boys' correlations showed a dramatic decrease over time. These results cannot help but raise some questions (and doubts) regarding academic dissociation and stereotype threat. Are there other factors in operation? Some researchers have criticized the Rosenberg Scale as being insensitive to the actual self-esteem of African Americans, as expressed in this study. However, Osborne counters that

> unless one can make a compelling argument that African American boys experience different issues than Whites during adolescence aside from stigma and negative stereotypes, this criticism also cannot account for the results observed, as most adolescents remain significantly, if not strongly, identified with academics (Osborne, 1997).

Aronson, Quinn, and Spencer (1998) point to four factors—task difficulty, ability evaluation, stereotype applicability, and domain identification—that appear to be important conditions in the research linking stereotypes with underperformance. They state that "[I]t is primarily under conditions where all these factors are present that stereotype threat poses the most serious obstacle to relax concentration and thus to high performance" (Aronson, Quinn, and Spencer, 1998, 93).

Steele and Aronson conducted a study in 1995 that attempted to examine stereotype threat by looking for independent evidence that a stereotype-threatening situation (diagnostic test taking) would induce targets to think about stereotypes. They reasoned that if African Americans underperformed because they were psychologically contending with a stereotype alleging lower ability, then maybe the subjects would demonstrate

greater cognitive activation of stereotypes when in the company of a stereotype threat situation. After being told the type of test they were to take (diagnostic or nondiagnostic) and scanning a sample test item (a difficult analogy from the verbal GRE), the participants were given a stereotype activation measure composed of a long series of word fragments such as _ _ C E. Prior research indicated that this was a good way of measuring either recently encountered or self-generated constructs. The participants' task was to quickly fill in the blanks to form an English word. A typical response might be to complete the word N-I-C-E. However, students contending with negative stereotypes regarding their intellectual abilities, might be more likely to complete the word R-A-C-E. This was exactly what happened in Steele and Aronson's study. The authors concluded that explicit evaluation may not be necessary to activate stereotypes and undermine performance. The mere difficulty of an intellectual task may be enough to bring the stereotype threat to mind.

This hypothesis was tested in a 1996 study by McGlone and Aronson (reviewed by Aronson, Quinn, and Spencer, 1998) in which African American and European American undergraduates were given two versions of the stereotype activation task. Half of the subjects were given a difficult version of the task, while the other half was given an easier version. The difficult version included examples such as this: _ _ T A P _ _ _ _; the easier version included examples such as this: T A _ _. Both versions contained the same race-related fragments. The result showed that the African Americans who were given the difficult version completed significantly more word fragments in a way that formed a race-related word, suggesting that their frustration with the items made them think about the stereotype alleging the inferiority of their group. The same subjects completed fewer total items than subjects in all other groups, suggesting that at least one reason the African Americans underperformed on this task was that its difficulty put them under additional apprehension about confirming negative stereotypes.

A study conducted at the University of Michigan in 1998 by Steele, Spencer, Hummel, Carter, Harber, Schoem, and Nisbett (1998) sought to increase academic performance by reducing a possible stereotype threat through three means: (1) It was emphasized to students that they had been recruited for the study because they had already met the tough admission standards at the University of Michigan; (2) Through the study's first semester, students involved participated in weekly seminars that allowed them to become acquainted with one another and to share common problems; (3) All students involved in the study participated in workshops for one of their courses, where they were exposed to advanced material beyond that taught in the course. These three factors were intended to convey the message that the participants' instructors and peers would not stereotype them, thought they were very competent and could excel academically, and believed they belonged at the University of Michigan.

Results of the four-year study showed that the program led to a substantial increase in African Americans' performance in school. African Americans randomly assigned to the program improved, on average, by four-tenths of a grade in comparison to African Americans randomly assigned to the control group. Furthermore, the increase in performance, although it slowed, was evident throughout the college years and fostered a higher retention rate. The authors concluded that the program decreased stereotype threat, which in turn promoted identification with school, which led to better grades.

Stereotype Threat and Mathematics Performance

Spencer, Steele, and Quinn (1991) conducted research into the experience of being confronted with judgments that were based on a stereotype concerning one's group. The researchers focused on the role of stereotype threat as a factor in women's mathematics performance. Their research consisted of three individual studies. In the first study, involving 28 women and men, the goal was to duplicate the documented pattern in which women underperformed in comparison to men on difficult tests, but performed as well as men on easier tests (given samples of equally prepared men and

women). Participants were told how to use the computer and how the test would be scored. The results were similar to those observed in earlier research.

In the second study, the effects of stereotype threat were tested directly by giving participants a difficult math test (as in the first study); this time, however, the participants were told that the test had revealed gender differences among previous test takers. In past studies, such a characterization had evoked the stereotype about women's presumed lesser mathematical ability. And indeed, the results of Spencer, Steele, and Quinn's research showed that when women were told there was a gender difference, they did worse than men, while women in the study who were not thus informed performed almost as well as the men. Even though Study 2 presented compelling evidence that stereotype threat could weaken the performance of women on a difficult math test, the experimenters wanted further evidence.

Spencer, Steele, and Quinn thought that perhaps women's underperformance in the experiments might be caused less by stereotype threat than by the lower performance expectations that they brought with them to the laboratory. Thus, in their third study, the researchers tried to measure the participants' evaluation apprehension, state of anxiety, and self-efficacy after they received instructions. The authors reasoned that if other variables mediated the effects of stereotype threat, they should vary the instructions for the test. The study involved 36 women and 31 men. One 20-minute test was given, similar to the tests given in the first two studies. The participants were either told that there were no gender differences on the test or (in the control group) they were told nothing regarding gender differences. The researchers found that when women were told there were no gender differences they performed as well as the men; but when they were told nothing they performed worse than the men.

Spencer, Steele, and Quinn concluded that stereotype threat tended to increase anxiety, and that evaluation apprehension and self-efficacy did not mediate the observed stereotype threat effects. Emotionality may have accompanied the women's perfor-

mance, but did not seem to have a large impact on it. Stereotype threat, in the authors' opinion, had its most disruptive effects on women's mathematics performance when women encountered new mathematics material at the limits of their skills. Also, only when the test was difficult and reflected an ability that the test taker cared about, did the stereotype became relevant and disruptive as a potential for self-characterization.

In another study, "When White Men Can't Do Math: Necessary and Sufficient Factors in Stereotype Threat," by Aronson, Lustina, Keough, Brown, and Steele (1997), the goal was to test two assumptions concerning stereotype threat. First, the authors tested the hypothesis that to interfere with performance, stereotype threat did not require a history of stigmatization or internalized feelings of intellectual inferiority, but could arise and become a detriment as a result of situational pressures alone; two separate experiments tested this hypothesis. Also tested was the assumption that stereotype threat is in part mediated by domain identification and is most likely to undermine the performances of individuals who are highly identified with the domain being tested.

In the first experiment, stereotype threat was induced by invoking a comparison between the non-stereotyped, high-ability test takers and a minority group proclaimed to excel at mathematics (Asians). In the control, no mention of this stereotype was made. There were 23 male participants in the study. The researchers predicted that the stereotype-threatened test takers would not perform as well as those who had not been stereotype threatened, a hypothesis supported by the results of the experiment.

In the second experiment, an attempt was made to see if stereotype threat would have any effect on persons who were not identified with the ability domain in question. In the researchers' view, for a person to be threatened by a self-evaluative implication of a stereotype that suggested low ability, s/he probably needed to either care about having the ability or at least care about the social consequences of being seen as not having the ability. The researchers felt that stereotype threat would have little effect on the unidentified. Their second experiment sought to test these hypotheses by conceptually replicating

the first experiment, but with the additional factor of including the students' degree of identification with mathematics.

Results of the test showed that when the stereotype was activated, moderately identified participants actually outscored high mathematics-identified participants. This finding indicated that in stereotype threat testing situations, it might be an advantage to be only moderately rather than extremely involved in a domain. In Aronson, Lustina, Brown, Keough, and Steele's study, the stereotype seemed to challenge moderately identified students to do their best. When placed in a situation where a minority group's high ability was made known and relevant, the highly skilled and identified White males experienced a decrease in intellectual performance. Thus, for high-identification test takers, situational pressures (stereotypes about Asians doing extremely well, along with a strong desire to perform well) were sufficient to interfere with performance.

Summary

In Steele and Aronson's study (1995) involving word completion problems, it is quite possible that stereotype threat was but one of several factors present. Prior involvement, practice, and interest could also have had a definite impact on the participants' performances. Some individuals enjoy and participate in word games. These individuals would likely do better on word tasks. It is possible that the African Americans who performed poorly on the difficult items may not have had much practice or much interest in word games.

Osborne's longitudinal study (1997) is interesting and offers some opposition to the work of Aronson, Steele, Spencer, and others who support the stereotype threat theory. In Osborne's study, the self-esteem of African Americans remained high even though grades and performance dropped through the school years. Possibly this suggests that factors other than academic performance, such as social (dating) success and popularity, are important in promoting high self-esteem. Osborne's study shows that both Hispanic American boys and African American boys showed evidence for disidentification

in the domain of reading (very strong disidentification in the case of the African American boys). However, only African American boys experienced serious disidentification with academics in general. Interestingly, Hispanic girls showed the strongest academic identification.

The study by Aronson, Quinn, and Spencer (1998) shows an increase in grades and retention for those participants who were randomly assigned to the program group, which received special attention. First, group members were first told that they were very competent individuals, who would not otherwise have been accepted into the university. This should have been a boost to their ego and positive self-concept. Next, they participated in weekly seminars that allowed them to become socially and emotionally involved with the other students in their special group. They were given the opportunity to get to know each other, share problems, and perhaps identify with each other's circumstances. Finally, they attended a subject master workshop in which they were exposed to advanced material. These three factors likely had a very positive effect on the students' frame of mind and thus their academic performance.

We should think more in terms of positive socialization in schools and encourage more verbalization, more personal interaction between all races, and more tutorial help for those students facing academic difficulties. These improvements might increase the performance levels of many students, including African Americans. African American students should not feel that they are, as a group, inferior to other students, but they should be aware that a stereotype to that effect is present in American society.

Research is beginning to offer concrete suggestions for ameliorating the problems associated with being a minority in the U.S. school system, including stereotype threat. The difficulties can be attacked, and future generations of minority students will be placed in positions that engender their greater success.

CHAPTER THREE

DESCRIPTION OF THE STUDY

The focus of this qualitative study was on the impact of culture circles on student beliefs and performance, specifically the impact of culture circles on African American students' mathematics performance and feelings of stereotype threat. The study was conducted in 1999 with eight volunteer minority students enrolled in an Algebra II class at Wilson High School, an inner city urban school in a southern-plains state. Data were collected in the form of field notes of classroom observations through group and individual interviews that were tape-recorded and transcribed.

A culture circle was formed with these students. The focus was on exploring their experiences, values, meanings, and visions of their past, present, and future learning. Problem-posing was a key strategy in the formation of a dialogic community as the culture circle evolved. Critical consciousness and conscientization with a focus on action were goals of the culture circle.

The Research Design and Methodology

The research methodology of this study was influenced by Lincoln and Guba's (1985) constructivist inquiry. The constructivist believes the researcher and the researched are interconnected. This research used the culture circle method developed by Freire (Shor, 1987,) including group discussion about subjects close to the participants' lives. Participants were selected with the goals of culture circles in mind.

In order to investigate the impact of the culture circle on mathematics learning, students were asked questions about their study of mathematics and the relationship between mathematics achievement, attitude, and stereotype threat. A secondary goal of the study was to make a difference in the students' lives by raising critical consciousness through the dialogic process. It was hoped that the students would confront stereotype threat and overcome their own potential difficulties as well as the social limitations

affecting their mathematics learning. The researcher's role in this project was based on Freire's approach to directing culture circles, as described below. Freire's methodology directly influenced the interventions, strategies, and analyses of the study.

A culture circle is a gathering of people who come together in order to achieve similar goals—to aspire to do better, to know more, to succeed in life. Freire suggests that an educator who wishes to work with such a group should be humble, gentle, and understanding (Shor, 1987). He explains that the facilitator must be able to communicate on the same level, grow with the circle members, and not act as the circle's director. Good listening habits are vital. Continual circle dialog, together with action, can lead to an education that is based on the needs and aspirations of the students, one that will in turn encourage them to take control of their own lives.

Dialog is very important to Freire's method of education. Dialog releases and exposes the feelings and aspirations of the students, as well as their ideas, impressions, unique experiences, and opinions. Through dialog, which promotes self-evaluation and self-exploration, students can come to better understand their own feelings and lives. Open dialog in the culture circle can allow members to view a situation or the world differently. In effect, by creating a safe environment for self-exploration and understanding, the culture circle can empower its members to redirect their lives, rise above their situation, and succeed.

Interventions and Strategies

Freire's strategies, including problem-posing, were used to establish trust and develop a culture circle that could lead to increased consciousness for the participants. Data were collected in two stages. The first stage lasted approximately six weeks at the beginning of the semester and involved preliminary observations and informal interactions with the class, including attending class three times a week and helping the teacher as seemed appropriate or as requested. The time was used to become acquainted with the students, for them to become acquainted with me, and to recruit participants for the

study. The second stage lasted approximately ten weeks and involved observations of the participants inside the classroom and weekly, individual interviews as well as the weekly culture group meeting. Criteria for participation included willingness, a desire to explore topics about mathematics learning, and teacher recommendation. The second stage of the study served as the primary data collection phase.

Validity

Validity describes the soundness and rigorousness of a study. Credibility, transferability, and reliability are three subsets of this issue; they are addressed individually below.

Credibility

Credibility refers to the "truth" of a study's findings and whether or not the investigator provides readers with a picture that truthfully depicts the phenomena under study. According to Lincoln and Guba (1985), there are several activities that one can do to enhance the probability of obtaining highly credible findings: prolonged engagement, persistent observation, and triangulation. Prolonged engagement was met by carrying out this study during a period of sixteen weeks. Regular observation and data collection addressed the requirement for persistency. Data were collected through the use of personal interviews with the students as well as the teacher, through group interviews with the students, and through observations (including tutoring sessions and classroom observations). Field notes were used to record the observations of the participants, and audiotapes were used to record all the personal and group interview sessions.

One measure of credibility is acceptance of the study's findings by members of the studied group. Data, analytic categories, interpretations, and conclusions must be examined by those who provided the data. To ensure acceptance, culture group members were asked continually throughout the study to assess the researcher's interpretations of their responses. Data were compared using a constant comparative method (Lincoln and Guba 1985).

Transferability

Transferability is concerned with the question of generalizing the findings of the research involved to other contexts or to other populations of interest. According to Lincoln and Guba (1985), qualitative research findings are not transferable, due to the nature of the research paradigm. Thus, the responsibility of generalizing the findings of the study does not rest on the shoulders of the researcher. It is up to the readers to make a decision as to how the study applies to other situations and what actions need to be taken. The researcher has the responsibility of providing a clear description of the study, so that readers can use it in their decision-making processes.

In this study, a detailed description of the participants and the procedures of the study are provided so that interested readers can form their own judgments of the findings and how to fit them into their own research interests.

Reliability

The focus of reliability is on the consistency of a study's findings. That is, it deals with the question of whether the same findings could be achieved by different investigators using the same methods. According to Lincoln and Guba (1985), reliability in qualitative research can be checked by using an outside "inquiring auditor" to evaluate the process of collecting and interpreting data and ensuring that the study was done in a fair manner.

Caveat

Patti Lather (1991) explains that approaches to research reveal the researcher's beliefs about the world they live in. Researchers enter into a research project because they have an interest in that area of research. Interest-free knowledge is not possible. Researchers always bring personal opinions and biases to their projects. Lather notes that there is no "neutral research," a claim that is similar to Freire's view that there is no "neutral education."

Data Sources

Data sources included the audiotapes from individual interviews, culture circle meetings with the students, and the teacher interviews, results of the Mathematics Anxiety Rating Scale Test (MARS-A) administered to participants, field notes and transcripts of audiotapes of the individual interviews and culture circle meetings. Transcripts were compiled from all audiotaped data and were analyzed as described below.

Data Collection

Participants were observed in the classroom, the teacher was interviewed weekly, and the culture circle meetings occurred once a week. A detailed log of observations was kept and complete transcripts of individual interviews and culture circle meetings were produced as the data processing evolved. A graphic of the research phases is shown below. (See Table 1). Questionnaires were analyzed to provide background information about the participants and served as discussion points with them. The MARS-A was administered as an indicator of the students anxieties about mathematics and as a way of introducing mathematics anxiety as a topic of discussion.

Table 1
Summary of Research Phases

Phase	Time	Classroom Observation	Individual Interviews	Culture Circle Meetings
I	6 Weeks	Completion of Questionnaires, Teacher Interview, Classroom Observations, Mathematics Anxiety Test		
II	9 Weeks	Classroom Observations	7 Formal Meetings and 7 Individual Interviews	7 Formal Meetings Discussion

Data Analysis

Transcriptions of audiotapes gathered from classroom observations, individual interviews with the students, the teacher interview, and the weekly culture circle meetings were part of both the first and second phase of this study. A reflective journal kept by the researcher also provided data for analysis. All the participants' class activities, the

researcher's face-to-face conversations with the participants and teacher, correspondence, and field notes concerning the research project were recorded in the reflective journal. Input from the participants concerning their journal entries were tape recorded during the individual interviews and culture circle meetings. Participants' written responses to the survey questionnaires were also included in the both phases of the study.

Data were compared by applying a constant comparative method (Lincoln and Guba, 1985). Categories from the multiple data sources were developed with respect to the research questions, which included the following:

1. How do these minority students perceive themselves as learners and doers of mathematics?
2. How do minority students feel about themselves and negative group stereotype pertaining to their mathematics learning?
3. What is the impact of culture circles focused on mathematics values, meaning, and goals?

Categories included students' feelings about mathematics, stereotype threat, and the impact of the weekly culture circle meetings on their classroom experiences. Changes related to mathematics that occurred during the weekly culture circle were traced with using these categories as a base for analysis. A matrix of categories was developed for comparing the categories. (See Table 2.)

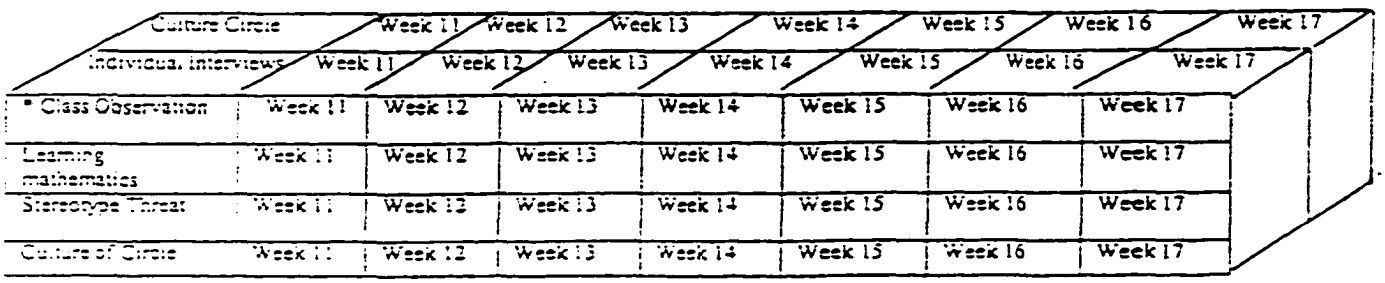
The study was designed to triangulate research by gathering in several ways and from various aspects rather than just one. The first step was to carefully read the data in order to develop a set of categories that adequately encompassed and summarized the data. The categories sought to explain the phenomena as well as describe them (Gall, Borg, and Gall, 1996). After formulating the category system, the data from each session were coded. Transcriptions were analyzed by coding three categories (See Table 2).

It was necessary to examine each recorded session and decide whether the phenomenon it described did or did not fit one of the categories in the category system. When all the coding was completed, a grouping strategy was employed to bring together

all the segments that were grouped with the same category code. By applying the method of constant comparison, a set of well-defined categories with clear coding instructions was developed.

Table 2

Matrix of Categories



* Classroom Observations occurred between Week 7 and Week 17.

Table 3 presents the three categories of data collection. "Beliefs in learning mathematics" refers to the participants perceptions of themselves as learners and doers of mathematics in the classroom community. "Stereotype threat" is defined as a situational threat affecting the behavior and beliefs of members of any group about whom a negative stereotype exists (Steele, 1997). "Culture circle" is a group of participants getting together to examine their situations in school, to question why they are in such situations, and to investigate how they can improve their performances (Shor, 1987).

Table 3
Approaches to Data Collection

Categories	Questions
Learning mathematics	Beliefs in Learning Mathematics
	Mathematics Experiences before Algebra II
	Experiences in Algebra II
	Problems Concerning the Homework
	Problems Concerning the Tests

Table 3
Approaches to Data Collection

Stereotype Threat	Problem-posing Negative Stereotype Threat
	Concerning Academic Ability
	Prejudice
Culture Circle	Negative Group Stereotype Threat Pertaining to Mathematics Learning
	Mathematics Frustration
	Effect of Culture on Mathematics Learning

The Setting: Wilson High School

Wilson High School is a public high school in an African American neighborhood in a large southern plains state city. Recently Wilson Academy for Health Sciences and Engineering opened its doors as a specialty school with a total enrollment of 932 students in grades six through twelve. African American students comprise 60 percent of the student body. Wilson Academy operates in partnership with the health sciences campus of the local research university. The academy offers a comprehensive academic curriculum enhanced by extensive laboratory, health care, and engineering experiences.

The Wilson High School staff comprises fifty-three classroom teachers, four administrators, one librarian, two and one-half guidance counselors, and seventeen support staff members, including administrative secretaries, an attendance secretary, registrar, financial secretary, clerks, classroom aides, custodians, and cafeteria workers.

The average number of years of teaching experience among the faculty was fifteen. There were twenty-five teachers with ten or fewer years of teaching experience and fourteen teachers with twenty or more years of experience.

Participants

Eight African American high school students in Algebra II (a year-long course) volunteered to participate in this research. Selection of the participants was based on

teacher recommendations, classroom observations of their verbal and behavioral characteristics, and willingness to participate. Of the eight participants, six were sixteen and two were eighteen years old. They each had at least one year of high school mathematics prior to Algebra II. Two of the participants were seniors, four were juniors, and two were sophomores. All of the students lived at home with at least one parent. Three of the participants worked full time outside the home to contribute to their family's income. The main reason the participants were enrolled in the Algebra II class was because it was a requirement for graduation. All participants were male and all provided approved release forms signed by their parents. (See Appendix D.)

Steve* was a 16-year-old African American sophomore at the time of the study. He lived with his parents and twin brother, Dowain, who also participated in the study. He had had several tutors in the past, mainly because he didn't think he had a strong enough foundation in mathematics. Prior to the study he had completed courses in Algebra I and Geometry, making a C in both courses. He studied very hard, but for the most part he memorized the subject matter and exhibited little or no understanding of the concepts of the subject. He was open about his opinions. On the MARS-A that all participants took at the beginning of the project, Steve scored very high, indicating that he suffered from mathematics anxiety. He received an F on the first test taken during the nine weeks and finished the semester with a grade of C.

Dowain was a 16-year-old African American sophomore at the time of the study. He lived with his parents and twin brother, Steve, who also participated in the study. Prior to the study he had completed courses in pre-Algebra, Algebra I, and Geometry, making a B in each of these classes. He mentioned having to deal with a lot of anxiety when it came to taking mathematics courses. When misidentified as his brother Steve, he was quick to correct. His MARS-A results showed that he also suffered from mathematics anxiety. He was easily frustrated. He studied very hard and understood most of the

*All names of student and adult participants are pseudonyms selected by the individuals.

concepts. He was easy to talk to and open about the topics of discussion in our weekly culture circle meetings and in individual interviews. He received a D on the first test taken during the nine weeks and finished the semester with a grade of B.

Bill was a 16-year-old African American junior at the time of the study. He lived with his mother and three sisters. He worked full time at a fast-food restaurant to help his mother support the family. Prior to the study he had completed courses in Algebra I and Geometry, making a D in both courses. He believed that Algebra II was difficult for him because of his previous difficulties with Algebra I. He was easily frustrated. When he did not understand some of the material in the class, he stopped listening to the teacher. He was a quiet, shy student. He did not talk much with other students or ask the teacher questions during class. He missed many of the classes; and when he was in class, he did not take notes. His MARS-A results showed the highest score for anxiety of the eight participants. His manner of dressing was not clean, and he complained about having to work full-time and that coming to school made him tired. Bill was hard to talk to. However, once he began to trust me, he was honest and open. He had experienced negative feelings of stereotype threat and believed that stereotype threat was real. He copied all of his homework from other students in the class. He received an F on the first test taken during the nine weeks and finished the semester with a grade of D.*

Ernest was a 16-year-old African American junior at the time of the study. He lived with his parents and two sisters. He was a popular football player at the school. Prior to the study he had completed courses in Algebra I and Geometry, making a C in both courses. He was very shy and quiet. He did not study or ask the teacher questions. He copied his homework from other students. He attended all the weekly culture circle meetings, and most of the time he did not say anything. After the second individual interview, he started to talk about some of his difficulties in the class. He never said a word in

---

* During the course of the study, Bill asked me if I could come to his home on Sundays to help him with his Algebra II. I agreed to help him, and continued to tutor him at his house throughout the semester.

class, but during individual interviews, he had numerous questions. He was open with his opinions about the topics of discussion. He did not suffer from mathematics anxiety according to his MARS-A results. He received an F on the first test taken during the nine weeks and finished the semester with a grade of C.

George was an 18-year-old African American senior at the time of the study. He lived with his parents and one sister. His mother worked as an administrative secretary at Wilson High School. Prior to the study he had completed courses in Algebra I and Geometry, making a C in both courses. Algebra II was a hard subject for him. The homework assignments and the tests were very difficult for him. He worked a full-time job at a fast-food restaurant to support himself. He was a basketball player and had a witty sense of humor. From the beginning, he showed no interest in learning mathematics; he paid no attention to the class or the teacher. He never had his homework done and always copied from other students. He had the lowest grade in the class for the semester. During the first few individual interviews, it became apparent that one of the reasons for his poor performance was that he had not adequately learned Algebra I the previous year.* He did not suffer from mathematics anxiety according to his MARS-A results. At the beginning the study, he did not want to openly talk about the causes of his poor performance. During subsequent individual interviews and weekly culture circle meetings, however, he shared his experiences with prejudice and the effects of negative feelings of stereotype threat. He strongly believed in the reality of stereotype threat and it had affected his performance in several situations. He received an F on the first test taken during the nine weeks and finished the semester with a grade of D.

John was an 18-year-old African American senior at the time of the study. He lived with his mother. (His father had left the family when John was three.) He worked full-time to support himself. Prior to the study he had completed courses in Algebra I and Geometry, making a B in both classes. He had also attempted Algebra II the two years

* I offered to tutor George and visited with his mother since she worked at the school.

prior to the study and had failed both times. According to John, he was growing up the first time he took Algebra II, so he did not apply himself because he did not feel it was important. He always completed his homework done on time. He held strong opinions and was very open with all the students during the weekly culture circle meetings. He came to these meetings on time and had strong interaction with the other students. He did not suffer from mathematics anxiety according to his MARS-A results. He received a C on the first test taken during the nine weeks and finished the semester with a grade of B.

Mike was a 16-year-old African American junior at the time of the study. He lived with his mother and two brothers. (His father had left the family when Mike was ten.) He was the most popular football player at the school and according to his teacher, he was the most intelligent student in the class. Prior to the study he had completed courses in Algebra I and Geometry, making an A in both courses. He was a very bright, laid-back student with a strong mathematics background. He was a very determined young man. He did not suffer from mathematics anxiety according to his MARS-A results. He received a B on the first test taken during the nine weeks and finished the semester with a grade of A.

Sonny was a 16-year-old African American junior at the time of the study. He lived with his parents and two sisters. Prior to the study he had completed courses in Algebra I and Geometry, making a B in both courses. However, he did not have a good background in Algebra I. He was the class clown, and he was always trying to make the other students laugh. When he arrived in class, his clothes were very colorful and his pants were almost falling from his body. He did not study, do his homework, or pay attention in class. He missed three of the weekly culture circle meetings and two of the individual interviews. As the semester progressed, he started to take the meetings more seriously and contributed a lot of information about his feelings and negative stereotype threat. He believed in the reality of stereotype threat, but also believed that an African American mathematics teacher would have a positive influence on his performance. He

felt that African American teachers would be good role models for African American students, and suggested that he would feel a sense of obligation to study harder for another African American. He received an F on the first test taken during the nine weeks and finished the semester with a grade of D.*

The Course

Algebra II was a year-long course. Students were admitted if they had passed Algebra I and Geometry. The Algebra II class from which the study's participants were selected had 27 students: 26 African American students (19 males and seven females) and one White male student. The instructor was a White male with twenty-five years of teaching experience.

In the fall semester of 1999, the class spent the first two weeks reviewing basic algebra using the school's selected text. The rest of the semester was spent investigating linear equations, systems of linear equations and inequalities, parabolas and functions and their use in solving application problems, and the graphing of functions.

Students were required to maintain an average of 70% on homework, quizzes, tests, and projects in order to make a passing grade and enroll in the next level class. The students were required to maintain a mathematics notebook/journal/portfolio, which was also counted as part of their grade. Students were also required to have access to and demonstrate proficiency in the use of a graphing calculator and to bring appropriate materials to class and participate in class activities. The instructional routine included questions on homework, grading homework in class, and individualized seatwork.

Grading was spread over nine-week periods, and consisted of 100 points for the three regular tests, 100 points for the final exam, 200 points for quizzes, and 100 points for class work. Semester grades were calculated by averaging the grades from the two nine-week periods, each counting 40%, and a final semester exam grade counting 20%.

---

* I tutored Sonny at his home weekly and with George at George's home several times.

Fall semester exams and grades were completed before Christmas. According to Mr. Jones, the teacher,

> I changed how I graded. I graded more on TOTAL points this time. I felt like for this particular group of students, it was more reasonable for so many of the students in the class. This would be the last course for most of these students. Many of them were not going to college. So, I decided to slow down a little bit in this class and to count their quizzes and their homework a little bit more. In this way, I hoped that I could raise some of their grades, give them a little more encouragement, a little more success so that maybe they will identify with it and maybe they will go on with it.

The class met for 80 minutes on Tuesdays and Thursdays, 9:40–11:00 A.M., one week and on Monday, Wednesday, and Friday, 9:40–11:00 A.M., on the alternate week. Students typically took six classes each day.

The Instructor

Bob Jones* taught Algebra II at Wilson High School. He was White and 52 years old. Mr. Jones was married and had a son and daughter, 27 and 24 years old. He had been teaching mathematics since 1975.

Mr. Jones received his B.S. degree in Mathematics Education and his Master's degree in Educational Administration. He had taught mathematics in several smaller cities and towns throughout the State. He had served as a high school principal for three years, as a pastor in a small church for five years, and as a bi-vocational pastor teaching mathematics for six years. He had taught General Mathematics, Algebra I, Algebra II, Geometry, Trigonometry, and Advanced Precalculus for ten years. His believed that stereotype threat did not exist. His beliefs stemmed from personal experience, in particular his experience dealing with discrimination because of his age and his overweight appearance. (See Appendix E: Teacher Interview.)

---

* A pseudonym.

Individual Interviews

At the beginning of each individual interview, the past week's class activities, tests/quizzes, homework problems, and any other concerns the students wanted to explore were discussed. The interviews then proceeded using a set of guiding questions that were designed to elucidate student interests, difficulties, and goals for learning mathematics. (See Table 4.)

Weekly Culture Circle Meetings

The weekly culture circle meetings were held in the school starting the eighth week of the semester. They meetings occurred weekly for seven weeks. The culture circle meetings took approximately two hours each Friday after class in the school library and all participants worked as a culture circle group and discussed their ideas about mathematics frustration, stereotype threat, and anxiety. Problem-posing related to their frustrations with mathematics and feelings of stereotype threat was a key component of the culture circle. Also, the group reacted to mathematics class experiences. These sessions were tape-recorded. (See Table 4.)

Table 4
Interviews and Group Meetings

PHASE	WEEK	MON.	TUES.	WED.	THURS.	FRI.	SAT.	SUN.
I	4	Observation		Observation		Observation	Teacher Interview	
I	5		Observation		Observation			
I	6	Questionnaires & Observation		Questionnaires & Observation		Observation		
I	7		Survey and Observation		Survey & Observation			Teacher Interview
I	8	MARS-A Test*		Observation		MARS-A Test results		

Table 4
Interviews and Group Meetings

I	9					1st Culture Circle Meeting		
II	10	Individual Interviews		Individual Interviews		Individual Interviews	Teacher Interview	
II	11		Individual Interviews	Individual Interviews	Individual Interviews	Culture Circle Meeting		Individual Interview
II	12	Individual Interviews			Individual Interviews	Culture Circle Meeting		
II	13					Culture Circle Meeting		Teacher Interview
II	14	Individual Interviews		Individual Interviews	Individual Interviews	Culture Circle Meeting	Individual Interviews	
II	15	Individual Interviews	Individual Interviews	Individual Interviews	Teacher Interview	Culture Circle Meeting	Individual Interviews	
II	16	Individual Interviews	Individual Interviews	Individual Interviews		Culture Circle Meeting		Final Teacher Interview
II	17	Final Individual Interviews	Final Individual Interviews	Final Individual Interviews		Culture Circle Meeting		
II	18		Final Individual Interviews			Final Culture Circle Meeting		

*Given in class

CHAPTER FOUR

PRESENTATION OF THE STUDY'S FINDINGS

Stereotype threat exists, and it began way back, when we were kids. Most of us have always been told that it is the White man's world. They own everything, including the educational system, and they do not care about African Americans. So, we do not care about them. So, this is how the stereotype threat started against us. (John, Participant, Individual Interview, Week 2—November 9, 1999

This chapter contains two sections. The first examines the eight participating students' beliefs about mathematics learning and describes their feelings about negative group feelings of stereotype threat and the impact of the culture circle's experience on mathematics values and goals. The second section focuses on the culture circle meetings and contains two parts. The first is an evaluation of the culture circle community, how it started, and how it grew as the study progressed. The second part describes the influence participating in the culture circle community had on these students.

Student's Beliefs

This section examines the eight participating students' beliefs and learning and describes the evaluation of participants' beliefs about learning mathematics, negative group stereotype feelings, and the impact of the culture circle's focus on mathematics goals and values. Learning mathematics is viewed as how students perceive themselves as learners and doers of mathematics in the classroom. Negative group feelings of stereotype threat is viewed as situational threats that affect the behavior of any group about whom a negative group stereotype exists. A culture circle is conceived as a group of participants getting together as a group to examine their situations in school and to question why they are in such situations and how to improve their performance. Problem-posing is a key strategy for culture circle discussions.

Steve

Steve's attitudes toward learning mathematics, negative feelings of stereotype threat, and attitudes toward the culture circle changed over the sixteen-week period of observation.

Learning Mathematics

Steve's attitudes toward learning mathematics went through two phases. In the first phase, Steve's study habits and understanding of the math concepts were poor. In the second phase, Steve focused on written communication with other students and the teacher about some of the difficulties he was experiencing. He increased his interactions with other students and the teacher as well as his class activities.

Phase One In phase one, which started week eight, during in his second individual interview, Steve discussed his expectations and his difficulties in class. He explained what activities the Algebra II class would have, how much homework he would have, and how important it was to understand the concepts for the tests. Steve believed that his parents were very important to his academic success. He commented on the importance of understanding and doing the homework, and the tutoring he received from his father, which he believed helped to maintain a good level of communication between them. He indicated that he had begun to spend a lot of time outside of class working with his father to try to understand the math concepts taught in class.

Steve believed that in Algebra I, he did not receive a strong, solid foundation for Algebra II, because he did not really get along with the teacher. Because he did not like the teacher, he never asked questions in class. He felt that this was one reason he did not succeed in that class.

Phase Two After the third individual interview and one culture circle meeting, Steve began to explore deeper layers of the classroom connections. He started by offering to bring drinks and pizza to a weekly group study with other students in the school library. This gesture helped the other participants recognize that there were concrete

ways to deal with the difficulties of their homework; and it made the group a richer and closer community.

At one of the culture circle meetings, Steve brought this topic up for discussion: How can a student overcome his mathematics anxiety and frustration? He gave an example:

> I always have some difficulties on tests, because I kept forgetting what I had studied. But, I will study harder. It is very important to learn mathematics. No matter what we will do with our lives, we need to learn mathematics. (II–4)

All of the other participants agreed with him. Group cooperation and communication between Steve and the rest of the participants grew as the study evolved.

Stereotype Threat

At first Steve emphasized the possibility of ignoring the negative feelings of stereotype threat. Later (during weeks ten through sixteen), he used the small group discussions to talk about the causes and effects of stereotype threat and how to overcome this feeling. For three weeks, Steve asked the whole group to learn more abut the theory of stereotype threat and its effects. In one of our culture meetings he said,

> I experienced anxiety caused by stereotype threat feelings, but I had a strong family background, and they helped me through such times. (CC–2)

Several participants shared different experiences of negative group feelings of stereotype threat. Steve's observation of the fellow group members and the exchange of ideas and information in the culture circle meetings played an important role in leading him to change his feelings about how to deal with negative group feelings of stereotype threat.

Culture Circle Meeting

Steve listened carefully and observed closely the other participants' interactions. By listening to their communication, he came to conclude that the exchange of ideas and information among members of the culture circle group was a key factor in changing his beliefs. Steve stated:

> I believe the group meetings were a big help to me to find out about our problems and what we needed to do to deal with them. Knowing about stereotype threat, which I did not know about before, was a great educational experience. This was a good way to deal with anxiety. It will help students see how other students feel about mathematics, the teacher, and what they need to do to deal properly with their anxiety and frustration. (CC-7)

Summary

Steve's classroom mathematics learning and his beliefs and feelings about negative stereotype threat changed over the sixteen weeks of the study. From the beginning of the study, he worked hard to pass the course, and he experienced anxiety and frustration while taking the tests and would forget most of the material he had memorized or studied. However, Steve's study habits were not good until week at ten, at which point he changed his study habits. His beliefs and learning of mathematics changed. He tried to understand the problem solving and the reasoning and stopped relying on memorizing. This significant change in his beliefs and learning was connected to his experiences in the culture circle meetings, where he learned the value of listening and asking questions. He left the study believing that culture circle meetings were a good way to deal with mathematics anxiety.

Dowain

Dowain's attitudes toward learning mathematics, negative feelings of stereotype threat, and attitudes toward the culture circle changed over the sixteen-week period of observation.

Learning Mathematics

Dowain's attitudes toward learning mathematics went through two phases.

Phase One Like his twin brother, Steve, Dowain believed that having good communication with his parents would play an important role in his success in the class. He identified as the problem he had learning mathematics his lack of confidence in taking tests. He believed that this lack of confidence and anxiety had a negative effect on his performance. Therefore, he felt that part of his teacher's role was to build his confidence in this class.

> I had always suffered from anxiety in mathematics, especially during a test. Different things will be on my mind at different times. I just get easily frustrated. But, once I think things through and calm down, I am able to perform well. (II-2)

Phase Two In week nine, Dowain changed his study habits, started sharing and cooperating with his brother, and began to communicate more extensively with the rest of the study participants. He expressed the feeling that his frustration in mathematics class was less than before and that he was gaining confidence while taking the tests. He believed that one of the important causes of this change was the influence of the culture circle meetings. He said:

> I had some difficulties about the concept of some of the homework. After I got some help with some problems I was having, I did all of the homework on my own. I knew if I could do the homework, the tests would be easy. The group meetings had a great effect on my performance in this class. (II-3)

Stereotype Threat

Dowain's beliefs about the effects of negative group feeling of stereotype on his performance went through two phases. In the first phase, from week eight through week eleven, he attempted to ignore the negative stereotype threat feeling. Beginning with

week twelve, he placed greater emphasis on learning more about the theory of stereotype threat. At one of the culture circle meetings, Dowain indicated that even though the threat can cause fear in some students, he was strong and open-minded and did not let these threats stop him from trying to learn mathematics:

> I had experienced anxiety caused by negative stereotype threat, but I wouldn't let it keep me from doing my very best. What I would do is study harder to show the other students, as well as the teacher, that I can do the work and just do as well as the others. I am not going to sit on the sidelines and watch the game, but I am going to jump in there and try my very best. (II-2)

Dowain mentioned several times during the culture circle meetings, as well as during the individual interviews, how much he had learned about how to study mathematics by the exchange of ideas and the interaction with the other participants and how he needed to overcome his anxiety during the tests. By the end of the study, Dowain claimed that

> I know stereotype threat and prejudice exists, but I would keep on doing my best. I do not let things like that stop me from learning mathematics. (CC-4)

Culture Circle Meeting

Phase One At the weekly group meetings, Dowain's focus was on the past week's class activities. For example, in week eleven, he attributed his successes to working on all homework assigned by the teacher. He then proposed that the group have a weekly group study. Steve, John, and Mike agreed with him.

Phase Two There was a significant change in Dowain's attitude toward sharing and interaction in the group meetings. He began to talk more often to other students in class, and he began to engage in mathematics activities with some of the other participants after class. In one of the culture circle meetings, Dowain said:

> I really liked the culture circle group meetings. I found out a lot about my problems with this course and mathematics anxiety. (CC-4)

Summary

Week ten was the turning point for Dowain. The more he reflected on his learning and discussed with other participants in the culture circle meetings the learning of mathematics by reasoning and problem solving ability, the greater the influence the dialogic process had on Dowain's beliefs and learning.

Bill

Bill's attitudes toward learning mathematics, negative feelings of stereotype threat, and attitudes toward the culture circle changed over the sixteen-week period of observation.

Learning Mathematics

Bill's attitudes toward learning mathematics went through two phases. The first phase started during week eight; the second phase started during week ten and continued to the end of the study. During that time, Bill increased his interactions with the teacher and within the culture circle group.

Phase One In one of the individual interviews, Bill was prompted to discuss his experiences in Algebra II. He said:

> I believe this class is difficult for me because of my difficulties with Algebra I. I also got frustrated easily. This frustration seemed to be caused by the style of teaching in this class. When I did not understand some of the material in this class, I stopped listening to the teacher. Even though I made a D the first nine weeks, I do feel that I could have done a lot better if I had tried harder. (II-4)

Bill had no interest in learning mathematics. He was the only son of a single mother, lived in a five-person home, and was of low socio-economic status. He worked full time at a fast food restaurant to support his family. He had had a bad stereotype experience in previous mathematics classes, which frustrated him. At the study's outset, he scored 94% on the MARS-A test, which indicated that he suffered from a high level of mathematics anxiety. He did not understand the concepts of mathematics. He explained:

> I think it is good to learn mathematics, but most of the time, I just do not like it. I am experiencing a lot of difficulties in Algebra II that caused me to hate mathematics. (II-2)

Bill's interest in attending the culture circle meetings was his first step toward establishing interest in learning mathematics.

Phase Two The second phase started with week twelve. Bill started asking questions and doing his homework. In his fourth individual interview, he asked for tutoring help on the weekends. He also became interested in the group study As the study pro-

gressed, Bill's interactions with the other students in class changed, and he started to do his homework without copying from other students in class.

Stereotype Threat

For the first three weeks, Bill believed that he had experienced stereotype threat in his previous mathematics classes. This stereotype negative group feeling caused additional anxiety and affected his performance on tests. He claimed:

> Last year in Algebra I, the teacher was White. When White students would do well on a test, he made a big deal of it in front of me. I felt a negative feeling that I was stupid. (II-3)
>
> I felt as long as I had this negative feeling and my frustration levels were high, I would have difficulties on my tests. (CC-3)

Bill believed that a multicultural curriculum would help African American students have a better educational experience, because they were more familiar with their own culture. He felt a multicultural curriculum would also be more interesting and meaningful in the learning of mathematics. He explained:

> I think it would help a lot. It would give me, as an African American, motivation to study more. All I know was that I was following a curriculum, which did not belong to me. I would like to see a curriculum that was developed more from African American people involved in education because they would have the same background, experience the same anxiety and pain caused by White people who were always looking down on us, and trying to make us believe that they were the smart ones and we were the dummies. (CC-7)

After week thirteen, Bill's interactions with the rest of the group improved. Getting to know the other culture circle participants as people, not simply as students, had a definite impact on him:

> Coming to the culture circle meetings was a good experience for me. The biggest thing I learned in the group meetings, and this research, was that I realized that **I am not as dumb as I thought.** I can be smarter and I can make good grades, as good as a smart White student. Also, I learned what the cause of my anxiety was and what I needed to do

> to deal with it. And, I learned about the effects of stereotype threat on minority students' performance. (CC-7)

Bill's observations in culture circle meetings and the exchange of information with the other participants played an important role in his decision to learn more about and become more sensitive to stereotype threat.

Culture Circle Meeting

At first, Bill did not ask questions or interact with the other culture circle participants. However, as the study progressed, his relationship with Steve and Ernest became closer. He showed interest in learning about other participants' difficulties. For example, he asked Steve how he prepared for tests and handled problems with his homework; he asked others how they dealt with their frustrations and anxieties about mathematics.

In one of the culture circle meetings, Bill said that the group meetings gave him opportunities to interact with other students and that was a good way to deal with anxiety. He claimed to have learned how other students felt about anxiety and mathematics frustration and how they became more aware of themselves, their feelings, and their beliefs about their learning due to their participation in the culture circle meetings.

Summary

The significant change in Bill's attitudes toward learning mathematics, stereotype threat, and the impact of the culture circle meetings was connected to the influence of the dialogic community he encountered in the culture circle. Bill recognized the importance of student dialog, and he learned the value of interaction and communication with the other participants.

Ernest

Ernest's attitudes toward learning mathematics, negative feelings of stereotype threat, and attitudes toward the culture circle changed over the sixteen-week period of observation.

Learning Mathematics

Ernest's attitudes toward learning mathematics went through two phases, starting in week nine.

Phase One In phase one, Ernest recalled that his experience with mathematics in junior high school had been negative.He then explained:

> Sometimes I felt Algebra II was fun, and sometimes I just did not like it at all. My difficulties in this class were that I did not understand some of the equations and just didn't know how to use them. I was not able to ask questions in front of other students because I am a shy person. I made a C the first nine weeks, but I am going to try to make a B in the course. (II-2)

After the third individual interview, Ernest began to discuss ideas and information about his difficulties in mathematics. In one of the culture circle meetings, he asked if anybody knew how he could control his mathematics frustration while doing homework? Mike's responded to Ernest's question by suggesting that he focus on learning how to do the homework and understanding the main ideas. The group agreed that copying or just getting by actually created more anxiety. By the end of the fourth culture circle meeting, the group appeared to be functioning as a team, as evidenced by Ernest's group invitation to his football game.

Phase Two The second phase started during week ten, when Ernest changed his study habits, started asking questions in class, and began to seek out the teacher for help. He commented:

> Many times I had difficulties with the homework assignments and quizzes. I could not ask questions in front of other students because I am shy. But after the third group

> meeting, I felt I needed help and started to go to my teacher from time to time, which did help me a lot. (CC-4)

Communications between Ernest and Mr. Jones and Mike increased as the study evolved. The small group interactions helped Ernest overcome his shyness, literally allowing him to find his voice. Once he became comfortable speaking at culture circle meetings, he started participating in class and interacting with his teacher.

Stereotype Threat

During week thirteen, Ernest asked that if anyone in the group experienced negative feelings of stereotype threat would they please share it with the group. Bill, George, and Sonny had a lot to say, and in response Ernest expressed an interest in studying more about the topic. Ernest recognized changes in Bill, George, and Sonny's interest in doing well in mathematics. Their perceptions and emphasis on meaningful mathematics learning allowed Ernest to reflect on his own learning.

Culture Circle Meeting

The influence of the culture circle's dialogic community was an important factor in Ernest's change. He said that it was hard for him to talk in front of other students in class because he always was a shy person. His interaction with the other students in the culture circle meetings motivated him to overcome this anxiety in class

Summary

By the end of the study, Ernest's interactions with the other participants had improved. The significant change in his attitudes toward learning mathematics, stereotype threat, and the impact of the culture circle meetings was connected to the influence of the culture circle meetings and their ability to foster learning opportunities for the study's participants.

George

George's attitudes toward learning mathematics, negative feelings of stereotype threat, and attitudes toward the culture circle changed over the sixteen-week period of observation.

Learning Mathematics

George's attitudes toward learning mathematics went through two phases. The first phase began during week nine. After the second culture circle meeting, George requested tutor to help him understand some of the difficult concepts in the course. The second phase started during week ten and continued until the end of the study.

Phase One In the second individual interview, George was asked to discuss his experience in Algebra II. He responded:

> I really had a hard time in this class. It was a very hard subject for me. The homework assignments, as well as the tests, were very difficult for me. I did not like Algebra II. I made a D the first nine weeks. This class was very stressful for me because I didn't get it. ... I could not do the homework at all. I had lots of difficulty with the homework, because I did not understand it. I felt that I did not need t take any Algebra II tests, because I did not understand it. It did not comply with my major. I just did not like mathematics at all. I had some difficulties from the start with Algebra. I did not like to take the tests, because I could not comprehend any of the material. (II-5)

George's first step toward establishing a goal of learning mathematics was to express interest in attending the group meetings and receive tutoring help.

Phase Two The second phase of his changing approach to learning mathematics began during week 11, when George's relationship with Bill, Sonny, and Ernest got closer. They showed some interest in learning and sharing. They would eat lunch together in the school cafeteria, and discussed some of the difficulties in the Algebra II class. They had not been friends before their study. In week 13, George stopped copying his homework, started to do his own homework, and sought help with his difficulties in the course. He suggested before each test that the group should get together for group study. Sonny and Bill agreed to study with him before each test.

Stereotype Threat

For the first four weeks of the study, George strongly believed that

> I had experienced anxiety caused by negative feelings of stereotype several times. I kept telling myself to study harder to prove that I could be as good as a White student, but it was still hard. (II–4)

George believed he could never feel fully comfortable as long as groups like the Ku Klux Klan existed. He felt that prejudice toward him could effect his performance. He explained:

> Prejudice really does exist. I see it a lot. For example, last week some students and myself went to Anadarko for a basketball game. On the way, we stopped at Braum's for ice cream. Some of the White people there called us "Nigger," not one time but several times. This made all of us, especially me, mad. Of course it will affect my performance, but I will try my best to do better than a White student. (CC-6)

The culture circle meetings helped George learn about the other participants' beliefs about negative group stereotype threat and changed his negative attitude. In one of our culture circle meetings he said:

> I believe that a multicultural curriculum and having an African American mathematics teacher would help African American students to have a better educational experience, and this will have a positive effect on negative group feelings of stereotype threat. (CC-7)

Culture Circle Meeting

Of the culture circle meetings, George noted:

> These group meetings helped me learn more about myself and the research helped me learn how to deal with the stereotype threat I face now and will continue to face throughout my life. You helped me by tutoring me and helping me understand the homework assignments and quizzes. The group meetings and individual interviews had a great influence on my performance on the last two tests and helped me get a passing grade. (II-7)

Summary

The significant change in George's attitudes toward learning mathematics, stereotype threat, and the impact of culture circle meetings was strongly connected to the influ-

ence of the dialogic community he encountered in the culture circle meetings. During the fourth teacher interview, Mr. Jones said of George, "I could not believe George could pass this class, but he tried hard the last four weeks. I am happy for him" (T I - 4).

John

John's attitudes toward learning mathematics, negative feelings of stereotype threat, and attitudes toward the culture circle changed over the sixteen-week period of observation.

Learning Mathematics

John's attitudes toward learning mathematics went through two phases. In the first phase, John's interactions with the other students and learning mathematics changed. During the second phase his learning methods included cooperation and goal-sharing with the other participants. Also, his relationship with his mother grew.

Phase One During the first phase, John showed an interest in learning and sharing. In the second individual interview, John responded to a question concerning his perceptions of his previous mathematics experience. John expressed that the first time he took Algebra II, he was basically growing up. He was becoming rounded and really getting to know who he was. He admitted that during his sophomore year and half of his junior year, he was not applying himself because he had not discovered the consequences of his actions. Now that he was a senior, he recognized what lay ahead of him and understood that he had to prepare in order to "dodge the holes." The group meetings encouraged John to interact with the other students and share his experiences of previously failing Algebra II. His positive and friendly attitude allowed him to build close relationships with the other participants.

Phase Two In the second phase, which began with week ten, John showed more self-esteem, motivation in mathematics activity, and had a great influence on Bill and George. During our fourth individual interview, Mr. Jones told me:

> I am happy with John's performance in this class. I think he even could do better. I believed John could perform without any difficulties in an advanced mathematics course. (TI-4)

Stereotype Threat

For the first week of the study, John showed a positive attitude. He was interested in the topic. He was very comfortable talking about negative group feelings of stereotype threat. He explained:

> Stereotype threat exists and it began way back, when we were kids. Most of us have always been told that it is the White man's world. They own everything, including the educational system, and they do not care about African Americans. So, we do not care about them. So, this is how the stereotype threat started against us. (II–1)

The culture circle meetings gave John an opportunity to share his experiences with others. After the fourth group meeting, his relationship with Bill, Sonny, and George got closer, and they kept talking about the negative group feeling caused by stereotype threat and sometimes made fun of the topic.

Culture Circle Meeting

The impact of the culture circle's focus on mathematics values changed after week eight. John said that the group meetings helped him a lot:

> The cultural group meetings helped me find out my weaknesses and what I needed to do to fix them. I would like to see the final findings of this research. It was a good experience for me. (CC-7)

By the end of the study, John's interaction with the other participants and his family had improved, and he tried to help everyone.

Summary

The significant changes in John's attitudes toward learning mathematics, stereotype threat, and the impact of culture circle meetings had a great influence on his interaction with the group. According to John, mathematics was not his favorite subject in school, but the experiences of the previous two years had proved to him that he needed to learn mathematics in order to be successful in school. He did all the homework assign-

ments and understood the material while working a full time job. He felt his great efforts helped him make a B in the course. As he explained:

> I knew all the material and did all the homework. I felt comfortable in class and used my experience from the last two years in Algebra II. The weekly meetings and individual interviews about the stereotype threat helped me realize that I am intelligent and need to prove it. (II–6)

Mike

Mike's attitudes toward learning mathematics, negative feelings of stereotype threat, and attitudes toward the culture circle changed over the sixteen-week period of observation.

Learning Mathematics

Mike's attitudes toward learning mathematics went through two phases. During the first phase, Mike discussed his expectations and study habits. The second phase started during the first week of the individual interviews and continued until the end of the study. During that time, Mike provided information about himself, his mathematics background, his future plans, and his past mathematics experiences in Algebra II.

Phase One John's first step in establishing the learning of mathematics was to express interest in attending the culture group meetings. His positive attitude and popularity in school as a football player, his strong mathematics background, and dress were a good motivation for the other participants in the group.

Phase Two Mike's comments and his interactions with the other participants helped the group see how to deal with their difficulties in the classroom. He became a role model for Bill and George.

During the second individual interview, Mike discussed his experience in Algebra II. He noted:

> The main problem I had in Algebra II was that we had a lot of clowns in this class. People really did not want to pay attention to the teacher. To me, Algebra II was fun. The tests in Algebra II were not difficult for me, even though I made a B the first nine weeks. I am going to turn my B into an A. When the course started, I was a little frustrated, but now I understand all of the material being taught. After each test, I corrected my mistakes so I could learn from them and do better next time. (II-2)

In the last culture circle meeting, Mike explained how he made an A in the course:

> I did all the homework, because I thought the teacher assigned them for a reason. Indeed, I was actively involved not only in doing homework but in participating in class and in

the group meetings. I was proud of his achievement because I felt it reflected the level of understanding I had of the course material. (CC-9

Stereotype Threat

From the first week of the group meetings, Mike expressed a positive attitude toward the topic of stereotype threat. He said:

> I believed that as long as students felt good about themselves, the negative feeling of group stereotype had less of an effect on their performance. I felt good about myself and felt that as long as they knew the material and studied hard, they could do well in mathematics. (CC–1)

During another of the meetings, Mike commented that he didn't care what other people thought about him, that he did not have time for that, and he would do his best. John, Dowain, and Steve agreed with him.

Culture Circle Meeting

The significant changes in Mike's classroom beliefs were influenced by the culture circle dialog. Mike believed that the group meetings allowed him to realize that all of the students in the class have experienced the same problems at some point. He felt that he would be able to help them with some of their difficulties. He also learned a lot about stereotype threat and its effects on African American students' performance. The group meetings made him consider many issues he had not previously thought about. He explained:

> I believe the group meetings helped me think about the difficulties that other students have in our class. I learned that working as a team was very supportive of each student on the team. (CC–5)

Mike learned the value of sharing through interaction and communication in the culture circle meetings.

Summary

The most significant change in Mike's beliefs about learning mathematics was his realization that he could help some of the other participants with their mathematics difficulties.

Sonny

Sonny's attitudes toward learning mathematics, negative feelings of stereotype threat, and attitudes toward the culture circle changed over the sixteen-week period of observation.

Learning Mathematics

Sonny's attitudes toward learning mathematics went through two phases. In the first phase, which started during week ten of the class, his parents were contacted via telephone and asked about his background and expectations. Sonny did not show any interest in learning mathematics and missed a many class and three of the culture circle meetings. The second phase started during week twelve and continued until the end of the study, during which time, Sonny received tutoring outside of school.

Phase One During the first individual interview, Sonny was asked to discuss his experiences in Algebra II. He answered:

> I used to find mathematics fun, because the teachers used to take their time to help me learn it. But, in this class, the teacher really did not care and wouldn't give me the help I needed. Sometimes he stereotyped me by calling me the class clown and accusing me of cheating on tests. But, I needed to finish this class, and so I will try to do better. I made a C the first nine weeks, but I wanted to make a B for the semester. Some of my difficulties in this class were that I did not have an understanding of what to do with some of the equations. Also, I liked to make the other students laugh and so I tried to be funny in class and sometimes forgot abut concentrating on the lesson being taught. (II–1)

At the beginning of the study, Sonny had no desire to learn mathematics. Group cooperation between him, Mike, and John, as well as group study with George and Bill, had some positive effects on his performance.

Phase Two The second phase started during week twelve when Sonny's relationship with John and Mike got closer. Through the culture circle meeting, Sonny moved toward a deeper connection with Mike and started to attend the group meetings on time.

Stereotype Threat

After four weeks of individual interviews and group meetings, Sonny believed that negative feelings caused by group stereotype could have been a threat to his performance in mathematics. The culture circle meetings, which helped him to get to know John and Mike, had a great influence on his beliefs and mathematics performance. Beginning with week thirteen, he placed greater emphasis on learning more about the negative group feeling of stereotype.

Culture Circle Meeting

The impact of the culture circle meetings went through from week twelve. Over the course of the group meetings, he changed his clothing style, did not miss classes, and did not try to make other students laugh.

Summary

The significant change in Sonny's classroom beliefs was connected to the influence of the culture circle meetings. Through the group meetings, he learned to take the learning of mathematics more seriously. At the last culture circle meeting, Sonny said:

> The group meetings were good because we were able to share our differences together. I found out about the effect of stereotype threat, which I had never thought about before and what I need to do to deal with this threat. (CC-9)

Culture Circle Meeting

The culture circle's focus on mathematics values and goals went through two phases. In the first phase, the emphasis was mainly on difficulties the students were encountering in class. The second phase, which started around week ten, was more participant-centered, the emphasis more on problem solving and dialog. Week ten was significant for several of the participants. It was clear that as they became more comfortable with me and with each other, their discussions became more honest and extended. Although they had discussed stereotype threat in previous culture circle meetings, a direct request for them to express their ideas and feelings about stereotype threat seemed to create a synergy that affected their interactions through the remainder of the study.

This section focuses on the students' culture circle meetings. It contains two subsections. The first focuses on the evaluation of the culture circle community, how it started, and how it grew as the study progressed. The second describes the influence that participation in the culture circle community had on each of the participants. A more personal tone has been adopted in this section in order to better convey the atmosphere of the culture circle meetings and the investigator's close involvement with the participants.

The Evolution of the Culture Circle Community

On September 24, we held our first meeting. I gave each student a copy of 10 questions (See Appendix A) to take home and return to me later. During that meeting, we briefly went over the questions and then shared information about ourselves and our backgrounds. I described my own background. (See Appendix C.)

I then described the phases of the research study to each student. Dowain asked, "Can you tutor me?" My answer was, "Yes, I will help you every week at your house or at the school library." He immediately replied, "It would be so wonderful to have someone help me with my Algebra II."

During the individual interviews and the initial group meeting, I informed each participant that I would be at the library after each group meeting on Friday, and that any

participant who was having difficulties should let me know. During the middle of the semester, I tutored George and Sonny on a regular basis, once a week on Sundays from 1:00 P.M. to 3:00 P.M. Bill received tutoring on Saturday mornings from 10:00 A.M. to 12:00 noon. I usually worked with Dowain in the school library after the weekly culture circle meetings.

On October 8, we held the first culture circle meeting in the school library. At the first group meeting I shared with the group my research interest in the culture circle dialog. They supported my ideas and expressed their desire to be engaged with each other in dialog and to learn from each other. Most of them expressed expectations and they all shared a desire for open discussions and exchanges of ideas.

John asked, "When you come to observe in our class, can we come and ask you questions?" My answer was "Yes, if it is okay with Mr. Jones. I will talk to him." Bill said it would be wonderful to have someone in the class to be able to help with difficulties. He described some of the frustration he experienced in class.

On October 22, we held our third meeting. Before getting underway, I informed the eight students that their teacher had agreed to let me offer some help during the class. This arrangement was welcomed by the participants.

The group discussed the past week's class activities, and then I asked them to discuss their problems concerning homework and tests. The purpose of these questions was to learn how the students followed their teacher's instruction when doing their homework and tests. It was important to know whether, when completing their homework assignments, the participants felt pressured with a lack of understanding of the materials. Bill, Sonny, George, and Ernest spoke of difficulties with their homework:

> Bill: I was not able to finish some of the homework our teacher assigned us; therefore, the next day I brought the homework to class and got help from other students. I always got frustrated when I was trying to figure out the assignments. (II-5)

Sonny: Most of the time, I did not understand the homework assignment, so I waited until our next class, and I got help from other students. (II-4)

George: I could not do the homework at all. I had lots of difficulty with the homework, because I did not understand it. (II-5)

Ernest: I had problems with some of my homework. I just did not understand the equations and formulas. Most of the time, I got help from other students in class before I turned it in. (II-3)

Mike, John, and Dowain believed that their success in the course was due to their working on all the homework assignments assigned by the teacher. The rest of the participants believed that their lack of interest in algebra was caused by their difficulties with their homework. They copied their homework assignments in class without understanding them. Only Steve complained that there was too much homework and that he experienced difficulties understanding the assignments. He believed that if he didn't do the homework, he could not get a C. Since Sonny, Bill, and George were not familiar with the material, they found the course very difficult. They had experienced difficulties understanding Algebra I, which caused a lack of interest in Algebra II. Therefore, they had no desire for further study of algebra and did not do the assigned homework.

This conversation led to a discussion of stereotype threat. Bill asked the other participants to discuss their views about anxieties caused by negative feelings of stereotype threat. Mike and John expressed the belief that as long as students felt good about themselves, the negative feeling of group stereotype would have less of an effect on their performance. Both felt good about themselves and felt that as long as they knew the material and studied hard, they could do well in mathematics. Dowain and Steve believe that even though this threat could create fear in some students, they themselves were strong and did not let such threats stop them from doing their very best to learn mathematics.

As the study progressed, my role began to change. At the beginning of the study, my role mainly involved introducing themes for dialog topics, providing the weekly tran-

scripts of my classroom observations, holding individual interviews, and facilitating the culture circle meetings. In the latter part of the study, my role became more that of an equal participant than an outside facilitator. I contributed to the discussions in the culture circle meetings by sharing my ideas and exchanging information. For example, in one of the culture circle meetings, I asked the participants to consider the following scenario: "Nick is the only White student in the class. Let's assume you and Nick both made a B on the final exam. If I asked you, as an African American student, to take the same test with only Nick in the class, would this cause you any anxiety?"

The responses indicated that Bill, Steve, Dowain, Sonny, George, and Ernest would feel the threat of stereotype. They believed that they would be compared with the White student and that this would cause anxiety and pressure and would definitely affect their performance. Mike was the only one who believed the new environment would not affect his performance.

Dowain believed he would feel that he was being compared to Nick. He would feel uneasy because that comparison would stick out in his mind and would cause him to make mistakes he normally wouldn't. He added that when you take a test, you are supposed to clear out your mind and be sure that you are ready for what you are about to be tested on. But, when you are told beforehand that you are being compared, it weighs on your mind. In such a situation, Dowain felt that he would feel uneasy and, as a result, do poorly on the test.

Steve believed he would feel uncomfortable if he was being compared with Nick and that this would affect his performance. He said that if he were taking the test with any other students in the class or school, he would feel much more comfortable.

George believed that the hypothetical situation would cause him anxiety and would affect his academic performance, especially if he knew he was being compared with a White student.

Ernest said that he really did not know what effect the situation would have on him. He added that he had never been in a situation of being compared with a White student.

Mike did not think that taking a test with Nick would affect his ability, as long as he knew that he could take his time and work everything out.

John said that if the school placed him in a situation where he had to take a test with Nick alone, that he would probably not take it. He reasoned that "You cannot put the whole weight of African Americans' performance capability on my head, and you cannot put the whole weight on Nick to say which race is smarter. Nick could be smarter, or I could be smarter, but you cannot judge the whole bunch by just one person. It is just a difference between people."

Sonny believed that he would not want to take a test where he would be compared with Nick alone. He would rather be compared with the rest of the class.

Finally, Bill said that the situation would affect his performance. He would not want to be compared with a White student. It would cause a lot of anxiety, put too much pressure on him, and would affect his performance. He said he did not like to be compared with White students.

The participants' roles begin to change over the course of the study. In the beginning, the culture circle discussions mainly followed dialog topics provided by me. But as the participants became more engaged and my role became more participatory, the students began to direct the course of the culture circle dialog meetings.

The Emerging Themes

Several factors contributed to the evolution of the culture circle community for the participating students. Transcripts of my classroom observations and individual interviews were important aspects of their involvement. In the group meetings, they were encouraged by one another to talk openly about their own individual ways of learning.

From these discussions, several themes began to appear. These themes fell into three general areas: (1) Time, (2) Parents, (3) Jobs.

Time

All eight students expressed concern about the limited time they had for study. Sonny, George, and Bill found it very difficult to attend the individual interview meetings. Bill, George, and John expressed their concern with the limited time they had to attend the culture circle meetings. They also found it difficult to study and do homework in the limited time they had available. For some, athletics demanded time. Sonny, who played basketball, mentioned that he found it difficult to find time for both practice and homework. For others, jobs demanded time:

> Bill: I need to work to help my single parent's mother. I cannot study at home, it is a hard adjustment for me to study and work every day. (II-2)
>
> John: It is very difficult for me to plan for study on a regular basis, because I need to work to pay for my car payments and car insurance. (II-3)
>
> George: I need to work to pay my car payment. My parent helps me with car insurance, but I have some bills to pay. (II-4)

It seemed that one of the reasons all eight of the students welcomed the time spent in the culture circle meetings was the constraints on their time that they felt on a regular basis. A desire to have quality time for dialog was expressed by all the participants in the study.

Parents

Parental influence was a concern of all eight students from the very beginning of the study. Each student credited the role of parents as being a strong factor in their education. During several individual interviews with Bill, Sonny, and George at their homes, their mothers express concerns about their childrens' performance in mathematics. Steve and Dowain's father had a strong influence on their performance in mathematics. He encouraged them and helped them with difficult homework assignments. When I discussed with Mr. Jones his interactions with parents in school, he expressed his pleasure

with the level of parental involvement: "I am very pleased with parents' involvement in school" (TI-1).

Jobs

Another subject that continued to reappear throughout the study was job-related problems. Some of the participants' concerns were with their jobs. For example, John, who has had to work to support himself for two years. He had to be at work by 4 P.M. Tuesday through Saturday in order to keep his job. He worked at a steak house five miles from his house, and most of the time he had a car problems. Like Bill and George, who worked full-time at a fast food restaurant, John found it difficult to plan for study, individual meetings, and other school activities.

CHAPTER FIVE

FINDINGS, CONCLUSIONS, LIMITATIONS, AND IMPLICATIONS FOR POTENTIAL RESEARCH

"I think it's a necessary part of a human vision to believe we can shape the future even if we can't shape it totally. (Waidrop, 1992, pp. 356–357)

The purpose of this study was to explore the impact of culture circles on minority high school students in mathematics. The following questions guided the study:

1. How do these minority students perceive themselves as learners and doers of mathematics?
2. How do minority students feel about themselves and negative group stereotype pertaining to their mathematics learning?
3. What is the impact of culture circles focused on mathematics values, meaning, and goals?

Findings

The following are findings of the study.

The findings of this study suggest that culture circle meetings greatly facilitated the students' ability to make positive changes in their mathematics performance and meaningful mathematical activity. Problem-posing through the exploration of negative group stereotypes and the strategy of circular dialoging where study themes were revisited provided opportunities for students' reflective and communal practices.

The need for communication and interconnectedness among students as a means of processing school and classroom situations seemed to grow. This study showed that the face-to-face communication in a culture circle could greatly influence students' beliefs and attitudes about and strategies for learning mathematics.

In this study, the relationship among the eight participants became closer through the culture circle meetings. At the beginning Mike, Ernest, Sonny, George, and Bill did not pay attention, and I dominated the climate of the meeting. Even though John encour-

aged the other participants to pay more attention and get involved in the discussions, there were no positive responses from the majority of the participants.

As the study progressed, some significant changes occurred in all the participants' attitudes. Week ten and eleven were critical points in this regard. These weeks corresponded to significant discussions and suggested the culture circle had an impact on all participating students. For example, Ernest, Sonny, George, and Bill's strategies shifted significantly from being negative and self-centered to being meeting and discussion orientation. The students were encouraged to explain their feelings as learners and doers of mathematics.

As they became more comfortable with me and with each other, the students openly shared and explored feelings about and strategies for succeeding in mathematics classes. Several of the students made significant shifts in their personal goals and beliefs about the importance of mathematics. For example, Bill went from being completely indifferent about learning mathematics to recognizing the importance of mathematics in his life and wanting to succeed in his mathematics class. He also realized that he was not as dumb as he thought he was and that by observing, listening, and asking questions he could overcome his mathematics anxiety.

Similarly, Sonny and George's attitudes within the culture circle meetings changed from being quiet and not paying attention to listening, observing, and asking questions. Their beliefs regarding learning through the culture circle significantly changed. Sonny quit trying to be the class clown and became more focused on his own learning as well as considerate of the other students' learning. Even his appearance changed: he started dressing nicely and even bought glasses similar to mine. George's interactions with his mother were affected by his participation in the group and because of the interactions I had with his mother. He became more cooperative and respectful of her and expressed his appreciation of his involvement with the group and with me during our individual interactions.

Even though Mike was a good student who did not encounter many mathematical difficulties himself, he became sympathetic of difficulties other students had in his class. By observing, listening, and asking questions, he came to an understanding of their difficulties and was supportive of their efforts to learn mathematics and overcome their math anxieties. Mike also came to believe that stereotype threat does exist and that it can have an effect on some African Americans' mathematics performance.

Steve, Dowain, and Bill's study habits and interest in learning mathematics changed from week ten on, when they began to get involved in the group discussions. After several years in school, Bill, for the first time, became a participating member of a group. There was positive change in his mathematics performance, and he realized the consequences of negative stereotype on his own mathematics anxiety. He saw the value of sharing information with other students from the same cultural and racial background.

As the study evolved, particularly in its second phase, starting with week ten, Steve, Dowain, and John began to value collaborative student efforts and understanding stereotype threat. They learned how to deal with the frustrations caused by lack of understanding and lack of confidence. For these changes, they credited the culture circle meetings, individual interviews with me, and the tutoring that I provided for them.

Bill, Dowain, Steve, Ernest, and John's beliefs regarding the value of the group meeting changed as well. The tangible rewards of better grades and more positive interactions with the classroom teacher confirmed for them their positive feelings for the culture circle.

Essential Conditions for Culture Circle Meetings

Freire felt strongly that educators should search with their students for the ideas and experiences that have meaning for their lives and which will, in turn, aid in providing specific educational direction for the individual students. Meaning and valuing evolved from critical consciousness and through participation in culture circles may contribute to

fundamental change and help combat social inequalities in general, and the deleterious effects of negative group stereotypes in particular.

When the eight students were asked about the factors that helped establish culture circle meetings, their answers supported Freire's suggestions. Each of the study participants listed trust, sharing, helpfulness, hope, and the tangible rewards of participating in the circle. Their common cultural and racial backgrounds allowed for the development of close relationships and shared meaning. Everyone felt the need to talk to each other. Everyone felt that talking about some difficulties within the group was helpful. For example, Steve spoke late in the study of the impact of the culture circle:

> I think group meetings helped a lot. This was a good way to deal with anxiety. It would help students see how other students feel about mathematics, the teacher, and what they need to do to deal properly with their anxiety and frustration. (CC- 8)

I facilitated the group meeting discussions by providing participants the transcripts of my weekly observations, individual interviews, and discussion with their teacher about their performance. As the group developed experience in dialog, I took on a more participatory role.

The study's participants all agreed that the culture circle meetings had a positive impact. They stressed the importance of having group meetings and being able to talk about the difficulties they encountered, negative feelings of group stereotype threat, and frustrations.

The use of stereotype threat discussions as a problem-posing strategy proved to be an effective means of soliciting participation and the sharing of experiences, as well as a means of exploring possible actions to improve mathematics learning approaches. Expressions of mathematics anxiety and feelings of and experiences with anxiety were also explored and connected with stereotype threat. As the sources of these anxieties were named and associated with stereotype threat, students felt empowered to retake control of their learning.

For example, prior to the study George believed that he did not have a brain for learning mathematics. Through interactions with other participants he realized he had been limiting his ability. He questioned whether he had adapted this stance towards learning because of stereotype threat. He was than able to consider possible actions for reaching achievement levels consistent with his ability.

Bill had the highest score for mathematics anxiety and felt he was stupid. Through the group meetings he realized that he was not dumb, and he learned to develop strategies that allowed him to feel more prepared and therefore minimized his mathematics anxiety.

Prior to the study, Steve studied hard, but for the most part simply memorized the subject matter without understanding the concepts that underlay it. Through one-on-one meetings with me and interactions with others in group meetings, he gained confidence and learned how to study mathematics.

Dowain was easily frustrated and suffered from mathematics anxiety prior to the study. By interacting with other participants, he learned to control his anxiety. And, like Bill, he developed study skills that allowed him to feel more prepared and confident.

Ernest was very shy and quiet, and prior to the study he did not try to study Algebra II, but simply copied all of his homework. Through the group meetings he gained confidence and started to talk to other participants about his difficulties in the class and even asked the teacher for help.

Prior to the study, Sonny dressed "funny," missed a lot of class, and was always trying to make other students laugh. He did not gain as much from the group meetings as other participants did, but through his interactions with them he learned to take learning mathematics more seriously.

John had taken Algebra II for two years prior to the study and had failed both times. Through the group meetings he began to see what lay ahead for him, and he gained more confidence in his ability to do well in mathematics.

Mike had a strong mathematics background prior to the study. The group meetings helped him realize that he could assists some of his fellow participants with their mathematics difficulties. His willingness to help constituted a significant change in his openness with others.

This study's findings suggest that as the culture circle became established and evolved so that the participating students were given opportunities to share their difficulties, beliefs, and values, this sharing positively affected their mathematics learning.

Limitations

There are several logistical and practical limitations to this study. There are also institutional limitations that affect the potential application of the strategies employed in the study.

The focus of the study was restricted to African American male students in Algebra II with previous mathematics experience. Had the students been of different or mixed racial or gender groups, the dynamics of the culture circle may have been very different. Had the students been minority students in a majority school the impact of the culture circle may have varied.

Our group meetings were scheduled for after school hours. The amount of time the eight participating students and I invested in order to make this study possible is inexpressible. Communication and dialog among the eight students was not considered part of their school schedule. There is no way to ascertain the potential impact of culture circles as a part of the school community at this point in time. Limitation of existing school structures, ideas about "value free" education, and standardized curricula make it difficult to explore the many ways culture circles could be used in schools.

Potential Future Research

This study examined the impact of the establishment of weekly culture circle meetings in an urban, inner-city high school. The impact of the culture circle on the school community or on the mathematics class was not examined in this study. How did

the class itself change because of the participation of these individuals in the culture? How might the school culture be affected by students' participation in culture circles, especially participation on a larger scale?

Despite institutional and curricular barriers to culture circle implementation, further research needs to explore how classrooms can be reorganized and curricula problemetized (Noddings, 1993) to allow students to become more engaged in the learning process.

Another area of untapped research would examine classroom discourse that provides opportunities for students to critically examine the social and cultural biases inherent in the mathematics they are asked to learned. "Students can be encouraged to explore implicit power relations and underlying assumptions about the mathematics society deems and prescribes as important for them to learn" (Fleener, 1999, p. 101).

Epilogue

I began this project with the goal of gathering information on the impact of culture circles on the mathematics performance of minority high school students in the hope that my findings could be used to help inform mathematics educators working with African American students. No research had been done on this topic, and I thought that knowing more about the impact of culture circle dialogs on African American students' mathematics performance would help mathematics educators help these students in their learning.

Information from the participants played an important role in sharpening my research focus as the project progressed. Moreover, I found that culture circle meetings facilitated the students' ability to make positive changes in their mathematics performance.

Based on my experiences in this study, and after tutoring more than ten African American students, I now believe that some of the difficulties students have in their mathematics courses can be traced to a lack of desire to learn in pervious years.

In undertaking this project, I have had the opportunity to reflect upon the role of group meetings and their effect on the learning of mathematics. I have learned that the culture circle can exert a strong influence on students' mathematics performance and meaningful mathematical activity.

REFERENCES

Aronson, J., Lustina, M., Keough, K., Brown, J. L., & Steele, C. M. (1997). Inducing Stereotype Threat in the Non-Stereotyped. *Psychological Review, 117,* 132–35.

Aronson, J., Quinn, D. M., & Spencer, S. J. (1998). Stereotype Threat and the Academic Underperformance of Minorities and Women. In K. Swim & C. Stanger (Eds.) *Prejudice: The Target's Perspective.* New York: Academic Press.

Cazden, C. B., (Ed.) (1990). *Review of Research in Education.* Washington, D.C: American Educational Research Association.

Clewell, B. C. (1989). Anderson, B., & Thorpe, M. (1989). *Breaking the Barriers: Strategies for effective and equitable Mathematics and Science instruction for Middle School Minority and Female Students.* San Francisco, CA: Jossey-Bass.

Finlay, L. S. & Faith, V. (1987). Illiteracy and Alienation in American Colleges: Is Paulo Freire's Pedagogy Relevant? In: *Freire for the Classroom.*

Fleener, M. J. (1999). Toward a poststructural mathematics curriculum. *Journal of Curriculum Theorizing, 15,* 92.

Freire, P. (1993). *Pedagogy of the Oppressed.* New York: Continuum.

Gall, M. D., Borg, W. R. & Gall, J. P. (1996). *Educational Research: An Introduction.* New York: Longman.

Gross, S. (1988). Findings by Gender and Racial/Ethnic Group. *Participation and Performance of Women and Minorities in Mathematics, Vol. 1.*

Guthrie, R. (1980). The Psychology of Black Americans. In R. Jones (Ed.). *Black Psychology.* New York, NY.

Horton, M. & Freire, P. (1991). *We Make the Road by Walking: Conversations on Education and Social Change.* Philadelphia: Temple University Press.

James, R. K. & Smith, S. (1985). Alienation of Students From Science in Grades 4–12. *Science Education, 69,* (1), 39–45.

Jensen, A. (1980). *Bias in Mental Testing.* New York: Free Press.

Lather, P. (1991). *Getting Smart.* New York: Rout Ledge Press.

Lincoln, Y. S. & Guba, E. G. (1985). *Naturalistic inquiry.* Beverly Hills, CA: Sage Publications.

Lockheed, M. E., Thorpe, M., Brooks-Gunn, J., Casserly, P. & McAloon, A. (1985). *Sex and Ethnic Differences in Middle School Mathematics, Science and Computer Science: What Do We Know?* Princeton, NJ: Educational Testing Service.

Nettles, M. T. (1988). *Toward Undergraduate Student Equality in American Higher Education.* New York: Greenwood.

Noddings, N. (1993). *Politicizing the mathematics classroom.* Albany, NY: State University of New York Press.

Oakes, J. (1992). *Lost Talent: The Underparticipation of Women, Minorities and Disabled Persons in Science.* Santa Monica, CA: Rand Corporation.

Ogbu, J. U. (1992). Understanding Cultural Diversity and Learning. *Educational Researcher, 21,* 5–14.

Ogbu, J. U. (1998). *Minority Education and Caste: The American System in Cross-Cultural Perspective.* New York: Academic Press.

Osborne, J. W. (1997). Race and Academic Disidentification. *Journal of Educational Psychology, 89,* 728–735.

Plumberg, D. (1999). 9,700 Juniors Read Poorly. *The Daily Oklahoman,* July 28, 1999, p. 11.

Powell, A. B. & Frankenstein, M., (Eds.) (1999). *Ethnomathematics.* New York: State University of New York Press.

Prigogine, I. & Stengers, L. (1984). *Order out of Chaos.* New York: Bantam Books.

Rakow, S. J. (1985). Minority Students in Science. *Urban Education, 20,* (1), 103–113.

Schibecci, R. A. (1990). Selecting Appropriate Attitudinal Objectives for School Science. *Science Education, 67,* (5), 595–603

Shor, I. (1987). *Freire for the Classroom.* Portsmouth, NH: Boynton/Cook Publishers.

Spencer S., Steele, C. M. & Quinn, D. (1991). Under suspicion inability: Stereotype threat and women's math performance. *Manuscript submitted for publication, 35,* 428.

Steele, C. M. (1997). A Threat in the Air: How Stereotypes Shape Intellectual Identity and Performance. *American Psychologist, 52,* 613–629.

Steele, C.M. & Aronson, J. (1995). Stereotype Threat and the Intellectual Test performance of African Americans. *Journal of Personality and Social Psychology, 69,* (5), 797–811.

Steele, C.M., Spencer, S., Hummel, Carter, Harber, Schoem & Nisbett (1998). African American College Achievement: A Wise Intervention.

Taylor, P. (1993). *The Texts of Paulo Freire.* Buckingham: Open University Press.

Thomas, G. E. (1984). *Determinants and Motivations Underlying the College Major Choice of Race and Sex Groups.* Washington, D.C: National Science Foundation.

United States Department of Education, Office of Educational Research and

Improvement, National Center for Education Statistics (1995). *The Educational Process of Black American Students* (NCES 95–765).

Valencia, R. R., Ed. (1997). Latinos and Education: An Overview of Sociodemographic Characteristics and Schooling Conditions and Outcomes. *Latino Education Issues: Conference Proceedings.*

Waldrop, M. M. (1992). *Complexity: the emerging science at the age of order and chaos.* New York: Simon and Schuster.

Zaslavsky, C. (1979). *Africa Counts: Number and Pattern in African Culture.* New York: Lawrence Hill.

APPENDIX A

SURVEY QUESTIONS

Stereotype Threat

The purpose of these questions is for deeper understanding of the effect of stereotype threat on African American students.

The written interview questions for the background interview will include the following:

4. African American students have trouble performing well in mathematics.	Agree	Disagree
5. Prejudice has negative affected my academic achievement.	Agree	Disagree
6. Teachers often expect lower performance from African American students.	Agree	Disagree
7. In school situations, sometimes I feel that others look down on me because I am an African American.	Agree	Disagree

Epistemology Beliefs

The following statements represent your personal attitudes toward mathematics. Read statement and decide to what personal attitudes toward mathematics. Read each statement and decide to what extent you agree with the statement. Choose 1 if the statement strongly represents your attitude. Choose 5 if the statement does not represent your attitude at all. Choose the number in between which best reflects your agreement or disagreement with them.

1	2	3	4	5
Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree

8. I like mathematics.	1	2	3	4	5
9. I am looking forward to taking more mathematics courses	1	2	3	4	5

10. In classroom, I feel prepared to learn mathematics.	1	2	3	4	5
11. I find learning mathematics is very stressful.	1	2	3	4	5
12. Compared to other subjects I like mathematics better.	1	2	3	4	5
13. Using different teaching styles, such as small-group experience and increased homework assignments can help affect mathematics anxiety.	1	2	3	4	5

Beliefs about mathematics

*Mathematics Anxiety Rating Scale (MARS-A)**

The items in the questionnaire refer to things and experiences that may cause tension or apprehension. For each item, place a (√) in the circle under the column that describes how much **you would be made anxious by it.** Work quickly, but be sure to think about each item.

How Anxious	Not at all	A little	A fair amount	Much	Very much
14. Doing a word problem in Algebra	○	○	○	○	○
15. Reading a novel with many dates in it.	○	○	○	○	○
16. Receiving a mathematics textbook.	○	○	○	○	○
17. Watching a teacher work an algebra problem on the blackboard.	○	○	○	○	○
18. Sitting in a mathematics class and waiting for the teacher to begin.	○	○	○	○	○
19. Reading and interpreting graphs or charts.	○	○	○	○	○
20. Raising your hand in a mathematics class to ask a question about something you do not understand.	○	○	○	○	○
21. Taking an examination (quiz) in a mathematics course.	○	○	○	○	○
22. Taking an examination (final) in a mathematics course.	○	○	○	○	○

23. Learning the part of a game dealing with scoring and remembering numbers.	O	O	O	O	O
24. Being given a set of addition problems to solve on paper.	O	O	O	O	O
25. Being given a set of subtraction problems to solve on paper.	O	O	O	O	O
26. Thinking about an upcoming mathematics test one week before.	O	O	O	O	O
27. Waiting to get a mathematics test returned on which you expected to do well.	O	O	O	O	O
28. Waiting to get a mathematics test returned on which you expected to do poorly.	O	O	O	O	O
29. Asking your mathematics teacher after class about something you did not understand.	O	O	O	O	O
30. Receiving your final mathematics grade on your report card.	O	O	O	O	O
31. Being given a "pop" quiz in a mathematics class.	O	O	O	O	O
32. Seeing a computer printout.	O	O	O	O	O
33. Listening to a lecture in a mathematics class.	O	O	O	O	O

APPENDIX B

GUIDING QUESTIONS FOR INDIVIDUAL INTERVIEWS

Beliefs

1. How do you feel about mathematics?
2. Explain your experiences learning in mathematics.

Epistemology

3. Do you feel you need to understand the meaning of procedure in Algebra?

Self Concept

4. How do you compare yourself with other students?
5. How do you compare your grade with other students?

Confidence

6. How well do you think you will do in school?

Stereotype Threat

7. Do you experience anxiety because of the stereotype feeling?
8. Does prejudice have any negative affects in your academic development?
9. How do you feel about yourself and negative group stereotype pertaining to mathematics learning?

APPENDIX C

RESEARCHER'S LIFE STORY

It is significant to understand why the posed research questions are important to me. My story that I am to share conveys the importance of these questions to me. My present status as a Ph.D. student and my overall concern for an equal education opportunity for all is due to my own life struggle to pursue my education.

My story indicates that stereotype threat existed for me and is an unfortunate occurrence that any group can fall victim to if they are placed in a situation where there is a negative group stereotype.

I grew up in Abadan, a popular city in southern Iran, with my parents and seven siblings. My family was rather poor; my father was a bricklayer in an Abadan refinery with not much of an income. At the age of thirteen, I had to quit school and go to work to help my father. At the age of fourteen, I too began working as a bricklayer along with my father. It was very hard work for me, but I was the oldest child and thus had to do it to help the rest of the family. I was, therefore, never given the chance to go to high school like the other kids my age with whom I grew up.

In the summer of 1959, having completed only elementary school, I was able to enroll into N.I.O.C. (National Iranian Oil Company) trade school, which was part of the Abadan refinery. The ministry of oil and gas in Iran is what the N.I.O.C. is responsible for, and to become a technical worker in the refinery, one had to go through a three-year training program. To become a technical worker was a dream for my family and me because then I would be working in the Abadan refinery just like my father.

After three years of training in 1962, I had completed the N.I.O.C. requirements and became a technical worker in the refinery. I was titled "worker #199495" and I was very proud of this achievement.

The Abadan refinery, which I joined, was one of the biggest crude oil refiners in the world, with eight distillation units each with a capacity of 600,000 BPD and 12,000 personnel (1,700 staff members, 10,000 workers, and a team of 300 managers).

At the beginning of my work experience, I was very happy and proud of the type of work I was doing as a day technical worker in the main workshops. However, my feelings soon changed when they transferred me to the conversion unit at the Cat Cracker Plant. This plant had ninety workers in three shifts; each shift had thirty workers with seven staff members. My position at this plant was what was titled as the processor. At the beginning of my shift, I was to do a routine check of the plant and get different samples from different products. Then I was to start cooking dinner for the staff members, setting up their tables and making tea for them. Finally, after they ate, I was to clean up after them as well. If any of the workers were unhappy doing this, or especially conveyed his unhappiness by not having the right attitude, he was in a lot of trouble.

It was a rule that in all of the units of the refinery, the workers had to be called by their first name, whereas the staff members had to be addressed by their title and last name. Even the restroom the workers used, the restaurants they ate in, the schools their children attended, the movie theaters they were given passes to, and the housing they were provided, all differed from the ones the staff members possessed. It was every worker's dream to go to a staff movie theater because it was a palace called Taj Cinema. It had a big concession stand, nice comfortable seating, and air conditioning. The workers' movie theater was more like a drive-in movie theater with outside seating. And obviously, in the wintertime and on rainy days, the workers and their families could not watch a movie. The gap between the salary of the worker and the staff member was so huge that the best workers made 30% of the least paid of the staff members. Worse than all of these inequalities was when everybody completed twelve days of work (four nights, four afternoons and four mornings). The workers got one day off, and staff members got four days off. This segregated life made me extremely unhappy. I no longer had

a desire to work there. I started to talk with older workers and my friends about the unjust aspect of the system. Almost every time I received the response that allegedly the staff members are smarter than the workers are. They come from educated families, have a high school education, money and connections, and we do not have any of those attributes. They are in a much better position than we are. Many of the older workers, age forty-five and older, lost all their hopes and dreams of a better future. Most of the time, they were even scared to talk about their views and always advised me to keep my thoughts to myself, swallow my pride, and accept things as they were or something would happen to me. I tried to listen to their advice, but each time I had to cook for the staff or wash their dishes, I would get so mad that I could not stop asking myself why I had to do what I was doing. I kept asking why such a big difference had to exist between the workers and the staff members. Perhaps I am poor, I would acknowledge that, but I am as smart as these staff members. I too can get a high school degree if I start attending school at night. This new dream of mine I would discuss with friends, only to have them tell me that I was crazy and that as long as I am employed at the refinery, it is impossible to get a high school degree. However, it didn't take a long time to change some of their minds and have them agree to start attending night classes with me.

At the age of twenty, I enrolled in night school at the level of seventh grade. At the beginning, it was very difficult to go to school at night, a distance of five Mike away from my house and then go to work right after, eight Mike in the opposite direction—all on an old bicycle. However, I was willing to put up with any amount of pressure, and stressful times, to get my education. It did not take long for me to manage my time well and get used to my new schedule, therefore making it not as tough after all.

Five co-workers and I all finished seventh grade. By that time, I was so in love with the education I was receiving that I started taking more classes. I finished eighth and ninth grade in one year. At this point, ten other workers from the refinery started night school at the level of seventh grade. By the time I was in the twelfth grade, there were

twenty-six workers going to school at night and working in the refinery at the same time. There were a great number of pressures I had to deal with at work while trying to study for school at the same time. There were a great number of pressures that I had to deal with at work while trying to study for high school at the same time. Some staff members, and coworkers, played several pranks on me. The most memorable ones are when they stole my bicycle, broke into my locker almost every week, and accused me of trying to cause a fire in the plant by changing the pumps' RPM and the towers' temperatures. Furthermore, staff members would have me unload tons of catalysts for hours without wearing any safety protection—such as a face mask, safety goggles, or proper covering for my clothes and skin. They would also sometimes send me alone at night to dip the crude tank, which was half a mile away. This was a task for two people because there were 100 narrow stairs that one had to climb first to get to the top of the tank. Then, one worker would hold a flashlight while the other would do the measuring. It was very difficult and dangerous for one sent to do this job. However, I was sent to do it alone time and time again. Pressures like this were a recurrence for me at work, and it proved to be a lot to handle along with school. However, I never gave up. Thank God for my father. I went home every day with a mouthful and my father was always there ready to listen, and offer me his undying support, understanding and encouragement.

In 1968 I finished high school with first place honors for nontraditional students among all the students in Abadan. My picture was in the school paper. A few months later, five of my co-workers who had begun school around the same time I had, also completed their degrees. Four months later, refinery management set up a meeting for all the employees, and at that meeting they announced that I was the first worker in fifteen years to be promoted to staff membership. This was the first time we as workers felt like we were somebody. Within the next few months, the other five graduates became part of the staff membership.

I worked as a staff member for seven months. During that time I never had the support or cooperation from other staff members. In fact, they would talk about me among one another and let everyone in the refinery know that my work couldn't be trusted because I used to be a worker. Therefore, the staff members showed me their obvious belief that I didn't belong that I wasn't really one of them, and never would be on the same level as they were. The very first day I was promoted, my boss had warned me not to talk personal kind of talk with any of the workers, or I would face punishment. One morning soon thereafter, a worker brought me a cup of tea when he recognized me as a former worker. He suddenly enlivened and asked me if I could tutor his oldest daughter with her mathematics. We agreed on meeting at a later time at his house. Later that very day, my boss moved my desk next to his and told me the next time I was to get personal with a worker, I would be history. Being a staff member was no longer good enough for me. I needed something more out of life. In 1969, I came to the United States with the big dream of becoming an engineer.

In 1971, N.I.O.C. changed their policies. No longer was any staff member allowed to ask the workers to prepare their meals for them, clean up after them, and the workers received a lot more benefits.

By 1978, more than fifty workers from the Abadan refinery with high school degrees moved to the United States, Canada and Europe to get a higher education.

In 1980, N.I.O.C. built four more crude refineries in the cities of Tehran, Esfahan, Shiraz and Tabriz. All of the personnel in the four refineries were staff members. Every one had the four days off with equal benefits. Furthermore, they all ate in the same restaurants, used the same supermarkets and movie theaters, and most important of all, everyone addressed one another by the first name.

On May 9, 1979, worker #199495 had his dream come true and received his chemical engineering degree from the University of Oklahoma. This was one of the most memorable and touching moments of my life. And this was only the beginning.

In July 1979, I returned home with my family with the dream to be able to use my knowledge and past experience in the Abadan refinery of N.I.O.C. To my unexpected surprise, I discovered that my country had changed tremendously. The Shah of Iran had been overthrown and the government completely changed. I was hired by the N.I.O.C. to work for the Esfahan refinery because the Abadan refinery had been destroyed in 1980 during the Iran-Iraq war. It was eventually rebuilt, but as a much smaller refinery.

Throughout the nine years I worked as a Process Engineer, Safety Engineer, Operation Supervisor of Crude Refinery, and Operations Manager of N.G.L. refinery, I continued to feel pressures. The pressures were different from the past, but nevertheless, as persistent. I felt like I was under a stereotype threat mainly because I was American educated. I had even adopted an American lifestyle to some degree. I wore blue jeans and listened to western music. The new religious management at the refinery told me that I would never be trusted, that all my work and final decisions would always be reviewed by someone else. It did not take long for me to grow very unhappy and tired of all the pressures of feeling stereotype threats at work.

In August 1989, after nine years at the N.I.O.C., I used my annual leave to take my family first to Turkey and then to the United States. I left my home, my car, and everything else I owned back in Iran in order to get my freedom again. If the refinery had any knowledge of my plans of coming back to the United States for good, they would have had me thrown in jail.

Arriving in Turkey was another challenge. At the Istanbul Airport, we were detained after our flight after they looked at my passport. We took the next flight, after I paid two policemen about $80.00, to let me go by and get on our plane. Getting off that flight at the London Airport, my wife and I were both detained as they dumped everything out of our luggage and searched them repeatedly. They threw everything back in the suitcase and handed us our bags; apologized, saying it was a mistake.

My first five years back in the United States were very hard. I could not find any kind of engineering job where I applied. As soon as the company realized I was Iranian, I never heard from them again. To support my family, I held all kinds of jobs such as bar-tending, waiting tables, plumbing, and driving a truck and cab. Meanwhile, I had started graduate school and begun work on my master's degree.

In June 1997, the Department of Environmental Quality of the State of Oklahoma hired me as an Environmental Engineer.

All in all, I feel like I have lived a fulfilling and interesting life. I am at a perfect point where I enjoy every day and am grateful for all I have been through to be where I am today. In this country, I have been able to continue my education and follow my dreams. What I want for others is the opportunity to do the same. How can I give back? How can I help others overcome limitations of their abilities and dreams often placed on them by unfair or unjust social practices?

APPENDIX D

TEACHER PARTICIPATION AGREEMENT

Dear Teacher,

My name is Joe Ahmadi. I am a doctoral student in the College of Education at the University of Oklahoma. I am planning to conduct research on the effects of stereotype threat on high school mathematics students. Dr. Jayne Fleener, Associate Dean of Research and Graduate Studies in the College of Education, is my academic advisor and will be supervising my work.

I would like permission to interview students from your class at school. The questions I plan to ask during the weekly interviews are designed to explore how students deal with stereotype threat on mathematics performance. These interviews and observations will continue throughout the first semester of the 1999–2000 school year. It is hoped that by encouraging students to explain how they are thinking, that a deeper understanding of how students learn and perform in mathematics classes will be developed. The interview will occur weekly outside of class and will be tape recorded for later analysis. Each student has the right at any time to withdraw from the study. I will also visit your classroom on a regular basis. There will be no risks or discomfort to the students of any kind.

Please read the agreement below and, if you consent, please sign and return to me. Thank you in advance for your willingness to consider allowing me to participate in your classroom and work with your students.

If you have any questions, you may call me at 722-9570. You may also contact the University of Oklahoma, Office of Research Administration, at 325-4757.

Joe Ahmadi

I, _____, agree to allow Joe Ahmadi to visit my classroom and interview my students as a part of his dissertation research. I understand that I may withdraw my consent to participate at any time without prejudice. I also grant my permission for you to audiotape my class, my students in group and individual interviews, and possible conversations we may have about your research.

_____ _____

Teacher Signature Date

STUDENT AGREEMENT FORM

Dear Mathematics Student,

My name is Joe Ahmadi. I am a doctoral student in the College of Education at the University of Oklahoma. I am planning to conduct research on the effects of stereotype threat on high school mathematics students. Dr. Jayne Fleener, Associate Dean of Research and Graduate Studies in the College of Education, is my academic advisor and will be supervising my work.

I would like permission to interview you at school. The questions I plan to ask during the weekly interviews are designed to explore how students deal with stereotype threat on mathematics performance. These interviews and observations will continue throughout the first semester of the 1999–2000 school year. It is hoped that by encouraging students to explain how they are thinking that a deeper understanding of how students learn and perform in mathematics classes will be developed. The interview will occur weekly outside of class and will be tape recorded for later analysis. You have the right at any time to withdraw from the study. I will also visit your classroom on a regular basis and work closely with the classroom mathematics teacher. There will be no risks or discomfort to you of any kind.

Please read the agreement below and, if you consent, please sign and return to me. Thank you in advance for your willingness to consider allowing me to participate in your classroom and work with your students.

If you have any questions, you may call me at 722-9570. You may also contact the University of Oklahoma, Office of Research Administration, at 325-4757.

Joe Ahmadi

I, _____, agree to participate in this study. I understand that I may withdraw from the study at any time without prejudice. I also grant my permission for you to audiotape me in group and individual interviews.

_____ _____

Student Signature Date

PARENT APPROVAL FOR PARTICIPATION

Dear Parent,

My name is Joe Ahmadi. I am a doctoral student in the College of Education at the University of Oklahoma. I am planning to conduct research on the effects of stereotype threat on high school mathematics students. Dr. Jayne Fleener, Associate Dean of Research and Graduate Studies in the College of Education, is my academic advisor and will be supervising my work.

I would like permission to interview your child at school. The questions I plan to ask during the weekly interviews are designed to explore how students deal with stereotype threat on mathematics performance. These interviews and observations will continue throughout the first semester of the 1999–2000 school year. It is hoped that by encouraging students to explain how they are thinking that a deeper understanding of how students learn and perform in mathematics classes will be developed. The interview will occur weekly outside of class and will be tape recorded for later analysis. Your child has the right at any time to withdraw from the study. I will also visit the classroom on a regular basis and work closely with the classroom mathematics teacher. There will be no risks or discomfort to the students of any kind.

Please read the agreement below and, if you consent, please sign and return to me. Thank you in advance for your willingness to consider allowing me to participate in your classroom and work with your students.

If you have any questions, you may call me at 722-9570. You may also contact the University of Oklahoma, Office of Research Administration, at 325-4757.

Joe Ahmadi

I, the parent of _____, agree to participate in this study. I understand that I, or my child, may withdraw from the study at any time without prejudice. I also grant my permission for you to audiotape my child in group and individual interviews.

_____ _____

Parent Signature Date

APPENDIX E

INSTITUTIONAL REVIEW BOARD APPROVAL

The University of Oklahoma

OFFICE OF RESEARCH ADMINISTRATION

November 2, 1999

Mr. Gholam H. Ahmadifar
10408 Bishops Gate
Oklahoma City OK 73162

Dear Mr. Ahmadifar:

The Institutional Review Board-Norman Campus has reviewed your proposal, "Effects of Stereotype Threat on Minority High School Students in Mathematics Performance," under the University's expedited review procedures. The Board found that this research would not constitute a risk to participants beyond those of normal, everyday life, except in the area of privacy, which is adequately protected by the confidentiality procedures. Therefore, the Board has approved the use of human subjects in this research.

This approval is for a period of twelve months from this date, provided that the research procedures are not changed significantly from those described in your "Application for Approval of the Use of Humans Subjects" and attachments. Should you wish to deviate significantly from the described subject procedures, you must notify me and obtain prior approval from the Board for the changes.

At the end of the research, you must submit a short report describing your use of human subjects in the research and the results obtained. Should the research extend beyond 12 months, a progress report must be submitted with the request for re-approval, and a final report must be submitted at the end of the research.

Sincerely yours,

Susan Wyatt Sedwick

Susan Wyatt Sedwick, Ph.D.
Administrative Officer
Institutional Review Board-Norman Campus

SWS:pw
FY00-24

Cc: Dr. E. Laurette Taylor, Chair, Institutional Review Board
Dr. Jayne Fleener, Instructional Leadership & Academic Curriculum

APPENDIX F

TEACHER INTERVIEW

The following is a transcript of the interview with Mr. Bob Jones*, Algebra II teacher at Wilson High School, which is located in an African American neighborhood in a large south central city.

J: I appreciate your taking the time for this interview. Did you have any teaching experience before you came to work at this high school?

B: Yes, I started teaching mathematics in 1975 at Chickasha Junior High School. I also coached basketball and football. Then, I went from there to Davenport High School in Davenport, Oklahoma, where I was the high school coach of basketball, football, and baseball. But, I was in the only teacher in the mathematics department. I had all high school mathematics. I taught everything, general mathematics, Algebra I, Algebra II, Geometry, Trigonometry, Advanced Precalculus. They did not have a calculus course, just a precalculus course, which I taught. Then I went into the pastorate, started actually, when I was still at Chickasha. A church had begun in a house so I became the pastor of that little church. I was a bi-vocational person, working as a teacher and a pastor. We grew and built the first building. So, when I left there, they were big enough to hire a full time pastor. That is one of the reasons I left there. They had gotten big enough to hire a full time pastor but I was not ready to do that full time. I wanted to go into high school coaching. So, I went to Davenport, Oklahoma. Well, while I was there, another church started in a home in Chandler, Oklahoma. So, I started preaching in that church and it grew to where they wanted a full time pastor. They asked me to be the full time pastor. Well, this was the second time I had to struggle with this idea, this decision. So, after a lot of prayer, and talking to my wife, and everything, we discussed it, and finally we decided to do that. So, I was pastor of the Chandler Southern Baptist Church. I got out of teaching after that year, and became a full time pastor. I did that for about 3 1/2 years in Chandler and then I moved to Mangum. Actually, I had several choices, but I went to Mangum and was there for 6 1/2 years. While I was there, I taught some at Mangum High School. They did not have enough teachers for one of their Algebra classes, and did not want to hire another full-time teacher. They asked me if I would teach it, so I taught Algebra there. There was a little country school named Martha School, which had a kindergarten through eighth grade. Then after being there for 6 1/2 years, I decided to go back into teaching. I went to Shidler, Oklahoma, full time teaching. Again, I was a bi-vocational pastor at a small church. I was the only teacher in Mathematics Department again. That was a good opportunity for me because I was there for six years. This gave me time to look at the mathematics department and try to improve it. It had a really poor curriculum. I had seven students in Algebra II and two in Trigonometry. The last year I was there, I had 35 students in Algebra II, and about 20 in Trigonometry, as well as having five

* A pseudonym.

taking AP Calculus. So, we had really built up the program, so that was really exciting.

J: Did you have any experience with minority students in your classes?
B: Chickasha had a large African American population. Probably 25 percent of the student population were American Indian students. Then, at Mangum, we probably only had 10-15 percent of the student population who were African Americans. Shidler was an all-Caucasian community and frankly since I am _ Cherokee Indian, I felt like a minority. There were very definite prejudice attitudes expressed at Shidler. They are very prejudiced against minority groups. The minority groups had no representation in the school at all.

J: How many students were there?
B: I am going to guess in the high school maybe 150 to 160 and no minorities.

J: Were there any minorities living in town?
B: None that I knew was aware of. I will say there was an African American girl who came in to the First Grade. I think they lived on the fringes of the district. The district was a large, rural district. That was the only minority student I knew in the whole school.

J: During all of this time in different cities, from Chickasha to all the small towns, have you had the opportunity to deal with a lot of minority students? Do you think they have a different feeling about education? Why?
B: I saw that a lot. I first started teaching in Chickasha, Oklahoma with a lot of the African Americans students there. At that time, Chickasha, was probably one of the most segregated cities I ever lived in. What I mean by that is, the African Americans all lived on the east side of town. The south part of town was the affluent White community. The north part of town was the very poor White community, and the middle of town was the middle-class White community. You could walk into the classroom and pretty well say by the way that kids were dressed and who they were where they lived. The African Americans used to have their own school there. So the ninth grade center, when I was there, had been the African Americans high school. Now, they were finally segregated, and they had come into the school. While I was there, we were having race problems. There were fights, lots of violence and problems. The African Americans kids kept to themselves mostly. They did not feel part of what was going on. It was very difficult to try to get them involved in their studies. They were mostly poor. One of my students was shot and killed breaking into a house. Another one was shot by his stepfather. These were junior high kids, seventh graders. It was pretty difficult for them. We were fortunate in that we did have an African American teacher who was in the very next room to me. He was a social study teacher and he dealt with these kids very directly. I would never use this word in my vocabulary; I have never used this word in my vocabulary. He would get some of the moronic kids in the hall and he would say that you are the reason that people call us "niggers", the way you are acting. He would just really read them the riot act to try to get them to see that they needed to change their behavior. It worked to some degree. He and I worked together very closely to try to reach a lot of African American kids and we were pretty successful with a lot of those kids. I used athletics and sports. Many times the kids would want to play sports, but they did not

like the classroom. So, I would say if you want to play sports, you have to have good grades. We worked with them like that.

J: What are the reasons of underperformance of African American students in mathematics class?

B: I had kids who literally would tell you that they could not do that. Buddy, I can't do that. I am not good enough to do that, or I am not smart enough to do that. I had a boy named Andrew James who was an African American boy who had failed the seventh grade. It was his second year of seventh grade. Andrew told me the first week of school that I can't do that. Everybody knows that I can't learn this. He was African American and it took a lot of work. What I had to do was make him a friend. Unfortunately most of the teachers he had were frustrated wanting him to learn and would treat him with more anger or would discipline him. I saw that was not working, obviously, so what I did was to be a friend to him. I would bring him in and joke with him. If he did not have his homework, I would ask him if his dog ate it. He would say, "Yeah, my dog ate it, Mr. Jones". Oh well, that dog is getting fat on your homework, isn't he? We would joke, and then I would have him come sit by my desk and work on his homework. I would have him do the work there in class. He passed my class, but I had to be creative. I had to allow him to do things differently. Another thing, in his group of friends, it was not a good thing to get good grades or to be smart. So, I could have him be smart in my class without telling anybody else. He could be who he wanted to be.

J: Do you think American Indian or African American students think that the educational system is not theirs, so they don't have to deal with it?

B: I think even more with the Indian community. Many in the Indian community think that it is the White man's education and they don't want anything to do with it. After I left Shidler, I became the principal at Butner High School. I had to go back to school to get my Master's in Administration. They had 165 kids, 52 percent American Indians, 20 percent African Americans, with the Caucasians in the minority there. While there I discovered I had a lot of problems with the African Americans and Indian community. There was a real sense of their feeling that they did not need this. They did not need an education. I would have African Americans students actually tell me, there were gangs in Wewoka, which was not far away as well as in Shawnee and Okemah. We were kind of surrounded by Seminole. A lot of them would sell drugs and they would even tell me that on week ends they could make more money than I could doing a regular job and so they did not need this education. There was one particular Seminole Indian girl who was referred to me by the teacher. I asked her what are you going to do with yourself? You are a junior in high school, 17 years old. If you don't graduate from high school, what are you going to do for a job? What are you going to do for money? I told her how important a high school diploma was. She said, "oh, I don't need it. I have plenty of money now. We have a house and we live on Indian land. We have money that we have now. I don't need your education."

J: Did you have problems teaching this Algebra II class?

B: When I first walked into this classroom all I saw were these all African American students. Nick, the only White student was not here yet. My one White student came about two weeks later. I saw they were fairly loud, the athletes and it was really a little intimidating to me. I am thinking, oh boy, can I handle this? How am I going to handle this group? So, I think I may have gone overboard trying to get along, be friendly, and make it open because of a little fear there. I finally realized that if I am going to help these kids, I am going to have to be a little tougher, and a little stronger. I don't want to get to the place where I just totally

shut out communications. If I just said "No, we are not going to move, we are going to make it totally quiet from bell to bell", I don't think they would do it. Secondly, they would resent it, and I think they would rebel. I tried to set some guidelines, show them what I was going to do for them. Giving a little bit in myself so that they would understand that I am trying to do what is best for them. I think most of them see that and we are getting a good response. I am very happy with the response that I am getting now. There is a boy named Ernest who sits way in the back, a very handsome young African American man, football player, who is well thought of, I am sure. But, Ernest is very, very slow at Mathematics. I don't know about other subjects, but in Mathematics he is very slow. He has come in for extra help after school, retaking some tests and things like that, but until recently he wasn't doing that. So, he has responded, and I am very happy to see him respond because he is the kind of kid I could never reach. I was mentioning Mike to you. Mike is probably the most intelligent African American student in the entire class.

J: You talked about prejudices and stereotype? What do you mean?

B: There is a very big resistance among many of the Indian students. When I say that, I am making kind of a stereotype statement. Through the efforts of the school, the counselor, and teachers, many of the Indian students are succeeding and going to college and things like that. But, there are still a very high percentage of students who don't really understand the need for education. They may narrowly understand it, but they don't understand it in the way they do things every day. They just try to get through high school. They don't seem to respond very well to any of those programs that we have for them and that sort of thing.

J: Did you have a hard time getting a teaching job because of your weight and your age?

B: Oh yes, I think age, weight and experience were problems in getting a job. You would think that experience would be a positive, but many times it is a negative because of pay. They don't want to pay more salary. They will take a first or second year teacher and pay much less. Secondly, I got many interviews because of my resume and my experience. Then when I would go for the interview, I would be told that it was an excellent interview, the best interview, wonderful interview, but then not get the job. I can only explain it by my age and my weight. That is all I can think of. I don't appear the same as the younger person who is more medium build. So, I definitely feel like there is a stereotype. No one has ever told me that specifically. One specific experience. Three years ago, I interviewed at Putnam City for an assistant principal position. I have five years experience as a high school principal, good, super cum laude for Master's Degree in Administration, not one negative blot on my record. I had excellent references, and I knew them very well. There were 40 applicants, or so, I found out later. They narrowed it to 10 by resume. I was one of the 10 that were interviewed by the first committee, which was chaired by the Director of Secondary Education, Dr. Joe Ciano, who is now the Director of Personnel in Oklahoma. They picked two to send to the Superintendent's Committee. I was one of those two. I did not get the job. The other person was hired. I had now had this experience three or four times, so I called Joe back and "told him that I was a little frustrated. I have been trying to find a position in the City. I am always a finalist, but I am always a bridesmaid, never get hired." I asked him if there is something that he could help me with. Dr. Ciano said, "Well, to tell you the truth, you were number one from our Committee. You were first when we sent the two names to the Superintendent of Schools. So, as far as I was concerned, you were the one that we would have hired if we had the authority to hire out of that group. But, the other person was

from the district already, etc., so we hired the other person." Well, I found out the other person was from the district, yes; the other person was a woman; the other person was in her middle 30's and fairly attractive. I don't know. I think they were being pressured to hire women, move women in places, and I understand that. But, she is also younger, she is also more attractive, and had a better build. So, there are a lot of factors there that I look at and I can look back at the same exact experience in Edmond, exactly. I was one of two finalists, but they hired a younger woman. I saw the same thing in Mid-Del where I made it to the final interview with the same exact experience. So, when you repeat that experience so many times, you start feeling like, what is happening. Once I did go to Putnam City North to interview for a mathematics position. I know for a fact that nobody with my credentials applied. I have excellent mathematics credentials. I have taught every level. They did not even call me back to tell me that I was not hired. They hired someone else. Then, when I found out whom they hired, I am not against women, but they hired a woman who was younger, whom I know had less experience and fewer credentials, but she got hired.

J: If education for minority students was based on their culture, do you think they would have shown more interest?

B: I think it would be more so. I am part Cherokee and I think that is where the Cherokee tribe has been wise. They have some of their own schools. Sequoyah School in Tahlequah, for instance, has many Indian teachers and principals. Even though it is very similar to the regular schools, there is more identification with my tribe at the school. So there is more emphasis among those students among the Cherokee tribe. I know some of the other tribes that don't have that and there is very little emphasis on education. Some of the parents want to change it. What they see is when their kids don't succeed initially, or when they have behavior problems, then they blame prejudice immediately. They always raise prejudice. Then the students also always think prejudice. So, if they don't get a good grade, the teacher is prejudice against Indians. If they are disciplined, the teacher is prejudiced against Indians. They feel like they don't have an even plane. They don't feel like they are going to be treated fairly in the first place. They feel like they are going to be prejudiced against, they make their mind up ahead of time that that is going to happen. And therefore, it is kind of difficult to reach through that to them. Plus, many times, Caucasian teachers do not understand the culture. Sometimes Indian students are very quiet and teachers want them to participate in class, but it is not in their culture to speak out. They are very quiet, withdrawn and they will sit there and quietly work if you will let them. But, many times teachers get frustrated with them because they won't speak out. Then, of course, when they ride the student about that, the students rebel and we have a discipline problem.

J: Do you think there is a stereotype threat among the African American students when they are competing with White students?

B: I think to a degree that is true. I think African Americans feel like there is competition that they don't want. I think African American students want to be judged for who they are among their own people rather than competing against the Whites. The Indians feel the same way. I think that is true. I think that is the beauty of the Sequoyah School situation. I see the same thing for women and girls. I have seen studies on that, and I agree with that from what I seen. Girls will definitely do better with only girls. I think classes where the vast majority is girls and the girls really competed and did well I those classes. But, when they are in the minority, they do not do as well. Well, the classes that you are looking at, my Algebra II class, with a minority of girls, you will notice that very few questions

come from the girls, even though many of the girls are very bright. But when I ask for questions, very few of the girls ask questions. Now, alone they will come to my office alone and they will ask questions and I will work with them. I notice this that one girl has been coming to my office quite a bit for help. One day she came and I had two boys who had come up for extra help, and she left. She was just not comfortable with them there. So, there is a sense in which the girls, especially African American girls, have some kind of fear or are uncomfortable being smart. So, sometimes being smart may cause anxiety because they don't want everybody think of as smart. Their friends talk about it and make fun of them sometimes when they find out. I see that in my class at times. Someone asks a question, and other people make fun of him. But there are some of the students who have a lot of problems and never ask questions.

J: Your Algebra II class has 27 students, one White male and seven African American females. If they had an African American teacher, do you think it would effect their performance?

B: I don't know. I haven't drawn any conclusion about that. I will tell you why. My experience has been that the African American teacher can reach the kids on a certain level, but I don't know that necessarily that the academic improvement was that much greater.

J: I meant that as far as the connection between African American and African American students.

B: Oh yes, I think there definitely would be because you would speak their language. Similar to the teacher I told you in Chickasha, Mr. Anderson. He could speak the language. I could never say to those kids what he said to those kids. But, he could because they knew who he was. He was in their community. I believe the culture can bring African American students and teachers closer and then their efficiency will improve.

J: The only White student in your class, actually is a minority in the class. I keep writing in my notes that he does not usually talk. How are his grades?

B: He is not doing very well. He probably at this point has a D. So, I was wondering about that. I was wondering that if he was in a situation where there was more White students if he would do any better. I don't know. I am kind of curious about that. He does not participate in class very often. I think he has asked a question maybe once or twice. But, he does seem to get along with the other students pretty well. As a matter of fact, I would say that the way he speaks is kind of funny. When he is in class and speaking to the other kids, he speaks a lot like they do. But, when he has come into my office for help, he speaks totally differently. He is more or less trying to adjust to the culture. I have seen that in the other direction. You have a minority student, any minority student, in a large classroom. A lot of times, they will do one of three things. They may withdraw completely. The other thing I have seen them do, though, is become part of that culture as much as they can, adjust to the culture. And the other thing I have seen them do, is rebel against that culture by being overly their own culture. I have seen that where, well you people are all White and I am not having to do this with you people and all of this. They become almost a prejudiced minority. I have seen that happen.

J: Do you think prejudice against minorities exists?

B: I think in our culture, there is a sense in which we look at two people. If one is younger and well spoken, and otherwise, they seem to be somewhat equal, even though they are not totally equal, they are going to definitely hire that person over

the older, chubby, you know heavyweight or fat person. You know the same would be true, I think, for the person with more of an accent or broken English, who is from another culture. As a matter of fact, we are talking about the perceived stereotypes and things like that. Frankly, I think in a lot of places the African American person, or the African American woman, who speaks affluent English, not the African American cultural English, would have a better chance of getting hired now because there is an openness now to hire minorities and those groups. There is still prejudice there because if they were to come in speaking cultural, African American, English, I don't think they would get hired as quickly. You will notice that a lot of the African Americans that are hired in a teaching position and things like that speak the standard American English. If you were in the other room, you would think they were White. There is no difference because of the speech. I think speech makes a big difference, I really do. Presentation and how you dress also make a difference, I think. The funny thing, I notice one of the differences at this school that we are in now, for instance, is that we have a number of teachers, African American teachers there, who are more African American cultural than those I have worked with before. I noticed that and it is different for me to be teaching with an African American teacher who is really culturally African American. In other words, one who speaks more of an African American dialect and blends in more with the African American community. The ones I have taught with in the past, were more identified with the White community, spoke more standard type English and very little African American dialect of any kind, unless they were with African American people. Then they would have more of that. I think there is more of a sense there is prejudice. I think the same thing applies to the Middle Eastern people at this time. I think in our culture, that the people from the Middle East area, if you ranked people on acceptance as far as prejudice, are the lowest on the totem pole as far as the most prejudice against them. Or maybe it is the highest as far as most prejudice right now. There are a lot of factors. It is not just racial. A lot of it is political.

J: What do you think about the African American culture?

B: When you think about it, the African Americans really did not have a culture of their own. I mean, we brought them from Africa as slaves and that sort of thing. They had no culture here in this country, so they have created their own culture. I think they have done that over the years. They have created their own kind of cultural things. They have rap music as a cultural thing more than any other thing. I have always loved African American music. When I grew up in the 60's, I listened to early 60's especially the Platters, the Temptations, and the Supremes. The African American groups were my favorites.

J: Do you think stereotype threat among African Americans exists? If an African American student wants to compete with White students in any comfortable situation is this African American student feeling fear? Is it anxiety for him to compete with the Whites, and therefore is it going to be a negative thing for him to perform as good as if he were competing against other African Americans?

B: I think anybody that really thinks about it can understand that. Because, well not anybody, maybe there are people who have never experienced that. I have experienced that. I know the African American community says that you are not African American and you have never really experienced this. I can see similar situations that I have gone through. Like being heavy, overweight. I can tell you another experience that I had in Mangum, Oklahoma. I had never lived in that rural community in my life. The people had their own way of speaking, their own little culture. I did not fit in. I can tell you that right now. They talk real slow.

Well, I talk fast, more, standard, English. I believe the pastor ought to dress the part, and so I wore a coat and tie wherever I went. I got kind of a wake up call when I was visiting one person trying to get him to come to church, getting involved, trying to befriend him and I was not getting very far. A person who knew him, who was not a member of the church, told me that if your pastor was not so stuffy, then I might think of coming. What he meant is that he wears a coat and tie every time he comes here, and he talks this high-falutin speech, he knows all this stuff about the Bible and all this. So, honestly, I went home and put my jeans on, slipped and an old shirt on, went down there and added more of a "Howdy, how are you doin'," and he started coming to church because I had accepted his culture and become a part of it. That may not be the exact same thing, but it is similar.

J: Do you have to know the culture, the language of the person if you want him to hear you?

B: Yes. Many of the times and the places I have been where the African American person was able to rise in the White community to a prominent place, it was because they could speak the language and be part of the culture. Now, I have seen that same African American person leave and he goes back to his culture and speaks just like everybody else. He is down there with everybody else. When he is in the White culture, he plays the game.

J: Is there any stereotype threat in a small town?

B: Oh, there is no doubt about that. In Apache, even though the majority of the students were actually American Indians, a minority, the school was actually run by a very few White people. I thought this was real ironic there. The people would come to my office, the parents sometimes, and they would complain about the school board being all White, or the mayor and counsel being all White, or the principal was White. I told them, wait a minute. You are judging me because I am 1/4 Cherokee, not completely Caucasian. But anyway, they were always surprised because of my appearance. And I would tell them, now look, you have the majority here, why don't you run someone for school board and vote together, or run someone for mayor or counsel, but they didn't do that. They did not empower themselves, they complained a lot, but they never took the power and elected people to positions. That is one thing that the African American community has started to do. They are starting to empower themselves by putting African American representatives, African American senators, and starting to do that. Problems in school are one of the things the good things that has happened for the African American community in that they have African American members on the school board. Those African American members on the school board have been looking out for the community. That is why we have the academy over here in the northeast, the African American area, because the African American school board members worked very hard to get that to happen. So, you know, I think when you have someone who has grown up there, who has invested in that group, that community and then gets that position of power, you empower them to go and represent you and that makes a big difference. I see that happening with the African American community. Honestly, I see there are still prejudiced people against African American people. But I think there is a lot less in the mind of the White community than there used to be. I think that a lot of the prejudice is in the minds of the African American children themselves, maybe their upbringing from their grandparents, older parents, who experienced it so they talk about it a lot. Similarly, I see this in the Indian community a lot. So, the children see things as prejudiced that aren't really. It is more of the way they have behaved, or acted, that someone saw not the fact that they were African American, but they see it is you

have to treat me that way because I am African American. And so, then there is that hesitancy in the classroom to say wait a minute, you are trying to make me White, and I don't want to be White. I am African American. I see this in kids a lot, and yet I know, like we were talking about, I know that they if they would make education a priority, get a good education, that the doors would open for them, regardless of their race. Especially for the African Americans, and especially for the African American woman right now, because our society is so open to women right now.

J: Mr. Jones, I want to thank you very much for your time.

B: Thank you, Joe. I am very interested to see the results of your research. Good luck.

APPENDIX G

CULTURE CIRCLE MATHEMATICS DIALOG TOPICS

The following mathematics topic emerged during the data collection process and were suggested by participants and me:

1. What are the causes of mathematics anxiety?
2. White students are better at mathematics than African American students.
3. Discussion about effect of culture in learning mathematics.
4. How important it is to deal with stereotype threat?
5. African American students have higher dropout than White students.
6. Share one example of stereotype threat.
7. How can you tell that the culture circle can help?
8. How can group meeting effect mathematics anxiety, negative feeling stereotype threat?
9. What do feel about education system in United States?
10. Asian American students are better in mathematics than African American students.
11. African American, Latino and American Indian students have lower grades than White students.
12. What do you think about the theory of stereotype threat?
13. How do you benefit from this study?
14. If the teacher were ask you to take a test with Nick (the only White student in class), do you think you would feel any stereotype threat?

APPENDIX H

INDIVIDUAL INTERVIEW TOPICS OF DISCUSSION

The following mathematics topics were discussed during the individual interviews; the topics were suggested through the process of data collection and by participants and me:

1. Why did you take Algebra II?
2. Why did you agree to participate in this study?
3. How do you feel about mathematics?
4. Explain your past experience with learning mathematics.
5. Discuss some of the difficulties you experience while doing the homework or test.
6. What is your definition of mathematics and Algebra?
7. What do you think about your teacher's style of teaching?
8. Explain some of the difficulties you are experience in Algebra II class.
9. Does stereotype threat exist?
10. What is the your definition of stereotype threat?
11. Share one example of stereotype threat?
12. Did you experience negative group stereotype threat?
13. How do you feel about yourself as a African American and negative stereotype threat pertaining to mathematics learning?
14. What do you think about the only White student in your class?
15. Why does the research show some African American students receive lower grades and have higher drop out rates than White students?
16. What do you think about school curriculum?
17. What do you think about other minorities such as Latino and American Indian students' performance in mathematics?