AN ASSESSMENT OF THE ATTITUDES AND ANXIETIES OF THE AFRICAN-AMERICAN STUDENTS WHO WERE ENROLLED IN DEVELOPMENTAL MATHEMATICS II CLASSES AT HALIFAX COMMUNITY COLLEGE

by

Wendell Perry

Dissertation submitted to the Faculty of
the Virginia Polytechnic Institute and State
University in partial fulfillment of the requirements
for the degree of

DOCTOR OF EDUCATION

in

Community College Education

APPROVED:

D.A. Clowes, Chairman

John K. Burton

Betty Koball

Harold W. Mick

Samuel D. Morgan

January, 1995

Blacksburg, Virginia

c.2

LD
5655
V856
1995
P477
c.2

AN ASSESSMENT OF THE ATTITUDES AND ANXIETIES OF THE AFRICAN-AMERICAN STUDENTS WHO WERE ENROLLED IN DEVELOPMENTAL MATHEMATICS II CLASSES AT HALIFAX COMMUNITY COLLEGE

by

Wendell Perry

Committee Chairman: Dr. Darrel Clowes
Curriculum and Instruction

(ABSTRACT)

The purpose of this study was to examine two affective variables that usually hinder the mathematical performance of students. Specifically, this study was to assess the attitudes toward the learning of mathematics and the mathematics anxieties of the African-American students enrolled in Developmental Mathematics II classes at Halifax Community College. Along with assessing the attitudes toward the learning of mathematics and the mathematics anxieties of the African-American students, the study examined if there was a difference between attitudes towards learning of mathematics and mathematics anxieties of the African-American and non African-American students.

Using the two instruments (Fennema-Sherman

Attitudes toward the Learning of Mathematics Scales and Suinn's Mathematics Anxiety Rating Scale) of the study, along with the long interviews of some of the African-American students, it was found that overall the attitudes toward the learning of mathematics were positive and that mathematics anxieties were not prevalent among the African-American students. It was also found that there were no significant differences between the mathematics anxieties of the African-American and non African-American students and no significant differences between the attitudes toward the learning of mathematics of the African-American and the non African-American students who were enrolled in the Developmental Mathematics II classes at Halifax Community College.

ACKNOWLEDGEMENTS

The author wishes to express his sincere appreciation to the many individuals whose cooperation and encouragement made this study possible. Although it is impossible to acknowledge the contributions of each individual, the efforts of some do merit special recognition.

To Dr. Darrel A. Clowes, the chairman of my committee, special gratitude is expressed for his guidance and constructive review throughout this study. Special gratitudes are also expressed for the remaining members of my committee; Dr. John K. Burton, Dr. Betty Koball, Dr. Harold Mick, and Dr. Samuel D. Morgan. Their timely advice and support provided the encouragement needed during the entire study.

A very special thanks goes to Mrs. Jeanette Alston for finding the time to type and retype each and every change suggested before reaching this acceptable copy. Thank you, also, Mrs. Connie Wardsworth for your transcriptions.

Finally, this study is dedicated to my wife, Phyllis, and our two daughters, Fernanda and Wendy Lou, for their love, prayers, patience, encouragement, and understanding support during the duration of my

graduate studies and especially this dissertation. I will always thank you for the many sacrifices you made in order for me to complete this dissertation.

Table of Contents

	Page
ACKNOWLEDGEMENTS	iv
LIST OF TABLES	x
CHAPTER	
1. INTRODUCTION	
Background	1
Significance of the Study	6
Statement of the Problem	8
Definitions of Terms	15
Statement of Purpose	19
Research Questions	19
Assumptions	20
Limitations of the Study	21
Delimitations of the Study	22
2. REVIEW OF THE LITERATURE	
Anxiety	24
Mathematics Anxiety	25
Summary	28
Suggested Causes of Math Anxiety	29
Summary	32
Suggested Causes of Math Anxiety in African-American Students	32

Summary 34

Mathematical Preparation of African-American Students Entering Community Colleges 35

Studies Relating Mathematics Achievement With Mathematics Anxiety 36

Summary 41

Attitude 41

Summary 42

Attitudes Toward Mathematics 43

Summary 46

Studies Relating Attitudes Toward Mathematics to Mathematics Achievement 46

Summary 50

Similarities between Mathematics Anxiety or Attitudes Toward the Learning of Mathematics of African-American and non African-American Students in Developmental Mathematics. 51

Summary 54

Summary of Literature Review 54

3. METHODOLOGY 57

Design of Study 58

Population 61

Instrumentation 62

Data Collection 67

Methods of Analysis 70

4. FINDINGS 74

Research Question one 74

Research Question two 77

Research Question three 83

Research Question four 92

Analysis of Interviews 101

Findings From Interviews 110

Summary 113

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS 119

Summary 119

Summary of findings 121

Conclusions 124

Recommendations 127

BIBLIOGRAPHY 128

APPENDICES Page

A	Request for African-American Normative Data	136
B	Questionnaires used in this study	141
	Richard M. Suinn's Mathematics Anxiety Rating Scale	142
	Six of Fennema-Sherman's Attitudes Related to the Learning of Mathematics Subscales	155
C	Long Interview Protocol	165
D	Request to use Richard M. Suinn's Self-reporting Mathematics Anxiety Rating Scale	171
E	Request to use Fennema-Sherman's Self-reporting Mathematics Anxiety Rating Scale	175
F	Letters of Request and Permission to do Phase one of the Study	178
G	Letters of Request and Permission to do Phase two of the Study	182
H	Consent to Participate in Interviews form and Certification of Exemption of Projects Involving Human Subjects	185
I	Transcriptions of Long Interviews	189
J	Field Notes	223
	Dr. D. Clowes	224
	Wendell Perry	227
VITA		230

LIST OF TABLES

TABLE		PAGE
1	The pass-fail records of the African-American and non African-American students enrolled in Developmental Math II at Halifax Community College from fall quarter 1988 to spring quarter 1993.	12
2	Race and gender of students responding to the situations on Suinn's Mathematics Anxiety Rating Scale.	76
3	Means and standard deviations of the nine items on Mathematics Anxiety Rating Scale that had means above 3.000.	78
4	Means and standard deviations of the responses on items 54, 75, 76, and 85 by student gender and student race.	79
5	Analysis of variance for gender and race with mathematics anxiety.	81
6	Mean scores and standard deviations for gender and race with mathematics anxiety.	82
7	Students by gender and race who responded to the Fennema-Sherman Attitudes toward the Learning of Mathematics Scale.	85
8	Means and standard deviations of the scores on attitude towards success in mathematics by gender and race.	86
9	Means and standard deviations of the scores on the usefulness of mathematics scale by gender and race.	87

Table		Page
10	Means and standard deviations of the scores on the attitudes toward teachers scale by gender and race.	89
11	Means and standard deviations of the scores on the male domain scale by gender and race.	90
12	Means and standard deviations of the scores on the confidence in learning mathematics scale by gender and race.	91
13	Means and standard deviations of the scores on the effectance motivation scale in mathematics by gender and race.	93
14	Means, standard deviations, and minimum and maximum scores made on the six attitudes toward the learning of mathematics scales.	94
15	Analysis of variance for gender and race with attitudes toward the learning of mathematics.	96
16	Mean scores and standard deviations for gender and race with attitudes toward the Learning of mathematics.	97
17	Analysis of variance for students gender and race with attitude towards success in mathematics.	99
18	Result of Newman/Keul's multiple comparison report for the student race category with attitude towards success in mathematics.	100
19	Analysis of variance for student's gender and race with attitude towards the usefulness of mathematics.	102

Table		Page
20	Analysis of variance for student's gender and race with attitude towards how teachers feel about them as learners of mathematics.	103
21	Analysis of variance for student's gender and race with attitude towards mathematics as a male's domain.	104
22	Analysis of variance for student's gender and race with attitude towards confidence in learning mathematics.	105
23	Analysis of variance for student's gender and race with attitude towards effectance motivation.	106
24	Richard M. Suinn's Mathematics Anxiety Rating Scale percentile equivalency of the student scores.	108
25	Fennema-Sherman's attitudes toward the learning of mathematics scale percentile equivalency of the student scores.	109

An assessment of the attitudes and anxieties of the African-American students who were enrolled in Developmental Mathematics II classes at Halifax Community College.

Chapter One

Background

In recent years, according to Leder (1987), there has been a growing recognition that understanding the nature of the learning of mathematics requires exploration of affective as well as cognitive factors. Affective factors generally refer to a wide range of feelings and moods. In the context of mathematics education, these feelings and moods are often expressed with words such as anxiety, confidence, frustration, and satisfaction according to McLeod, (1988). Two affective factors, anxiety and attitudes, have been topics of high interest to many researchers. This interest has been reflected in the studies of Aiken, (1970), (1976); Tobias, (1978; Brown, (1979); Kulm, 1980; Suydam, (1984); Llabre and Suarez, (1985); Fennema and Sherman, (1986); Battista, (1986); Bassarear, (1986); Lester and Garofalo, (1987); Suinn, (1988); and Hauge, (1991).

Anxiety, in general, has been defined in various ways. According to Atkinson, Atkinson, Smith, and Hilgard (1987), it is the unpleasant emotions characterized by such terms as worry, apprehension and fear that we all experience at times in varying degrees. Morris (1985) contends that anxiety is a feeling of fear or flight, but without an identifiable source. According to Morris (1985) anxious people experience all the symptoms of fear. Some of these symptoms are butterflies in the stomach, shallow breathing, muscle tension, and the inability to think clearly and so on - but they don't know why. Skemp (1979) regards anxiety as an emotion which signals an individual's inability to change away from an anti-goal state. According to Skemp (1979), an anti-goal state is a state which we try to avoid or get away from usually because it has a negative contribution to our survival. Woolfolk and McCune-Nicolich (1984) indicated that a person who has a general tendency to become anxious is more likely to respond to many types of situations with sweaty palms and a rapid heartbeat. This individual is said to have trait anxiety. Individuals with trait anxiety generally experience anxiety more intensely than

others. On the other hand, according to Woolfolk and McCune-Nicolich (1984), an individual who experiences anxiety that occurs in a specific threatening situation when the normal reaction is to feel anxious is said to have state anxiety.

Kitchens (1979) states that anxiety is normal and, in times of sudden trouble, can sharpen a person's reactions. Anxiety that sharpens a person's reaction is called facilitating anxiety and is very helpful to the individual in the performance of a task. Gibson (1981) agrees that not all anxiety is harmful. She states that a little anxiety serves to increase the adrenalin in students and keep them interested and alert.

When anxiety is not helpful, it is called debilitating. Debilitating anxiety, to some degree, exists in any learning situation. In this case, a person is often not able to perform because of the anxiety which has interrupted his/her thoughts and affected his/her bodily state. Thus, it can be concluded from the Morris (1985) and Woolfolk and McCune-Nicolich (1984) studies that this is when trait and/or state anxiety affect learning.

Educational researchers have found that anxiety

interferes with the performance of students in school according to Dembo, (1988). Fear of embarrassment, fear of failure, and fear of social pressures, as well as unconscious fears, all contribute to anxiety in learning as described by Bohuslov, (1980). Some school subjects evoke more anxiety than others. Mathematics has been labeled as a subject that raises the anxiety level in many students. Dembo (1988) found that anxiety in mathematics classes stems from time pressures to complete work, humiliation by being called to perform in front of the class, and the high emphasis on right answers. Mathematics anxiety is not necessarily related to general anxiety; a math anxious person may not be the generally anxious type or vice versa. Morris (1981) found that mathematics anxiety is not related to general intelligence; it often affects persons who are highly successful in other areas.

As with anxiety, there is also a lack of consensus on a single definition of attitude. Woolfolk and McCune-Nicolich (1984) characterize attitudes as a relatively enduring perception, learned through positive and negative experiences and/or modeling. In addition Morris (1985) states that attitude is a fairly stable organization of beliefs, feelings, and

behavior tendencies directed toward some object. Morris (1985) states that an attitude toward something has three major components; beliefs about the object, feelings about the object, and behavioral tendencies toward the object. Leder (1987) notes that attitudes involve individuals' thoughts, feelings, and preferred behaviors. Lester and Garofalo (1987) hold the position that attitudes are traits, albeit perhaps transient ones, of the individual. For an example in the mathematical domain, Lester and Garofalo (1987) state that an individual may have developed a particular attitude toward a class of problems which affects his/her performance on a specific problem in that class. At the same time, a particular problem may give rise to an unanticipated emotion which is a situation-specific state. Frustration, as an example, may set in when a student finds that he/she has made little progress toward solving a problem after working diligently on it for a considerable amount of time. Suydam (1984) contends that an individual's attitude toward mathematics has many facets, ranging from awareness of the structural beauty of mathematics and of its usefulness to feelings about the difficulty and challenge of learning mathematics,

to an interest in a particular method of learning or teaching mathematics. She further declares that attitudes towards mathematics are probably formed and modified by many forces, including teachers' enthusiasm and methods, parents and other adults, self-concept, learning style, and experiences with mathematics in and out of the school setting.

According to Leder (1987), the continuing concern of social psychology with attitude research serves as a testimony to the complexity of the area. In spite of the difficulties in conducting research on attitudes, the last decade has been a period of substantial progress in our knowledge of attitudes, especially attitudes toward mathematics. Much of this progress has come about through the extensive use of the Fennema-Sherman scales and other similar instruments according to McLeod, (1987).

Significance of the Study

Almost all of the research on math anxiety in college students has been carried out in traditional colleges and universities in which the majority of the students are non African-Americans and tend to come

from middle and upper class backgrounds (Hauge, 1991). Matthews (1984) also stated that, in studies that have been done, the primary focus was not on African-Americans. Many of the studies that were done concerned sex related differences, and sometimes may have included race as background material. However, race differences was not the focus of such studies. Bassarear (1986) noted that although there has been considerable research in the affective domain in mathematics with elementary and secondary students, very few studies have been done with college students and with remedial populations.

According to educational researchers a variety of influences impact ones' academic achievement. However, while both cognitive and affective variables have been studied and related to academic achievement for all students in general and white students specifically, little knowledge exists that establishes the impact of attitudes and anxieties on African-American students much less on African-American community college students in developmental mathematics classes.

Therefore, this study is needed because it will add to the research literature a study on the anxieties and/or attitudes of African-American students. This

study will contribute additionally because it addresses anxieties and attitudes of African-American students enrolled in developmental math classes in community colleges. The study will have particular relevance for Halifax Community College. This study will examine these two affective variables that are not usually studied by researchers on African-American students.

Statement of the Problem

Halifax Community College is located in Halifax County, North Carolina. There are four public high schools (two county and two city) located in Halifax County. These high schools are within three separately controlled school systems. The school systems are referred to as the Halifax County School System, the Weldon City School System, and the Roanoke Rapids City School System. There are also three private high school systems in Halifax County. The Halifax County School System, the Weldon City School System and one of Halifax County's neighboring counties (Northampton County) are listed among the six lowest performing school systems in the state of North

Carolina on state wide testing (Daily Herald, June 6, 1994). For high schools, core courses included in state wide testing were Algebra I, Biology, Economics, Legal and Political systems, English I, Physical Science, and U. S. History. North Carolina school systems are graded as to the percentage of students who scored A's or B's on those core courses. Overall, 39.6 percent of the state's students had at least a B average in those courses. Among individual systems across the state, the percentage ranged from 14.5 percent in the Halifax County schools to a high of 62.6 percent in Chapel Hill/Carrboro schools (Daily Herald, June 6, 1994). The Northampton County's system percentage on the core courses was 27.9 and Weldon's system was 15.4. These three school systems, (Halifax County, Weldon City and Northampton County) are predominately African-American and located in rural poor counties.

The majority of the students enrolled at Halifax Community College come from Halifax County and Northampton County school systems. For the 1993-94 school year eighty percent of the students enrolled at Halifax Community College came from Halifax County, eighteen percent from Northampton County, and two

percent from other neighboring counties in the state and Virginia. Since Halifax Community College adheres to the "open door" policy of the North Carolina Department of Community Colleges, it has drawn many African-American students from these counties who exhibit little enthusiasm for taking mathematics beyond what they have already taken. Many of these African-American students have to take an introduction to algebra course because they fail to make the required scores that would exempt them from the developmental mathematics sequence of courses. From the fall of 1988 through the spring of 1993, six hundred eighty-six African-American students enrolled in an introductory algebra course (Developmental Mathematics II) at Halifax Community College. Forty-five percent passed, thirteen percent withdrew, and thirty-nine percent (267 students) were either classified as in progress or failed. Sixty-four percent of these two hundred sixty-seven students (170 students) never passed or finished the introductory algebra course. During the same time frame, six hundred seventy non African-American students enrolled in Developmental Mathematics II at Halifax Community College. Sixty-one percent passed,

fourteen percent withdrew, and twenty-five percent (169 students) were either classified as in progress or failed. Sixty-four percent of these one hundred sixty-nine students (108 students) never passed or finished the introductory algebra course also. A student classified as in progress had to repeat the course another quarter. Overall the passing rates for African-American and non African-American students enrolled in Developmental Mathematics II from the fall of 1988 thru spring of 1993 were forty-five percent and sixty-one percent respectively. These data seem to indicate that approximately one out of every two African-Americans passed and three out of every five non African-American students passed during this time frame. Table 1 depicts the pass-fail records of the African-Americans and non African-American students that were enrolled in Developmental Math II from the fall of 1988 to the spring of 1993.

Studies have shown that some of this lack of enthusiasm or poor performance of students taking mathematics may be attributed to the roles that parents, peers, previous high school math preparation, and teachers have played in shaping their attitudes and anxieties towards mathematics. Because students

Table 1
Enrollment in Developmental Mathematics From Fall '88 to Spring '93

HALIFAX COMMUNITY COLLEGE — MATH 91 STUDENTS

QUARTER	RACE	NO. ENROLLED	PASSED NO.	PASSED %	WITHDREW NO.	WITHDREW %	FAILED NO.	FAILED %	IN PROGRESS NO.	IN PROGRESS %	NEVER PASSED/FINISHED NO.	NEVER PASSED/FINISHED %
Fall '88												
	AA	14	5	36.00	2	14.00	1	7.00	6	43.00	7	100.00
	NAA	20	11	55.00	6	30.00	0	0.00	3	15.00	1	33.00
		34	16	47.00	8	24.00	1	3.00	9	26.00	8	89.00
Winter '88-89	AA	19	9	47.00	2	11.00	1	5.00	7	37.00	5	63.00
	NAA	11	4	36.00	3	27.00	0	0.00	4	36.00	3	75.00
		30	13	43.00	5	17.00	1	3.00	11	37.00	8	67.00
Spring '89	AA	8	1	13.00	2	25.00	1	13.00	4	50.00	4	80.00
	NAA	12	5	42.00	1	8.00	1	8.00	5	42.00	4	67.00
		20	6	30.00	3	15.00	2	10.00	9	45.00	8	73.00
Summer '89	AA	1	0	0.00	0	0.00	0	0.00	1	100.00	0	0.00
	NAA	7	5	71.00	0	0.00	0	0.00	2	29.00	2	100.00
		8	5	63.00	0	0.00	0	0.00	3	38.00	2	67.00
Fall '89	AA	14	9	64.00	0	0.00	3	21.00	2	14.00	5	100.00
	NAA	43	30	70.00	2	5.00	0	0.00	11	26.00	8	73.00
		57	39	68.00	2	4.00	3	5.00	13	23.00	13	81.00
Winter '89-90	AA	22	6	27.00	5	23.00	3	14.00	8	36.00	8	73.00
	NAA	34	23	68.00	5	15.00	2	6.00	4	12.00	5	83.00
		56	29	52.00	10	18.00	5	9.00	12	21.00	13	76
Spring '90	AA	18	7	39.00	1	6.00	5	28.00	5	28.00	10	100.00
	NAA	29	11	38.00	7	24.00	1	3.00	10	34.00	11	100.00
		47	18	38.00	8	17.00	6	13.00	15	32.00	21	100.00

Note: AA - African-American; NAA - Non African-American

HALIFAX COMMUNITY COLLEGE — MATH 91 STUDENTS

											FAILURES/IN PROGRESS	
		NO.	PASSED		WITHDREW		FAILED		IN PROGRESS		NEVER PASSED/FINISHED	
QUARTER	RACE	ENROLLED	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
Fall '90												
	AA	43	23	53.49	4	9.30	7	16.28	9	20.93	10	62.50
	NAA	54	37	68.52	6	11.11	4	7.41	7	12.96	7	63.64
	Total	97	60	61.86	10	10.31	11	11.34	16	16.49	17	62.96
Winter '90-91												
	AA	36	15	41.67	4	11.11	5	13.89	12	33.33	12	70.59
	NAA	38	20	52.63	7	18.42	3	7.89	8	21.05	6	54.55
	Total	74	35	47.30	11	14.86	8	10.81	20	27.03	18	64.29
Spring '91												
	AA	47	23	48.94	7	14.89	6	12.77	11	23.40	10	58.82
	NAA	25	14	56.00	4	16.00	2	8.00	5	20.00	4	57.14
	Total	72	37	51.39	11	15.28	8	11.11	16	22.22	14	58.33
Fall '91												
	AA	71	40	56.34	9	12.68	3	4.23	19	26.76	13	59.09
	NAA	85	63	74.12	8	9.41	5	5.88	9	10.59	7	50.00
	Total	156	103	66.03	17	10.90	8	5.13	28	17.95	20	55.56
Winter '91-92												
	AA	65	20	30.77	10	15.38	6	9.23	29	44.62	20	57.14
	NAA	40	21	52.50	4	10.00	6	15.00	9	22.50	11	73.33
	Total	105	41	39.05	14	13.33	12	11.43	38	36.19	31	62.00
Spring '92												
	AA	71	32	45.07	9	12.68	7	9.86	23	32.39	14	46.67
	NAA	47	26	55.32	12	25.53	4	8.51	5	10.64	5	55.56
	Total	118	58	49.15	21	17.80	11	9.32	28	23.73	19	48.72
Fall '92												
	AA	89	44	49.44	15	16.85	4	4.49	26	29.21	12	40.00
	NAA	92	54	58.70	9	9.78	9	9.78	20	21.74	12	41.38
	Total	181	98	54.14	24	13.26	13	7.18	46	25.41	24	40.68

HALIFAX COMMUNITY COLLEGE — MATH 91 STUDENTS

											FAILURES/IN PROGRESS	
		NO.	PASSED		WITHDREW		FAILED		IN PROGRESS		NEVER PASSED/FINISHED	
QUARTER	RACE	ENROLLED	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
Winter '92-93												
	AA	92	35	38.04	12	13.04	13	14.13	32	34.78	26	57.78
	NAA	84	54	64.29	12	14.29	4	4.76	14	16.67	11	61.11
	Total	176	89	50.57	24	13.64	17	9.66	46	26.14	37	58.73
Spring '93												
	AA	76	40	52.63	8	10.53	4	5.26	24	31.58	14	50.00
	NAA	49	29	59.18	8	16.33	3	6.12	9	18.37	11	91.67
	Total	125	69	55.20	16	12.80	7	5.60	33	26.40	25	62.50

entering open admissions institutions are frequently not well prepared in mathematics, Hauge (1991) believes that many of these students would have significant problems with math anxiety. Bohuslov (1980) also concurs with Hauge (1991) that lack of adequate mathematical background coupled with a poor attitude and math anxiety may well inhibit, if not actually terminate, the academic progress of many otherwise capable students. Therefore, the problem is to assess the attitudes toward the learning of mathematics and the mathematics anxieties of the African-American students in the Developmental Mathematics II classes at Halifax Community College and to determine if these attitudes and anxieties are significantly different from non African-American students.

Definitions of Terms

In order to have a common understanding of some of the terms used throughout the study, the following will be the working definitions.

Anxiety

The primary response to a situation appraised as threatening is anxiety. Anxiety means the unpleasant

emotion characterized by such terms as worry, apprehension, tension and fear that we all experience at times in varying degrees (Atkinson et al, 1987 and Gergen, Suls, Rosnow, and Lana, 1989). Therefore for this study, math anxiety will refer to the tension or apprehension that a student may experience performing different mathematical tasks (Suinn, 1988). This tension and apprehension will be measured by a score that an individual makes on the Mathematics Anxiety Rating Scale. For this study any student who scores above the 75th percentile on the Mathematics Anxiety Rating Scale (MARS) will be considered math anxious.

Attitudes

The sources of attitudes are cultural, familial, and personal. We tend to assume the attitudes that prevail in the culture in which we grow up. According to Chaplin (1985), some of our attitudes are also developed as adults on the basis of our own experiences. McLeod (1988) asserts that attitudes toward mathematics are affective responses that involve positive or negative feelings of moderate intensity and reasonable stability. Many investigators seem to select for their definition a measurement procedure

that is convenient for the purpose of their study according to Leder, (1987). Therefore for the purpose of this study, attitude will refer to the tendency on the part of a student in a Developmental Mathematics II class at Halifax Community College to respond positively or negatively towards an encountered event in a mathematical situation that may have an effect on his/her disposition towards mathematics. Operationally, attitudes will be defined as the traits measured by the Fennema and Sherman (1986) attitude towards the learning of mathematics scales. For this study any student who scores below the 25th percentile will be considered as an individual who has a negative attitude towards mathematics.

Developmental Mathematics II

This is an introductory algebra course (known as Mat 91) taught at Halifax Community College. This course deals with the following content: (1) the basic operations on integers and simple algebraic expressions, (2) solving linear equations and their applications, (3) products and factors of polynomials, (4) the basic operations on algebraic fractions, and (5) ratios and proportions.

Focus Group

This group will be an interactive discussion group that will consist of six to eight members and a moderator whose main purpose is to promote group interaction (Fern, 1982; and Calder, 1977).

High-Risk

The terms high-risk, marginal, educationally disadvantaged and academically unsuccessful are used interchangeably to specify students whose erratic high school records, economic plight, unimpressive standardized test scores, and race/cultural/class distinctions have succeeded in placing them at a disadvantage in contention with the vast majority of students applying for entry into college (Moore, 1970).

Long Interview

Non directive interviews with no time limits. A protocol is used at the discretion of the interviewer to guide the discussion with probing questions as needed.

Mathematical Performance

The performance of students is measured by their success or failure in their developmental mathematics

II classes at Halifax Community College.

African-American

A negro student enrolled in the Developmental Mathematics II classes at Halifax Community College.

Non African-American

A caucasian student enrolled in the Developmental Mathematics II classes at Halifax Community College.

Statement of Purpose

The purpose of this study was to examine two affective variables that usually hinder the mathematical performance of students. Specifically, the study was to assess the attitudes toward the learning of mathematics and the mathematics anxieties of the African-American students enrolled in Developmental Mathematics II classes at Halifax Community College.

Research Questions

1. What are the mathematics anxieties of the African-American and non African-American students in the Developmental Mathematics II classes at Halifax Community College as measured by Richard M. Suinn's

Mathematics Anxiety Rating Scale?

2. Is there a difference between the Mathematics Anxieties of the African-American and non African-American students as measured by the Richard M. Suinn's Mathematics Anxiety Rating Scale?

3. Are the attitudes toward the learning of mathematics of African-American and non African-American students in the Developmental Mathematics II classes at Halifax Community College as measured by sixty-six questions taken from six of the nine different Fennema-Sherman attitudes toward the learning of mathematics scales positive or negative?

4. Is there a difference between the attitudes toward the learning of mathematics of the African-American and the non African-American students as measured by the Fennema-Sherman attitude scales?

Assumptions

1. It was assumed that the responses to the self-rating scales were not influenced by the presence of an instructor, and, in fact, reflect the true attitudes and/or anxieties of the students.

2. It was assumed that the self-rating scales were unbiased towards any particular group of students.

3. It was assumed that the focus group interviews would provide more information about attitudes and anxieties than the individual interviews in a shorter time period.

4. It was assumed that math anxiety is an anxiety.

5. It was assumed that one's attitude (about self, about mathematics, and learning) will affect both the quality and quantity of cognitive effort brought to bear in an achievement setting (Bassarear, 1986).

Limitations and delimitations of the study

The following limitations and delimitations should be considered as one considers the implications of the study.

Limitations of the study

1. The study is confined to a rural community college in Halifax County in the state of North Carolina. Because of the irregular attendance patterns and high attrition rates normally associated with community college students, the number of students surveyed in the Developmental Math II classes was hampered by irregular attendance from one

survey or phase to the next. A student surveyed on the MARS may not have been surveyed on the Fennema-Sherman attitudes scales because of non-attendance and the results of one quarter surveyed may not be typical of another.

2. The data gathering instruments were not normed on African-Americans only [See Appendix A].

Delimitations of the study

1. The students selected for this study are limited to those who were enrolled in Developmental Mathematics II classes at Halifax Community College. Halifax Community College is a comprehensive community college that offers transfer, technical, and vocational curricula, as well as continuing education classes, for many adults. It is located in a predominately African-American county that is rural and poor. It adheres to the open door policy set forth by the North Carolina Community College System.

2. The instruments were comprised of self-reporting items on a Likert-type scale.

3. The long interviews were conducted only once during the duration of the study.

4. The study is descriptive with no effort to

generalize to a larger population outside of Halifax Community College.

Chapter Two

Review of the Literature

Anxiety

Anxiety, in general, has been described in various ways. Some of the many descriptions given include such statements as unpleasant emotions characterized by such terms as worry, apprehension and fear (Atkinson et al., 1987), an emotional state which signals an individual's inability to change away from an anti-goal state which has a negative contribution on his/her survival (Skemp 1979), or the feeling of fear or flight without an identifiable source (Morris, 1985). Anxious people don't know why they feel this way, or why their thought process has been interrupted and their bodily state has been affected (Morris, 1985). If anxiety is sufficiently intense, it blocks ones ability to think and concentrate (Kitchens, 1979). Anxiety is normal and in times of sudden trouble can sharpen a person's reactions. At best, one would like to use anxiety to improve performance, but, at the very least, it would be desirable to learn to control anxiety and work unimpeded by it (Kitchens, 1979).

The tendency of an individual to be anxious in

general is known as trait anxiety (Spielberger, 1972). A person may not be highly anxious in general, yet be very anxious in specific threatening circumstances. An individual who is anxious in a specific threatening circumstance is said to have state anxiety. (Spielberger, 1972).

Educational researchers have found that anxiety affects a student's performance in school also (Dembo, 1988). Anxiety becomes more intense as school work becomes more difficult and, for some, grows with each experience of an unsatisfactory grade (Kitchens, 1979). For others, fear of embarrassment, fear of failure, and fear of social pressures, as well as unconscious fears contribute to their anxiety in learning situations (Bohuslov, 1980).

Mathematics Anxiety

Mathematics has been labeled as a subject that raises the anxiety level of many students. According to Green (1990), of all the school subjects the one that has been most susceptible to the adverse effects of anxiety is mathematics. For some the subject is enjoyable and fun; for others it makes palms sweat, stomachs churn, and heads ache (Hodges, 1983). Math

anxious students will sit through a required mathematics course, recognizing the results of not learning the materials as presented yet suffering from such a fear of mathematics that they are hampered in their thinking and performance and are prevented from learning the materials. The math anxious are especially sensitive to criticism and would rather sit through a whole class without understanding than to risk ridicule by asking what they deem a dumb question (Morris, 1981). Skiba (1990) adds that we are all to familiar with the flushed and fidgety student who is frustrated daily by the tortuous rigors of a mathematics class. Levitan (1994) indicates that for students who are truly math anxious, one can usually observe the fear emanating from their souls. This fear makes them say things such as; "oh, please, anyone who is listening, please let me pass this course, I promise I won't take another math course as long as I live" (Levitan, 1994).

Betz (1978) says that 68% of students in math classes experience math anxiety. Richardson and Suinn (1972) estimated that 11% of University students show high enough levels of math anxiety to be in counseling. According to Crawford (1980), math anxiety is by no

means restricted to the typical classroom situation. Filling out tax forms, balancing a checkbook, determining interest, buying a new home, doing comparative shopping, understanding your phone bill, setting up a retirement plan, and buying insurance are just some of the day-to-day experiences that often give rise to the tensions and fears characteristics of math anxiety.

Johnson (1984), McClellan (1984), and Powell (1990), say that math anxiety is the greatest obstacle facing many African-American students. McClellan further stated that math anxiety has more harshly affected African-Americans than any other segment of our present society. Tobias (1978) and Greenwood (1984) concur and state that women along with minorities are usually identified as individuals who most suffer the pangs of math anxiety.

What then is math anxiety? Math anxiety has been defined in a variety of ways. Richardson and Suinn (1972) define math anxiety as feelings of tension and anxiety that interfere with the manipulation of numbers and the solving of mathematical problems in a wide variety of ordinary life and academic situations. Brown (1979) says it is an anxiety that is associated

with number manipulation or mathematical concepts. Suinn (1988) indicates that it refers to the tension or apprehension that a student may experience performing different mathematical tasks. Tobias (1976) says math anxiety is an "I can't" syndrome, and whenever it strikes - for some as early as the sixth grade or for still others, not until calculus or statistics - it creates the same response and symptoms; I can't do this. Hauge (1991) indicates that research has suggested that math anxiety is a variable which has a negative relationship with important measures of classroom behaviors in mathematics.

Crawford (1980) says that math anxiety can be described simply as a fear of figuring, a fear of doing anything mathematical. Trent (1985) suggests that math anxiety is a developmental-organizational disability generally accompanied by an avoidance reaction. Kogelman and Warren (1978) state that many men and women from students to corporation presidents suffer from math anxiety which is an intense emotional reaction to math based on past experience.

Summary

The research literature has described mathematics anxiety in a variety of ways. For this study, however,

Suinn's (1988) mathematics anxiety description will be used. Therefore for this study, mathematics anxiety will refer to the tension or apprehension that a student might experience while performing various mathematics tasks that are indicated by Suinn's (1988) Mathematics Anxiety Rating Scale.

Suggested Causes of Math Anxiety

Math anxiety does not have a single cause but is the result of different factors working in resonance with bad experiences (Kogelman & Warren 1978). It is not necessarily related to general anxiety either. According to Morris (1981), a math anxious person may not be the generally anxious type. She further states that it may affect people who are successful in other classes and areas. Most suffers of math anxiety, who clearly remember how their anxieties were created, reported that the situation occurred in school, with the majority being created in elementary schools (Hackworth, 1982). Hilton (1980) somewhat in agreement with Hackworth, says that the defects of elementary mathematics education such as rote calculation, memory dependence, unmotivating problems, spurious applications, authoritarianism, and tests are the main

causes of math anxiety. Betz (1978), who said that math anxiety is viewed as a psychological problem, in her research found that there was a moderately strong relationship between math anxiety and the number of years of high school preparation. This relationship, which was found to be consistent across sexes, suggested that high school math preparation strongly influences how a college student will feel about math.

Many students form the idea that in mathematics there is only one "right" answer. For the anxious, mathematics becomes a rigid, authoritarian subject consisting of rules to be memorized and obeyed, and formulas to be applied blindly. Memorization, then, replaces understanding. Memorization often leads to endless confusion. Reliance on memorized procedures erodes self-confidence, contributes to the feeling that one is a "fake" and "no good at math," and supports the belief that math can never be understood, only memorized (Morris, 1981).

Mysteries and myths, inadequate out-of-class experience, language, mathematics and mistaken meaning, and stress in the classroom are some of the contributing factors to math anxiety (Tobias, 1980). Kogelman and Warren (1978) concur with Tobias (1980)

when they state that many of the most commonly held views of math are based on myths about the subject. According to Kogelman and Warren (1978) twelve math myths that most math anxious people hold on to are: men are better in math than women; math requires logic, not intuition; you must always know how you got the answer; math is not creative; there is a best way to do a math problem; it's always important to get the answer exactly right; it's bad to count on your fingers; mathematicians do problems quickly in their heads; math requires a good memory; math is done by working intensely until the problem is solved; some people have a math mind and some don't; and there is a magic key to doing math. The principal cause of math anxiety according to Greenwood (1984) lies in teaching methodologies used to convey the basic mathematical skills to our youngsters, be they computational skills or those involving algebra or geometry. Smith (1981) agreed with Greenwood in that she says among the obvious causes of math anxiety are: instructors' insistence on the right answer; the need to perform math skills with speed; and the fact that math knowledge is cumulative. Smith's less obvious causes are in line with Tobias (1980) and Kogelman

and Warren (1978): the defeat experienced when a student cannot master the next highest level of math skill, the myth that some people are not mathematically minded, and the inability of some students to handle frustration.

Summary

There are many suggested causes of mathematics anxiety. Some of the most common causes suggested by researchers are bad classroom experiences in mathematics in elementary school, poor high school mathematics preparation, myths that people have to be mathematically minded to do mathematics, the need to perform mathematics skills with speed, poor performance on mathematics tests, instructors' insistence on the right answer, and the ability to perform the next level of mathematics skills.

Suggested Causes of Math Anxiety in African-American Students

There has been little direct research on math anxiety in African American students in open admission colleges and universities (Hauge, 1990). However, there are several causes of math anxiety that are common among African-American students (McClellan,

1984). She says, contrary to general belief, mathematics anxiety is not inherent, it is a developmental phenomenal that once allowed to develop is extremely difficult to eliminate. The following is a list of causes of math anxiety that are common to African-American as reported by McClellan (1984): low expectation and callous reactions by teachers to students' questions and responses, over emphasis on fundamental and computational procedures by teachers instead of guiding students through creative problem solving, parental expressions of their difficulties with mathematics, inadequate knowledge of the achievements of African-American historically in science and engineering, the belief that special talents are required, the belief that mathematical ability is inherit instead of developed, and the failure to be properly trained in early grades due to inept teaching methods and lack of commitments. Hauge (1991) also states that because African-American students entering open admissions universities are frequently not well prepared in mathematics, one might anticipate that many of these students would have significant problems with math anxiety. Many of these students have relatively low skill levels in

mathematics. Even though lack of comprehension is often due to poor education and preparation, many African-American students place the locus of attribution on themselves and conclude that their failure is caused by low intelligence. Powell (1990) contends that high-density living conditions and uncontrollable noise are factors that cause African-American students to fall behind in the understanding of mathematical concepts, and ultimately discontinue their efforts to succeed. Bohuslov's (1980) study which was conducted at the College of Alameda to assess the factors contributing to math anxiety and to determine methods for fostering positive attitudes toward math among women and non-traditional students revealed that math anxiety seemed to be induced more by testing than by math itself.

Summary

The suggested causes of mathematics anxiety in African-American students are similar to the causes in traditional students. The belief that special talents are required to do mathematics, people are born with mathematics abilities, the failure to be

properly trained in mathematics in the early grades, and taking mathematics tests are some common similarities.

Mathematical Preparation of African-American Students entering Community Colleges

In community colleges, more so than in universities, student populations tends to reflect the ethnic composition of its surroundings (Cohen & Brawer, 1984). Cohen and Brawer further indicated of all the postsecondary educational structures in America, the public community colleges have borne the burden of the poorly prepared students in the twentieth century. This poor preparation has generally been defined in terms of student deficiencies (Richardson, 1990).

African-American students in general are deficient, poorly prepared, in mathematics when entering open admission universities (Hauge, 1991). The same would apply to African-Americans entering community colleges. Research is available which documents African-American students' deficiencies in mathematics and science (Powell, 1990). Researchers (Matthews et al., 1984; Johnson, 1984; McClellan, 1984; Hall & Post-Krammer, 1989; Stiff & Harvey, 1988) indicate that

African-American students are underrepresented in advanced levels of mathematics in high schools.

Students in rural schools are likely to be poorly informed about various occupational roles and the educational requirements for careers that make use of advanced math (Valverde, 1984); and African-American students fail to understand how mathematics is useful in every day life and tend to think of mathematics as something done only with pencil and paper in the classroom (Matthews et al., 1984). These are two of the many reasons why African-American students fail to participate in all areas of mathematics while in high school. A sizable percentage of this population would not be in college at all were it not for the community colleges (Cohen & Brawer, 1984). The community colleges provide a chance at educational advancement for the sizable percentage of African-American students who come through their doors with deficiencies, poorly prepared, in mathematics.

Studies Relating Math Achievement With Math Anxiety

Several studies have been done that found some relationship between math achievement and math anxiety. Betz (1978) did a study at Ohio State University with

652 students. Of the 652 students, 122 students were enrolled in the most basic mathematics course offered at the university. This course was a review of high school algebra and was designed for students whose placement scores indicate least readiness for college-level math. Three hundred forty-eight of the 652 students were enrolled in an advance math course and the remaining 182 students were enrolled in introductory psychology. The study was designed to investigate factors related to the prevalence and intensity of math anxiety in college students. One of the results indicated a moderate relationship between math anxiety and math achievement test scores. This means, according to Betz, high achievement in math is related to lower reported levels of math anxiety. She concluded that her results were in agreement with other research investigating the relationship between math anxiety and math achievement. Results also indicated a moderately strong relationship between math anxiety and number of years of high school math. This relationship, consistent across sexes and subject groups, suggests that high school math preparation strongly influences how a college student feels about math. Betz also indicated that expressions of anxiety

were most common when the items concerned math tests; about half of the students in all groups reported getting really "up tight" during math test.

Betz (1978) also suggested that the moderate degree of relationship between math anxiety and test anxiety suggests that some students reporting test anxiety may be primarily math anxious individuals. She said these individuals experience their greatest difficulties with anxiety during math tests.

Clute (1984) investigated the relationship of mathematics anxiety, teaching method, and their interaction to mathematics achievement. The sample used consisted of 81 students enrolled in a survey math course; 44 were from the University of California, Riverside, and 37 from California State College, San Bernardino. The study revealed that students with high mathematics anxiety tended to score lower on mathematics achievement test than the student with low mathematics anxiety.

Research by Calvert (1981), involving 441 students enrolled in pre-calculus mathematics courses at Black Haw College, Illinois, was conducted to measure the correlation between the level of students' math anxiety and four independent variables: sex, age, math

background, and the highest grade received in a math course. The study revealed that females were more likely to have higher levels of math anxiety than males, students who had completed only a general mathematics course were more likely to have higher levels of mathematics anxiety than students who had completed more difficult courses, and students receiving a "C" in their previous math courses were likely to have higher levels of math anxiety than students who had received higher grades.

Green (1990) investigated test anxiety, mathematics anxiety, and teacher feedback among university students enrolled in remedial mathematics to explore student motivation within an instructional framework. Results indicated that test anxiety has a significant effect on remedial mathematics students' mathematics achievement, and that informative feedback and remarks improved motivation and test performance.

Levitan (1994) indicated that math anxiety and math ability do not always correlate the way many people expect, namely; poor students are math anxious and good students are not. He says some good students are frightened even though they continually receive A's. They lack confidence in their ability. Levitan further

indicated that he had encountered poor students who were incredibly confident of their ability, actually...their inability. They know that they are poor in math, they will always be poor in math, their parents and friends expect them to be poor in math, and they accept that they are poor in math. Therefore, they aren't anxious one tiny bit.

Hauge (1991) systematically studied the math anxiety among minority students in an open admissions predominately African-American university. The purpose of the study was to extend the generalizability of research previously conducted in traditional universities. In doing the study, the relation of math anxiety to the students' previous experiences in mathematics, to their attitudes toward mathematics and to their current performance on mathematics tests were examined. The subjects in the study (N = 106) were all of the students enrolled in sections of college mathematics, a freshman-level survey course designed for non-mathematics majors to meet the university's basic education requirement in mathematics. Significant relationships were found for seven of the ten attitudinal statements sampled and math anxiety scores. The students who perceived mathematics as

difficult, had previous trouble with the subject, and felt poorly prepared to take it tended to have higher math anxiety scores. The students who perceived math more positively, who looked forward to taking it, and felt they had done well in it before tended to have lower math anxiety scores.

Summary

The research literature does indicate that math anxiety and math achievement are correlated. There is evidence that high math achievement is related to low levels of math anxiety. The literature suggested that students who have completed only general mathematics or have been poorly prepared in mathematics are more likely to experience high levels of math anxiety and to perform poorly in high levels of mathematics. The poorer performance in math as a result of math anxiety is said to occur during mathematics tests.

Attitude

As with anxiety, there is also lack of consensus on a single definition of attitude. The New World Book Dictionary (1981) says an "attitude is a way of thinking, acting, or feeling; or behavior of a person toward a situation or cause". Woolfolk and

McCune-Nicolich (1984) characterize attitudes as a relatively enduring perception, learned through positive and negative experiences and or modeling. Morris (1985) states that attitudes are a fairly stable organization of beliefs, feelings, and behavior tendencies directed toward some object. Leder (1987) states that attitudes involve individuals' thoughts, feelings, and preferred behaviors. Lester and Garofola (1987) hold the position that attitudes are traits, albeit perhaps transient ones, of the individual. For example in the mathematical domain, they state that an individual may have developed a particular attitude toward a class of problems which affects his/her performance on a specific problem in that class.

According to Chaplin (1985) the sources of attitudes are cultural, familial, and personal. We tend to assume the attitude that prevail in the culture in which we grow up. Some of our attitudes are developed as adults on the basis of our own experiences.

Summary

The research literature has described attitudes in various ways. They have been described as a way of

thinking, acting, or feeling; or behavior of a person toward a situation or cause, fairly stable organization of beliefs, feelings, and behavior tendencies directed toward some object, and even as a relatively enduring perception learned through positive and negative experiences and or modeling. For this study, an attitude will refer to the tendency on the part of a student in a Developmental Mathematics II class at Halifax Community College to respond positively or negatively towards an encountered event as stipulated on the Fennema-Sherman (1986) attitudes toward the learning of mathematics scales.

Attitudes toward Mathematics

Reyes (1981) states that a variety of factors influence students as they make decisions about how much mathematics to take in high school and post secondary school. She indicates that attitudes or feelings about mathematics are important factors in students' decisions. Not only do attitudes toward mathematics influence a student's willingness to enroll in more mathematics courses, but these attitudes also influence how much effort a student will put into learning mathematics after enrolling in mathematics

classes (Reyes, 1981). Students' attitudes toward mathematics can actually make a difference in how frequently teachers interact with them (Reyes, 1981). She says that teachers seem to pay more attention to students who are sure of themselves in mathematics than they do to students who are less sure of themselves, even when both sets of students perform equally well in mathematics.

Fennema and Sherman (1986) are in agreement with Reyes; they indicate that a person's attitude toward mathematics is critical for deciding to take mathematics and for learning it. Wikoff and Buchalter (1986) indicate that a person's attitude in high school toward mathematics is not only critical for deciding to take mathematics and to learning it, it is also critical in college. They indicate that many college students are afraid to take mathematics courses and when forced to do so do not do well, even though they may earn good grades in other courses.

According to Suydam (1984), an individual's attitude toward mathematics has many facets, ranging from awareness of the structural beauty of mathematics and of its usefulness, to feelings about the difficulty and challenge of learning mathematics, and to interest

in a particular type of mathematics or particular method of learning or teaching mathematics. She further declares that generally attitudes toward mathematics tend to remain positive until the sixth grade and then to become increasingly less positive as students progress through school. According to Roberts (1969), when students come to college their attitudes have largely been crystallized, and these attitudes determine the student's receptively toward the subject. Crawford (1980) states that most math-anxious adults display an unrealistic and sometimes illogical attitude toward their failures with math problems and their subsequent lack of math capabilities. They believe that math is not for them and never will be. This belief is so strong that it prevents them from taking the first steps toward analyzing what their math difficulties really are and how to go about remedying them. Crawford (1980) further states that studies and programs in math education have shown that succeeding with math problems is more often determined by one's attitude and feelings toward the subject than by any innate aptitude for math. Crawford (1980) also contends that attitude, not aptitude, is most likely the source of math anxiety problem. According to

Bohuslov (1980) negative attitudes about math affect large numbers of people, particularly women and nontraditional students.

Summary

Attitudes toward mathematics affect the willingness of a student to enroll in advance math classes in high school and also in college. When enrolled in mathematics, it influences the effort a student puts into learning the subject and succeeding with or competing a math problem. Attitudes towards math have been suggested as the most likely source of math anxiety, and they affect large numbers of nontraditional students.

Studies relating Attitudes toward Mathematics to Mathematics Achievement.

Elderveld (1983) did a study which involved 513 developmental mathematics students from eight community colleges in Northern Illinois. Of this group, 250 were registered in traditional courses and 263 in nontraditional courses. The purpose of the study was to identify variables which could be used to discriminate between successful and unsuccessful students in developmental mathematics courses in

community colleges. The following independent variables were selected as potential discriminators: (1) instructional method, (2) cognitive style, (3) numerical skills (4) age, (5) sex, (6) self-assessment of knowledge of mathematics, (7) self-assessment of attitude toward mathematics, (8) self-assessment of mathematical ability, and (9) reason for taking developmental mathematics. The dependent variable was success or failure in the developmental mathematics course. Elderveld indicated that the results of his study could be used to form a compositive picture of the successful community college developmental mathematics student. Successful students in this study were more likely to: (1) score higher on an arithmetic skills test, (2) enroll in a course featuring traditional instruction, (3) be older, (4) assess their mathematical ability higher, and (5) assess their attitude toward mathematics more positively.

Stones et al (1980) conducted a study to assess the influence of sex, size of high school graduating class, high school mathematics background, and attitudes toward mathematics on mathematical competency in two-year college students. The study involved 338 students attending pre-calculus mathematics courses at

six different community colleges. The findings indicated that attitudes toward mathematics are significant factors in explaining differences in mathematical competency. The results further indicated that on the average the higher the attitude score, the higher the competency score exhibited.

Bleyer (1980) did a study to: (1) identify those attitudes toward mathematics that initially exist among college students in first-level required mathematics courses at selected institutions; (2) assess the relationship of those attitudes to subject variables such as age, sex, and institutional type; and (3) study the effect of those attitudes on the learning of mathematics in the selected courses. The study involved 420 freshmen: 96 were in a university, 242 in a technical institute, and 82 were in a community college. The findings indicated that: (1) the majority of those students studied held predominantly negative attitudes toward mathematics; (2) fear or dislike for mathematics is not peculiar to the students in any particular type of postsecondary institution but is, rather, an attitude commonly shared by students at various institutional types, and (3) the negative attitudes indicated may affect the learning of

mathematics only indirectly. She further indicated that the partial correlation results tend to support those who claim the learning of mathematics is more likely to be a function of ability than of attitude. Nevertheless, she adds, the indications that negative attitudes contribute to math avoidance and failure to perserve when once enrolled cannot be ignored as attitudinal factors indirectly affecting the learning process.

Bassarear (1986) in his research findings supports the findings of some previous studies that, in general, attitudes are only weakly related to performance. He suggests that it may be more productive when studying attitudes and performance not only to focus on specific attitudes but also to focus on different kinds of students (males and females, students of relatively different ability, helpless, denying, and pressured students). In these different kinds of students, according to Bassarear, certain dynamics may be operating.

Brown (1979) did a study of students enrolled in four classes in mathematics at a predominantly black, urban community college. The research was designed to identify their attitudes toward mathematics, test these

attitudes with various correlates, identify possible factors responsible for developing negative attitudes toward mathematics, and make recommendations for methods of improving attitudes toward mathematics. Some of the conclusions drawn by Brown were: (1) community college students with negative attitudes toward mathematics possess unique anxieties toward mathematics; (2) females possess more negative attitudes toward mathematics than males; (3) females with negative attitudes toward mathematics (more so than males) possess definite personality characteristics; (4) attitudes toward mathematics do not influence achievement; and (5) attitudes toward mathematics were influenced to a great extent by teacher attitudes.

Summary

Research literature tends to indicate that attitudes toward mathematics do not influence mathematics achievement directly. Several conclusions about attitudes and beliefs are possible. However, one is that students' attitudes and beliefs do not affect performance as powerfully as had once been thought, that much or most of a person's success in mathematics

is explained by the student's cognitive and metacognitive skills, and ability or other factors (Bassarear, 1986). Bassarear (1986) says that at the very least, for some students poor attitudes and beliefs cannot help but undermine their ability to learn mathematics. Bleyer, (1980) contented also that negative attitudes may affect the learning of mathematics only indirectly. Nevertheless, Bleyer adds, the indications that negative attitudes contribute to math avoidance and failure to perserve when once enrolled cannot be ignored as attitudinal factors indirectly affecting the learning process.

Similarities between Mathematics Anxiety and or Attitudes toward the Learning of Mathematics of African-American and non African-American students in Developmental Mathematics.

The Amount of research that focuses especially on race differences in mathematics in an attempt to explain and lessen these differences is small (Reyes & Stanic, 1985). Most of this research has either focused on white students or has not examined carefully the possibility of different patterns of mathematics achievement among African-American and non African-American students (Reyes and Stanic, 1985). Almost all of the research done especially on

mathematics anxiety in college students has been carried out in traditional colleges and universities in which the majority of the students were white and came from middle and upper middle class backgrounds (Hauge, 1991).

Research is available that documents African-American students' deficiencies in mathematics and science (Powell, 1990). It is documented through research that African-American students take fewer courses in mathematics and science than non African-American students, have lower mathematics achievement records than non African-American students, and African-American students have mathematics anxieties and attitudes that are similar to non African-American students. Kogelman et al., (1981) reported on their findings of five mathematics anxiety workshops that were held at Bronx Community College. Bronx Community College is located in Bronx overlooking the Harlem River. During the time of the workshops, Bronx Community College was surrounded by urban blight - burned out buildings, broken glass, abandoned cars. The population of Bronx Community College was over eighty-five percent African-American and Hispanic during the time of the workshops. Most of the students

had severe academic deficiencies and were required to take remedial courses. The planners of the workshops assumed that mathematics anxiety workshops that focused on changing attitudes can be successful in enabling people to overcome their fears of mathematics. The workshops were modeled after the workshop in Kogelman and Warren's book, Mind Over Math. Although the mind over math approach was originally used primarily for groups of white, middle-class people, it was assumed by the workshop planners that this approach could be applied to the large minority population at Bronx Community College. It was concluded, in spite of some possible mistakes on the part of the planners, that it is possible to run highly structured mathematics anxiety workshops with minority students. It was also noted that the workshops brought out essentially the same issues and dynamics as they did with traditional student groups (Kogelman et al., 1981). Hauge (1991) did a study to find out whether the research findings on mathematics anxiety that have been reported in the literature were generalizable to nontraditional settings. Hauge concluded that, within the limitations of the study that was done at a university with a predominately minority enrollment, the patterns of

relationship that were uncovered relating to mathematics anxiety were similar in some respects to earlier reports from more traditional universities.

Summary

African-American students in developmental mathematics have experienced and hold many of the same kinds of myths that caused a fear of mathematics and math avoidance in traditional students. The frequently described symptoms of math anxiety were: an inability to focus on written materials, headaches, backaches, queasy stomachs, sweaty palms and diarrhea. The pressures of timed tests, speed drills, and flash cards contributed to a long term sense of inadequacy, but far more damaging were their experiences of having been punished or humiliated at the blackboards. Many students believed that the ability to do mathematics was God given rather than a skill learned or developed (Kogelman et al., 1981).

Summary

This chapter notes the difficulties confronting researchers in getting consensus on definitions of anxiety and attitudes, especially when it comes to

investigating the relationship between these affective variables and mathematics achievement. Bassarear (1986) stated that these difficulties include the lack of a model of affect, the large number of variables hypothesized to affect achievement, and difficulties both in defining and measuring students attitudes toward mathematics. Leder (1987) indicated also that because of this lack of consensus different conceptualizations of attitude lead to differences in operational definitions and many investigators select for their definition a measurement procedure that is convenient for the purpose of their study. However, in the literature, there tends to be a consensus that attitudes toward the learning of mathematics causes math anxiety. Hauge (1991) indicates that students with positive attitudes toward mathematics have lower math anxieties. Attitudes towards mathematics affect students' willingness to enroll in math classes in in college, and once enrolled, it determines the effort put forth in learning the subject. The literature also indicates that there is a strong relationship between math anxiety and the number of years of high school math taken by a student. This relationship suggests that high school math preparation strongly influences

how a college student feels about math (Betz, 1978). Betz indicated that the degree of relationship between math anxiety and test anxiety suggests that students reporting test anxiety may be primarily math anxious and are experiencing their greatest difficulties with anxiety during test.

Research indicates that African-American students take fewer math courses than non African-American students. Even though African-American students take fewer courses while in high school than non African-American students, they have some of the same anxieties and attitudes that non African-American students have - a fear of mathematics, a belief that you have to be gifted to do math, pray for the ability to pass a math exam, and dread to take an advance course in mathematics.

Chapter 3

Methodology

This chapter presents the research methods employed in this study. The design of the study, population, instrumentation, data collection, and methods of analysis are discussed. The purpose of this study was to assess the attitudes toward the learning of mathematics and the mathematics anxiety of the African-American students that were enrolled in Developmental Mathematics II classes at Halifax Community College. The following research questions were addressed:

1. What are the mathematics anxieties of the African-American and non African-American students in the Developmental Mathematics II classes at Halifax Community College as measured by Richard M. Suinn's Mathematics Anxiety Rating Scale?

2. Is there a difference between the mathematics anxieties of the African-American and non African-American students as measured by the Richard M. Suinn's Mathematics Anxiety Rating Scale?

3. Are the attitudes toward the learning of mathematics of African-American and non

African-American students in the Developmental Mathematics II classes at Halifax Community College as measured by sixty-six questions taken from six of the nine different Fennema-Sherman's attitudes toward the learning of Mathematics Scales positive or negative?

4. Is there a difference between the attitudes toward the learning of mathematics of the African-American and the non African-American students as measured by the Fennema-Sherman's attitude toward the learning of mathematics scales?

Design of the Study

This study, which was confined to the students enrolled in both day and evening Developmental Mathematics II classes at Halifax Community College, was done in two phases. In phase one, the students in the Developmental Mathematics II classes were given two survey questionnaires during the winter quarter of 1992. The first one was Richard M. Suinn's Mathematics Anxiety Rating Scale. This scale consisted of ninety-eight items in a Likert format. [see Appendix B]

The second questionnaire was a shorter version of Fennema-Sherman attitudes toward the learning of mathematics scales. [see Appendix B]. The students

were given the following six of the nine Fennema-Shermnan attitudes toward the learning of mathematics subscales; (1) attitudes toward success in mathematics, (2) the teacher's scale, (3) mathematics as a male domain, (4) effectance motivation in mathematics, (5) usefulness of mathematics, and (6) confidence in learning mathematics. Each of these six subscales contained twelve items in which six were positively stated and the remaining six were negatively stated. Two items (one positive and one negative) that I deemed not applicable to adult college students were omitted from each of the following subscales; attitudes toward success in mathematics, usefulness of mathematics, and the teacher's scale. The students had a total of sixty-six items of a Likert format to respond to: thirty-three were positively stated and thirty-three negatively stated with five response alternatives. The three Fennema-Sherman subscales that were not used were the mathematics anxiety scale, and the father and mother scales. The mathematics anxiety scale was not used because this study used Suinn's Mathematics Anxiety Rating Scale. The mother and father scales were not used because the Fennema-Sherman scales were designed for use with

secondary students and I deemed these questions were really not applicable for adult college students.

The scale dimensions of anxiousness on Richard M. Suinn's Mathematics Anxiety Rating Scale were "not at all", "a little", "a fair amount", "much", and "very much". The following values were assigned for the analysis of the data: not at all = 1, a little = 2, a fair amount = 3, much = 4, and very much = 5. The response alternatives on the Fennema-Sherman attitude scales were strongly agree, agree, undecided, disagree, and strongly disagree. The following values were assigned to the responses on the positively stated items; strongly agree = 5, agree = 4, undecided = 3, disagree = 2, and strongly disagree = 1. The values were reversed for the negatively stated items; strongly agree = 1, agree = 2, undecided = 3, disagree = 4, and strongly disagree = 5. These values as indicated were used on all of the scales except the male domain scale. The values of strongly agree = 5, agree = 4, undecided = 3, disagree = 2, and strongly disagree = 1 were used for each of the twelve items in the male domain scale.

In phase two, two focus group interview sessions were planned with eleven African-American students (6 in the morning session and 5 in the afternoon session)

who had participated in phase one, however two long interviews were held instead. On the day of the scheduled focus group interviews only five of the eleven students who volunteered to participate actually came. Three female students came for the morning session. Two students came for the afternoon session (one male and one female). The long interviews were moderated by Dr. D. Clowes of Virginia Tech on the campus of Halifax Community College. A protocol was used. [See Appendix C]. It was used only to keep the students focused during the interviews. The three females were interviewed together in the morning session and the other two students were interviewed together in the afternoon session. Both of the long interviews were recorded and transcribed. Field notes were also written after each session.

Population

The population of interest for this study was the Developmental Mathematics II students at Halifax Community College. The sample for this study in phase one was the day and evening students who were enrolled in Developmental Mathematics II during the winter quarter of 1992. In phase two of this study, data were

obtained by interviewing five of the African-American students who responded to one or both of the surveys in phase one. These five African-American students were selected because they were either above the 75th percentile on the MARS or below the 25th percentile on the Fennema-Sherman attitude scales.

Instrumentation

Instrument One

The Mathematics Anxiety Rating Scale (MARS), copyrighted by Richard M. Suinn (1988), is a 98-item Likert type scale composed of brief descriptions of situations that may arouse different levels of anxiety in adult clients. A very wide variety of situations are included to permit its application to diverse groups of clients, including both students and non-students. The scores on the MARS could range from 98 (not at all anxious) to 490 (very much anxious). One hundred of these MARS instruments were purchased from the Rocky Mountain Behavioral Science Institute, Inc. located in Fort Collins, Colorado for sixty dollars ($60/per one hundred). [See Appendix D].

Normative Data

The Mathematics Anxiety Rating Scale was normed on

a sample of 397 students at the University of Missouri. (Richardson & Suinn, 1972). The mean score was 215.38 with a standard deviation of 65.29. Percentile ranks for raw scores are as follows:

Percentile	Score
95	325
80	267
75	225
60	228
50	215
40	189
20	165
5	123

Reliability Data

A test - reliability coefficient for the MARS was calculated from the scores of two complete classes (n = 35) of students from the original large Missouri sample who were retested seven weeks later. The mean MARS score on the first testing was 235.08 (SD = 51.26); the mean score was 232.97 (SD = 56.46) on the second testing. The Pearson product-moment coefficient between these two sets of scores was .85.

An internal consistency reliability coefficient (Cronback Alpha) was .97. This indicates that the average intercorrelation of the items in MARS is high, that the MARS is highly reliable, and that MARS items are heavily dominated by a single homogenous factor, presumably mathematics anxiety (Richardson and Suinn, 1972).

Instrument Two

This instrument contained items selected from six of the nine, domain specific, Likert-type scales that were developed by Elizabeth Fennema and Julia Sherman (1975, reprinted 1986). The scales were designed to measure attitudes related to the learning of mathematics by both females and males. The Fennema-Sherman scales were purchased from the University of Wisconsin - Madison at a cost of $11.25 per copy. [See Appendix E].

The six subscales used are described as follows with the split-half reliabilities indicated in parentheses.

Attitude toward success in Mathematics (.87)

This scale was designed to measure the degree to which students anticipated positive or negative

consequences as a result of success in mathematics. They evidence this fear by anticipating negative consequences of success as well as by a lack of acceptance of responsibility for success.

The Teacher's Scale (.88)

This scale was designed to measure students' perceptions of their teacher's attitudes toward them as learners of mathematics. It included perceptions of the teacher's interest, encouragement and confidence in the student's ability.

Usefulness of Mathematics (.88)

This scale was designed to measure students' beliefs about the usefulness of mathematics currently and in relationship to their future education, vocation or other activities.

Mathematics as a male domain (.87)

This scale was designed to measure the degree to which students see mathematics as a male, neutral, or female domain in the following ways: (1) the relative ability of the sexes to perform in mathematics, (2) the masculinity/femininity of those who achieve well in mathematics, and (3) the appropriateness of this line

of study for the two sexes.

Confidence in learning mathematics scale (.93)

This scale was designed to measure confidence in one's ability to learn and to perform well on mathematical tasks. The dimensions range from distinct lack of confidence to definite confidence. This scale is not intended to measure anxiety and/or mental confusion, interest, enjoyment or zest in problem solving.

The effectance motivation scale (.87)

This scale was designed to measure effectance as applied to mathematics. This dimension ranges from lack of involvement in mathematics to active enjoyment and challenge seeking. The scale is not intended to measure interest or enjoyment of mathematics.

Since the Fennema-Sherman scales were designed for use with secondary students, two items (one positive and one negative) I deemed not applicable to college students were omitted in each of the following scales: attitude toward success in mathematics, usefulness of mathematics, and the teacher's scale. This gave the students a total of sixty-six items to which to

respond. The scores on these sixty-six questions could range from 66 (negative attitude) to 330 (positive attitude). The following three subscales were eliminated: the mother and father scales seemed inappropriate for these adult students, and the mathematics anxiety scale was eliminated because the study used Richard M. Suinn's Mathematics Anxiety Rating Scale.

There are no norms for these scales. The total scores on these scales are only meaningful when compared to scores of other people or to scores of the same person obtained at different times. (Reyes, 1981).

Protocol

A protocol was used by the moderator, Dr. D. Clowes, of the long interviews to keep the students as they discussed their experiences with mathematics at various times in their life focused on the purposes of the interview. The protocol contained probing questions that were related to the research questions.

Data Collection

Data were collected in two phases. In phase one,

permission was granted by the President, Dr. Elton L. Newbern, Jr., and the Board of Trustees of Halifax Community College to gather data from students enrolled in Developmental Mathematics II classes. [See Appendix F]. Students who were enrolled in both day and evening classes of Developmental Mathematics II were given two survey questionnaires. The first questionnaire was given near the end of a class period and before the drop/add period ended for the quarter. One hundred forty students were present and responded on this questionnaire. The second questionnaire was given five days after the first questionnaire. One hundred thirty-seven students were present and responded on this questionnaire. One hundred eleven students responded to both questionnaires. Each questionnaire was administered by the instructors of the Developmental Mathematics II classes.

In phase two, permission was granted by President, Dr. Elton L. Newbern, Jr., and the Board of Trustees of Halifax Community College to interview some students who participated in phase one of the study. The interview was also approved by Dr. Ernest R. Stout, Chairman of the Institutional Review Board, and by the Human Subjects Committee at Virginia Polytechnic

Institute and State University. [See Appendix G].

A letter was sent to twenty-six African-American students who were either currently or previously enrolled at Halifax Community College, had participated in phase one of the study, and had scored either above the 75th percentile on the Mathematics Anxiety Rating Scale or below the 25th percentile on the Attitudes toward the Learning of Mathematics asking them to volunteer to participate in one of two focus group interviews. [See Appendix H]. The letter was followed by a telephone conversation with each student that had a listed telephone on file with the registrar at Halifax Community College. Eleven of these twenty-six individuals volunteered to participate. On the date of the planned focus group interviews, only five of the eleven who volunteered actually came to the focus group interviews. These five consisted of four females and a male who were all currently enrolled. The focus groups planned turned into two long interviews. Three of the females participated in the 10:00 a.m. session, and the other two (one female and one male) participated in the 1:00 p.m. session. The interview sessions were taped.

Methods of Analysis

This section describes the methods used to treat the data. The analysis of the quantitative data include (a) a basic measure of central tendency, (b) a measure of variability, (c) analysis of variance, and (d) percentile rank. On the qualitative data, Morgan's (1988) ethnographic approach to presenting the views of students gotten through interviews was used. The data were analyzed using Number Cruncher Statistical System (NCSS) (Hintz, 1991) set at .05 level of significance.

Phase One

The specific procedures used for each of the four research questions in phase one of the study follows:

Research question one. The numerical values assigned to item responses were not at all = 1, a little = 2, a fair amount = 3, much = 4, and very much = 5. The scores on the ninety eight items on the MARS were summed to determine a total score for an individual student. A total score could range from 98 to 490. A high score indicated a high level of mathematics anxiety. The NCSS was used to determine the mean and standard deviations for each student's

responses on the MARS. The presentation of data includes the items with means greater than 3.000.

Research question two. Data were analyzed with analysis of variance (ANOVA) to test (a) the main effect of student gender, (b) the main effect of student race, (c) and to determine the possibility of an interaction between student gender and student race in respect to math anxieties. In this analysis mathematics anxiety was used as the dependent variable, and student gender and student race were independent variables.

Research question three. The response alternatives for each item are strongly agree, agree, undecided, disagree, strongly disagree. The following values were assigned to the responses on the positively stated items; strong agree = 5, agree = 4, undecided = 3, disagree = 2, and strongly disagree = 1. The values were reversed for the negatively stated items; strongly agree = 1, agree = 2, undecided = 3, disagree = 4, and strongly disagree = 5. This scheme of scoring was used on all the scales except the male domain scale. The values for the response items on the male domain were strongly agree = 5, agree = 4, undecided = 3, disagree = 2, and strongly disagree = 1. These values were used

for both positively and negatively items. The scores on the sixty-six items were summed to determine a total score for each individual. A total score on the sixty-six items could range from 66 to 330. A high score indicated a positive attitude towards mathematics. The NCSS was used to determine the mean and standard deviation for each student's responses on each of the six scales.

Research question four. Data were analyzed with ANOVA to test (a) the main effect of student gender, (b) the main effect of student race, (c) and to determine the possibility of an interaction between student gender and student race in respect to attitudes toward the learning of mathematics. In this analysis attitudes toward the learning of mathematics was used as the dependent variable, and student gender and student race were independent variables.

Phase Two

The specific procedures used in phase two of this study follows: The two planned focus group sessions were not viable, only three out of the six students who volunteered for the morning focus group session came and two out of the five students who volunteered

for the afternoon session came, hence two long interview sessions were held. The three students who came for the morning session were all females. The two students who came for the afternoon session were a female and a male. Therefore at this point a decision was made to use these students in long interviews. Dr. Clowes of Virginia Tech was used as moderator. A tape recorder was used to record the comments of the students. Each tape was transcribed. [See Appendix I]. Morgan's (1988) ethnographic approach was used in the presentation of the students comments during the long interviews. This approach consists of balance between direct quotations of the students and a summarization of their discussions. A protocol was used by Dr. Clowes to begin the discussions and to keep the discussions focused. Field notes were written after each long interview session by Dr. Clowes and me (the researcher), and the notes were compared. [See Appendix J].

Chapter 4

Findings

This chapter includes an analysis of the research data that were gathered in Phase I and Phase II of this study. The data analysis of Phase I is presented through answering the four research questions, and for Phase II, the summarization of the findings of the long interviews held will be given.

Research Question One: What are the mathematics anxieties of the African-American and non African-American students in the Developmental Mathematics II classes at Halifax Community College as measured by Richard M. Suinn's Mathematics Anxiety Rating Scale?

There are 98 items on Richard Suinn's Mathematics Anxiety Rating Scale. Each of these items depicts a mathematical situation that might cause an adult client to be anxious. A student decided on his/her degree of anxiousness by using the following dimensions: not at all, a little, a fair amount, much or very much. The following values were assigned to the dimensions: not at all = 1, a little = 2, a fair amount = 3, much = 4 and very much = 5. One hundred forty students in the Developmental Mathematics II classes at Halifax

Community College responded to the situations on the Mathematics Anxiety Rating Scale. Table 2 depicts the distribution of students in this study by gender and race.

There were nine items on the Mathematics Anxiety Rating Scale for which these students had mean responses greater than 3.000. A response score of 3.000 or greater indicates a fair amount of anxiety was involved. These nine items are as follows:

#15	Doing a word problem in algebra.
#51	Reading a formula in chemistry.
#54	Taking an examination (final) in a math course.
#61	Having a friend try to teach you how to do a math problem and finding that you cannot understand what is being said.
#75	Thinking about an upcoming math test one hour before.
#76	Thinking about an upcoming math test five minutes before.
#78	Waiting to get a math test returned on which you expected to do well.
#84	Not knowing the formula needed to solve a particular problem.
#85	Receiving your final math grade on your report card.

The above items indicated the greatest concern for this

Table 2

Race and gender of students responding to the situations on Suinn's Mathematics Anxiety Rating Scale.

	AA	NAA	TOTALS
Female	63	52	115
Male	15	10	25
Total	78	62	140

Note.

AA - African-American

NAA - Non African-American

population. Table 3 gives the means and standard deviations for the nine items on the MARS. Four of these nine items had means greater than 3.300. Table 4 gives the means and standard deviations of the responses to these four items by gender and race.

The mean score for the sample (N = 140) was 226.9286 with a standard deviation of 66.45793. (Normative Data: As a comparison, the mean score for Missouri sample N = 397, was 215.39 with a standard deviation of 65.29). An internal consistency reliability coefficient, Cronback Alpha, for this study's data was found to be .9708 (N = 140). To compare an internal consistency reliability coefficient, coefficient alpha, of .97 (N = 397) was found on the Missouri sample. The lowest score on the MARS for the students in this study was 102 and the highest score recorded was 432, giving a range of 330 points.

Research question two: Is there a difference between the mathematics anxieties of the African-American and non African-American students as measured by the Richard M. Suinn's Mathematics Anxiety Rating Scale?

In a two-way ANOVA, mathematics anxieties was used

Table 3

Means and Standard Deviations of the Nine items on Mars that had Means above 3.0000.

Item	Means	Standard Deviation
15	3.05	1.50455
51	3.035714	1.659552
54	3.35	1.463833
61	3.014286	1.341028
75	3.314286	1.527144
76	3.428572	1.636556
78	3.014286	1.434356
84	3.235714	1.472094
85	3.314286	1.39931

Table 4

Means and Standard Deviations of the responses on items 54, 75, 76 and 85 by student gender and student race.

		AA		NAA	
Item	Gender	M	SD	M	SD
54	1	3.143	.1805	3.808	.1986
	2	2.8	.3699	3.1	.4530
75	1	3.127	.1925	3.538	.2119
	2	3.533	.3946	3.000	.4833
76	1	3.1904	.2056	3.6737	.2264
	2	3.8	.4215	3.1	.5624
85	1	3.206	.1746	3.577	.19215
	2	3.4	.3578	2.5	.4382

Note.

1 - Female

2 - Male

AA - African-American

NAA - Non African-American

as the dependent variable and student gender and student race were independent variables. The purpose of this analysis was (a) to test the main effect of student gender (i.e. are mathematics anxieties different across student gender categories?), (b) to test the main effect of student race (i.e. are mathematics anxieties different across racial categories?), and (c) to determine the possibility of an interaction between student gender and student race in respect to math anxieties. The result of this statistical analysis is shown in Table 5 and the respective means and standard deviations are in Table 6. This statistical analysis was performed at the .05 level of significance.

The analysis of variance resulted in a nonsignificant effect of student gender, F (1,139) = 0.84, p 0.3611; a nonsignificant effect of student race $F(1,139) = 0.53$, p 0.4683; and no interaction between student gender and student race on mathematics anxieties, $F(1,139) = 0.13$, p 0.7143. The means on mathematics anxieties did not differ across student gender or racial categories and the interaction between student gender and racial categories was nonsignificant.

Table 5

Analysis of Variance for gender and race with mathematics anxiety.

Source	df	SS	MS	F	P
Gender	1	3755.445	3755.445	0.84	0.3611 *
Race	1	2365.639	2365.639	0.53	0.4683 *
Interaction	1	601.779	601.779	0.13	0.7143 *
Error	136	608312.9	4472.889		
Total	139	613915.3			

* Not significant at the .05 level.

Table 6

Mean Scores and Standard Deviations for gender and race with mathematics anxiety.

	M	SD	n
Gender			
1	229.1391	6.2366	115
2	216.76	13.3759	25
Race			
AA	230	7.5726	78
NAA	223.0645	8.4937	62
Gender/Race			
1 / AA	231.5873	8.42604	63
1 / NAA	226.1731	9.2745	52
2 / AA	223.3333	17.26825	15
2 / NAA	206.9	21.1492	10

Note.

1 - Female

2 - Male

AA - African-American

NAA - Non African-American

Research question three: Are the attitudes toward the learning of mathematics of African-American and non African-American students in the Developmental Mathematics II classes at Halifax Community College as measured by sixty-six questions taken from six of the nine different Fennema-Sherman's Attitudes Toward the Learning of Mathematics Scales positive or negative?

The following six subscales were used in this research. Attitude toward success in mathematics (10 statements, 5 positive and 5 negative); usefulness of mathematics (10 statements, 5 positive and 5 negative); mathematics as a male domain (12 statements, 6 positive and 6 negative); confidence in learning mathematics (12 statements, 6 positive and 6 negative); effectance motivation in mathematics (12 statements, 6 positive and 6 negative); teacher's scale (10 statements, 5 positive and 5 negative). The response alternatives for each item were strongly agree, agree, undecided, disagree, and strongly disagree. The following values were assigned to the responses on the positively stated items; strongly agree = 5, agree = 4, undecided = 3, disagree = 2, and strongly disagree = 1. The values were reversed for the negatively stated items with strongly agree = 1 to strongly disagree = 5. For the

mathematics as a male domain scale the values ranged from strongly agree = 5 to strongly disagree = 1 for all twelve items. Table 7 gives the breakdown of the students responding to Fennema-Sherman's scales by race and gender.

The score for each scale is obtained by adding the scores of the individual items. The attitude towards success in mathematics scale has a range of possible scores from a low score of 10 to a high score of 50 with 30 as the midpoint. Table 8 shows the means and standard deviations of the students by gender and race on the attitude toward success in mathematics scale. All the means are above the midpoint which would tend to indicate a positive attitude towards having success in mathematics.

The usefulness of mathematics scale has a range of possible scores from a low score of 10 to a high score of 50 with 30 as the midpoint. Table 9 shows the means and standard deviations of the students by gender and race on the scale. All the means are above the midpoint. This would indicate that the students had a positive attitude about the usefulness of mathematics currently and in its relationship to their future education or vocation.

Table 7

Students by gender and race who responded to the Fennema-Sherman Attitudes toward the learning of mathematics scale.

	AA	NAA	TOTALS
Female	57	54	111
Male	14	12	26
Totals	71	66	137

Note.

AA - African American

NAA - Non African-American

Table 8

Means and standard deviations of the scores on Attitude towards success in mathematics by gender and race.

	AA	NAA
Female		
M	42.3333	44.05556
SD	.6671988	.68548156
Male		
M	39.35714	43
SD	1.346259	1.454126

Note.

AA - African-American

NAA - Non African-American

Table 9

Means and standard deviations of the scores on the usefulness of mathematics scale by gender and race.

		AA	NAA
Female			
	M	40.29824	40.7222
	SD	.8715969	.8954808
Male			
	M	39.85714	41.66667
	SD	1.758689	1.899602

Note.

AA - African-American

NAA - Non African-American

The teacher's scale has a range of possible scores from a low of 10 to a high score of 50 with a midpoint of 30. Table 10 shows the means and standard deviations of the students by gender and race on the teacher's scale. The means are above the midpoint which would indicate that the students perceptions of how their teachers felt about them as learners of mathematics were positive.

The male domain scale has a range of possible scores from a low of 12 to a high score of 60 with a midpoint of 36. Table 11 shows the means and standard deviations of the scores on the male domain scale. The African-American students had means above the midpoint and the non African-Americans had means below the midpoint. It seems that the African-American students do not stereotype mathematics as a male's domain as much as the non African-American students.

The confidence in learning mathematics scales has a range of possible scores from a low of 12 to a high score of 60 with a midpoint of 36. Table 12 shows the means and standard deviations of the scores on the confidence in learning mathematics scale. The means are above the midpoint which would indicate that the students had confidence in their abilities to learn and

Table 10

Means and standard deviations of the scores on the attitudes toward teachers scale by gender and race.

	AA	NAA
Female		
M	38.01754	36.94444
SD	.8767798	.9008056
Male		
N	34.21329	35.16667
SD	1.769147	1.910897

Note.

AA - African-American

NAA - Non African-American

Table 11

Means and standard deviations of the scores on the male domain scale by gender and race.

		AA	NAA
Female			
	M	38.42105	35.51852
	SD	.7236108	.7434395
Male			
	M	36.35714	35.41667
	SD	1.460086	1.577073

Note.

AA - African-American

NAA - Non African-American

Table 12

Means and standard deviations of the scores on the confidence in learning mathematics scale by gender and race.

	AA	NAA
Female		
M	42.21053	37.37037
SD	1.291709	1.327104
Male		
M	40	40.91667
SD	2.606381	2.815214

Note.

AA - African-American

NAA - Non African-American

to perform well on mathematical tasks.

The effectance motivation scale in mathematics has a range of possible scores from a low of 12 to a high of 60 with a midpoint of 36. Table 13 shows the means and standard deviations of the scores on the effectance motivation scale in mathematics. All the means are above the midpoint except the mean of the non African-American male students. It seems that the non African-American male students did not indicate the willingness to explore and experiment with various mathematical situations. The exploration and experimentation that effectance motivation is referring to is similar to problem solving attitudes.

Table 14 gives the means, standard deviations and minimum and maximum scores made on the six attitude scales by all students who responded.

Research Question four: Is there a difference between the attitudes toward the learning of mathematics of the African-American and the non African-American students as measured by the Fennema-Sherman attitude scales?

In a two-way ANOVA, attitudes toward the learning of mathematics were used as the dependent variables and student gender and student race were independent

Table 13

Means and standard deviations of the scores on the Effectance motivation scale in mathematics by gender and race.

	AA	NAA
Female		
M	40.92983	37.74074
SD	1.23216	1.265924
Male		
M	36.28571	35.66667
SD	2.486226	2.685431

Note.

AA - African-American

NAA - Non African-American

Table 14

Means, standard deviations, and minimum and maximum scores made on the six attitudes toward the learning of mathematics scales.

Attitude Scales	M	SD	MIN	MAX
1	42.86642	5.182414	28	50
2	40.62774	6.543977	22	50
3	36.0562	6.661863	16	50
4	36.80292	5.579426	22	60
5	39.96351	9.893111	14	60
6	38.73723	9.406874	12	60

Note.

1 - Attitude towards success in mathematics

2 - Usefulness of mathematics

3 - Attitudes toward teachers scale

4 - Mathematics as a male domain

5 - Confidence in learning mathematics

6 - Effectance motivation scale in mathematics

variables. The purpose of this was (a) to test the main effect of student gender (i.e. Are attitudes toward the learning of mathematics different across student gender categories?), (b) to test the main effect of student race (i.e. Are attitudes toward the learning of mathematics different across racial categories?), and to determine the possibility of an interaction between student gender and student race in respect to attitudes toward the learning of mathematics. The result of this statistical analysis is shown in table 15 and the respective means and standard deviations are in table 16. This statistical analysis was performed at the .05 level of significance.

The analysis of variance resulted in a nonsignificant effect of student gender, F (1,136) = 1.62, p 0.2059; a nonsignificant effect of student race, F (1,136) = 0.06, p 0.8033; and no interaction between student gender and student race on attitude toward the learning of mathematics, F (1,136) = 1.81, p 0.1806. Overall, the means on attitudes toward the learning of mathematics did not differ across student gender or racial categories and the interaction between student gender and racial

Table 15

Analysis of variance for gender and race with attitudes toward the learning of mathematics.

Source	df	SS	MS	F	P
Gender	1	1287.79	1287.79	1.62	0.2059 *
Race	1	49.65618	49.65618	0.06	0.8033 *
Interaction	1	1444.408	1444.408	1.81	0.1806 *
Error	133	106026.7	797.1929		
Total	136	110434.4			

* Not significant at the .05 level.

Table 16

Mean scores and Standard Deviations for gender and race with attitudes toward the learning of mathematics.

	M	SD	n
Gender			
1	237.4234	2.677991	111
2	229.1923	5.537262	26
Race			
AA	239.0282	3.350831	71
NAA	232.4545	3.47544	66
Gender/Race			
1/AA	242.2105	3.739765	57
1/NAA	232.3704	3.842243	54
2/AA	226.0714	7.546016	14
2/NAA	232.8333	8.150629	12

Note.

1 - Female

2 - Male

AA - African-American

NAA - Non African-American

categories was nonsignificant.

Each of the Fennema-Sherman subscales that was used was also analyzed by a two-way ANOVA holding each subscale as the dependent variable and student gender and student race as independent variables. All of these statistical analyses were performed at .05 level of significance. The statistical analysis on the attitude toward success in mathematics resulted in a significant effect of the student race category. The result of this statistical analysis is shown in table 17. A Newman/Keul's post hoc multiple comparison test indicated that the means of the African-American and non African-American students were far enough apart to make a significant difference. The Newman/Keul's test reveal that there is a significant difference between the attitudes of the African-American and non African-American students toward success in mathematics. The non African-American had the most positive attitude. Table 18 shows the Newman/Keul's range test at Alpha = .05.

The statistical analyses on the following subscales, usefulness of mathematics, teachers' scale, mathematics as a male's domain, confidence in learning mathematics, and effectance motivation, resulted in

Table 17

Analysis of variance for student's gender and race with attitude towards success in mathematics.

Source	df	SS	MS	F	P
Gender	1	85.182	85.182	3.36	0.0692 *
Race	1	150.84	150.84	5.94	0.0161 **
Interaction	1	19.33	19.33	0.76	0.3843 *
Error	133	3374.31	25.37		
Total	136	3639.52			

* Not significant at the .05 level

** Significant at the .05 level

Table 18

Result of Newman/Keul's multiple comparison report for the student race category with attitude towards success in mathematics.

Newman/Keul's Range Test (Alpha = .05)	
African-American	Non African-American
41.74648	43.86364

non-significant differences in all categories. The results are listed in the tables as follows: table 19 - usefulness of mathematics, table 20 - teacher's scale, table 21 - mathematics as a male's domain, table 22 - confidence in learning mathematics, and table 23 - Effectance motivation.

Analysis of Interviews

The purpose of the long interviews was to engage the student participants in a group conversation about their mathematical experiences, especially in Developmental Mathematics II at Halifax Community College. In the analysis of the long interviews, comments by students were probed for some indication of extreme anxiousness and attitudes towards mathematics.

Five African-American students volunteered to participate in one of two sessions. (Sessions were held on November 12, 1993 at 10:00 a.m. and 1:00 p.m.). There were four females and one male involved. Three of the females participated in the 10:00 a.m. session and a female and male participated in the 1:00 p.m. session. Eleven African-American students had agreed to participate in one of two planned focus group

Table 19

Analysis of variance for student's gender and race with attitude towards the usefulness of mathematics.

Source	df	SS	MS	F	P
Gender	1	11.844	11.844	0.27	0.6019 *
Race	1	54.791	54.791	1.27	0.2627 *
Interaction	1	29.823	29.823	0.69	0.4081 *
Error	133	5759.144	43.302		
Total	136	5824.015			

* Not significant at the .05 level.

Table 20

Analysis of variance for student's gender and race with attitude towards how teachers feel about them as learners of mathematics.

Source	df	SS	MS	F	P
Gender	1	163.229	163.229	3.73	0.0557 *
Race	1	.076	.076	0.00	0.9668 *
Interaction	1	21.449	21.449	0.49	0.4849 *
Error	133	5827.84	43.818		
Total	136	6035.738			

* Not significant at the .05 level.

Table 21

Analysis of variance for student's gender and race with attitude towards mathematics as a male's domain.

Source	df	SS	MS	F	P
Gender	1	24.580	24.80	0.82	0.3658 *
Race	1	77.394	77.394	2.59	0.1097 *
Interaction	1	20.174	20.174	0.68	0.4125 *
Error	133	3969.507	29.846		
Total	136	4833.679			

* Not significant at the .05 level.

Table 22

Analysis of variance for student's gender and race with attitude towards confidence in learning mathematics.

Source	df	SS	MS	F	P
Gender	1	9.350	9.350	0.10	0.7543 *
Race	1	80.669	80.669	0.85	0.3587 *
Interaction	1	173.673	173.673	1.83	0.1789 *
Error	133	12648.98	95.105		
Total	136	13310.82			

* Not significant at the .05 level.

Table 23

Analysis of variance for student's gender and race with attitude towards Effectance motivation.

Source	df	SS	MS	F	P
Gender	1	236.521	236.511	2.73	0.1006 *
Race	1	75.996	75.996	0.88	0.3504 *
Interaction	1	34.614	34.614	0.40	0.5282 *
Error	133	11509.61	86.538		
Total	136	12034.54			

* Not significant at the .05 level

sessions. Six for the 10:00 a.m. session and five for the 1:00 p.m. session. Only five, as mentioned above, showed up for the interviews on November 12, 1993. Therefore long interviews were held. Four of these students had a percentile rank above the third quartile (a score of 280) on the MARS. They had scores ranging from 290 to 357. The fifth one, a female, had a score that fell in the first quartile (a score below 217) on the Fennema-Sherman attitude scales. She did not take the MARS. Her score was 201 whereas the scores for each student on the Fennema-Sherman scales ranged from 165 to 306. Three other of these students took the Fennema-Sherman also, and only one of them (the male) had a score in the first quartile. The scores of these three ranged from 212 to 273. Four of these students had also taken Developmental Math II at least two times. Only eleven of the 137 students responding had a lower score than 201. Table 24 gives the percentile equivalency of the individual scores on Richard M. Suinn's Mathematics Anxiety rating scale from the highest score to the lowest. Table 25 gives the percentile equivalency of the individual scores on Fennema-Sherman's attitudes toward the learning of mathematics from the highest score to the lowest.

Table 24

Richard M. Suinn's Mathematics Anxiety Rating Scale percentile equivalency of the student scores.

Percentile	Score
99	432
95	332
80	291
75	280
60	242
50	222
35	197
25	176
20	169
10	139
0	102

N = 140

Table 25

Fennema-Sherman's attitudes toward the learning of mathematics scale percentile equivalency of the student scores.

Percentile	Score
99	306
95	289
80	261
75	255
60	246
50	235
35	224
25	217
20	212
10	203
0	165

N = 137

Findings From Interviews

In conversation with the students some of them felt they were not good at math and had some apprehension about taking the next course following the Developmental Mathematics II course.

> "I'm not good at math and right now I waited to take math because I'm not smart in math, and taking math and other subjects I would fail somewhere, and probably that math."

> "I heard that it was real hard and I am going to let that wait."

> "I have to go to 110. I have heard about that. I am afraid of it."

> "It causes fear just knowing I have something coming after this course."

> "And that MAT 110 from what I can see, Lord Have mercy; most of the stuff that you do is either right or wrong."

Word problems were indicated by the students as that one part of math that gave them the biggest problems.

> "Mostly, like I say, the word problems are the ones really get to me. When you have to keep going back and forth into it or doing something, otherwise, I like math."

> "Word problems are the hardest, but all the rest of it is pretty easy."

> "So any way, either way I've got to take it. And I've seen the book and I read the problems (word problems). I don't like reading problems."

"I get lost in which way I am suppose to go with it. What am I suppose to do - division or what? I don't know what I'm suppose to do with it unless I understand what I am doing. And with that; I get lost."

"Sometimes I can read it but I just don't understand it. I get confused."

Based on the information shared with us by the students, some of them exhibit some general anxiousness during tests.

"I get nervous and in my mind; I'm wondering what I am suppose to do. But on the test, I always get nervous, any test. and I am blocking my whole mind out because I am setting up there nervous. So, I am always nervous at test time."

"I get kind of nervous when it comes time to take a test. Tests make me nervous, anyway. I be hoping I can do whatever to pass it."

"I get somewhat nervous. I try the best I can. I don't get too uptight about it. I just try my best and I feel I'm passing the test, but when I get my paper back, the grade shows some careless mistakes that I made and it caused my grade to come down."

"I think that's the biggest part of it -- nervousness. I know when I get ready to take a test it's like my mind forgets everything that I know when it is time to take the test. And it won't come back to me, sometimes."

"Yes, I get very nervous when it comes to take a test."

"Tests bother me sometimes, but not all the time. It all depends on what my grade point is."

For some, math in general was not their favorite subject.

> "Because I don't like math, I don't like math period."

> "Still, I don't like math. I knew I had to keep up with it in order to pass it and to get out of it. But math is nothing I like."

Some of these students mentioned that they were not actively encouraged by their parents/teachers to study and to take all the mathematics they could while in high school. One felt that having more math, especially algebra, would have helped.

> "No, I was just like on my own when I took it in high school and general mathematics is what I took all the way through. I didn't have algebra; they had that trigonometry and stuff like that, but I had only took general math. I guess it would have helped me if I had algebra."

> "No, it about basically what I picked up here that determines what I can do."

> "Most of them said, like, take these two maths. Mostly like basic math, general math, and that's it. They don't teach you like, well you are doing good in general math; you can go ahead and go to Algebra I. They don't ever tell you about your careers, what you want to do. They don't never say, like if you want to be a teacher, you need to take Algebra I -- they don't tell you that. I think they need to do that. Don't get any encouragement about your needs or what you are going to do in your life."

These students felt that the pace of the

Developmental Mathematics II was too fast and this pace was a general cause of anxiety.

> "No more than unless they can go a little slower; and spend a little more time. Maybe they could go back and not try to cover the the whole book."

> "Well, if you move too fast for me, I can't get anything. But if you take it slower, say my speed, well then I get it. But to move right fast with it, I'll never get it."

> "Yes, I was good in it back there because, you know, like I say, it was the time; you had more time to work on that one than what we have here. You could get this part and go to the next part. Just too rushed up to try to get everything."

Summary

The purpose of this chapter was to report the analysis of the research data obtained in phase I and phase II of this study. The data in phase I were analyzed with respect to each research question and the interviews in phase II were summarized.

PHASE I

For research question one, data were analyzed to determine the mathematics anxieties of the African-American and non African-American students in the Developmental Mathematics II classes at Halifax Community College as measured by Richard M. Suinn's Mathematics Anxiety Rating Scale. It was found that nine of the ninety-eight items that were designed to depict mathematical situations that might cause an adult client to be anxious had means greater than 3.000. A mean of 3.000 or greater indicates some general anxiety occurs with students in the various situations depicted by these nine items.

For research question two, data were analyzed to determine if there were a significant difference between the mathematics anxieties of the African-American and non African-American students. It was found that the means on mathematics anxieties did not differ across student gender or racial categories and the interaction between student gender and racial categories was nonsignificant.

For research question three, data were analyzed to determine the attitudes toward the learning of mathematics of African-American and non

African-American students in the Developmental Mathematics II classes at Halifax Community College as measured by six of Fennema-Sherman attitudes toward the learning of mathematics subscales.

On the attitude towards success in mathematics, all the means of the African-American and the non African-American students were above the midpoint of the range of possible scores. A mean above the midpoint would tend to mean that on average these students had a positive attitude towards success in mathematics.

On the usefulness of mathematics scale all the means here were above the midpoint of the range of possible scores. This would indicate that on average these students had a positive attitude about the usefulness of mathematics currently and its relationship to their future education or vocation.

On the teachers scale all the means are above the midpoint of the range of possible scores. This would indicate that on average these students perceptions of how their teachers felt about them, as learners of mathematics were positive.

On the male domain scale, the African-American students had means above the midpoint of the range of

possible scores and the non African-American students had means below the midpoint. It seems that African-American students do not stereotype mathematics as a male's domain as the non African-American. However, this difference between the means was not enough to be a significant difference between African-American and non African-American students by race.

On the confidence in learning mathematics scale, all the means were above the midpoint of the range of the possible scores. This would indicate that on the average the students had confidence in their abilities to learn and to perform well on mathematical tasks.

On the effectance motivation scale, all the means were above the range of the possible scores except the non African-American male students. It would indicate that on the average the non African-American male students did not indicate an attitude of willingness to explore and experiment with various mathematical situations. However, this difference between means was not enough to cause a significant difference between the African-American and non African-American students by gender.

For research question four, data were analyzed to

determine if there were a significant difference between the attitudes toward the learning of mathematics of the African-American and the non African-American students. Overall, it was found that the means on attitudes toward the learning of mathematics did not differ across student gender or racial categories and the interaction between student gender and racial categories was nonsignificant, however, when analyzing each subscale with a two-way ANOVA, the statistical analysis on the attitude toward success in mathematics resulted in a significant effect of the student race category. This was the only subscale that resulted in a significant effect in any category when analyzed separately.

PHASE II

In phase II, five African-American students were used in long interviews. There were no extreme forms of anxiety mentioned during our conversations that would have hindered the normal performance of an individual within a mathematical setting. These students were not at all anxious about math. Testing or thinking about an impending test caused some general anxiety in these students. The nervousness which

resulted because of test anxiety probably contributed to the poor performance on tests in many cases. Having little background knowledge of algebra, the pace of Developmental Mathematics II, missed days from class, and a fear of an impending math course were also sources of general anxiety. There was an indication that having more math, especially algebra, would have helped.

Some of these students had a disposition to hate all mathematics in general. This disposition appears to have been born out of inadequate preparation in mathematics while in high school, lack of parental support and encouragement in mathematics, and perhaps low expectation on the part of each student themselves.

Chapter 5

Summary, Conclusions, and Recommendations

This chapter contains a summary of the study including the statement of purpose, the problem of the study, research procedures, a summary of the findings and conclusions based on the findings of the study, and recommendations.

Summary

The purpose of this study was to examine two affective variables that usually hinder the mathematical performance of students. Specifically, the study was to assess the attitudes toward the learning of mathematics and the mathematics anxieties of the African-American students enrolled in Developmental Mathematics II classes at Halifax Community College. Along with assessing the attitudes toward the learning of mathematics and the mathematics anxieties of the African-American students, the study examined if there was a difference between the mathematics anxieties of the African-American and the non African-American students. This study also examined if there was a difference between the

attitudes toward the learning of mathematics of the African-American and the non African-American students. This study gathered data in two phases. In phase one, two survey questionnaires were used to assess the attitudes toward the learning of mathematics and mathematics anxieties of the students enrolled in the Developmental Mathematics II classes. In phase two, long interviews were used to assess additional data from African-American students only.

The problem of this study was to assess the attitudes toward the learning of mathematics and the mathematics anxieties of the African-American students in the Developmental Mathematics II classes at Halifax Community College and to determine if these attitudes and anxieties are different from non African-American students. The population of interest for this study was the Developmental Mathematics II students at Halifax Community College. The sample for this study in phase one was the day and evening students who were enrolled in the Developmental Mathematics II classes during the winter quarter of 1992. In phase two of this study five African-American students were interviewed. These five students were selected because they were either above the 75th percentile on

the MARS or below the 25th percentile on the Fennema-Sherman attitude scales. Two instruments were used to collect data in phase one. A 98-item questionnaire which was composed of brief descriptions of situations that may arouse different levels of anxiety in adult clients was used to assess mathematics anxiety, and a 66-item questionnaire selected from six of the nine domain specific scales that were designed to measure attitudes related to the learning of mathematics by both males and females was used to assess the attitudes toward the learning of mathematics. Analysis of variance was used as the statistical procedures to analyze the data in phase one. In phase two, Morgan's (1988) ethnographic approach was used in the presentation of the students comments during the long interviews.

Summary of Findings

Using the MARS, it was found that there were nine items that gave a fair amount of mathematics anxiety to the students. The nine items are as follows:

- Doing a word problem in algebra.
- Reading a formula in chemistry.
- Taking an examination (final) in a math course.

- Having a friend try to teach you how to do a math problem and finding that you cannot understand what is being said.
- Thinking about an upcoming math test one hour before.
- Thinking about an upcoming math test five minutes before.
- Waiting to get a math test returned on which you expected to do well.
- Not knowing the formula needed to solve a particular problem.
- Receiving your final math grade on your report card.

Overall, the means on mathematics anxieties did not differ across student gender or racial categories, and the interaction between student gender and racial categories was nonsignificant. Using the Fennema-Sherman's attitudes towards the learning of mathematics scales, it was found that the students responses on the following scales were positive: (1) having success in mathematics; (2) the usefulness of mathematics; (3) the teacher's scale; and (4) confidence in learning mathematics. The non African-American male students did not indicate the willingness to explore and experiment with various mathematical situations as indicated by the responses on the effectance motivation in mathematics scale.

African-American students did not stereotype mathematics as a male's domain as did the non African-American students on the male's domain scale. Overall, the means on the attitudes toward the learning of mathematics did not differ across student gender or racial categories, and the interaction between student gender and racial categories was nonsignificant.

In the long interviews, there were no extreme forms of anxiety mentioned during the conversations that would have hindered the normal performance of an individual within a mathematical setting. Testing or thinking about an impending test caused some general anxiety in these students. Also, the fear of an impending math course was a source of general anxiety. The fear was a result of inadequate preparation while in high school. It was mentioned that having more math, especially algebra, would have been a great help in Developmental Mathematics II. The nervousness which resulted because of test anxiety probably contributed to the poor performance on test in many cases.

Some of the students who were interviewed had a disposition to hate all mathematics in general. This disposition appears to have been born out of inadequate preparation in mathematics while in high

school, lack of parental support and encouragement in studying mathematics, and perhaps low expectation on the part of each student.

Conclusions

Based on the findings of this study, along with the related literature, the following conclusions are formulated:

Mathematics anxiety, the tension or apprehension that a student might experience while performing various tasks that are indicated by Suinn's (1988) Mathematics Anxiety Rating Scale, was not prevalent among the African-Americans and non African-American students that were enrolled in the Developmental Mathematics II classes at Halifax Community College during the study. Only about 9.2% (nine items) of the 98 items on the MARS indicated a fair amount of anxiety in these students. Forty-four percent (four items) of these nine items dealt with situations concerning testing. One hundred five of the one hundred forty students responding to the MARS scored at or below the 75th percentile (third quartile) score of 280. The scores on the MARS have a possible range of scores from a low score of 98 (not at all anxious) to a high score

of 490 (very much anxious). The remaining thirty-five students scores ranged from 280 to 432. This would lead one to conclude that general anxiety was more prevalent among these students, and when it comes to the study of mathematics, general anxiety occurred mostly during testing or when students were about to be tested. The interview data also support the prevalence of general anxiety among the African-American students. This general anxiousness occurred most often during testing for these African-American students. This study confirms the conclusions of the studies of Betz (1978) and Bohuslov (1980). Betz (1978) indicated that expressions of anxiety were most common when the items in her study concerned math tests; about half of the students in all groups of the study reported getting really "up tight" during tests. Bohuslov (1980) indicated that math anxiety seemed to be induced more by testing than by math itself.

Overall, the attitudes toward the learning of mathematics, traits that were measured by the Fennema-Sherman (1986) attitude towards the learning of mathematics scales, were positive for these African-Americans and non African-American students. The first quartile score for these students on the

Fennema-Sherman scales was 217. Only eleven of the 137 students responding had a score lower than 201.

The findings of no significant differences between the mathematics anxieties of the African-Americans and non African-American students and no significant differences between the attitudes toward the learning of mathematics of the African-Americans and non African-American students who were enrolled in the Developmental Mathematics II classes at Halifax Community College are no different from previous findings of Kogelman et al., (1981) and a later study of Hauge (1991). Therefore, we can conclude that the African-Americans and non African-American students that were enrolled in the Developmental Mathematics II classes are much more alike than different in their anxieties and attitudes.

The findings in this study may lead one to conclude that math anxiety in itself and/or any attitudes towards the learning of mathematics that these students may or may not have, may not be the only obstacles to their success in the Developmental Mathematics II classes at Halifax Community College. The interviews suggested that prior preparation in mathematics seems to be a powerful factor in the success or failure of

of these students. Prior preparation coupled with perhaps mathematical myths have caused general anxiety to debilitate their performance in mathematics. This conclusion would be aligned with Johnson, (1984); McClellan, (1984); Powell, (1990); and Hauge, (1991) studies that concluded that nontraditional students who perceived mathematics as difficult, had previous trouble with the subject, and felt poorly prepared to take it tended to have higher mathematics anxieties.

Recommendations

Mathematics anxiety and negative attitudes are not the predominant factors operating in the African-American students enrolled in Developmental Mathematics II classes. There is evidence of lack of preparation. Therefore it is recommended that Algebra one should be taught to all students in the area county schools in the eighth grade.

Career Counseling should be started in the seventh grade to alert students to the need for studying math in order to pursue a career in math or science.

Bibliography

Bibliography

Aiken, L. R., Jr. (1970). Attitudes Toward Mathematics. Review of Educational Research, 40 (4), 551-596.

Aiken, L. R., Jr. (1976). Update on Attitudes and Other Affective Variables in Learning Mathematics, Review of Educational Research, 46 (2), 293-311.

Anderson, B. J. (1990). Minorities and Mathematics: The new frontier and challenge of the nineties. Journal of Negro Education, 59 (3), 260-272.

Atkinson, R. L., Atkinson, R. C., Smith, E. E. and Hilgard, E. R. (1987). Introduction to Psychology, (9th ed). Chicago: Harcourt Brace Jovanovich.

Bassarear, T. J. (1986). The effect of attitudes and belief about learning, about mathematics, and about self on achievement in a college remedial mathematics class. Unpublished doctoral dissertation, University of Massachusetts, Amherst.

Bassarear, T. J. (1986). New perspectives for investigating the relationship between attitudes and performance in mathematics courses. Proceedings of the Eighth Annual Meeting of the PME-NA, East Lansing, MI.

Battista, M. T. (1986). The relationship of mathematics anxiety and mathematical knowledge to learning of mathematical pedagogy by preservice elementary teachers. School Science and Mathematics, 86 (1), 10-19.

Betz, N. E. (1978). Prevalence, distribution, and correlates of math anxiety in college students. Journal of Counseling Psychology, 25 (5), 441-448.

Bleyer, D. R. (1980). Students' attitudes toward mathematics and their relationship to learning in required mathematics courses in selected postsecondary institutions. Community/Junior College Research Quarterly, 4, 331-347.

Bohuslov, R. L. (1980). A Method for dealing with Attitudes and Anxieties in Mathematics. (Eric Doc. No. 194158).

Brown, R. M. (1979). A determination of Attitudes toward Mathematics and an analysis of factors which are associated with negative attitudes toward mathematics of students at an urban community college: A descriptive study. Unpublished doctoral dissertation, (ED 257658), Heed University, Hollywood, Florida.

Calder, B. (1977). Focus groups and the nature of qualitative marketing research. Journal of Marketing Research, 14: 353-364.

Calvert, E. L. (1981). A study of the relationship between level of mathematics anxiety and sex, age, mathematical background, and previous success in mathematics. Graduate Seminar Paper - Eric Doc. 200-265.

Chaplin, J. P. (1985), Dictionary of Psychology (3rd ed.). New York: Dell Publishing Co.

Clute, P. S. (1984). Mathematics anxiety, instructional method, and achievement in a survey course in college mathematics. Journal for Research in Mathematics Education, 15 (1), 50-58.

Cohen, A. M. & Brawer, F. B. (1984). The American Community College. San Francisco: Jossey-Bass.

Crawford, C. G. (1980). Math without fear. New York: Vision Books.

Daily Herald (Roanoke Rapids, N.C.) (1994). New report card gives less than high grades to schools, (June 6, 1994), 79 (234)

Dembo, M. H. (1988). Applying Educational Psychology in the Classroom (3rd ed.). New York: Longman.

Devore, J. Peck, R. (1990). Introductory Statistics. Minnesota: West Publishing Co.

Elderveld, P. . (1983). Factors related to success and failure in developmental mathematics in the community college. Community/Junior College Quarterly of Research and Practice, 7 (2), 161-174.

Fennema, E. & Sherman, J. A. (1986). Fennema-Sherman attitudes scales: Instruments designed to measure attitudes toward the learning of mathematics by females and males. Wisconsin Center for Educational Research, Wisconsin.

Fern, E. F. (1982). The use of focus groups for idea generation: the effects of group size, acquaintanceship and moderator on response quantity and quality. Journal of Marketing Research. 19:1-13

Gergen, M. M., Suls, J. M., Rosnow, R. L., & Lana, R. E. (1989). Psychology: A beginning. New York: Harcourt Brace Jovanovich.

Gibson, J. T. (1981). Psychology for the Classroom (2nd ed.). New Jersey: Prentice-Hall.

Green, L. T. (1990). Test Anxiety, Mathematics Anxiety, and Teachers Comments: Relationship to achievement in remedial mathematics classes. Journal of Negro Education, 59 (3), 320-335.

Greenwood, J. (1984). My anxieties about math anxiety. Mathematics Teacher, 77 (9), 662-663.

Hackworth, R. D. (1982). Math anxiety reduction: a workbook. Florida: H and H Publishing Co.

Hall, E. R. & Post-Kammer, P. (1987). Black mathematics and science majors: Why so few? Career Development Quarterly, 35, 206-219.

Hauge, S. K. (1991). Mathematics Anxiety: a study of minority students in an open admission setting. (Eric Doc. No. 335229).

Higgenbotham, J. B. & Cox, K. K. (1979). Focus Group Interviews: A reader. Chicago: American Marketing Association.

Hilton, P. (1980). Math anxiety: some suggested causes and cures. Two Year College Mathematics Journal, 11.

Hintze, J. L. (1987). Number Cruncher Statistical System. Utah: Hintze.

Hodges, H. L. B. (1983). Learning styles: Rx for mathophobia. Arithmetic Teacher 30 (7), 17-20.

Johnson, M. L. (1984). Blacks in Mathematics: A status report. Journal for Research in Mathematics Education, 15 (2), 145-153.

Kitchens, A. N. (1979). Approach to relieving anxiety in the mathematics classroom. Unpublished doctoral dissertation, The University of North Carolina at Greensboro, Greensboro.

Kogelman, S., Forman, S., & Asch, J. (1981). Math Anxiety: help for minority students. American Educator, Fall, 5(3), 30-32.

Kogelman, S. & Warren, J. (1978). Mind over math. New York: McGraw Hill.

Kulm, G. (1980). Research on Mathematics Attitude. In R. J. Shumway (Ed.) Research in Mathematics Education. (PP. 357-387). Reston, VA: National Council of Teachers of Mathematics.

Leder, G. C. (1987). Attitudes toward Mathematics. In T. A. Rombert & D. R. Stewart (Eds.). The Monitoring of School Mathematics (PP 261-277). Wisconsin Center for Education Research, Madison, Wisconsin.

Lester, F. K., Jr., & Garofalo, J. (1987). The influence of affects, beliefs, and metacognition on problem solving behavior: Some tentative speculations. Paper presented at the annual meeting of the American Educational Research Association, Washington, DC, April 1987.

Levitan, M. L. (1994). Math Anxiety - What it is and how can we get some? In General Terms, Issue No. 1. Philadelphia: Saunders College.

Llabre, M. M. & Suarez, E. (1985). Predicting math anxiety and course performance in college women and men. Journal of Counseling Psychology, 32 (2), 283-287.

Matthews, W. (1984). Influences on the learning and participation of minorities in mathematics. Journal for Research in Mathematics Education, 15 (2), 84-95.

Matthews, W., Carpenter, T. P., Lindquist, M. M. & Silver, E. A. (1984). The third national assessment: Minorities and mathematics. Journal for Research in Mathematics Education, 15 (2), 165-171.

McClellan, K. T. (1984). Math Anxiety: Cure, Impact and Challenge to Black Students. Eric Doc. 241270.

McLeod, D. B. (1988). Research on learning and instruction in mathematics: The role of affect. Paper prepared for discussion at "The first Wisconsin symposium for research on teaching and learning mathematics", Madison, Wisconsin.

McLeod, D. B. (1987). New approaches to research on attitude. In T. A. Rombert & D. R. Steward (Eds.), The Monitoring of School Mathematics (PP. 279-290). Madison, WI: Wisconsins Center for Education Research.

Moore, W., Jr. (1970). Against the Odds: The High-risk student in the community college. San Francisco: Jossey-Bass.

Morgan, D. L. (1988). Focus groups as qualitative research. Qualitative Research Methods, 16. Newbury Park: Sage Publications.

Morris, C. G. (1985). Psychology: An Introduction. (5th ed.). Englewood Cliffs, New Jersey: Prentice-Hall.

Morris, J. (1981). Math Anxiety: Teaching to avoid it. The Mathematics Teacher, 74 (6), 413-417.

Powell, L. (1990). Factors associated with the under-representation of African-Americans in Mathematics and Science. The Journal of Negro Education., 59 (3), 292-298.

Reyes, L. H. (1981). Attitudes and Mathematics. In M. M. Lindquist (Ed.), Selected issues in Mathematics education. Chicago: National Society for the Study of Education. 161-184.

Reyes, L. H. & Stanic, G. M. A. (1985). A review of the literature on Blacks and Mathematics. Information Bulletin No. 1, 1985. ED 260945

Richardson, F. C. & Suinn, R. M. (1972). The Mathematics Anxiety Rating Scale: Psychometric data. Journal of Counseling Psychology, 19 (6), 551-554.

Richardson, Jr. R. C. (1990). Responding to student diversity: A community college perspective. Denver Co: Education Commission of the States.

Roberts, F. (1969). Attitudes of college freshman towards mathematics. The Mathematics Teacher, 32 25-27.

Skemp, R. R. (1979). Intelligence, learning, and action. New York: Wiley.

Skiba, A. (1990). Reviewing an old subject: Math Anxiety. Mathematics Teacher, 83 (3), 188-189.

Smith, J. B. (1981). Math Anxiety and the student of 80's. Eric Doc. 200296.

Spielberger, C. (1972). Conceptual and methodological issues in anxiety research. In C. Spielberger (Ed.) Anxiety: Current trends in theory and research, 2. New York: Academic Press.

Stiff, L. V. & Harvey, W. B. (1988). On the education of black children. Journal of Black Studies, 19 (2), 190-203.

Stone, I. D., Beckmann, M. W. & Stephens, L. J. (1980). Factors influencing mathematics competencies in two-year college students. Community/Junior College Research Quarterly, 5, 31-36.

Suinn, R. M. (1988). The Mathematics Anxiety Rating Scale. Fort Collins, Co: RMBSI, Inc.

Suydam, M. N. (1984). Attitudes toward Mathematics. Arithmetic Teacher, 32 (3), 12.

The World Book Dictionary (1981, ed.). Chicago, Ill: Doubleday.

Tobias, S. (1976). Math anxiety - Why is a smart girl like you counting on your fingers? Ms, 5 (1), 56-59.

Tobias S. (1978). Overcoming Math Anxiety. New York: W. W. Norton.

Tobias, S. (1980). Math anxiety: What you can do about it. Today's Education, 26-29.

Trent, R. M. (1985). Hynotherapeutic restructuring and systematic desensitization as treatment for mathematics anxiety. Eric Doc: 260325.

Valverde, L. A. (1984). Underachievement and underrepresentation of Hispanics in mathematics and mathematics related careers. Journal for Research in Mathematics Education, 15 (2), 123-133.

Wilkoff, R. L. & Buchalter, B. D. (1986). Factor analysis of four Fennema-Sherman's Mathematics attitude scales. Instructional Journal of Math Education and Science Technology, 17 (6), 703-706.

Woolfolk, A. E. & McCune-Nicolich. L. (1984). Educational Psychology for Teachers (2nd ed.) New Jersey: Prentice-Hall.

Appendix A

Request for African-American Normative Data on Questionnaires.

P. O. Box 312
Garysburg, NC 27831
December 5, 1991

Wisconsin Center for Education Research
School of Education
University of Wisconsin-Madison
Madison, Wisconsin

Dear Sir:

On December 12, 1990, I purchased your Fennema-Sherman Mathematics Altitudes Scales (reprinted March 1986) to be used in a research project that I would like to do as a doctoral student at Virginia Tech under the direction of Dr. Darrel Clowes. I'm seeking more information on the normative data for these scales. Please send me the break down of the ethnicity of the students that were involved. What I'm really seeking is to determine if these scales have been normed on African-American students only.

Thank you for sharing your information.

Yours,

Wendell Perry

Wisconsin Center for Education Research
School of Education • University of Wisconsin-Madison
1025 West Johnson Street • Madison, Wisconsin 53706 • (608) 263-4200

Wendell Perry
P.O. Box 312
Garysburg, NC 27831

December 12, 1991

Dear Mr. Perry:

This letter is in response to your request for a break down of the ethnicity of the students that were involved in the Fennema-Sherman Mathematics Attitude Scales. I regret to inform you that there is no information available on ethnicity. If you have other questions please call me at (608)263-9477.

Janice Gratch
Janice Gratch
Administrative
assistant for Eliz
Fennema

P. O. Box 312
Garysburg, NC 27831
December 5, 1991

Rocky Mountain Behavioral Science, Inc.
P. O. Box 1066
Fort Collins, Colorado 80522

Dear Sir:

On February 8, 1991, I purchased 100 Mathematics Anxiety Rating Scales (MARS) to be used in a research project that I would like to do as a doctoral student at Virginia Tech under the direction of Dr. Darrel Clowes. You mentioned in your informational brief that normative data are available on the students that were involved. What I'm really seeking is to determine if the MARS has ever been normed on African-American students only.

Thank you very much for sharing your information.

Sincerely,

Wendell Perry

Rocky Mountain
Behavioral Science Institute, Inc.
P.O. BOX 1066 • FORT COLLINS, CO 80522
(303) 221-0602 • 1-800-447-6354

Wendell Perry
PO Box 312
Garysburg, NC 27831

January 8, 1992

Dear Mr. Perry:

Thank you for your interest in the MARS. The only normative data we have is included in the information for users. We do not have data on African-American students only. We do not think a specific study of this nature has been done. You might try looking into the references (enclosed) from the informational brief and information for users.

Good luck with your research. Please let us know if we can be of further assistance.

Sincerely,

Ruth W Edwards

Ruth W. Edwards, Ph.D.
Executive Director

enclosures

Executive Director
Ruth W. Edwards, Ph.D.

Directors
Fred Beauvais, Ph.D.
Charles W. Cole, Ph.D.
John E. Hinkle, Ph.D.
C. Dean Miller, Ed.D
Weston H. Morrill, Ph.D.
E.R. Oetting, Ph.D.

Appendix B

Questionnaires

Name _____ Total Score _____

MATHEMATICS ANXIETY RATING SCALE (MARS)

The items in the questionnaire refer to things and experiences that may cause tension or apprehension. For each item, place a check (✓) 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
1. Deciding how much change you should get back from buying several items.	O	O	O	O	O
2. Having someone watch you as you add up a column of numbers.	O	O	O	O	O
3. Having someone watch you as you divide a five digit number by a two digit number.	O	O	O	O	O
4. Being asked to add up 976 + 777 in your head.	O	O	O	O	O
5. Dividing a five digit number by a two digit number in private with pencil and paper.	O	O	O	O	O
6. Figuring out a simple percentage, like the sales tax on something you buy.	O	O	O	O	O
7. Listening to a salesman show you how you would save money by buying a higher priced product because it reduces long term expenses.	O	O	O	O	O
8. Listening to a person explain how your share of expenses on a trip was figured out (including meals, transportation, housing, etc.).	O	O	O	O	O
9. Having to figure out how much it will cost to buy a product on credit (figuring in the interest rates).	O	O	O	O	O

Copyright 1988 by Richard M. Suinn. All rights reserved. Published by RMBSI, Inc., P.O. Box 1066, Fort Collins, CO 80522.

How anxious . . .	Not at all	A little	A fair amount	Much	Very much
10. Adding up a bill for a meal when you think you have been over-charged.	O	O	O	O	O
11. Telling the cashier that you think the bill for the meal was wrong and watching the cashier add up the bill again.	O	O	O	O	O
12. Being treasurer for a club.	O	O	O	O	O
13. Adding up the dues received and the expenses for a club you belong to.	O	O	O	O	O
14. Adding up 976 + 777 on paper.	O	O	O	O	O
15. Doing a word problem in algebra.	O	O	O	O	O
16. Solving a problem such as: If x = 11, and y = 3, then the result of x/y is equal to _____?	O	O	O	O	O
17. Solving the problem such as: If x = 12, and y = 4, then the ratio of x to y is equal to _____?	O	O	O	O	O
18. Figuring out your grade average for last term.	O	O	O	O	O
19. Reading an article on the basketball team, showing what percentage of free throws each player made, the percentage of field goals made, the total number attempted, etc.	O	O	O	O	O
20. Reading a novel with many dates in it.	O	O	O	O	O
21. Counting the number of pages left in a novel you are reading.	O	O	O	O	O
22. Being asked to guess how many people are at a large gathering you are attending.	O	O	O	O	O
23. Receiving a math textbook.	O	O	O	O	O

How anxious . . .	Not at all	A little	A fair amount	Much	Very much
24. Watching someone work with math tables.	O	O	O	O	O
25. Watching a teacher work an algebra problem on the blackboard.	O	O	O	O	O
26. Signing up for a math course.	O	O	O	O	O
27. Listening to another student explain a math formula.	O	O	O	O	O
28. Walking into a math class.	O	O	O	O	O
29. Having to figure the miles per gallon of gas for a car.	O	O	O	O	O
30. Watching someone work with a calculator.	O	O	O	O	O
31. Looking through the pages of a math text.	O	O	O	O	O
32. Working on an income tax form.	O	O	O	O	O
33. Reading your W-2 form (or other statement showing your annual earnings and taxes).	O	O	O	O	O
34. Studying for a math test.	O	O	O	O	O
35. Starting to read a new chapter in a math book.	O	O	O	O	O
36. Walking to class and thinking about a math course.	O	O	O	O	O
37. Meeting your math teacher while walking in the hall.	O	O	O	O	O
38. Reading the word "Statistics".	O	O	O	O	O
39. Sitting in a math class and waiting for the teacher to begin.	O	O	O	O	O

How anxious . . .	Not at all	A little	A fair amount	Much	Very much
40. Solving a square root problem.	O	O	O	O	O
41. Signing up for a course in Geometry.	O	O	O	O	O
42. Checking over your monthly bank statement.	O	O	O	O	O
43. Taking the math section of a standardized test, like an achievement test.	O	O	O	O	O
44. Having someone explain bank interest rates while describing savings accounts.	O	O	O	O	O
45. Raising your hand in a math class to ask a question about something you do not understand.	O	O	O	O	O
46. Reading and interpreting graphs or charts.	O	O	O	O	O
47. Reading a cash register receipt after you buy something.	O	O	O	O	O
48. Figuring the sales tax for something that costs more than $1.00.	O	O	O	O	O
49. Having a person show you the best way to divide your money into a savings and a checking account.	O	O	O	O	O
50. Figuring how you would make more money: by taking a job that has a lower salary, but includes, room, meals, and travel; or a job that has a higher salary, but no other benefits.	O	O	O	O	O
51. Reading a formula in chemistry.	O	O	O	O	O
52. Hearing a lecture in a social studies class where the teacher is commenting on some figures, like the percentage of each socio-economic group who voted Republican.	O	O	O	O	O

How anxious . . .	Not at all	A little	A fair amount	Much	Very much
53. Taking an examination (quiz) in a math course.	O	O	O	O	O
54. Taking an examination (final) in a math course.	O	O	O	O	O
55. Hearing two of your friends talking about the best way to figure out the actual cost of a product.	O	O	O	O	O
56. Having someone ask you to recheck the numbers in a simple calculation, such as division or addition.	O	O	O	O	O
57. Being asked by a friend to answer the question: "How long will it take to get to the state capital if I drive at 30 miles per hour?"	O	O	O	O	O
58. Studying for a driver's license test and memorizing the figures involved, such as the distances it takes to stop a car going at differing speeds.	O	O	O	O	O
59. Hearing friends quote the odds on a game as they make bets.	O	O	O	O	O
60. Playing cards where numbers are involved, like poker or blackjack.	O	O	O	O	O
61. Having a friend try to teach you how to do a math problem and finding that you cannot understand what is being said.	O	O	O	O	O
62. Making a schedule for your daily routine, setting aside times for classes, study time, meals, recreation, etc.	O	O	O	O	O
63. Juggling class times around at registration to determine the best schedule.	O	O	O	O	O

How anxious . . .	Not at all	A little	A fair amount	Much	Very much
64. Deciding which courses to take in order to come out with enough credit hours for promotion or graduation.	O	O	O	O	O
65. Working a concrete, everyday application of mathematics that has meaning to you, e. g., figuring out how much you can spend on recreational activities after paying other bills.	O	O	O	O	O
66. Working on a math problem which seems less important in your life, such as "If x = outstanding bills, and y = total income, calculate how much is left for recreational purposes."	O	O	O	O	O
67. Being given a set of addition problems to solve on paper.	O	O	O	O	O
68. Being given a set of subtraction problems to solve on paper.	O	O	O	O	O
69. Being given a set of multiplication problems to solve on paper.	O	O	O	O	O
70. Being given a set of division problems to solve on paper.	O	O	O	O	O
71. Picking up your math textbook to begin working on a homework assignment.	O	O	O	O	O
72. Being given a homework assignment of many difficult math problems, which is due the next time the class meets.	O	O	O	O	O
73. Thinking about an upcoming math test one week before.	O	O	O	O	O
74. Thinking about an upcoming math test one day before.	O	O	O	O	O
75. Thinking about an upcoming math test one hour before.	O	O	O	O	O

How anxious . . .	Not at all	A little	A fair amount	Much	Very much
76. Thinking about an upcoming math test five minutes before.	O	O	O	O	O
77. Checking the time and figuring out whether or not you can stop in two more stores and still meet a friend at the exact time you said you would.	O	O	O	O	O
78. Waiting to get a math test returned on which you expected to do well.	O	O	O	O	O
79. Waiting to get a math test returned on which you expected to do poorly.	O	O	O	O	O
80. Walking to math class.	O	O	O	O	O
81. Realizing that you have to take a certain number of math classes to meet the requirements for graduation.	O	O	O	O	O
82. Picking up a math textbook to begin a difficult reading assignment.	O	O	O	O	O
83. Being called on to answer a question in a math class on a topic you have spent some time studying.	O	O	O	O	O
84. Not knowing the formula needed to solve a particular problem.	O	O	O	O	O
85. Receiving your final math grade on your report card.	O	O	O	O	O
86. Opening a math or statistics book and seeing a page full of problems.	O	O	O	O	O
87. Being responsible for collecting the dues for a club and keeping track of the amount received.	O	O	O	O	O

How anxious . . .	Not at all	A little	A fair amount	Much	Very much
88. Getting ready to study for a math test.	O	O	O	O	O
89. Listening to a lecture in a math class.	O	O	O	O	O
90. Figuring out your monthly budget.	O	O	O	O	O
91. Being given a "pop" quiz in a math class.	O	O	O	O	O
92. Seeing a computer printout.	O	O	O	O	O
93. Having to use the tables in the back of a math book.	O	O	O	O	O
94. Being told how to interpret probability statements.	O	O	O	O	O
95. Asking your math teacher to help you with a problem that you don't understand.	O	O	O	O	O
96. Being asked to explain how you arrived at a particular answer for a problem.	O	O	O	O	O
97. Adding up the results of a survey or poll.	O	O	O	O	O
98. Acting as secretary, keeping track of the number of people signing up for an event.	O	O	O	O	O

Anxiety Response Card

Total Score _____

Social Security Number _____

Name _____

Sex: Male [ ], Female [ ].

Race: African-American [ ], White [ ], Other [ ].

Have you taken Developmental Mathematics II before?
Yes [ ], No [ ].

How many times? 1 [ ], 2 [ ], 3 [ ], 4 [ ].

How anxious . . .	Not at all	A little	A fair amount	Much	Very much
1.	[ ]	[ ]	[ ]	[ ]	[ ]
2.	[ ]	[ ]	[ ]	[ ]	[ ]
3.	[ ]	[ ]	[ ]	[ ]	[ ]
4.	[ ]	[ ]	[ ]	[ ]	[ ]
5.	[ ]	[ ]	[ ]	[ ]	[ ]
6.	[ ]	[ ]	[ ]	[ ]	[ ]
7.	[ ]	[ ]	[ ]	[ ]	[ ]
8.	[ ]	[ ]	[ ]	[ ]	[ ]
9.	[ ]	[ ]	[ ]	[ ]	[ ]
10	[ ]	[ ]	[ ]	[ ]	[ ]
11.	[ ]	[ ]	[ ]	[ ]	[ ]
12.	[ ]	[ ]	[ ]	[ ]	[ ]
13.	[ ]	[ ]	[ ]	[ ]	[ ]

How anxious . . .	Not at all	A little	A fair amount	Much	Very much
14.	[ ]	[ ]	[ ]	[ ]	[ ]
15.	[ ]	[ ]	[ ]	[ ]	[ ]
16.	[ ]	[ ]	[ ]	[ ]	[ ]
17.	[ ]	[ ]	[ ]	[ ]	[ ]
18.	[ ]	[ ]	[ ]	[ ]	[ ]
19.	[ ]	[ ]	[ ]	[ ]	[ ]
20.	[ ]	[ ]	[ ]	[ ]	[ ]
21.	[ ]	[ ]	[ ]	[ ]	[ ]
22.	[ ]	[ ]	[ ]	[ ]	[ ]
23.	[ ]	[ ]	[ ]	[ ]	[ ]
24.	[ ]	[ ]	[ ]	[ ]	[ ]
25.	[ ]	[ ]	[ ]	[ ]	[ ]
26.	[ ]	[ ]	[ ]	[ ]	[ ]
27.	[ ]	[ ]	[ ]	[ ]	[ ]
28.	[ ]	[ ]	[ ]	[ ]	[ ]
29.	[ ]	[ ]	[ ]	[ ]	[ ]
30.	[ ]	[ ]	[ ]	[ ]	[ ]
31.	[ ]	[ ]	[ ]	[ ]	[ ]
32.	[ ]	[ ]	[ ]	[ ]	[ ]
33.	[ ]	[ ]	[ ]	[ ]	[ ]
34.	[ ]	[ ]	[ ]	[ ]	[ ]
35.	[ ]	[ ]	[ ]	[ ]	[ ]

How anxious . . .	Not at all	A little	A fair amount	Much	Very much
36.	[ ]	[ ]	[ ]	[ ]	[ ]
37.	[ ]	[ ]	[ ]	[ ]	[ ]
38.	[ ]	[ ]	[ ]	[ ]	[ ]
39.	[ ]	[ ]	[ ]	[ ]	[ ]
40.	[ ]	[ ]	[ ]	[ ]	[ ]
41.	[ ]	[ ]	[ ]	[ ]	[ ]
42.	[ ]	[ ]	[ ]	[ ]	[ ]
43.	[ ]	[ ]	[ ]	[ ]	[ ]
44.	[ ]	[ ]	[ ]	[ ]	[ ]
45.	[ ]	[ ]	[ ]	[ ]	[ ]
46.	[ ]	[ ]	[ ]	[ ]	[ ]
47.	[ ]	[ ]	[ ]	[ ]	[ ]
48.	[ ]	[ ]	[ ]	[ ]	[ ]
49.	[ ]	[ ]	[ ]	[ ]	[ ]
50.	[ ]	[ ]	[ ]	[ ]	[ ]
51.	[ ]	[ ]	[ ]	[ ]	[ ]
52.	[ ]	[ ]	[ ]	[ ]	[ ]
53.	[ ]	[ ]	[ ]	[ ]	[ ]
54.	[ ]	[ ]	[ ]	[ ]	[ ]
55.	[ ]	[ ]	[ ]	[ ]	[ ]
56.	[ ]	[ ]	[ ]	[ ]	[ ]
57.	[ ]	[ ]	[ ]	[ ]	[ ]

How anxious . . .	Not at all	A little	A fair amount	Much	Very much
58.	[ ]	[ ]	[ ]	[ ]	[ ]
59.	[ ]	[ ]	[ ]	[ ]	[ ]
60.	[ ]	[ ]	[ ]	[ ]	[ ]
61.	[ ]	[ ]	[ ]	[ ]	[ ]
62.	[ ]	[ ]	[ ]	[ ]	[ ]
63.	[ ]	[ ]	[ ]	[ ]	[ ]
64.	[ ]	[ ]	[ ]	[ ]	[ ]
65.	[ ]	[ ]	[ ]	[ ]	[ ]
66.	[ ]	[ ]	[ ]	[ ]	[ ]
67.	[ ]	[ ]	[ ]	[ ]	[ ]
68.	[ ]	[ ]	[ ]	[ ]	[ ]
69.	[ ]	[ ]	[ ]	[ ]	[ ]
70.	[ ]	[ ]	[ ]	[ ]	[ ]
71.	[ ]	[ ]	[ ]	[ ]	[ ]
72.	[ ]	[ ]	[ ]	[ ]	[ ]
73.	[ ]	[ ]	[ ]	[ ]	[ ]
74.	[ ]	[ ]	[ ]	[ ]	[ ]
75.	[ ]	[ ]	[ ]	[ ]	[ ]
76.	[ ]	[ ]	[ ]	[ ]	[ ]
77.	[ ]	[ ]	[ ]	[ ]	[ ]
78.	[ ]	[ ]	[ ]	[ ]	[ ]
79.	[ ]	[ ]	[ ]	[ ]	[ ]

How anxious . . .	Not at all	A little	A fair amount	much	Very much
80.	[ ]	[ ]	[ ]	[ ]	[ ]
81.	[ ]	[ ]	[ ]	[ ]	[ ]
82.	[ ]	[ ]	[ ]	[ ]	[ ]
83.	[ ]	[ ]	[ ]	[ ]	[ ]
84.	[ ]	[ ]	[ ]	[ ]	[ ]
85.	[ ]	[ ]	[ ]	[ ]	[ ]
86.	[ ]	[ ]	[ ]	[ ]	[ ]
87.	[ ]	[ ]	[ ]	[ ]	[ ]
88.	[ ]	[ ]	[ ]	[ ]	[ ]
89.	[ ]	[ ]	[ ]	[ ]	[ ]
90.	[ ]	[ ]	[ ]	[ ]	[ ]
91.	[ ]	[ ]	[ ]	[ ]	[ ]
92.	[ ]	[ ]	[ ]	[ ]	[ ]
93.	[ ]	[ ]	[ ]	[ ]	[ ]
94.	[ ]	[ ]	[ ]	[ ]	[ ]
95.	[ ]	[ ]	[ ]	[ ]	[ ]
96.	[ ]	[ ]	[ ]	[ ]	[ ]
97.	[ ]	[ ]	[ ]	[ ]	[ ]
98.	[ ]	[ ]	[ ]	[ ]	[ ]

DIRECTIONS
FENNEMA-SHERMAN MATHEMATICS ATTITUDE SCALES

Elizabeth Fennema - Julia A. Sherman
University of Wisconsin-Madison

On the following pages is a series of statements. There are no correct answers for these statements. They have been set up in a way which permits you to indicate the extent to which you agree or disagree with the ideas expressed. Suppose the statement is:

Example 1. I like mathematics.

As you read the statement, you will know whether you agree or disagree. If you strongly agree, check the square under **STRONGLY AGREE** on your answer sheet. If you agree but with reservations, that is, you do not fully agree, check the square under **AGREE**. If you disagree with the idea, indicate the extent to which you disagree by checking the square under **DISAGREE** or the square under **STRONGLY DISAGREE** if you strongly disagree. But if you neither agree nor disagree, that is, you are not certain, check the square under **UNDECIDED**. Also, if you cannot answer a question, check undecided.

Do not spend much time with any statement, <u>but be sure to answer every statement</u>. Work fast but carefully.

There are no "right" or "wrong" answers. The only correct responses are those that are true <u>for you</u>. Whenever possible, let the things that have happened to you help you make a choice. **DO NOT MARK ON THE BOOKLET.**

THIS INVENTORY IS BEING USED FOR RESEARCH PURPOSES ONLY AND NO ONE WILL KNOW WHAT YOUR RESPONSES ARE.

Attitude Toward Success in Mathematics Scale

1. It would make me happy to be recognized as an excellent student in mathematics.

2. I'd be proud to be the outstanding student in math.

3. I'd be happy to get top grades in mathematics.

4. Being first in a mathematics competition would make me pleased.

5. Being regarded as smart in mathematics would be a great thing.

6. People would think I was some kind of grind if I got A's in math.

7. If I had good grades in math, I would try to hide it.

8. If I got the highest grade in math I'd prefer no one knew.

9. It would make people like me less if I were a really good math student.

10. I don't like people to think I'm smart in math.

Usefulness of Mathematics Scale

11. I'll need mathematics for my future work.

12. I study mathematics because I know how useful it is.

13. Knowing mathematics will help me to earn a living.

14. Mathematics is a worthwhile and necessary subject.

15. I'll need a firm mastery of mathematics for my future work.

16. Mathematics is of no relevance to my life.

17. Mathematics will not be important to me in my life's work.

18. I see mathematics as a subject I will rarely use in my daily life as an adult.

19. Taking mathematics is a waste of time.

20. I expect to have little use for mathematics when I get out of school.

Teacher Scale

21. My teachers have encouraged me to study more mathematics.

22. My teachers think I'm the kind of person who could do well in mathematics.

23. Math teachers have made me feel I have the ability to go on in mathematics.

24. My math teachers would encourage me to take all the math I can.

25. My math teachers have been interested in my progress in mathematics.

26. When it comes to anything serious I have felt ignored when talking to math teachers.

27. I have found it hard to win the respect of math teachers.

28. Getting a mathematics teacher to take me seriously has usually been a problem.

29. My teachers would think I wasn't serious if I told them I was interested in a career in science and mathematics.

30. I have had a hard time getting teachers to talk seriously with me about mathematics.

Mathematics as a Male Domain (MD)

31. Females are as good as males in geometry.

32. Studying mathematics is just as appropriate for women as for men.

33. I would trust a woman just as much as I would trust a man to figure out important calculations.

34. Girls can do just as well as boys in mathematics.

35. Males are not naturally better than females in mathematics.

36. Women certainly are logical enough to do well in mathematics.

37. It's hard to believe a female could be a genius in mathematics.

38. When a woman has to solve a math problem, it is feminine to ask a man for help.

39. I would have more faith in the answer for a math problem solved by a man than a woman.

40. Girls who enjoy studying math are a bit peculiar.

41. Mathematics is for men; arithmetic is for women.

42. I would expect a woman mathematician to be a masculine type of person.

Confidence in learning Mathematics Scale

43. Generally I have felt secure about attempting mathematics.

44. I am sure I could do advance work in mathematics.

45. I am sure that I can learn mathematics.

46. I think I could handle more difficult mathematics.

47. I can get good grades in mathematics.

48. I have a lot of self-confidence when it comes to math.

49. I'm no good in math.

50. I don't think I could do advanced mathematics.

51. I'm not the type to do well in math.

52. For some reason even though I study, math seems unusually hard for me.

53. Most subjects I can handle O.K., but I have a knack for flubbing up math.

54. Math has been my worst subject.

Effectance Motivation in Mathematics Scale

55. I like math puzzles.

56. Mathematics is enjoyable and stimulating to me.

57. When a math problem arises that I can't immediately solve, I stick with it until I have the solution.

58. Once I start trying to work on a math puzzle, I find it hard to stop.

59. When a question is left unanswered in math class, I continue to think about it afterward.

60. I am challenged by math problems I can't understand immediately.

61. Figuring out mathematical problems does not appeal to me.

62. The challenge of math problems does not appeal to me.

63. Math puzzles are boring.

64. I don't understand how some people can spend so much time on math and seem to enjoy it.

65. I would rather someone give me the solution to a difficult math problem than to have to work it out for myself.

66. I do as little work in math as possible.

Attitude Response Card

Total Score _____

Name _____

Social Security Number _____

Sex: Male [ ], Female [ ].

Race: African-American [ ], White [ ], Other [ ].

Have you taken Developmental Mathematics II before?
Yes [ ], No [ ].

How many times? 1 [ ], 2 [ ], 3 [ ], 4 [ ].

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1.	[ ]	[ ]	[ ]	[ ]	[ ]
2.	[ ]	[ ]	[ ]	[ ]	[ ]
3.	[ ]	[ ]	[ ]	[ ]	[ ]
4.	[ ]	[ ]	[ ]	[ ]	[ ]
5.	[ ]	[ ]	[ ]	[ ]	[ ]
6.	[ ]	[ ]	[ ]	[ ]	[ ]
7.	[ ]	[ ]	[ ]	[ ]	[ ]
8.	[ ]	[ ]	[ ]	[ ]	[ ]
9.	[ ]	[ ]	[ ]	[ ]	[ ]
10.	[ ]	[ ]	[ ]	[ ]	[ ]
11.	[ ]	[ ]	[ ]	[ ]	[ ]
12.	[ ]	[ ]	[ ]	[ ]	[ ]
13.	[ ]	[ ]	[ ]	[ ]	[ ]

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
14.	[ ]	[ ]	[ ]	[ ]	[ ]
15.	[ ]	[ ]	[ ]	[ ]	[ ]
16.	[ ]	[ ]	[ ]	[ ]	[ ]
17.	[ ]	[ ]	[ ]	[ ]	[ ]
18.	[ ]	[ ]	[ ]	[ ]	[ ]
19.	[ ]	[ ]	[ ]	[ ]	[ ]
20.	[ ]	[ ]	[ ]	[ ]	[ ]
21.	[ ]	[ ]	[ ]	[ ]	[ ]
22.	[ ]	[ ]	[ ]	[ ]	[ ]
23.	[ ]	[ ]	[ ]	[ ]	[ ]
24.	[ ]	[ ]	[ ]	[ ]	[ ]
25.	[ ]	[ ]	[ ]	[ ]	[ ]
26.	[ ]	[ ]	[ ]	[ ]	[ ]
27.	[ ]	[ ]	[ ]	[ ]	[ ]
28.	[ ]	[ ]	[ ]	[ ]	[ ]
29.	[ ]	[ ]	[ ]	[ ]	[ ]
30.	[ ]	[ ]	[ ]	[ ]	[ ]
31.	[ ]	[ ]	[ ]	[ ]	[ ]
32.	[ ]	[ ]	[ ]	[ ]	[ ]
33.	[ ]	[ ]	[ ]	[ ]	[ ]
34.	[ ]	[ ]	[ ]	[ ]	[ ]
35.	[ ]	[ ]	[ ]	[ ]	[ ]

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
36.	[ ]	[ ]	[ ]	[ ]	[ ]
37.	[ ]	[ ]	[ ]	[ ]	[ ]
38.	[ ]	[ ]	[ ]	[ ]	[ ]
39.	[ ]	[ ]	[ ]	[ ]	[ ]
40.	[ ]	[ ]	[ ]	[ ]	[ ]
41.	[ ]	[ ]	[ ]	[ ]	[ ]
42.	[ ]	[ ]	[ ]	[ ]	[ ]
43.	[ ]	[ ]	[ ]	[ ]	[ ]
44.	[ ]	[ ]	[ ]	[ ]	[ ]
45.	[ ]	[ ]	[ ]	[ ]	[ ]
46.	[ ]	[ ]	[ ]	[ ]	[ ]
47.	[ ]	[ ]	[ ]	[ ]	[ ]
48.	[ ]	[ ]	[ ]	[ ]	[ ]
49.	[ ]	[ ]	[ ]	[ ]	[ ]
50.	[ ]	[ ]	[ ]	[ ]	[ ]
51.	[ ]	[ ]	[ ]	[ ]	[ ]
52.	[ ]	[ ]	[ ]	[ ]	[ ]
53.	[ ]	[ ]	[ ]	[ ]	[ ]
54.	[ ]	[ ]	[ ]	[ ]	[ ]
55.	[ ]	[ ]	[ ]	[ ]	[ ]
56.	[ ]	[ ]	[ ]	[ ]	[ ]
57.	[ ]	[ ]	[ ]	[ ]	[ ]

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
58.	[ ]	[ ]	[ ]	[ ]	[ ]
59.	[ ]	[ ]	[ ]	[ ]	[ ]
60.	[ ]	[ ]	[ ]	[ ]	[ ]
61.	[ ]	[ ]	[ ]	[ ]	[ ]
62.	[ ]	[ ]	[ ]	[ ]	[ ]
63.	[ ]	[ ]	[ ]	[ ]	[ ]
64.	[ ]	[ ]	[ ]	[ ]	[ ]
65.	[ ]	[ ]	[ ]	[ ]	[ ]
66.	[ ]	[ ]	[ ]	[ ]	[ ]

Appendix C

Long Interview Protocol

Focus Group Interview

Introduction: Hello, How are you all today? I'm Dr. Clowes, your moderator for this session. I am a professor of education at Virginia Tech, and this is Wendell Perry, a Doctoral student at Virginia Tech and an instructor of Mathematics here at Halifax Community College. Wendell and I are concerned about mathematics anxieties and attitudes toward the learning of mathematics that Developmental Math II students might have.

Ground Rules: We would like for only one person to speak at a time so that what each of you have to say can be clearly recorded. Please don't carry on side conversations because everything you have to say is very important to us. We are here to learn from your experiences in mathematics. You may want to make some notes before you make your statement.

Warm-up: Would each of you please tell what program you are enrolled in here at Halifax Community College? If you are not enrolled, why?

What has been your experience with mathematics at Halifax Community College?

Probing for Math Anxiety

1. One thing I have heard students in a math class say is: Whenever they try to solve a word problem they get a mental block - I wonder what you have to say about your problem-solving experiences?

2. You have gone to your advisor to register for classes - You have been told that you have to take an introductory to algebra course - Your first reactions are?

3. Given a homework assignment on problems you don't fully understand and they are due the next class meeting, how do you react to this?

4. You are sitting in a math class, several problems have been worked by the instructor that you don't understand, you don't ask questions because

5. Your math instructor has just announced that there will be a test on the materials that we are studying now next week, I wonder what you have to say about your experiences over the week knowing that you have a test coming up?

6. Would you share your reactions just one hour before you take a math test?

7. I have often heard students in a math class say during a test they have various physical reactions: butterflies in their stomachs, sweaty palms, feel nausea, headaches - I wonder if you would share your experiences during a math test.

8. You are told at the beginning of your math test to do your best because this test is very important. Would you share your reactions after you hear this comment?

9. Math is always the last thing I want to take because

10. Just walking into a math class I

11. In order to do math you must be born with math

ability - would you please share your feelings on this comment?

12. I used to enjoy math until - Please state two or more experiences that caused this change.

Probing for Math Attitudes

1. When I think of math, the first words that come to mind are

2. Most subjects I can handle o.k., but when it comes to math I have

   Why?

3. Mathematics is of no importance to me, I'll never need it. Would you share with me your thoughts on this comment.

4. To be successful in math you must have a math mind - What are your thoughts on this statement?

5. Figuring out math problems does not appeal to me because

6. When a question is left unanswered in a math class, I

7. I usually let (husband, wife, sister, brother) handle all of my affairs that need math because

8. I'm just too slow to do math in my head (agree, disagree). What are your thoughts on this?

9. I usually spend (more, less, about the same amount of) time on math as I do on my other subjects - Why?

10. Males naturally do math better than females. Comment on this statement please.

11. I never feel secure about attempting mathematics problems because

12. When it comes to math, my teachers (have always, have never) - How would you complete that statement?

Close-out Are there other experiences that you had in math that you would like to share at this time?

Final Comments:

Thank you so much for your time and comments. The comments you have made are very valuable to this study. You have been a tremendous help. We have really enjoyed talking with you. We might want to get together again before the study is completed. Thank you.

Appendix D

Request to use Richard M. Suinn's Mathemaitcs Anxiety Rating Sclae

P. O. Box 312
Garysburg, NC 27831
October 3, 1990

Dr. Richard M. Suinn
Rocky Mountain
Behavioral Science Institute, Inc.
P. O. Box 1066
Fort Collins, Colorado 80522

Dear Dr. Suinn:

I am a doctoral student at Virginia Polytechnic Institute and State University in Blacksburg, Virginia. I am assessing the attitudes and anxieties of African-American students that are enrolled in Developmental Mathematics II (Remedial Algebra) at Halifax Community College. I would like very much to have your permission to use your Mathematics Anxiety Scale in my study.

Please send me a copy of it.

Thank you very much for your consideration.

Yours in better education,

Wendell Perry

Rocky Mountain
Behavioral Science Institute, Inc.
P.O. BOX 1066 • FORT COLLINS, COLORADO 80522

Wendell Perry
PO Box 312
Garysburg, NC 27831

October 9, 1990

Dear Mr. Perry:

Thank you for your interest in the **Mathematics Anxiety Rating Scale**. Enclosed is a sample copy of the **MARS, MARS-A, & MARS-E**. We regret that we cannot allow you to reproduce them free of charge. Much of the use of these instruments are for research purposes in a school setting and we cannot discriminate on pricing. They are copyrighted instruments and available for purchase through RMBSI, Inc. for $60/100 MARS & MARS-A, and $30/100 MARS-E.

Good luck with your research. Please contact us if you would like to order.

Sincerely,

Ruth W. Edwards

Ruth W. Edwards, Ph.D.
Executive Director

Enclosures

cc Dr. Richard M. Suinn

Executive Director
Ruth Edwards, MBA

Directors
Fred Beauvais, Ph.D.
Charles W. Cole, Ph.D.
John E. Hinkle, Ph.D.
C. Dean Miller, Ed.D.
Weston H. Morrill, Ph.D.
E. R. Oetting, Ph.D.

INVOICE

Rocky Mountain
Behavioral Science Institute, Inc.
P.O. Box 1068, Fort Collins, Colorado 80522

TERMS: 30 Days
Past Due accounts are subject to a service charge of 1½% per month. An account is past due when unpaid after 30 days. In addition, costs and reasonable attorney's fee for collection may be charged.
Please pay from Invoice.

DATE February 8, 1991

PURCHASE ORDER NO

BILLING ADDRESS

Wendall Perry
PO Box 312
Garysburg, NC 27831

DELIVERING ADDRESS

Samd

QUANTITY	DESCRIPTION	UNIT PRICE	TOTAL PRICE	
100	Mathematics Anxiety Rating Scale (MARS)	$60/100	60	00
	Shipping & Handling		4	25
	Paid CK#586		-60	00
	TOTAL		4	25

Appendix E

Request To Use Fennema-Sherman's Attitudes Related to the Learning of Mathematics Scales

P. O. Box 312
Garysburg, NC 27831
October 15, 1990

Dr. Elizabeth Fennema
Wisconsin Center for Education Research
University of Wisconsin-Madison
Madison, Wisconsin 53706

Dear Dr. Fennema:

I am a doctoral student at Virginia Polytechnic Institute and State University in Blacksburg, Virginia. I am assessing the attitudes and anxieties of African-American students that are enrolled in Developmental Mathematics II (Remedial Algebra) at Halifax Community College. I would like very much to have your permission to use your nine, domain specific, Likert - type scales measuring important attitudes related to mathematics learning.

Please send me a copy of each and bill me for any expense that you may incur.

Thank you very much for your consideration.

Yours in better education,

Wendell Perry

RECEIPT

Ck. 551
№ 25853

University of Wisconsin-Madison

Received from Perry Wendell Date Dec. 12, 1990

Amount eleven dollars $ 11.25

For 1 - Copy Sherman Scales, Proc. Fees, 1st Class

Department UCEP Center Document Service Signed Elaine Larson

Appendix F

Letter of Permission To Do Phase One of the Study

P. O. Box 312
Garysburg, NC 27831
December 4, 1992

Dr. Elton L. Newbern, Jr., President
Halifax Community College
P. O. Drawer 809
Weldon, NC 27890

Dear Dr. Newbern:

As you are aware, I am a doctoral student in the department of Administrative and Education Services at Virginia Polytechnic Institute and State University majoring in Community College Education. As a part of my dissertation proposal approval, I have been asked by the chairman of my dissertation committee, Dr. Darrel A. Clowes, to begin gathering data for the first phase of my proposal. I now request your permission and the permission of the Board of Trustees to pursue this study on the campus at Halifax Community College by using all the Developmental Mathematics II classes this winter quarter.

Mrs. Donna Davis and the part-time faculty members, who teach Developmental Mathematics II courses, have consented to administer two Likert-type scales for me in their respective classes. The two scales are the Mathematics Anxiety Rating Scale and the Fennema-Sherman Attitudes towards the learning of mathematics scale. It should take atmost twenty minutes for each scale when administered.

The two scales do not contain any sensitive information or information that would jeopardize any student or instructor. However, I have asked for the social security number, gender, race and the number of times each person has taken the Developmental Mathematics II course so that I may use this information for future reference to some individuals in phase two of the proposal. This personal information will not be included in any part of a written report.

If you need further information concerning proposal research questions, methodology, or other aspects of my

proposal, please let me know. Thank you for your continued support.

Sincerely,

Wendell Perry

copy to: William T. Stanley
Evelyn Lewis

HALIFAX COMMUNITY COLLEGE

P.O. DRAWER 809 WELDON, N.C. 27890 (919) 536-2551

DR. ELTON L. NEWBERN, JR.
PRESIDENT

December 7, 1992

Mr. Wendell Perry
P. O. Box 312
Garysburg, NC 27831

Dear Mr. Perry:

On behalf of the Board of Trustees, your request to gather research data for the first phase of your dissertation proposal on Halifax Community College's campus during winter quarter 1992 is approved.

I wish you much success as you begin your project.

Sincerely,

Elton L. Newbern, Jr.
President

Appendix G

Letter of Permission to do Phase two of the Study

P. O. Box 312
Garysburg, NC 27831
October 11, 1993

Dr. Elton L. Newbern, Jr., President
Halifax Community College
P. O. Drawer 809
Weldon, NC 27890

Dear Dr. Newbern:

As you are aware, on July 20, 1993 I passed my dissertation prospectus examination. As a result of this, I am now able to move into phase two of my data gathering process. This phase will consist of focus group interviews with some African-American students here on campus who responded to the surveys in phase one. The date for these focus group interviews has been set for November 12, 1993. I am now requesting your permission and the permission of the Board of Trustees to use these African-American students, and to hold these interviews on Halifax Community College campus in the board room of the student center. Dr. Darrell A. Clowes, my dissertation committee chairman, will be on campus to assist in the focus group interviews.

African-American students will be chosen to participate according to their high anxiety scores as measured by Richard Suinn's Mathematics Anxiety Rating Scale, and/or their negative attitudes toward the learning of mathematics as measured by Fennema-Sherman Attitude Scale. Each of these students will be sent a consent to participate form. This consent form spells out the nature of their involvement, their right to withdraw or not to respond to a question if they chose to do so, the purpose of the study, and that the interviews will be audio-taped. No sensitive information or information that will jeopardize any student or instructor will be asked.

If you need further information concerning this phase of my data collection, please let me know. Thank you for your continued support.

Sincerely,

Wendell Perry

copy to: William T. Stanley
Dr. James L. Person

HALIFAX COMMUNITY COLLEGE

P.O. DRAWER 809 WELDON, N.C. 27890 (919) 536-2551

DR. ELTON L. NEWBERN, JR.
PRESIDENT

October 13, 1993

Mr. Wendell Perry
P. O. Box 312
Garysburg, NC 27831

Dear Mr. Perry:

In reference to your letter dated October 11, 1993, your request to use Halifax Community College students for the interview/data gathering stage of your dissertation is approved. Approval is also granted for you to conduct these interviews on the college campus, Room 308, on November 12, 1993.

I wish you much success as you pursue your educational objectives.

Sincerely,

Elton L. Newbern, Jr.
President

Appendix H

Certification of Exemption of Projects Involving Human Subjects and Consent to Participate Forms

CONSENT FORM

Thank you very much for your participation in one or both of the self-assessment surveys on mathematics anxiety and attitude towards mathematics given to you in your Developmental Math II class last winter quarter. This time I am asking you to please participate in a focus group interview on Halifax Community College's campus. The focus group will consist of six to eight students who were enrolled in Developmental Math II during this particular quarter and participated in the surveys. The focus group interviews will be moderated by Dr. Darrel A. Clowes and me. Dr. Clowes is a professor in the Department of Curriculum and Instruction at Virginia Polytechnic Institute and State University which is located in Blacksburg, Virginia. I am located in Office 138 on your campus. The telephone number to my office is 536-7239. Please call or come by the office for further information.

The focus group interview process that I am asking you to volunteer to participate in will address the special concerns that I, as a graduate student with Virginia Tech, have with the possible existence of mathematics attitudes and anxieties of the African-American students in Developmental Math II classes at Halifax Community College. Therefore, the focus group interviews will focus on your feelings and experiences with math, especially Developmental Math II. The focus group interview will last at least one hour and it will be audio-taped by Melvin Margerum. During the transcription of the tape all identifying names, if any names are given, will be removed to provide total anonymity. Furthermore, if the data is used in any of my final reports, the identity of any individual will be masked in such a way that quoted comments cannot be attributed to any one individual.

Your decision regarding volunteering to participate will not affect your status here at Halifax Community College in any way. Your volunteering is very important in helping me to accurately assess the mathematics attitudes and anxieties of African-American Students in Developmental Math II.

The focus group interviews will be held on November 12, 1993 at 10:00 A.M. and 1:00 P.M. in the Student Center's Conference Room (room 308) at Halifax Community College. Please select the time that is convenient for you. If you have a class, I will get an excused absentee for you. If you are not enrolled, we still want your participation. If you decide to participate, you may choose not to answer or make any comment on any question, and you may discontinue your participation at any time without penalty or prejudice, by stating that you do not wish to participate any further. You may then quietly get up and leave the group.

This study has been approved by the President, Dr. Elton L. Newbern, Jr., and the Board of Trustees of Halifax Community College. The study has also been approved by Dr. Ernest R. Stout, Chairman of the Institutional Review Board, and by the Human Subjects Committee at Virginia Tech. If you have further questions you may contact Dr. James L. Person, Dean of Student Affairs at Halifax Community College (536-7203) or Dr. Darrel A. Clowes at Virginia Tech (703 - 231-5269).

Your signature below indicates that you have read the information above and have agreed to participate in a focus group interview under the conditions described above. If you will volunteer to participate, please return this Consent Form or bring it by my office no later than **November 8, 1993.**

CUT HERE AND RETURN THE BOTTOM PORTION

CONSENT FORM

_____ _____

Signature of Participant Date

_____ _____

Telephone Number Time I wish to Participate

CERTIFICATION OF EXEMPTION OF PROJECTS
INVOLVING HUMAN SUBJECTS

Principal Investigator(s): Wendell Perry and Dr. Darrel A. Clowes

Department(s): EDAE

Project Title: Dissertation

Source of Support: Departmental Research _____ Sponsored Research _____ Proposal No._____

1. The criteria for "exemption" from review by the IRB for a project involving the use of human subjects and with no risk to the subject is listed below. Please initial all applicable conditions and provide the substantiating statement of protocol.

[WP] a. The research will be conducted in established or commonly established educational settings, involving normal education practices. For example:

1) Research on regular and special education instructional strategies;

2) Research on effectiveness of instructional techniques, curricula or classroom management techniques.

[ ] b. The research involves use of education tests (__ cognitive, __ diagnostic, __ aptitude, __ achievement), and the subject cannot be identified directly or through identifiers with the information.

[WP] c. The research involves survey or interview procedures, in which:

[WP] 1) Subjects cannot be identified directly or through identifiers with the information;

[WP] 2) Subject's responses, if known, will not place the subject at risk of criminal or civil liability or be damaging to the subject's financial standing or employability;

[WP] 3) The research does not deal with sensitive aspects of subject's own behavior (illegal conduct, drug use, sexual behavior or alcohol use);

[ ] 4) The research involves survey or interview procedures with elected or appointed public officials, or candidates for public office.

[ ] d. The research involves the observation of public behavior, in which:

[ ] 1) The subjects cannot be identified directly or through identifiers;

[ ] 2) The observations recorded about an individual could not put the subject at risk of criminal or civil liability or be damaging to the subject's financial standing or employability;

[ ] 3) The research does not deal with sensitive aspects of the subject's behavior (illegal conduct, drug use, sexual behavior or use of alcohol).

[ ] e. The research involves collection or study of existing data, documents, recording pathological specimens or diagnostic specimens, of which:

[ ] 1) The sources are publicly available; or

[ ] 2) The information is recorded such that the subject cannot be identified directly or indirectly through identifiers.

2. I further certify that the project will not be changed to increase the risk or exceed exempt condition(s) without filing an additional certification or application for use by the Human Subjects Review Board.

Note: If children are in any way at risk while this project is underway, the chairman of IRB should be notified immediately in order to take corrective action.

Wendell Perry Oct. 4, 1993
Principal Investigator(s) Date

Dr. Darrel A. Clowes
Principal Investigator(s) Date

Departmental Reviewer Date

Chair, Institutional Review Board Date

Appendix I

Transcriptions of Long Interviews

HALIFAX COMMUNITY COLLEGE
Student Interview Notes
10:00 a.m. Session

(could not understand the beginning of the tape)

INTERVIEWER: Are you taking math at this time?

STUDENT: No, I had to take Math 90 before I could get into the nursing program; it's required.

INTERVIEWER: But then you will have to take math again?

STUDENT: No.

INTERVIEWER: Not in the nursing program?

STUDENT: No.

INTERVIEWER: Why did you decide not to take math this term?

STUDENT: I just was not ready.

INTERVIEWER: Ready for what?

STUDENT: Probably because I really have to focus on that and, well, what I heard was that it was real hard. (could not understand) I am going to let that wait.

INTERVIEWER: How about you? (talking to another student)

STUDENT: I'm not good at math and right now I want to wait to take math because, well, it's like her, I am not smart in math, and taking math and other subjects. I would fail somewhere, and probably that math.

INTERVIEWER: To some of us, math is a nervous situation to begin with. Can you remember back to last semester when you were taking math, early in the term when you were just beginning? Can you describe your feelings about that?

STUDENT: Well, it was much easier because I took it twice. It was too fast the first time. You couldn't

learn--well, you could, but it was just hard. It was just hard. The second time it was just like a piece of cake.

SECOND STUDENT: I took it in high school and it was a lot easier for me, but the ones who had never taken it before, those were the ones who failed because I was making A's some, and they were like how do you all do this; show me! I felt sorry for them because, you know, the teacher, you know they say like slow down, can you go back and show us this, and she would say like I can't, you know, it's required by the school you got to cover this much. And then they would go on to the next step and they never did learn the first one, you know what I'm saying? To me, I knew it because I had it in high school and it was easy for me. But it was hard for them. And then my sister, we both were in it, and she tutored some students and she really took the time and showed them. Kind of like, oh this is what she was saying. Then, you know, when we get into the classroom, we just go to another step of math and then, like, oh God, I've messed up all over again. I mean, they get confused.

INTERVIEWER: You showed, at least put on the test, said you were anxious about math.

STUDENT: Anxious, I've always loved math. To me it's like a challenge. It makes sense; you learn what you have to do; you got to remember what you learn from your previous math and math they give you now. I was always good in math, algebra, geometry. I loved it. I really love math, you know, but a lot of people don't like it. To me it was easy.

INTERVIEWER: She is saying that it was easy for her, but she was anxious about it. What about you? Does that fit your pattern?

STUDENT: No.

INTERVIEWER: I didn't think so.

STUDENT: Because I don't like math. I don't like math period.

ANOTHER STUDENT: Algebra was my first time taking it; I never had it in high school and I failed Math 90 the first time. No, the first time I passed Math 90; Math 91 I failed it. One thing was that I missed the first three days. If you miss the first three days, you may not even want it in the first place. And then, you got to know the patterns in order to go to the next step because all the other steps come behind those first ones all the way through, and I missed that. And by missing that, I failed that altogether and I had to take Math 91 twice. The second time it was easier because I started the class on time. Still, I don't like math. I knew I had to keep up with it in order to pass it and to get out of it. But math is nothing I like.

INTERVIEWER: Let me sort of interject here. I keep hearing you say math is nothing I like. Let's get into that "like" a little bit if we can. Can you open up a little bit more? Where did that "not like" come from? Can you go back a little bit? Is there an experience that you had somewhere down the line where maybe sort of made your mind set that you just don't like math? Somewhere down the line can you recall anything? Just take your time. Relax.

STUDENT: I don't know. I guess it's ... I'm not going to say that.

INTERVIEWER: Do you want to think a little bit?

STUDENT: Yes, I'll think a little bit on it.

ANOTHER STUDENT: You probably don't like math because math is like a experiment, ok. You have to feel within yourself and especially if it is related to a course here and, if you flunk it, it make you bring down your self esteem about yourself; like you are dumb, and especially if you see a lot of other people passing it and you are not passing and it make you feel very bad about yourself and that's why most people say they don't like it, but you got to look at it in a way of I can do it. If they can learn it, I can learn it, too. You have got to tell yourself because you know nothing is hard.

STUDENT: I agree nothing is hard; it's just the fact that math is something that I never cared about. I learned math. But it is just something....it's just the things you have to do in math; the things you have to keep up with. And the steps and something that I didn't have in high school and doing it out here is a totally different thing for me and doing so.

INTERVIEWER: Talking about not taking math in high school, you didn't have any math at all?

STUDENT: I had math but not algebra. I did basic math. Adding, subtraction, fractions. I guess it would be ok if they would go a little slower. They go through too many chapters, you know, and it's a whole lot for you to remember, especially when you are doing all those exponents, x's and y's and this kind of stuff. And that "110" from what I can see, Lord have mercy; most of the stuff that you do is either a right or a wrong.

INTERVIEWER: Was 91 what you repeated?

STUDENT: Yes.

INTERVIEWER: Did you feel differently about it the second time?

STUDENT: I knew I was going to pass it the second time. You can sit in a class and even if you see you are failing, you can sit back and instead of dropping out, you can just sit back and see, you know what's going on and then the second time you take it, you just pick it up. You can see the steps because you have been in there the whole three months. So you know basically what's going on. You really know that much by the time you got to that spot.

INTERVIEWER: Would I say it right if I would say that second time around when something comes up it is not something new? Is that the difference?

STUDENT: No.

STUDENT: There is nothing new because we have already seen it, and we about know what to do next time. Like taking tests over. And by missing the first three days

of Math 91 that throws it way off. If you miss one day, you are lost. Yes, cause then you done gone on to another chapter. And that first chapter before that you missed, it's that chapter that keeps you going through the book. You don't stop and go back, you go forward. It's always the same thing; you just add a little bit more to the next chapter. It's another problem but it's the same just like the beginning of the book.

STUDENT: You keep going; you can't go back because that requirement has got to be met. It's required by HCC. They got to reach that point, you know. And I tell you the truth, the teacher, she say we are behind, but I don't understand; well we got to go; we got to cover. She begins like worry herself. We got to reach this point, class. And they (the students) are like ..."God, I know I got to take it over." We got to get where Miss so-in-so is at. Yes, even if we are behind we have got to catch up with this other teacher. Like you said, we have to be up to where we are suppose to be even though you don't even know. I guess this is why a lot of them get an "IP" or drop out.

INTERVIEWER: Does that upset you when she says we have got to catch up?

STUDENTS: Yes! Yes! Oh, yes. We don't know it.

INTERVIEWER: Then you become a little more anxious then, right? Is that what you are saying?

STUDENTS: Become worried. We get upset at the school?

INTERVIEWER: That's sort of compounding the situation when you begin rushing; you get upset and stuff.

STUDENT: Sometimes you say to yourself, just forget it.

STUDENT: But I say I am going to try. If I flunk, I flunk.

INTERVIEWER: What happens if you end up with one of these things where they get ahead of you or get away from you? Is there a way to catch up?

STUDENT: No, because they can't go back. You just have to pick up where you stopped. That's right. Ask someone who do know how; ask them because they know how to do it. Like you might go to the teacher and if he's got the time, he'll show you. But again, he explain it so fast, you know.

STUDENT: I took some tutoring classes and that helped me out, too.

STUDENT: One teacher took time out and that was at 8:00 in the morning and she didn't have to do that. She showed us some steps. This was my second time in Math 91.

INTERVIEWER: What prompted you to go to that?

STUDENT: Because I wanted to know how to do it.

INTERVIEWER: And she made that special effort to be here?

STUDENT: You know I wanted to know if I be here at 8:00 in the morning. We didn't have to be here at 8:00 in the morning, but we wanted to understand it and learn it because of the fact that we were taking a class and we did want to pass--I did--and I know that I got this Math 110 ahead of me, so I had to come on out of that class. And I wanted to learn it.

INTERVIEWER: How do you feel about knowing that you have to take Math 110 now?

STUDENT: My instructor tried to get me to take it the winter quarter but with all the other classes right now I don't want to take it yet because at 8:00 in the morning, my mind is not functioning like it should be on math at 8:00 in the morning because I work second shift. It's too early and then it is only offered again at 1:00 so I don't want it at 1:00 because I am rushing too because I got to be at work that evening. So any way, either way I've got to take it. and I've seen the book and I read the problems (word problems). I don't like reading problems.

INTERVIEWER: You don't like word problems? Say something about that? Just what bothers you now when

you talk about solving word problems?

STUDENT: I get lost in which way I am suppose to go with it. What am I suppose to do - division or what? I don't know what I'm suppose to do with it unless I understand what I am doing. And with that, I get lost.

INTERVIEWER: You get lost. Do you say "what the heck" with it or is your mind blocking or something?

STUDENT: My mind is blocked is the reason I can't figure it out.

STUDENT: Sometimes I can read it but I just don't understand it. I get confused.

INTERVIEWER: Terminology sometimes bothers you.

STUDENT: Just reading it over and over again.

INTERVIEWER: What happens when you do this?

STUDENT: Like you say, it's blocked. Which way do I go? I leave that problem alone and go to the next one. If I can see a way I can do that one, then the next problem you can sometimes go back and figure out what to do with the one you skipped.

INTERVIEWER: Gives you a little confidence right here, then.

INTERVIEWER: I would like to go back to when you took math in high school. Was it the same pattern there?

STUDENT: No, it was much easier. It went a lot slower. Yes, you had a whole year or so and in this you don't have but three months. It's a lot to learn. You have to learn a year and a half in three months. You know, they crowd it all in there. And that makes it really, really hard to do. You have only one day to cover that section. When you only have one day to do it and then go to something else. Sometimes you do two parts in that one day. That's a whole lot to keep up with especially if it's those big long word problems that takes up a whole page.

INTERVIEWER: But now, is that changed from the way you felt about math back in high school to the way you get it here?

STUDENT: Yes, it's a big change.

INTERVIEWER: Is the time the only difference between when you were successful with it back there?

STUDENT: Yes, I was good in it back there because, you know, like I say, it was the time; you had more time to work on that one part than what we have here. You could get this part and go to the next part. Just too rushed up to try to get everything.

INTERVIEWER: Does that fit with each of you two?

STUDENT: Well, I had general math in school and it wasn't a problem, just general math. It was just that I had to pick it up when I came here and I guess that's the difference in it for me. I never had algebra when I was in high school, but I took it and it was a challenge for me to take algebra. And, I had learned some of the things that was in Math 90 like fractions and things when I was in high school, but I had kind of lost track of it, but it wasn't hard to pick that up in Math 90. But in Math 91 it was hard. I think I did good not to have had it before. So my challenge now is 110.

INTERVIEWER: You got a fear, it seems like, right? You said it's a challenge to you.

INTERVIEWER: Why did they not talk to you then to take algebra in high school since it sounds like you both are going to have to take it here?

STUDENT: I took algebra in high school. I just forgot it; it has been so long. It's something you forget when you don't use it everyday.

INTERVIEWER: Well, that's true. What did you take, one course then in algebra? Did they not encourage you to take more?

STUDENT: We didn't have to take but two maths, and I didn't go any higher after I passed what I had to do.

INTERVIEWER: Have both of you changed the idea of what you want to do from the actual time you were in high school until now?

STUDENT: What do you mean by that?

INTERVIEWER: Well, there are many areas you are looking into going that apparently require math. Did anyone talk to you before in high school about your planning on going into nursing about the math you have to take? Did they give you any advice or suggestions?

STUDENT: Most of them said, like, take these two maths. Mostly like basic math, general math, and that's it. They don't teach you like, well you are doing good in general math; you can go ahead and go to Algebra I. They don't ever tell you about your careers, what you want to do. They don't never say, like, if you want to be a teacher, you need to take Algebra I--they don't tell you that. I think they need to do that. Don't get any encouragement about your needs or what you are going to do in your life.

STUDENT: But, my son, he's in Algebra I and he likes it. I don't know where he gets it; and he's good at it because I had him doing my lessons here so he knows what he is doing. I'm glad of that because it will follow him all the way through and he's only in the eighth grade.

INTERVIEWER: How about for you? I assume that at this stage you will encourage him to continue to take math. Did your parents do that to you?

STUDENT: No, I was just like on my own when I took it in high school and general math is what I took all the way through. I didn't have algebra; they had that trigonometry and stuff like that, but I had only took general math. I guess it would have helped me if I had had algebra.

STUDENT: Yes, you can't turn back the clock.

STUDENT: Yes, that's all right. I'm picking it up.

INTERVIEWER: What about you? Did you get any encouragement from your parents?

STUDENT: No, it about basically what I picked up here that determines what I can do. I'm good in math. I kind of like math until I get to something that really bothers me--I can't do it...then I can, too, if I put my mind to it. I know I can do it. Sometimes you have so much to do. It kind of gets in my way and I don't have time to think about it.

INTERVIEWER: Is there any particular parts in math that gives you problems?

STUDENT: Mostly, like I say, the word problems are the ones that really gets to me when you have to keep going back and forth into it or doing something. Otherwise, I like math.

INTERVIEWER: Is that the general consensus; that word problems seem to be the thing that stands out? Is there anything else that you sort of get upset when it comes to math--word problems, reading problems?

STUDENT: Word problems are about the hardest, but all the rest of it is pretty easy. When she be writing on the board, I basically know it.

INTERVIEWER: What happens come around test time?

STUDENT: It's all right as long as I know it and I knew what was going to be on the test and I knew I had already learned that. I be nervous now because they all try to get you out without no mistakes.

STUDENT: Sometimes when it is time to take the test you know it, but when you do it, your mind just goes blank because you are saying well I know I'm going to pass this but you forget that one step, and when you forget one step, you throw the whole thing off. and the problem is wrong. So many steps. Forget exponents, positive, negatives...always got to be conscious of these things when doing math.

INTERVIEWER: Are test a bad time? I shouldn't say that because they are never good times. Are they bad or terrible at times?

STUDENT: When you study and you know what problems they are going to give you and you know what you are

suppose to do, then, to you, it's like, it's not as bad but you have problems with that problem and it's on the paper and you, like, oh my God, what do you have to do with it and then you start getting test anxiety and then all ones you do know you are going to miss on that one because, you know.

INTERVIEWER: What about someone announcing a test several days in advance?

STUDENT: Most of the time, our instructor, he'll give us examples just like what's going to be on the test. Only thing you got to do is study that.

INTERVIEWER: So that doesn't bother you at all when you have examples to study by?

STUDENT: Right. Showing us about what is going to be on the test-- it much easier that way. It doesn't be the same problems that he gives us. It will still throw you off because it will be some different that aren't just like what he gave us. You, like, have to do another extra step than what was in the example. That's why you have got to know it.

INTERVIEWER: Does that bother you when you come to something like that, like, oh my God, here is something he didn't talk about or he didn't show us to review or something. Does that bother you?

STUDENT: No, if I know it, it don't; if I don't I just skip it and go on to the next one and come back to it.

INTERVIEWER: What about you?

STUDENT: No if it is similar to the ones that I have learned. And it wouldn't be no problem as long as I already know it and if it is similar to the examples, it's not hard.

INTERVIEWER: What are you going to be studying here?

STUDENT: Social worker.

INTERVIEWER: What about you?

STUDENT: Same, but I might change it; I'm thinking about changing it.

INTERVIEWER: To what?

STUDENT: I am undecided because there are so many. Maybe criminal justice.

STUDENT: That requires math too, right?

INTERVIEWER: Criminal justice, yes, it requires Math 110. In order to get an associate degree in applied science from us, you have to have that Math 110 (General College Math); that's required by the Southern Association.

STUDENT: Most curriculums require Math 110.

INTERVIEWER: You are talking about nursing. What level? Is that the RN?

STUDENT: The first level is LPN and the second level is RN.

INTERVIEWER: So you are going to start with the first level and work your way through?

STUDENT: I'm on the first level now. The only math I had to take was Math 90 for the nursing program.

INTERVIEWER: So the RN move to the next math.

STUDENT: No math required in nursing?

INTERVIEWER: No math for RN nursing?

STUDENT: That's it. I'm glad. So many students have problems. That's the only good thing about it.

STUDENT: But you like math.

STUDENT: Yes, I like it.

INTERVIEWER: There is something that keeps puzzling me. I don't know whether you can help me or not. When Mr. Perry asked you to take that survey (questionnaire) for us, the way you answered was interpreted that you

were anxious about math. Yet when we talk here, you do not sound very anxious.

STUDENT: What do you mean by anxious? When we go over it, or when we are taking it, does it mean it makes you anxious.

INTERVIEWER: Not the quickness anxious. We are talking about bodily reactions to something. That's what we call anxious. We say people are anxious when, like you said you get a mental block. Can't do this. You become anxious, like that. Not when you are in a hurry. Not in a hurry to do something--it's like, God, I can't do that. According to research, that's when people become anxious when they get to a word problem and they can't do it. They have a mental block.

INTERVIEWER: We are talking about a physical response. Test anxiety can do that, but it can be other things, too. I guess that's a legitimate question to ask to get a sense at the physical response.

INTERVIEWER: In this math-setting problems, do you get any physical reactions that you recall?

STUDENT: I try to think what did I put on that paper.

INTERVIEWER: I'll be glad to show it to you.

INTERVIEWER: I know that when Wendell gets anxious, his stomach growls.

INTERVIEWER: He should know. Every time I go to his office to talk with him I get tensed up for some reason; I get anxious. I was anxious a few moments ago when I was worrying about the students coming. That's what we are talking about. Reactions like that.

STUDENTS: We saw it.

STUDENT: I have had the headache. Then start moving my legs. I just get nervous.

INTERVIEWER: That's the anxiousness we are talking about. What we are trying to look at is to see if we can find that these physical reactions exist. Sometimes, research says that that part can sometimes

be alleviated by doing certain things provided that the instructor knows that there is some anxiety within the classroom with some students. They (instructors) can, sometimes, now move those things because they (researchers) say that if there is some anxiety there, the math will not be performed. There will be a blockage and you can't do it. She says she gets a headache; and you are not thinking straight. When her legs are shaking and so forth, what it is saying to her is hey, something here is not going right and I am not functioning properly here and your mind is not functioning properly. That's what we are trying to say.

INTERVIEWER: But I don't hear you two describing that kind of situation.

STUDENT: I get puzzled.

INTERVIEWER: Puzzled, ok.

INTERVIEWER: But that's more of a mental state.

STUDENT: I get nervous and in my mind, I'm and wondering what I am suppose to do. But on the test, I always gets nervous, any test. And I am blocking my whole mind out because I am sitting up there nervous. So, I am always nervous at test time.

INTERVIEWER: That's normal. In fact, certain nervousness is pretty helpful; it helps us focus.

INTERVIEWER: What we are trying to get at is if you go through the whole quarter, not just at test time, but in a math situation, just walking to class sometimes and say God, why do I have to go to this class; I hate it. You see. What did you say? You said no, I just said walk to class.

STUDENT: Yes, I be thinking what you got to do when you get in there. It's all right. If I know I am passing it, I feel good. I mean I feel good about myself. Like I said when I took Math 91 twice, the second time going around, I didn't mind the classes. I liked the class because I knew what I was doing. So once I know what I am doing, I feel good about. If I don't know it, I know I am going to get nervous. It

all right as long as I know it and I knew that.

INTERVIEWER: This is helpful, your answers. One of the things that Wendell's work is doing is raising some questions about just what the test indicated, and what you are saying is helpful and we are trying to make some sense of it. One of the awful things in this business is that you don't always know what the test are testing. People go through all these funny ways of doing tests but they are never really sure because they are messing around with people. Pretty imprecise business. I think what we are hearing you say is that you get a certain amount of anxiety mostly during testing situations. But it is not a problem; it's a natural reaction. You talk about occasionally having a headache reaction, stress reaction. And that's a more direct manifestation that they would anticipate but with a small sample of three, I don't attribute it directly to anxiety. Yet you are tested about the same. It raises the question of what the test results tell you but it doesn't answer the question.

INTERVIEWER: Wendell, do you have anything else you want to say?

INTERVIEWER: No not unless you all have something else you want to say now that we are talking, some other experiences. We are still talking about math and something you may want to throw out and share with us.

STUDENT: I'm looking forward to going to Math 110.

INTERVIEWER: You are looking forward to Math 110?

STUDENT: No more than unless they can go a little slower. And spend a little more time. Maybe they could go back and not try to cover the whole book.

INTERVIEWER: What about the tutoring sessions or math lab? Do you have any help with that?

STUDENT: Some of them do and some of them don't. If you can find somebody who can tutor you. You have to understand what they say. My sister-in-law was helping me while back in business math. She would sit there and do the problem which took the whole page, but yet she couldn't explain to me how she did that problem.

Still, yet I don't know, it's like that with a tutor, a person cannot tell you something if you don't know the person and I am not involved with that person. I don't think I could still pick it up from someone I don't know. I guess that's why I have never had a tutor out here. So, I try to catch it while I'm in class or at home and look at it more carefully.

INTERVIEWER: You have your son to help you.

STUDENT: Yes, he's good so I'll get him to help.

INTERVIEWER: Yes, that time problem is a tough one to do and you are never really sure of the right answer on it. One answer is you get through the book and other answer is you get through the book and don't have the students with you, it doesn't make much sense. So every teacher has to do a trade off.

INTERVIEWER: Ok, I think some of you have classes, right? Thank you for your time and your efforts this morning. It's been quite helpful. Leave your consent form because we will need that for our records. You've been very helpful. Thank you very much.

HALIFAX COMMUNITY COLLEGE
Interview Notes
1:00 p.m. Session

INTERVIEWER: We know that from your scores that you two are anxious, and Wendell is doing some statistical things with the results of the test, but the other part of it is that we can get responses on the test, but you don't know what they mean.

STUDENT: Right.

INTERVIEWER: And we don't know this.

INTERVIEWER: The evaluation of the responses that you made; it tells us that you fall into this category of students, but we don't know a whole lot about what goes on behind that. But what it's really saying is that you're anxious, anxious about math. And what we are curious about is what in the world anxiety is, in that sense, to a real person. Does that mean anything? In any event, it may not mean a darn thing. That is why we are curious about it. Wendell's interest is that he has been teaching a long time and sees a lot of people who are having difficulty with math. This concerns him and he wants to try to understand the problem more. He and I have been concerned with the same kinds of problems. That is why we are working together on this. So that's really what we are about. I encourage you to chat with us a little bit about yourselves. Does the notion that you are anxious in math sound right? Reasonable? Is that reasonably describing yourself? We want to tape this, too, if you don't mind. Go ahead.

STUDENT:: Well, I wouldn't say I was anxious; it's that I just need a lot more help in the algebra part. The other parts of math are ok. Once it gets to the algebra stage, especially the college algebra, calculus, that's when it gives me difficulty.

INTERVIEWER: But the word term you are using is difficulty, not anxiety.

STUDENT: Yes.

INTERVIEWER: How does that fit with you?

STUDENT: I wouldn't say anxious either. Some math I could do. But when I was taking Algebra, I had a lot of problems because I never took algebra when I was in high school. So that made it difficult, too, when I came out here and had to take it.

INTERVIEWER: You took Math 91 here. Did you do all right the first time?

STUDENT: No. I had to retake it.

INTERVIEWER: Worked better the second time?

STUDENT: Yes. The second time more of it just came to me.

INTERVIEWER: Have you been away from school for a while?

STUDENT: Yes, I graduated in '79.

INTERVIEWER: I can see that. I took a ten-year break. Years just don't go together very well.

STUDENT: It's hard to get back into it (school) altogether when you have been out that long.

INTERVIEWER: And math, in particular.

STUDENT: Right.

INTERVIEWER: How about yourself? Did you have a break between high school and here?

STUDENT: Not really. I had a fresh start straight out of high school and came straight here. I just didn't have much algebra in high school. I took Algebra I, which was divided into two parts, Algebra I-A and Algebra I-B. Algebra I-A the first year and Algebra I-B the second year. I didn't get out of Algebra I-B.

INTERVIEWER: Now when you came here, you took Math 91?

STUDENT: I started with Math 90 and then 91, and I'm in Math 91 again.

INTERVIEWER: So you are working your way up through that. So, you both have been through the mill.

STUDENT: Right.

INTERVIEWER: Have your feelings about, well, if you think back to that first semester, did you take math that first semester you were back in college?

STUDENT: No, I came back way before that. After I graduated from high school, I came out here and took Home and Family Living--that was a total different curriculum. And then when I finished that, I came back and took business administration. And that's when I took algebra.

INTERVIEWER: So, you had been back into the college scene a bit.

STUDENT: Right.

INTERVIEWER: When you started the math course, what were your feelings about math?

STUDENT: Well, I just wanted to get all the math I can, but when I came to take algebra, it kind of changed a little bit because I didn't know nothing about algebra and it was hard. But now, I feel better, a little bit better, about algebra. I still know how to do most of it.

INTERVIEWER: Are you relaxed about it now?

STUDENT: Yes because come time to take a test; I get kind of nervous when it comes time to take a test.

INTERVIEWER: What kind of nervousness?

STUDENT: Well, I mean I'm praying hoping that I can pass it.

INTERVIEWER: There are a couple of kinds of nervousness that we talk about. One is before you do an athletic event you tend to get nervous and anxious, but this is the kind that helps your performance. And then there is the other one with the sweaty palms, and I just can't get myself together and my pen drops.

STUDENT: I have both.

INTERVIEWER: Is it more now or less than it was the first term?

STUDENT: It's a little bit less, but I still kind of get nervous. The tests make me nervous, anyway. I be hoping I can do whatever to pass it.

INTERVIEWER: Are you so far?

STUDENT: Yes, I'm doing much better than I was doing before.

INTERVIEWER: How does yours fit? You've kind of come right up through, you know, you had to go back and get restarted with Math 90 and went right on through.

STUDENT: Well, after my second round with 91, I had to go get a tutor. I could understand the math, it's just that I can't put all the pieces together and understand it all as one. It just confuses me all together.

INTERVIEWER: Any particular part of math where confusion comes in?

STUDENT: Yes, it comes out, in fact, at the end of the book; it comes down to the last two chapters. That's where I get weak at.

INTERVIEWER: That's kind of putting a lot of new stuff together there. Is there an introduction of new material at this point?

INTERVIEWER: Some in terms of factoring; he's got some other things he has to bring into play at the time.

INTERVIEWER: When you get there, do you have any, in the sense we are talking about, how people react, do you get any of those?

STUDENT: I get somewhat nervous. I try the best I can. I don't get too uptight about it. I just try my best and I feel like I'm passing the test, but when I get my paper back, the grade shows some careless mistakes that I made and it caused my grade to come down.

INTERVIEWER: Would those mistakes be pertaining to things you get into in factoring or just...

STUDENT: I just forget that exponent or leave the negative sign out or I don't use parentheses or whatever.

INTERVIEWER: That falls into the category of dumb ass, too, because I use to do that. I use to blow the addition/multiplication stuff. I'd be playing around in algebra doing practical arithmetic. Is that kind of thing hitting you, too?

STUDENT: Yes.

INTERVIEWER: But you are not describing any--why does this happen?

STUDENT: I don't know; I've been trying to work with it; trying to improve those careless mistakes. They improve, but there are still some careless mistakes that I make. And they are not as great as the other ones.

INTERVIEWER: You always have to wonder if you just lose your cool doing the thing or nervousness.

STUDENT: That's part of it.

STUDENT: I think that's the biggest part of it--nervousness. I know when I get ready to take a test it's like my mind forgets everything that I know when it is time to take the test. And it won't come back to me, sometimes.

INTERVIEWER: I do a little technique with some of my classes. I don't work in math, but I have people to define some terms before I have them to write an essay on an issue, a way to warm up and to get their thoughts organized to use these terms in what they write. Would an approach like that be helpful in what you are describing?

STUDENT: I think it will.

INTERVIEWER: I guess I'm curious of whether its the functions themselves that are giving you problems, in

which case will warm up with them or whether it a more general nervousness---doesn't ring a bell particularly? I guess that's fine.

STUDENT: Sometimes it more like fear because I fear that I'm going to fail the course again and have to take it over and over.

INTERVIEWER: Yes...that's what you are going to stop... And it can't get in the way. How about going back into the high school...its way back for you and more immediate for you; how about back there? Was the fear factor at work back there?

STUDENT: Well, my second year it was. The first year it was fairly simple. No problems; just a breeze.

INTERVIEWER: Really, the second year where you really blanked out. Why was that?

STUDENT: My first year was like the first half of Algebra I; the second year was the other half. I don't know what happened.

INTERVIEWER: Could changing teachers make a difference?

STUDENT: That could be. I had good teachers then; they explained everything. They worked with you and were patient and everything and worked the problems out.

INTERVIEWER: How was math when coming through elementary school?

STUDENT: I did good in math back then. I really had no problems back then. It's just that the algebra got me out here because I never took it, and I didn't know anything about it and that made it hard for me.

INTERVIEWER: That's clearly a tough league.

STUDENT: Yes.

INTERVIEWER: How about you? How was math for you earlier?

STUDENT: Elementary school?

INTERVIEWER: Yes.

STUDENT: In elementary school I had a big problem with multiplication. It went away once I got in junior high school. I didn't have problems until I got out here.

INTERVIEWER: Is that the thing about learning your tables?

STUDENT: Yes, that's what it was.

INTERVIEWER: I had a daughter who did that. Just would not learn her tables. I'd be sitting with her on the sofa night after night -- six times six; 24. I'd say, what? Well, she still doesn't know it; still doesn't know it. She got a graduate degree and has to use a calculator to do multiplication. Did that set up any bad vibes for you with math, having had that early experience?

STUDENT: Yes, it didn't last long, though, it was like maybe fourth and fifth grade years.

INTERVIEWER: Then you were ok with math generally after that?

STUDENT: Yes.

INTERVIEWER: Are you sure?

STUDENT: Maybe, I had a little trouble with multiplying fractions and dividing fractions. It took me a long time to understand it. It wasn't like I go to class one day and they explained it all and I knew it right then.

INTERVIEWER: But it apparently came eventually?

STUDENT: Yes.

INTERVIEWER: Yes, it's hard to know sometimes those early things that carry on a lot. They were going to keep me back in the second grade because I could not spell, and they were right, I could not spell. My mom persuaded them to promote me, anyway. And it turns out

that I had to learn this stuff. I don't know the difference between vowels. To this day, I can't spell worth a flip, and I'm on the university faculty. It set up all sorts of ripples for me later. I still can't spell, but I keep trying. That's why I was asking the question really. Sometimes you run into an obstacle like that and walk away from it in one sense. Now, both of you have been through, well you have been through Math 91 and you are still in the process. Where do you go from here with math? Is there another step?

STUDENT: I have to go to 110. I have heard about that. I am afraid of it.

INTERVIEWER: Yes, that makes sense. What is your curriculum now?

STUDENT: Commercial art and advertising design.

INTERVIEWER: Oh, really, they have to go to Math 110. Will you be taking math?

STUDENT: No, not in the curriculum I am in now. I don't think it's got a math elective, but I'm not sure. But when I was in Business Administration, I took 110, and I didn't do too good in that at all.

INTERVIEWER: Not a happy time?

STUDENT: No.

INTERVIEWER: Well, that was quite a leap for you then, wasn't it, because you just finished 91.

STUDENT: Right, that was two or three quarters ago.

INTERVIEWER: That must have been a pretty depressing class.

STUDENT: It was.

INTERVIEWER: Can you talk a little bit about what kind of feelings you had in 110?

STUDENT: Well, I didn't understand all of it anyway. Some of the words they had in there were simple, but I

didn't understand what they were talking about. And that gave me a big problem.
INTERVIEWER: In what sense?

STUDENT: Well, I just didn't understand what they were really asking. The questions they were asking I didn't understand what they were asking; I didn't know how to work what they were asking.

INTERVIEWER: How did that make you feel?

STUDENT: Well, nervous and to forget it, really. Just forget it, yes, just forget it.

INTERVIEWER: Give up; don't worry about it.

STUDENT: Right.

INTERVIEWER: Simple way to put it--you wanted to just blow it off?

STUDENT: Yes.

INTERVIEWER: It's kind of an avoidance thing, I guess, huh?

STUDENT: Yea, especially when I go to do something, and I can't do it. I usually put it aside and go back to it later. When I see I can't do it, I get the attitude where forget it. I'll get it the next day or get somebody to show me how to do it.

INTERVIEWER: The last term you were doing 91. How did you feel going through that?

STUDENT: I felt fine going through that because I knew how to do it because I had been through it one time. Then going through it the second time, I knew it exactly what to do with it.

INTERVIEWER: So you were confident, yet, you had some discomfort with test?

STUDENT: Right

INTERVIEWER: But that was kind of a normal reaction you generally had with test.

STUDENT: Yes, I get very nervous when it comes time to take a test.

INTERVIEWER: But it didn't interfere?

STUDENT: No, no I still managed to pass it.

INTERVIEWER: Some of the folk have mentioned that taking 91 would be better if it were slower.

STUDENT: I agree with that.

INTERVIEWER: Do you feel some pressure with the pace of it?

STUDENT: Well, if you move too fast for me, I can't get anything. But if you take it slower, say my speed, well then I get it. But to move right fast with it, I never get it. I like it slower so I can get it and I can understand what he or she is saying. I can pick it up more than if it's real slow.

INTERVIEWER: And then you can usually take it to the next step.

STUDENT: Right, I can't get anything if it's fast.

INTERVIEWER: How do you feel about that?

STUDENT: Well, 91, that I have taken, it didn't go too fast. I like the speed of it. I would probably feel better if it was lengthen out like a regular school year or shorter...I don't think it should be that long...are you talking about the speed of the class or class time?

INTERVIEWER: No, well, more like whether they teach too many concepts and the pace of these concepts covered at the end of the term. In that sense...pace.

STUDENT: Well, the last two chapters obviously goes too fast.

INTERVIEWER: Yes, that's interesting if you kind of get to pen point a place where things fall apart or bother you. Do you have anything on that, Wendell?

INTERVIEWER (PERRY): Not on that point there, but I hear you saying fear. When you say fear, can you talk a little more about that fear, if you don't mind.

STUDENT: First off, it's like I fear failing the class and then the challenge. It's a big challenge. That's what I am talking about.

INTERVIEWER: You just don't have fear of just if someone would say "math" to you. That's not what you are talking about, right?

STUDENT: It's more like algebra.

INTERVIEWER: Factoring?

STUDENT: Yes.

INTERVIEWER: You talked a little about tests, too. Let's see if we can talk a little more about that. How do you react to, for example, say you are taking a test and the instructor says do the best you can on this test now because it is very important. Would that cause any changes of your thought processes when you are taking a test and he/she says something like that? Sometime, they go around and say do the best you can on this thing now because it is very important.

STUDENT: That makes me very nervous then because I am praying hoping that I pass it. You know, and too it makes me think my grade is failing and I need this test to pull it up.

INTERVIEWER: So some other thing is factored into this thing; it's not just the test, it's some other things, right?

STUDENT: Right.

INTERVIEWER: How about you?

STUDENT: Tests bother me sometimes, but not all the time. It all depends on what my grade point is.

INTERVIEWER: Give me some of your thoughts about tests. Your instructor may say look we are going to have a test, let's say the day is Monday, we are going

to have a test on Wednesday. The time is told and giving you enough time before you take the test. Does something come to mind that you would like to share with us?

STUDENT: First of all, I try to get a tutor between that day and Wednesday, and I try to do a little studying on my own. It may scare me some, yes. It depends on how familiar I am with the chapter.

INTERVIEWER: Do either of you use the math lab much?

STUDENT: No.

INTERVIEWER: Can you tell me why not?

INTERVIEWER (PERRY): When we talk about math labs, we don't have a math lab, say here. They have places they go for tutoring. The tutoring room.

INTERVIEWER: I was just curious when you feel the need for some kind of help you go to the tutoring room?

STUDENT: Yes.

INTERVIEWER: Does that work for you?

STUDENT: Some. But sometimes I think I can do it better on my own. And then sometimes I do need a tutor. It depends on what subject it is and where I'm at in the book.

INTERVIEWER: I hear you say you can do it better on your own. Is it because there is a confusing factor there between what you hear in the classroom and maybe what the tutor is trying to say?

STUDENT: Yes, it is different. He or she or her or him don't explain it like they do in class and that kind of confuses me.

INTERVIEWER: Ok, that's what I want to get into.

STUDENT: I'll be thinking what he says in class and what they say in here. And that confuses me.

INTERVIEWER: So sometimes you feel like you are not getting any help at all. Is that what you are saying?

STUDENT: No, I won't say that. It's just that I feel that sometimes I can do it myself, get my own. It's better.

INTERVIEWER: Do both of you feel that sometimes you feel more comfortable just working it out yourself?

STUDENT: Right.

INTERVIEWER: Can you talk a little about that--the difference between what works when you work it out yourself versus turning to someone else to kind of help you through it?

STUDENT: Well, when it is something kind of simple, I can do it better on my own. But if it is something hard, then I can understand it more better when somebody else explains it to me. See what I am saying?

INTERVIEWER: Does hard mean new or complicated?

STUDENT: The tutor?

INTERVIEWER: No, I'm just saying if something is new or hard.

STUDENT: Well, something new is complicated to me. It's hard; I don't know what it is. Once they explain it to me, I can understand it. But if it's something I've never seen before, and I can't do it myself. I do better if they explain it. I kind of understand what he or she is saying, if they don't make it hard. If they make it hard, then I don't understand what they are saying.

INTERVIEWER: I'm curious because you, too, mentioned the notion there were times when you went to tutoring and there were times when you rather do it yourself.

STUDENT: Well, most of the time when I go, I need a tutor most of the time because the teacher explains something new and the whole class understands it and sometimes I can't follow along with it. So I come back to a tutor. Or come back to see the teacher later on

so the teacher can explain it.

INTERVIEWER: In that way, does it work?

STUDENT: Yes. It works a lot better.

INTERVIEWER: And you are willing to do that?

STUDENT: Yes.

INTERVIEWER: That's a big step forward. When do you end up doing anything else?

STUDENT: You mean outside of school?

INTERVIEWER: No, when you are here and you decide you don't need a tutor at all this hour.

STUDENT: I really don't, when I need help that's when I go. I don't try on my own unless I understand it or when somebody else explains it to me. I know I can do it myself.

INTERVIEWER: So you are kind of plowing new ground with this thing?

STUDENT: Right.

INTERVIEWER: So that's where you need the help. Once you get the ground plowed you are able to take care of it yourself.

STUDENT: Right

INTERVIEWER: Maybe not a bad analogy. Does that make sense. You are a math teacher.

INTERVIEWER (PERRY): Yes, that makes some sense and in terms of something new, if this is the first time, you cannot follow the concept of something you have seen in some other class then it may be entirely new to you. It depends on what "new" means because, for example, he talks about fractions in arithmetic and you talk about fractions in algebra, too. The concepts are the same but it looks new because you got these x and y's being involved; but the concepts are the same in terms of how you add and subtract.

INTERVIEWER: Would it be reasonable to say that when you get, as Wendell is describing, a concept, you have dealt with before, like fractions, but it's in a new setting; it's in a new situation now (in algebraic terms); that's an area where you really see that as something you need help with?

STUDENT: Yes, I do.

INTERVIEWER: Am I right, is that what you keep saying to me?

STUDENT: Yes.

INTERVIEWER: What's going on in my head is the notion that you are telling us that you can master the concepts as long as the way they are presented stays the same, you are comfortable with it. But when they change the context, you may be doing the same thing but now you are working with algebraic work with some different kind of arrangement, a factor that it's not easy to transfer the notion from the early stage to this next stage. You really need some help with that.

STUDENT: Right.

INTERVIEWER: It makes sense, I presume that at that stage is when you get some concern or nervousness, right?

STUDENT: Right.

INTERVIEWER: So the next trick for you guys really is learning how to transfer what you know how to do in one set to the next situation. Where you will need less and less help and you can do it more on your own. Probably where there are a couple of light bulbs going on.

INTERVIEWER (PERRY): Are there any other experiences that you had over the years that math related that you can talk about?

STUDENT: I don't. Nothing but algebra.

STUDENT: When I took the SAT I had some math on that that I had never had before. There was some

geometry--a lot of geometry. That's what hurt my SAT grade the most. I was wondering if that is a part of 110. Math 110. Geometry was a part of 110.

INTERVIEWER (PERRY): It's designed, again it's like you are talking about that time frame. The way the book is designed, 110 is a survey of math--it takes you across the general math concepts, talks a little about statistics and probabilities, very basic things like the mean and mode and things like that. It shows you how to figure out your grade point average, things like that showing them how it is applied. We get into some basic algebra, again, and then we move into some business concepts. It sort of surveys across a level of courses and gets into the business concepts. Like how to find compound interest and things of that nature that kids still don't know how to deal with. When somebody says, when you go into a store, that your interest is going to be compounded quarterly, at least the student knows what the person is talking about. How many times a year, and stuff like that. Compounded annually. It's a survey of topics; that's what it is. Geometry is way on in the back and if that's what you are afraid of, half of the time we don't even get into it. So I hear you saying a lot of time you heard that Math 110 was hard and you were afraid of it. They say that it's hard. But you are basing that on what you have heard. You have not taken it before. But you are basing it on what you hear, right, and that's causing some sort of fear. Am I understanding it right? Just hear-say, now. Is that the general run of the mill for you when you have trouble with a math course? You sometimes hear someone say this is hard; these problems are hard. Say for example in 91. You might be talking to a friend or someone. Your friend may say "God, man, I can't get these problems." Does that sort of set your mind because you think because he can't do them, they are hard and I can't do them. Something like that?

STUDENT: Not really. It's just when I see how complicated it can be and then I have to move on to the other course higher than 90 or 91. That is what causes my fear.

INTERVIEWER: It causes fear just knowing you have something coming after this course.

STUDENT: Yes.

INTERVIEWER: Most things in life are not as bad as they seem. Let me tell you what little bit I can put together out of this thing. It's hard to really understand what goes on. We went into this with the notion that you both had been tagged nervous and anxious about math in some form. It sound as though what for you is anxiety or nervousness isn't about math in general. It tends to be about various parts of math. For you, the factoring section in algebra seems to be a particular complication that's hard to unravel. But those are fairly general. One of the things we were looking to see is does it get you anxious to the point where anxiety becomes a problem, where you get nervous, palms sweat, you move into avoidance behavior, where that becomes just the way in general you respond to math situations. It doesn't sound like that is true. There are times, perhaps, but it is not the general pattern.

STUDENT: Right.

INTERVIEWER: I don't know what that tells us. But it is clear that these tests put a label on people, yet we still don't know what to do with the label. I guess we are learning something if we can attest knowing that. It is wonderful how the text books can be so flatly wrong. Believe it or not, you have been very helpful. You really have.

INTERVIEWER: Thank you for taking time out. I know that you had to cut your classes to come and I appreciate it a whole lot. You cut your 1:00 class to come help us out and anything we can do, let me know. I appreciate your taking your time a whole lot. It's been very helpful to me that you decided to come in here and rap. Thank you very much.

Appendix J

Field Notes

11/12/93
Field notes from "Focus Groups"
Darrel Clowes

10 A.M. group was three students plus Wendell and myself. The session began about 10:10 and ran until 11:05. The participants were three African-American female students.

The students appeared to know each other and to be comfortable together. The students were concerned about their progress in math but did not describe anxiety at the physical level - except for one who cited headaches and used the term "test anxiety." They could cite no early traumatic experiences but did all indicate little parental encouragement or support for academics or for math particularly. The high school teachers apparently never encouraged math taking for these students - one of them may be an exception - she took Algebra I in high school. She stopped there.

Anxiety was expressed in terms of having little background for the Math 91 - a pre-algebra course - and then in terms of the pace of the classes. If you missed a class or a concept, the impression was that you could seldom recover the lost ground. Again, these are general sources of angst, not specific and focused concerns.

Is attitude a disposition? Harold may be correct on this. It appears there are background factors - poor high school preparation and parental support - that make this a disposition. Additionally, the county schools are among the weakest in the state on standardized testing and show clear patterns of segregated schooling with resulting lowered expectations. These may include lower expectations on the part of students and thus present a pre-disposition to failure - here an attitude.

Is anxiety tension or apprehension? In the physical sense there was little sense of a tension except for one's headaches in test situations. She made an A in the class she took and had little sense of tension in class roles. The other two did not express

an indication of tension as part of the math experience. Apprehension seemed the much more appropriate term for these students as they describe their relationship to math, and that indicates that Harold may be correct that the terms used in this dissertation and as we interpret the two tests are circular.

1 PM focus group consisted of two African-American students - one female and the other a male. The size of this and the prior group make the normal dynamics of a focus group impossible; therefore we will have to treat these as long interviews. The same pattern of analysis can be made with the data. We can strengthen the analysis by adding our field notes to the data gathered to give us three sources - questionnaires, interviews analyzed, and the field notes.

The students were forthright and open. The male student had taken a pre-algebra course in high school but failed the algebra class that followed. He came to HCC directly after dropping out of the high school or possibly graduating - I was not clear. He was in his third attempt at Math 91 (pre-algebra) at the college. He presented himself as assured and confident. He gradually acknowledged difficulties with math but narrowed his difficulties to the final section of the 91 course - factoring. He had no associations with physical reactions but did attest to fear and anxiousness. He reported a history of difficulty with multiplication tables in his early years, said he had overcome that problem, but indicated continuing difficulties with the multiplication function. Ivan seemed to show generalized anxiety or a disposition to fear about math. He did not show specific physical responses to particular situations. He did seem to experience difficulty moving beyond performing a mathematical operation to transforming that action into the next application of the same principle. The problem appears to be a failure to understanding the concept involved.

The female student graduated from the general curriculum over ten years ago. She had only a general math course in high school. She had returned for a

certificate program some years ago, then recently returned for a business administration program which she is now downgrading to an office management program. She took the 91 course twice completing it successfully last term. She described a physical anxiety reaction to testing in general and particularly to math. She did not associate this with the math class itself despite it being a jump from her arithmetic classes in high school to the pre-algebra in college. She did not indicate fear; she did experience generalized anxiety. When she repeated the course she felt much less stress since the material was familiar. She too experienced difficulty transferring knowledge (skill at a manipulation) to another setting. Again here appears to be little learning at the concept level with the attendant difficulty in transferring knowledge from one situation to another.

Both students said they used the tutoring room for assistance. In no case was the male student willing to use himself to learn a concept or function he was uncomfortable with. He always turned to another. The female was willing to study herself if it was something she was already familiar with but just needed reminding. For new material or "hard" material she also turned to another. This seemed to support the idea that concepts were not learned, functions were and thus any transfer of knowledge was very difficult. They were willing to look outside for help - they were not "helpless" and they were not paralyzed by fear or anxiety. This seems to return to the notion of generalized anxiety.

Wendell Perry
Conference Room in the Student and Nursing Education Center
November 12, 1993
Field notes on Interview Sessions

Session one: 10:00 - 11:00 A.M.

On November 12, 1993, at 10:00 A.M., Dr. Darrel A. Clowes of Virginia Tech, three African-American female students that are enrolled at Halifax Community College and I met in the conference room (308) of the Student and Nursing Education Center. We sat at the big conference table. The three female students were sitting together with one at the end of the table and the other two were on each side of her at the corner of the table. Dr. Clowes and I sat on opposite sides of the table facing the students. The purpose of this meeting was to engage the three female students into a conversation about their math experiences, especially in MAT 91. Two of these students indicated they had to repeat MAT 91. Thought they were unprepared for it the first time they took it. Unprepared means that one had never had a course similar to MAT 91, and they both had been out of high school a while before entering Halifax Community College. Even though these two had to repeat MAT 91 they basically like the course itself; but had somewhat of an attitude toward math in general. These two make comments such as they hated math, wasn't good at math, had heard that the next required math, MAT 110, was hard and had not registered for it for that reason. They indicated some general test anxiety. Solving word problems sometimes caused a mental blockage when unable to arrive at a solution.

The student that didn't have to repeat MAT 91 was quite energetic, quite talkative, and always smiled when she talked. She indicated no problems with MAT 91, yet she scored in the seventy-fifth percentile.

There were no visual signs of any of these students being highly anxious individuals.

Session two: 1:00 - 2:00 P.M.

At 1:00 on November 12, 1993, Dr. Clowes and I met with two African-American students (one female and one male). The meeting was held in the conference room (room 308) of the Student and Nursing Education Building. We all sat at the conference room table. The male student sat at the end and the female sat at the corner next to him. Dr. Clowes and I sat on opposite sides of the table facing these two students. The purpose of this meeting was to engage these two students in a conversation about their experiences in math, especially MAT 91. The male student is presently enrolled in MAT 91. He has had to repeat this course. He indicated some fear within a math course. He was always afraid that he would have to take the course over. He indicated fear of having to take a required math course within his curriculum. This fear was based on "hear-say". He had heard that the course was hard. He indicated that he did not complete the basic algebra course he took in high school.

The female student indicated that she had to repeat MAT 91 when she took it. She indicated some confusion occurs at times when working problems; some nervousness during test times; and the inability to understand the words used in solving problems. She did not take any algebra in high school.

There were no visual signs that indicated that any one of them was a highly anxious individual.

Summary Across Sessions

- Did not detect any extreme anxiety and/or attitude as indicated by the MARS and the Fennema-Sherman scales.

- Some apprehension - fear of a math course not yet taken. Mostly based on hear-say. Maybe this apprehension (fear) of MAT 110 is math anxiety that Richard Suinn speaks of on MARS when he surveys for things that may cause tension or apprehension.

- Some mental blockage when solving word problems.

- No great emotions mentioned.

- A lack of preparation for some for MAT 91.

- A possible hypothesis that seemed to have emerged from the long interviews as conceived by Dr. Clowes is that the psychological constructs of math anxiety and math attitudes may be covering the most fundamental question, which is a curriculum question. People may show signs of anxiety when the real issue is that they are not prepared for the course.

VITA

Wendell Perry
P. O. Box 312
Garysburg, North Carolina

EDUCATION

1995 Ed.D. in Junior and Community College Education, Virginia Polytechnic Institute and State University

1968 M.S.T. in Mathematics
Rutgers the State University

1962 B.S. in Mathematics
North Carolina Central University

PROFESSIONAL EXPERIENCE

Mathematics Instructor, Halifax Community College, Weldon, North Carolina (1969 - present).

Mathematics Instructor, Northampton County High School, Jackson, North Carolina (1968 - 1969).

Academic Year Institute in Mathematics, Rutgers the State University (1967 - 1968).

Mathematics Instructor, Willis Hare High School, Northampton County, Jackson, North Carolina (1962 - 1967)

DATE OF BIRTH: February 23, 1941

Wendell Perry