DIFFERENCES IN I.Q.S AND ARITHMETIC ACHIEVEMENT IN TWO SCHOOLS IN MONTGOMERY COUNTY, TENNESSEE

BY

EVELYN DONAHOO McCLAIN

DIFFERENCES IN I.Q.s AND ARITHMETIC ACHIEVEMENT IN TWO SCHOOLS IN MONTGOMERY COUNTY, TENNESSEE

A Research Paper

Presented to

the Graduate Council of

Austin Peay State University

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

in Education

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by

Evelyn Donahoo McClain

August, 1970

To the Graduate Council:

I am submitting herewith a Research Paper written by Evelyn Donahoo McClain entitled "Differences in I.Q. and Arithmetic Achievement in Two Schools in Montgomery County, Tennessee." I recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts in Education, with a major in Curriculum and Instruction.

Allan S. Williams
Major Professor

Accepted for the Council:

Wayne C. Stanley
Dean of the Graduate School

ACKNOWLEDGEMENTS

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Appreciation is extended also to Dr. Wayne Stamper, Dean of Graduate School and Dr. Ellis Burns, Professor of Education, for their helpful suggestions and encouragements.

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CHAPTER I

INTRODUCTION

Since early in the history of man there have been cultural differences among the races of the world. Due to these existing differences in cultural background it has been noted that not all children achieve at the same level. The low achievement of some students has long been a concern of educators. Much research has been done about the cultural differences and the disadvantaged child.[1] There have been attempts to improve the school curriculum so as to aid the disadvantaged child in achieving success and a feeling of adequacy.[2]

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[1]Mario D. Fantini and Gerald Weinstein, The Disadvantaged: Challenge to Education (New York: Harper and Row, 1968; Joe Frost and Glen Hawkes, The Disadvantaged Child (Boston; Houghton Mifflin Company, 1966); Frank Riesman, The Culturally Deprived Child (New York: Harper and Row, 1962); Staten W. Webster, The Disadvantaged Learner (San Francisco; Chandler Publishing Company, 1966).

[2]John M. Beck and Richard W. Saxe, Teaching the Culturally Disadvantaged Pupil (Illinois: Charles C. Thomas, 1965); Lester D. Crow, Walter I. Murray and Hugh H. Smythe, Educating the Culturally Disadvantaged Child (New York: David McKay Company, 1966); Joseph C. Loretan and Shelley Umans, Teaching the Disadvantaged (New York: Columbia University Teachers College Press, 1966); Sidney W. Tiedt, Teaching the Disadvantaged Child (New York: Oxford University Press, 1968).

THE PROBLEM

The purpose of this study is to compare the arithmetic achievement of two selected groups of children at the sixth grade level in school populations where basic differences in cultural background are present. In the comparison, selected factors, such as I.Q. test scores, father's occupation, race, and sex are used.

LIMITATIONS OF THE STUDY

This paper does not attempt to measure all known or unknown factors that may be relevant to the differences in arithmetic achievement. Some of the limiting factors are: (1) the school plant (one of the schools is a new modern structure more conducive to learning than the other much older and less attractive building); (2) the educational aspirations of the students (a child from a deprived environment may feel there is no chance for him to obtain a good education); (3) preparation and experience of teachers (some teachers are more successful in motivating students to learn than others); (4) the environment of the home (often there is antagonism by the parents toward schools and teachers or, parents may not place as high a value on education); and (5) the health and diet of the student (many times a student may be in poor health or have an improper diet which could limit his achievement).

This study includes seventy children enrolled in two elementary schools during the 1969-70 academic year in the Clarksvile-Montgomery County School District.

HYPOTHESES

The following null hypotheses are tested:

1. There is no difference in I.Q. of students and arithmetic achievement.

2. There is no racial difference in arithmetic achievement of students.

3. There is no difference in sex of the students and arithmetic achievement.

4. Occupation of the fathers of students and arithmetic achievement will not differ.

THE SETTING

In this paper School A refers to Barksdale Elementary School. Barksdale School is located in the southeast section of Clarksville, Tennessee. It enrolls approximately 700 students from grades one through six. The population in this area consists mainly of white collar workers including teachers, engineers, businessmen, buyers, and contractors. The students from this school that are included in the research are white.

School B refers to Bailey Cobb School. This school is located near downtown Clarksville in what is chiefly a

low income area. It enrolls approximately 425 students from grades one through six. The population in this area is composed of mostly laborers and blue collar workers such as butchers, cooks, janitors, truck drivers, and factory workers. Students from this school used for this study are non-white.

DEFINITION OF TERMS

All people are disadvantaged in some respect, some more than others or in a different manner than others. There are also many different cultures among people. In this paper the disadvantaged refers to those that are environmentally deprived.

Disadvantaged is any child or youth for whom the curriculum is outdated, inadequate, or irrelevant. Those who are blocked in any way from fulfilling their human potential.

Culture refers to the institutions, the structures, the customs and traditions and the methods of organization of the people involved.

Cultural Disadvantaged means the variety of social, economic, and ethnic-interracial factors which impede full freedom of choice and which destroy an individual's right to maximum opportunity.

Extreme Disadvantaged are those whose poverty and socially discriminated position severely limit their human potential.

Cultural Difference refers to those persons whose attitudes, traditions, mores, and ethical codes differ from other societies.[3]

METHODOLOGY

Before beginning the actual work on this paper, a letter of intent was sent to Mr. T. M. Oakley, Acting-Director of the Clarksville-Montgomery County School System. (See Appendix A). Permission was granted by Mr. Oakley in the form of a letter giving his consent for research work in Barksdale and Bailey Cobb Schools involving the sixth grade of these schools. (Appendix B). This letter was presented to Mr. Albert Alcock, principal of Barksdale School and to Mr. Ernest Shelton, principal of Bailey Cobb School. Verbal consent was given for work involving their sixth grade students.

The Lorge-Thorndike Intelligence Tests[4] were administered to the students of Barksdale and Bailey Cobb Schools in April 1969. Results were put in tabular form to test the four null hypotheses. In order to gather the arithmetic

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[3]Mario D. Fantini and Gerald Weinstein, The Disadvantaged: Challenge to Education (New York: Harper and Row, 1968).

[4]Irving Lorge and Robert L. Thorndike. The Lorge Thorndike Intelligence Test. (Boston: Houghton Mifflin Company, 1954).

grade placement scores, the Stanford Achievement Tests[5] were administered to students of both schools in April 1970.

The Chi-Square Technique was the statistic used to test the four hypotheses. Tables were included to supplement the text and to guide the reader.

ORGANIZATION OF THE STUDY

Numerous agencies, educators, and authorities have concerned themselves with the growing problem of the disadvantaged child.

In the following chapter a review of the literature is discussed.

Chapter III will discuss the results of the study.

In Chapter IV, the summary, conclusions, and recommendations will be discussed.

The Bibliography and Appendices complete the remainder of the paper.

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[5]Truman L. Kelley, Richard Madden, Eric Gardner and Herbert C. Radman. Stanford Achievement Test (New York: Harcourt, Brace and World, Inc., 1963).

CHAPTER II

REVIEW OF THE LITERATURE

Educational authorities have written much concerning the problems, identification, and diagnosis of the culturally different and the disadvantaged. Only a brief summary of the writings of the authorities and experts are included in this study.

Since 1964 programs and literature dealing with the educational problems of disadvantaged youth have proliferated at a rapid rate. Among the most noteworthy of the publications are those by Bertolaet and Nystrand.[1]

All groups of people have a culture of some sort. Although culture is not identical with environment, it is certainly a part of the environment to which the young are exposed. Culture must however, be distinguished from the environment and defined as the aggregate of those attitudes, traditions, mores, and ethical codes peculiar to the particular society.[2]

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[1] Frederick W. Bertolaet and Raphael O. Nystrand. "Urban Educational Problems" Encylopedia of Educational Research, Ed. 4: 1502. (New York: The MacMillan Company, 1969).

[2] Mario D. Fantini and Gerald Weinstein. The Disadvantaged: Challenge to Education (New York: Harper and Row, 1968), p. 5.

To many a youth from the disadvantaged environment, schooling is one long obstacle course; all along the way are signs with arrows pointing to the nearest exit. The urge to resist these directional signs requires almost superhuman will power; the obstacles are too massive. Life at school, for this youngster is uncomfortable; life for his group is always uncomfortable. He has become aware, in his own strange way, of what Thomas Pettigrew, in the book Teaching the Disadvantaged, referred to as "the subtle cultural cues which tell you that you don't count and that good grades and high I.Q. scores are middle class roads to success, not yours." His crime is that he was born poor, of parents who are, more often than not, unemployable and who are, for certain, uneducated. For the disadvantaged youngster, who comes to school with little faith in the value of schooling and virtually no faith in himself as a learner, this arid, uninteresting, fact-centered approach to mathematics is almost a guarantee of failure.[3]

Children from disadvantaged families lack many of the experiences which facilitiate mathematical learning at school.[4]

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[3]Joseph O. Loretan and Shelley Umans. Teaching the Disadvantaged. (New York: Columbia University Teachers College Press, 1966), pp. 1-2.

[4]M. E. Dunkley. "Some Number Concepts of Disadvantaged Children." Arithmetic Teacher. XII (May, 1965), p. 359.

Disadvantaged children do not succeed in mathematics, many times, not by their lack of intellectual potential and development but by being motivated by school situations. Of course, motivation and achievement are intertwined. But when the child's cultural background puts him out of tune with intellectual pursuits, the task then becomes one of presenting the abstractions in such a way as to be immediate and of interest to the child. Some have suggested the "discovery" teaching technique within the structure of mathematics seizes onto the power of intrinsic motivation.[5]

We must find ways to provide deprived children with the opportunity to develop their intellectual abilities fully. This development will not occur unless early in their school life they learn to master certain mathematical tasks which are fundamental to their future intellectual progress.[6]

This child needs highly motivating, provocative, thought producing materials and approaches. That is why the discovery approach is so important. He needs to be given not only the tools, but also the method by which to apply these tools to new situations. Another problem is the

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[5]Sidney W. Tiedt. Teaching the Disadvantaged Child. (New York: Oxford University Press, 1968), p. 171.

[6]Dunkley, op. cit., pp. 359-361.

"language" of mathematics. Words and symbols should be based on considerations of clarity and utility and precision of meaning.[7]

"Discovery" is a term which frequently describes a learner's goal-directed behavior when he is forced to complete a learning task with minimal guidance from the teacher. Discovery teaching carries the advantage, many times, of non-verbal instruction. By various inquiries with concrete and paper-pencil experiences the children are led to solution.[8]

The mathematics teacher must build up the environmental experiences so necessary for pre- and beginning-number experiences. A general awareness of numbers needs to be aroused. In a "learning lab" classroom the impoverished background is supplemented and the natural curiosity of the child stimulated.[9]

Mathematics and science are subjects usually too abstruse and esoteric for students from disadvantaged backgrounds. These areas are thought to require abilities not usually possessed by the deprived children: the ability to hypothesize, to analyze, to synthesize, and finally to generalize. Children from deprived backgrounds are usually offered the so-called basic or general mathematics and

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[7]Loretan, op. cit., p. 194.

[8]Tiedt, op. cit., pp. 171-172.

[9]Tiedt, op. cit., p. 173.

science courses, in which the content is prosaic and "realistic" and the method that of traditional learning by rote.[10]

Difficulties in mathematics are often due to absence, inattention, insufficient practice or other factors of a temporary nature which have resulted in the inadequate mastery of certain mathematical skills. For many children, however, the casual factors are basic and must be corrected or alleviated before steady progress can be assured. Such casual factors include physical deficiencies, insufficient mental maturity to understand the mathematical processes and the techniques of problem solving, poor work habits and emotional problems.[11]

The difficulty in teaching disadvantaged children lies in the extent of the problems faced by the teacher. (1) The range of the individual differences is great. Thus, small group procedures must be employed if instructional time is to be used to the best advantage. (2) The experimental background is practically nonexistent in terms of naming colors, ability to do rote and rational counting and ability to recognize and write numerals. (3) Language development is of primary concern and must take precedence over mathematics. (4) Absence of drive for academic

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[10] Loretan, op. cit., pp. 193-195.

[11] Theodore L. Torgerson, Georgia S. Adams, and Albert J. Harris. Measurement and Evaluation. (New York: The Dryden Press, 1954), p. 328.

achievement and lack of reinforcement at home may well exist. If material is presented so that learning is fun and exciting, then children will succeed.[12]

Basically, the techniques that work with the disadvantaged are the same as those to be used with the average children. When they are not used, however, the results are most disastrous. For example, it is common to find teachers attempting to instill number concepts without providing blocks, bottle caps, counters or similar concrete material.[13]

Pupils do not fail in arithmetic in a vague, general sense, nor do they need remedial work of a vague and general type. Pupils' errors and failures are specific. The more exactly they can be located, the more promptly they can be removed.[14]

Factors which retard development, block learning, and therefore affect test scores include frightening speed requirements, lack of test-taking skill, fatigue, hunger, absence of competitive drive, low aspiration, low expectation of success, and negative self-image. Many disadvantaged

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[12]Mary Folsom. "New Math' --Too Verbal for the Disadvantaged?" The Instructor, LXXVI (March, 1967), pp. 26, 72, 74, 166.

[13]Folsom. op. cit., p. 166.

[14]Harry A. Greene, Albert N. Jorgensen, and Raymond Gerberich. Measurement and Evaluation in the Elementary School. (New York: Longmans, Green, and Company, 1942), p. 318.

children are not oriented to tests, promptness, time, speed or competition.[15]

All learning presupposes a motive or drive. Motivated children often take their cues from the behavior of adults, as in matching or copying; and are subsequently rewarded in various ways for doing so. Scholastic achievement of pupils actually in school, at all grade levels from the first to the twelfth, is positively correlated with socio-economic ratings of their homes.[16]

The means of the scores of pupil performance increases with the increasing level of education and skill of the breadwinning parent. Elementary mathematics seems to provide a bias against the child from a lower socio-economic environment.[17]

A frequent contributing factor is a distaste of mathematics, accompanied by an attitude of defeatism. Children quite frequently enter school with the idea that mathematics will be difficult for them because a parent or older sibling could not master it. Others do consistently

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[15]Gertrude Noar. Teaching the Disadvantaged. (Washington, D.C.: National Education Association, Department of Classroom Teachers, 1967).

[16]James B. Stroud. Psychology in Education. (New York: Longmans, Green and Company, 1960), pp. 383-412.

[17]Robert A. Passy, "Socio-Economic Status and Mathematics Achievement," Arithmetic, XI (November, 1964), pp. 469-470.

poor work in mathematics because of certain attitudinal or personality factors.[18]

The results of a study by Hall indicates that attitudes regarding mathematics can be significantly changed when careful attention is given to methods and materials.[19]

The results of a study by Warden indicate that the causes for the "Leftouts" maladjustment are (1) a lack of language facility, (2) deprivation in early interpersonal affiliation, (3) relative status deprivation among teachers and age-mates, (4) disadvantage in knowledge and/or acceptance of the values typical of the "middle-class culture" of the heterogeneous school, and (5) low levels of self-esteem.[20]

In most of our schools there are several different cultural groups attending the same classes. Culture may be defined as all behavior learned by an individual in conformity with a group. While mental ability and social status alone do not insure success or failure in mathematics any attempt to measure the achievement of pupils in

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[18] Leona E. Hall, Methods and Materials of a Mathematical Program for the Disadvantaged and Underachieving Child. Disseration Abstracts, XXVIII (July, 1967), 154A-155A.

[19] Ibid., 154A.

[20] Sandra A. Warden, The Leftouts: Disadvantaged Children in Heterogeneous Schools. Dissertation Abstracts. XXVIII (July, 1967), 296A-297A.

mathematics must face the problem of social-class differences in motivation. These differences in intelligence and scholastic achievement are measured by tests.[21]

The American School has been an important instrumentality in raising the standard for all and in encouraging mobility among the more able.[22]

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[21] Allison Davis, Social-Class Influence Upon Learning, (Cambridge: Harvard University Press, 1948), pp. 47-59.

[22] Willard C. Olson, Child Development, (Boston: D.C. Heath and Company, 1949), p. 260.

CHAPTER III

ANALYSIS OF THE DATA

This chapter presents the findings of this study. The data were processed as indicated in Chapter I with an attempt to identify some of the characteristics of students and their varying grade level of the Stanford Achievement Test and their Intelligence Quotient.

The data presented in this chapter deals with the extent to which sex, father's occupation, and race could possibly affect arithmetic achievement scores.

The variables cited are those which have been judged to be of importance with respect to achievement and therefore collected for this study.

Table I illustrates the distribution of the boys and girls included in this study.

Table I. Population of Students

	Boys	Girls	Total
School A	16	19	35
School B	15	20	35
Total	31	39	70

The findings from the data are analyzed in this section hypothesis by hypothesis. Each of the four hypotheses is restated, tables are presented whenever necessary, and then the findings are discussed.

Hypothesis 1

There is no difference in I.Q. of students and arithmetic achievement.

This hypothesis was explored by examining the null hypothesis that there is a difference in I.Q. scores of students and their arithmetic achievement scores.

The Pearson Product-Moment Correlation method was used to test this null hypothesis.

Table II contains the summary for this analysis. The correlation between arithmetic achievement and I.Q. is .86. According to a scale by Robert H. Koenker in Simplified Statistics[1], this indicates a highly dependable relationship, which says that the hypothesis must be rejected in favor of the null hypothesis which states that there is a difference in I.Q. scores of students and their arithmetic achievement scores.

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[1]Robert H. Koenker, Simplified Statistics, Bloomington, Illinois, L. McKnight & McKnight Publishing Company, 1961, p. 52.

Table II. Arithmetic Achievement Scores and I.Q. Scores

School A		School B	
Arithmetic Achievement	Intelligence Quotient	Arithmetic Achievement	Intelligence Quotient
7.3	134	5.8	118
7.1	128	7.8	115
5.7	126	5.9	115
7.6	124	5.4	112
7.4	121	3.5	110
9.5	121	4.5	105
8.0	121	7.1	104
7.6	121	5.1	100
7.6	121	5.6	100
7.3	120	5.3	99
7.9	119	6.1	98
6.3	118	5.1	98
5.5	117	4.2	97
6.4	116	4.6	97
6.3	116	5.3	96
6.1	115	5.1	96
6.3	115	5.0	95
9.0	114	3.4	93
7.9	112	4.4	92
5.8	112	3.9	92
8.4	112	4.3	88
4.8	112	3.9	88
5.5	111	3.7	88
7.0	109	4.6	87
7.4	109	4.4	86
7.7	107	4.5	85
4.4	103	4.3	85
4.9	101	3.5	85
4.6	100	4.3	84
4.7	98	3.8	84
5.1	98	4.6	81
4.3	92	4.6	80
4.6	91	4.8	79
4.5	87	3.9	74
5.3	83	4.1	68

r = .86

Hypothesis 2

There is no racial difference in arithmetic achievement of students.

In examining Hypothesis 2, it was restated in the form that there is a racial difference in arithmetic achievement scores.

The Chi-Square technique was used to test this hypothesis. The .05 level of probability was accepted as the minimum level of significance.

As seen in Table III, the observed value of chi-square was 50.00, which is greater than the .05 level of probability (3.841). This indicates that there is a significant difference in racial differences and arithmetic achievement scores.

In this view, we again must reject the hypothesis and accept the null hypothesis which states there is a racial difference in arithmetic achievement scores.

Table III. Average Arithmetic Grade Placement Scores

	Average Arithmetic Grade Placement Scores
School A	6.5
School B	4.8

$x^2 = 50.00$ d.f. = 1 level of probability = .05

Hypothesis 3

There is no difference in sex of the students and arithmetic achievement.

This hypothesis was examined by restating the hypothesis in the null form. That is, there is a difference in the sex of the students and arithmetic achievement.

Again, the Chi-Square technique was the statistic used in testing this hypothesis.

As seen in Table IV, the observed value of chi-square was 1.33 which is less than the .05 level of probability (3.841). Therefore, it is concluded that there is no significant difference between boys and girls. The null hypothesis is rejected in favor of the hypothesis that there is no difference in sex of students and arithmetic achievement.

Table IV. Sex and Average Arithmetic Grade Placement Scores

	Average Arithmetic Grade Placement Scores	
	Boys	Girls
School A	6.5	6.5
School B	4.7	4.8
Average	5.6	5.65

$x^2 = 1.33$ d.f. = 3 level of probability = .05

Hypothesis 4

Occupation of the fathers of students and arithmetic achievement will not differ.

This hypothesis was explored by examining the null hypothesis that there is a difference in the occupation of the fathers of students and arithmetic achievement.

The Chi-Square test was used to test this hypothesis.

As seen in Table V, the chi-square value of 8.159, with 4 degrees of freedom, is less than the .05 level of probability (12.592). Because the frequency in Laborer column in School A was zero, the obtained chi square value was not statistically significant. This means that the null hypothesis cannot be accepted or rejected.

Table V. Occupation Areas and Average Arithmetic Grade Placement Scores

	White Collar	Blue Collar	Laborer
School A	(28) 6.5	(7) 6.1	(0) -
School B	(5) 4.9	(12) 4.6	(18) 4.7

$x^2 = 8.159$ d.f. = 4 level of probability = .05

CHAPTER IV

SUMMARY, RECOMMENDATIONS AND CONCLUSIONS

It has been the purpose of this study to observe the arithmetic achievement of students in schools of different cultural backgrounds and to determine what, if anything, causes the difference in arithmetic achievement and make recommendations for improvement. Literature pertinent to the study was reviewed and included in the study. Test results from the two schools were collected and the data included in various tables.

RECOMMENDATIONS

In view of the collected data, the following recommendations are made:

1. A teacher training program for working with and understanding the culturally different student.
2. Development of a curriculum that is meaningful to the culturally different student.
3. A home-help program in which the parents are given aid in learning to understand and encourage their children.
4. Materials and books geared to the interest of the culturally different student.

CONCLUSIONS

From this study of students with differences in cultural background, it may be concluded that there are differences in I.Q. and arithmetic achievement. The causes for these differences are many and few can be resolved. There are some things the schools have accomplished and can continue to accomplish in the way of bridging the gap in the culturally different. Some suggestions for schools and educators are listed under RECOMMENDATIONS. In spite of the dedicated work of concerned people many of the causes have no answer at this time. It is hoped that by the efforts of those people that are concerned with the problems of education more and more will be accomplished in the way of meeting the needs of all students and in helping students achieve to the best of their ability.

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APPENDIX A

LETTER OF INTENT

Byrns Darden School
Clarksville, Tenn.
May 5, 1970

Mr. T. M. Oakley, Acting Director
Clarksville-Montgomery County School System
Clarksville, Tennessee

Dear Mr. Oakley:

I am enrolled as a graduate student at Austin Peay State University. As one of the requirements in obtaining a Master of Arts Degree, I am writing a research paper on arithmetic achievement and the culturally different child. I would like to request permission to conduct research work with the sixth grade students in Barksdale and Bailey Cobb Schools.

Yours truly

/s/ Evelyn McClain
Evelyn McClain

APPENDIX B

LETTER OF PERMISSION

May 11, 1970

Mrs. Evelyn McClain
Byrns Darden School
Clarksville, Tennessee

Dear Mrs. McClain:

You certainly have the approval of this office to conduct research with the sixth grade students in Barksdale and Bailey Cobb Schools.

Very truly yours,

/s/ T. M. Oakley
T. M. Oakley, Acting Director
Clarksville-Montgomery County
School System

TMO:ah