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THE EFFECTS OF THE CLUSTER PLAN ON MATHEMATICS AND SCIENCE STUDENTS' ACHIEVEMENT SCORES IN THE OKLAHOMA CITY PUBLIC SCHOOLS, 1970-1971.

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THE UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

THE EFFECTS OF THE CLUSTER PLAN ON MATHEMATICS AND SCIENCE STUDENTS' ACHIEVEMENT SCORES IN THE OKLAHOMA CITY PUBLIC SCHOOLS, 1970-1971

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

DOCTOR OF EDUCATION

BY

RUTH AHSMUHS KRAEMER

Norman, Oklahoma

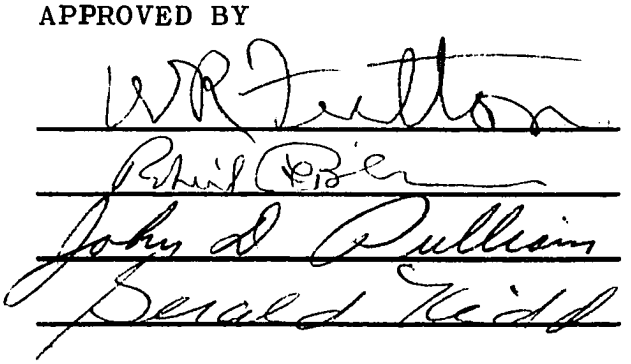
1972

THE EFFECTS OF THE CLUSTER PLAN

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ACKNOWLEDGMENTS

Reaching for an attainment beyond oneself is a humbling experience, and this work represents the most humbling experience in my life. Many individuals in the Oklahoma City Public School system--at the Board of Education and in the individual schools--deserve recognition for their support of this study. Credit is due to my committee, Dr. Robert F. Bibens, Dr. Gerald D. Kidd, and Dr. John D. Pulliam, who were always willing to extend assistance and guidance; my chairman, Dr. W. R. Fulton, gave of himself as a true professional educator, always ensuring that this research project was a learning experience, a growing experience for me. It is my hope that in the future I can be the support to others that so many have been to me.

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CHAPTER I

THE PROBLEM: ITS BACKGROUND AND SCOPE

Introduction

With a court order to racially integrate secondary schools by September, 1970, the Oklahoma City Board of Education searched for a way to accomplish the order. Their search led the Board to consider what other cities had been doing to accomplish desegregation mandates.

The Board carefully examined and evaluated "educational parks" which have been instituted in some areas (see Appendix A); furthermore, the Board considered the extensive applications of flexible scheduling in some cities. But foremost in their considerations was the strong public sentiment in Oklahoma City to maintain the neighborhood school; public sentiment was even stronger against any kind of forced busing.

In A Proposal for School System Desegregation Through the Improvement of the Quality of Education,[1] designed by a group of professors of education at the University of Oklahoma, the Board saw an answer to their dilemma. The proposal

---

[1]Robert F. Bibens, George Henderson, Raymond Lutz, and Robert Ohm, A Proposal for School Systems Desegregation Through the Improvement of the Quality of Education, unpublished.

included more than just an answer to the desegregation mandate. It also provided a way to improve education for all students.

The proposal outlined a provision for educational improvement through the establishment of special centers for language arts, social studies, mathematics, science, and foreign languages. The rationale was that if a school system could concentrate all of its monetary allowance for a given curriculum area in one geographical location, rather than spreading the money among several schools, more up-to-date equipment could be maintained; also, qualified teaching personnel could concentrate their efforts in their special fields.

In the proposal, each school was to be a home school for students in its attendance area as well as a specialized center for students from other attendance areas. Each home school was to offer extensive elective courses to students in its attendance area, thereby maintaining a traditional neighborhood school with which students could identify.

The Cluster Plan

The Oklahoma City Board of Education accepted the professors' proposal, but they modified it to meet their immediate needs. The modified plan satisfied the court order, which was the immediate necessity.

In a considerably modified version of the professors' original proposal, the Oklahoma City Board of Education

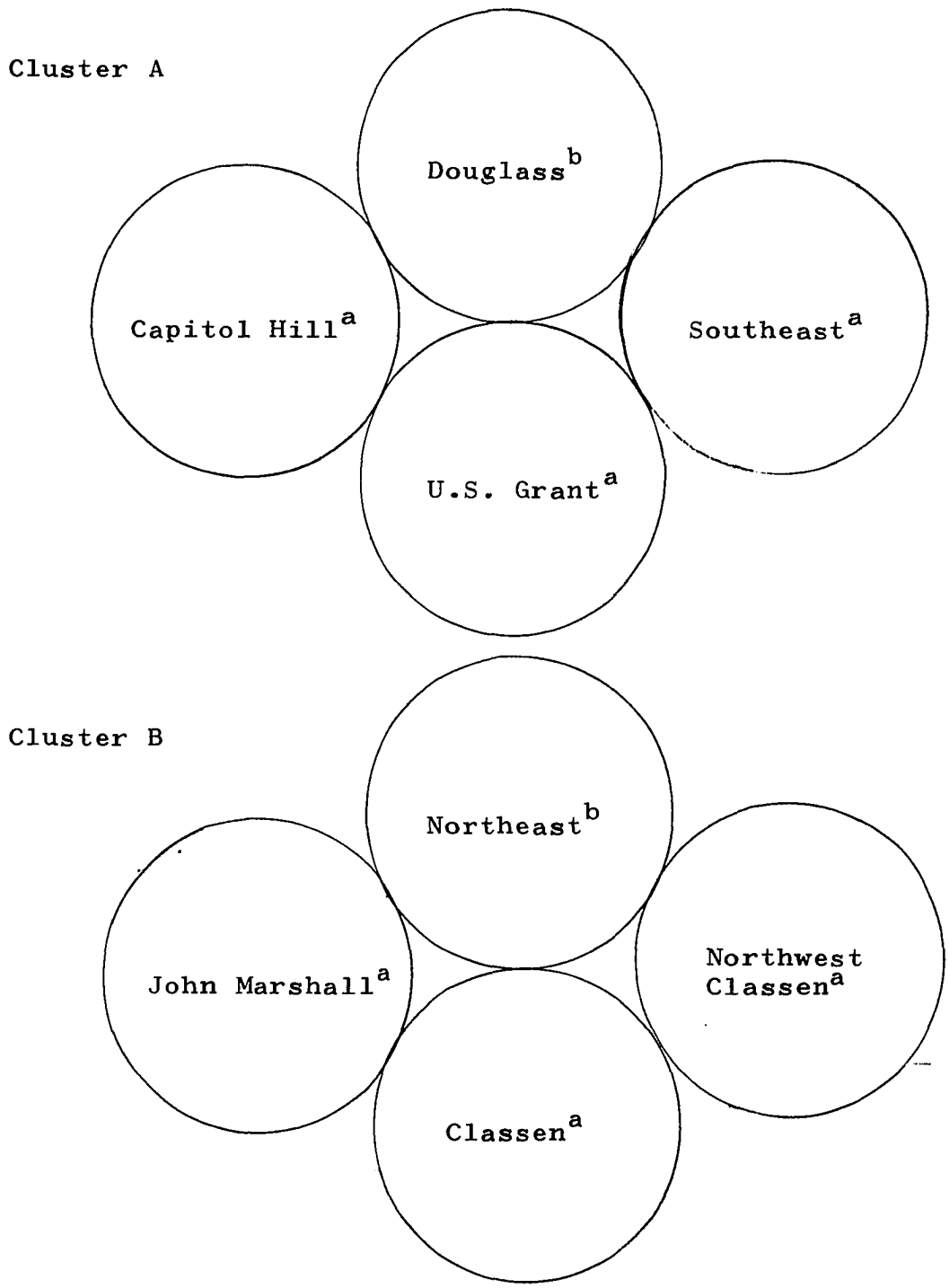
initiated a cluster plan. The plan provided for eight of Oklahoma City's high schools to be divided into two clusters. Cluster A included Douglass High School, a predominantly black school, as well as U.S. Grant, Capitol Hill, and Southeast which are predominantly white high schools. Cluster B included Northeast High School, also a predominantly black school as well as the predominantly white high schools, Northwest Classen, Classen, and John Marshall. A ninth Oklahoma City high school, Star Spencer, was not included in the initial cluster plan for two reasons: 1) its remote location in far northeast Oklahoma City, and 2) its already racially integrated student population.

Within each cluster, each predominantly black high school, Douglass in Cluster A, and Northeast in Cluster B, was a science center for the whole cluster. The other three high schools in each cluster, U.S. Grant, Capitol Hill, and Southeast in Cluster A, and Northwest Classen, Classen, and John Marshall in Cluster B, became mathematics centers. (Figure 1)

Each of the eight high schools in the cluster plan offered biology, the basic science course, as well as applied mathematics, the basic mathematics course to students in its own attendance area. Therefore, the courses involved in the clustering were advanced mathematics and science courses. This limited the number of students

Figure 1

Cluster Schools



[a]Mathematic Centers
[b]Science Centers

involved in the cluster plan to those with prerequisites for the advanced courses.

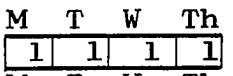
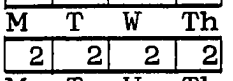
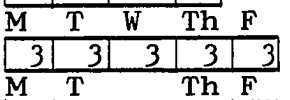
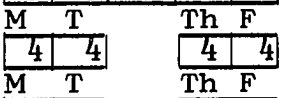
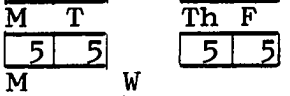
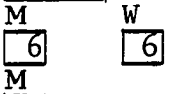
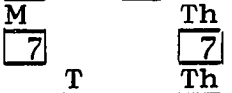
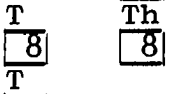
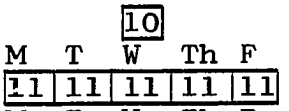
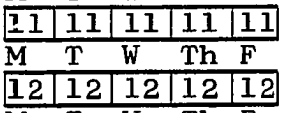
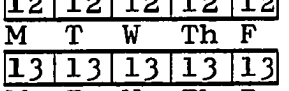
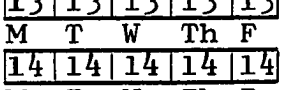
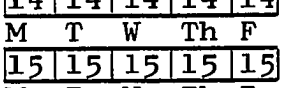
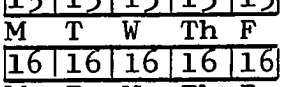
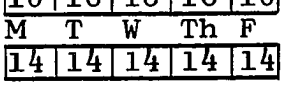
The Oklahoma City Board of Education further designed a flexible schedule to accommodate the cluster plan. The schedule divided the school week into sixteen time blocks. Longer time blocks of at least two and a half hours were allowed for classes which were clustered. Figure 2 and 3 are outlines of the time blocks and the weekly schedule.

As a further innovation, buses were provided by the School Board for students going from one school to another for classes. However, bus rides were entirely voluntary. Students were allowed to drive their own cars or ride with their friends if they preferred to avoid riding buses.

Now the questions arise: Does evidence support the rationale of the cluster plan? In other words, can a school system improve educational opportunity simultaneously with meeting desegregation goals? More specifically, did Oklahoma City do it? Possibly the more desirable solid research approach to use in answering these questions would have been to compare standardized test scores of students before clustering with standardized test scores of comparable matched students after clustering. However, no such measures were obtained before clustering; therefore, the most desirable approach was automatically eliminated.

Figure 2

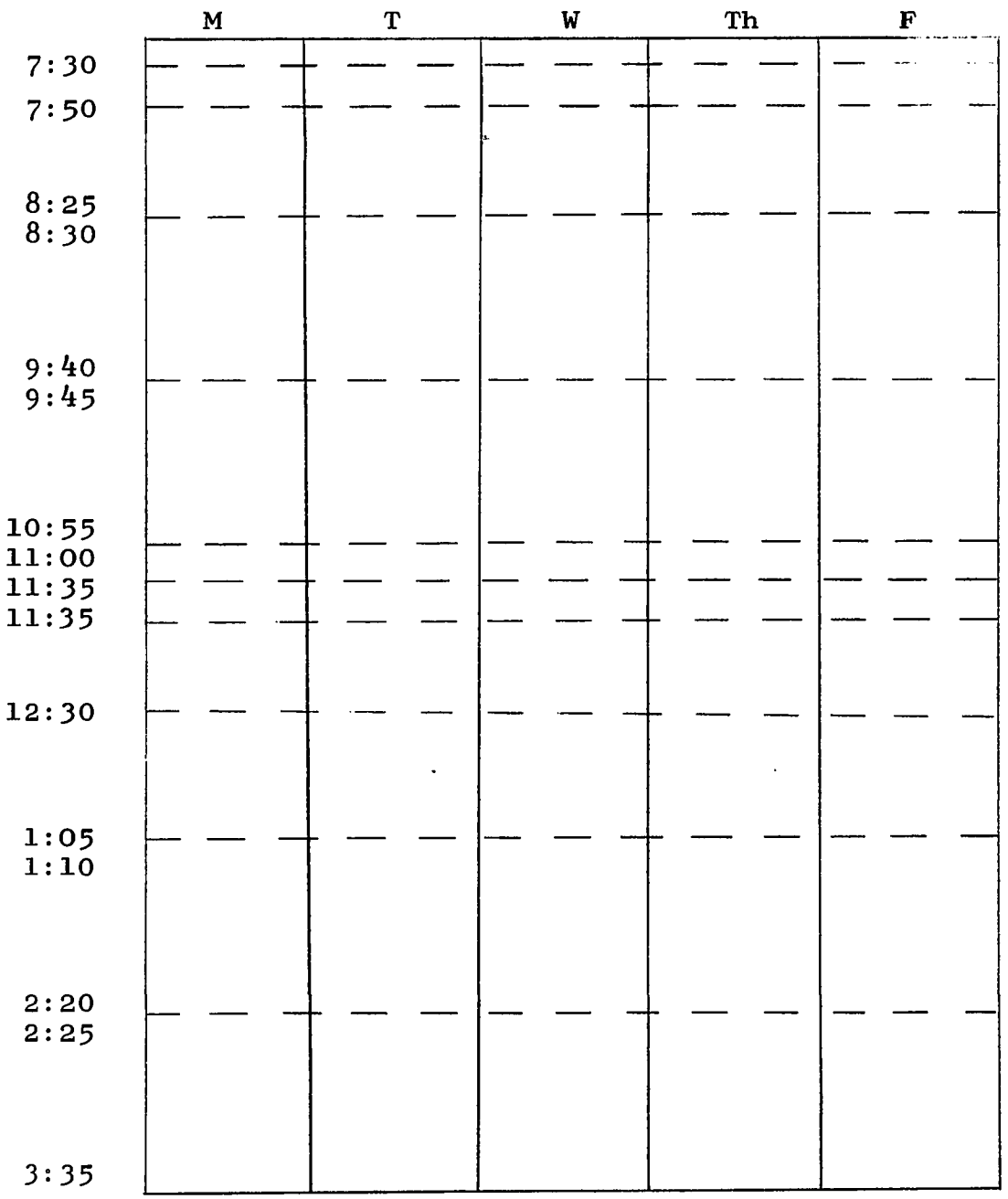
Time Blocks Designed for the Cluster Plan

1	8:30-9:40	
2	9:45-10:55	
3*		
4	1:10-2:20	
5	2:25-3:35	
6	8:30-10:55	
7	1:10-3:35	
8	8:30-10:55	
9	1:10-3:35	
10	8:30-10:55	
	1:10-3:35	
11	7:50-9:40	
12	9:45-11:35	
13	12:30-2:30	
14	8:00-11:00	
15	12:10-3:35	
16	7:30-8:25	
Voc-Tech School	8:00-11:00	

*The meeting times of the time block 3 vary with the classes before and after.

Figure 3

Sample Weekly Schedule Form Used in Oklahoma City*



*Each student filled in his own weekly schedule from a printed schedule.

Probably the second most desirable research approach and the one used in this study was to compare standardized test scores of students in the cluster plan with students from the same population, the Oklahoma City Public Schools, who were not included in the cluster plan. Obvious considerations in this approach were that achievement differences might be attributed to the effectiveness of teachers or to the socio-economic level of students.

All teachers of the clustered classes were considered to be experienced teachers in that they had taught longer than three years, the probationary period in the Oklahoma City System. Teachers of courses corresponding to the clustered classes also were experienced on the same basis. These same teachers were deemed by principals to be equally effective. Furthermore, students of as many clustered teachers as possible were included in the research to minimize effects of teacher differences on student performance.

The socio-economic levels of the nine Oklahoma City high schools were defined in terms of Title I government subsidization. According to government regulations, schools eligible for Title I funds must have at least 15 percent of the enrollment classified as poverty cases, or they must have at least 103 incidents, or families, of poverty. The two science centers, Douglass High School in Cluster A and Northeast High School in Cluster B, as well as two of the

mathematics centers, Capitol Hill in Cluster A and Classen in Cluster B, were Title I schools in 1970-1971. The four remaining mathematics centers, U.S. Grant and Southeast in Cluster A, and Northwest Classen and John Marshall in Cluster B, as well as the non-clustered school, Star Spencer, did not qualify for Title I funds. The socio-economic level of the nine high schools was considered as the clusters were being formulated. The purpose was to establish an equitable distribution of high and low economic levels. (Figure 4)

Figure 4

Title I Schools

Cluster A	Cluster B	Non-Cluster
Douglass*	Northeast*	
Capitol Hill*	Classen*	Star Spencer
U.S. Grant	John Marshall	
Southeast	Northwest Classen	

*Title I Schools

Statement of the Problem

The problem of this study was to determine if there was a difference between the achievement of students enrolled in the cluster plan in Oklahoma City Public Schools and the achievement of students enrolled in the same courses in a traditionally organized Oklahoma City school which was

not involved in the cluster plan. More specifically, based on test scores from standardized achievement tests, the study was to determine if there was a difference between the measured achievement of advanced mathematics students and advanced science students in the cluster plan and the measured achievement of advanced mathematics students and advanced science students in a traditionally organized school which was not in the cluster plan, 1970-1971.

Limitations of the Study

The study was limited to secondary schools in the Oklahoma City Public School System. The study was further limited to only advanced mathematics and advanced science students.

Definition of Terms

For purposes of this study, the following definitions are offered:

Cluster Plan - plan designed by the Board of Education of the Oklahoma City Public Schools and implemented for the first time in the school year 1970-1971. This is not to be confused with the term "cluster" as it is applied to vocational education.

Cluster School - that school outside a student's attendance area to which he has been assigned for a specific advanced mathematics or science course.

Flexible Scheduling - schedules which make provisions for classes to meet for varying lengths of time, as predetermined, but not at will.

Home School - that school in whose defined attendance area a student lives.

Mathematics Achievement - for this study, confined to the mathematics achievement of students as measured by pretests and posttests of the Metropolitan High School Mathematics Test.

Neighborhood School - that school which is closest to a student's home.

Non-cluster School - that school which followed the traditional organizational plan; i.e., all students attending the school lived in the attendance area, and the schedule for each student was the same every day, five days a week.

Science Achievement - for this study, confined to the science achievement of students as measured by pretests and posttests of the Metropolitan High School Science Test.

Title I School - that school which qualified for federal subsidization (Title I funds) on the basis of low income families in the attendance area of the school.

Purpose of the Study

Information comparing the achievement of students in the cluster plan with students in a traditional school may be used to make decisions about further organizational changes in the Oklahoma City Public Schools. This

information may further be useful to other school districts in making organizational changes. Therefore, the purpose of this study was to obtain evidence to be used in evaluating the effectiveness of the cluster plan.

Hypotheses

Based on scores from the Metropolitan High School Mathematics Test and the Metropolitan High School Science Test, the following four Null hypotheses were proposed:

1. There is no significant difference among the pre-test mathematics scores of the two cluster groups and non-cluster group.

2. There is no significant difference among the pre-test science scores of the two cluster groups and non-cluster group.

3. There is no significant difference among the mathematics achievement gain scores of the two cluster groups and the non-cluster group.

4. There is no significant difference among the science achievement gain scores of the two cluster groups and the non-cluster group.

Population

The Oklahoma City Board of Education requested that subjects for the study be limited after random selection to fifty mathematics students and fifty science students in each of the two clusters. The mathematics students who

were tested, were from U.S Grant High School in Cluster A and Northwest Classen High School in Cluster B. The science students who were tested, were from Douglass High School in Cluster A and Northeast High School in Cluster B. Also, fifty mathematics students and fifty science students from the non-cluster high school, Star Spencer High School, were used after random selection of tests given to all advanced mathematics and advanced science students of the non-cluster.

Research Design

The study utilized a Pretest-Posttest, control group true experimental design. The design was used in conjunction with the Analysis of Variance (ANOVA) statistic. Figure 5 is a graphic representation of the experimental design.

Figure 5

Pretest-Posttest Control Group
True Experimental Design[2]

R	O	X	O
R	O	X	O

[X] Experimental treatment given--in this case, the cluster plan.

[R] Random selection of students.

[O] Observation--test given in this case.

[2] Stanley Campbell, Experimental Designs for Research (Chicago: Rand McNally and Co., 1969).

The instruments. The Metropolitan High School Mathematics Test, grades 9-12, and the Metropolitan High School Science Test were used in the experiment. Forms Am and Bm were used for the pretest and posttest, respectively. The mathematics test included tests in Mathematical Analysis and Problem Solving. The science test included tests in Scientific Concepts and Understandings and Science Information.[3]

Testing Procedure. Form Am of the Metropolitan High School Mathematics Test was administered to the mathematics students in both cluster and non-cluster schools at the end of the first quarter of the school year. Similarly, Form Am of the Metropolitan High School Science Test was administered to the Science students in both cluster and the non-cluster schools at the end of the first quarter.

Form Bm of the Metropolitan High School Mathematics Test and the Metropolitan High School Science Test was administered as a posttest measure on all subjects. This testing was during the fourth quarter of the school year.

It would have been desirable to give the pretest earlier in the school year, but extensive schedule changes prohibited earlier testing. However, it is thought that in this case, differences in the pretest scores would have been minimal.

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[3]Oscar Krisen Buros, ed., Sixth Mental Measurements Yearbook (Highland Park, New Jersey: Gryphen Press).

Organization of the Study

The report of the study was organized into five chapters. The first chapter is a description of the study, including the background, significance, and limitations of the study. It also contains the statement of the problem, the hypotheses used to test the problem, a description of the procedures followed in the collection of the data, the research design of the study, the statistical treatment used in the analysis of the data, as well as the definition of terms used in the study.

Chapter II consists of a review of selected research studies which are relevant to this study. The procedures which were followed in setting up the experiment and collecting the data is reported in Chapter III, and Chapter IV contains the treatment and analyses of the data. The summary of the study, the conclusion based on the findings, a discussion, and recommendations for further research are included in Chapter V.

CHAPTER II

RELATED RESEARCH

Two factors which have been found to be consistently related to achievement gain are the socio-economic level of students and the transporting of students from one type of ethnic composition to another. Research directly related to the cluster plan appears to be non-existent. However, research related to busing, or transporting school children from their neighborhood school to another school district, usually for the purpose of desegregation, is in abundance. The transporting of school children from their neighborhood schools is an integral component of the cluster plan in the Oklahoma City Public Schools; therefore, it is thought that literature related to this factor is relevant to this study. However, the research in this chapter will be confined to or will stress the academic achievement of students as it is affected by a change of school areas.

Some studies which are mentioned were conducted solely to examine the effect of school desegregation on minority races; they are relevant to this study only from the standpoint of academic achievement. The present study in no way attempts to measure differences of achievement between or among races.

Community Zoning Plan

Somewhat similar to the cluster plan in Oklahoma City is the community zoning plan in New York City. The community zoning plan was an experimental program which involved the interchange of large numbers of pupils, necessitating rearrangement of personnel, equipment, and supplies. During the 1964-65 and 1965-66 school years, the Office of Educational Research of the New York City Board of Education conducted an evaluation of the program.

Eight schools were involved in the community zoning plan. Selected elementary schools were paired to achieve ethnic balance. Although the full report on the plan is comprehensive, the data which are most relevant to this study are the results in achievement scores. The analysis of standardized test scores revealed that nearly all pupil groups and sub-groups improved in standing in relation to national norms and predictive or expected achievement levels.[1] The Metropolitan Achievement Tests in reading and arithmetic were administered to the pupils in grades two through six in all eight schools. Alternate forms were given at initial and final test times.

The students were classified into three ethnic groups: Negro, Puerto Rican, and Other. The scores were

---

[1] Evaluation of the Community Zoning Program Summary Report. New York City Board of Education, New York.

analyzed by pupil groups according to whether the pupils originally attended a school whose enrollment was predominantly Negro and Puerto Rican, or predominantly Other. Pupils were also grouped according to whether they were attending the same school which they had attended prior to June 1964 (the "Home" group), or had been transferred to the other school of the pair requiring them generally to travel a somewhat longer distance (the "Travel" group).

Pupils with higher achievement scores at the beginning of the experiment made greater improvement than pupils of lower initial standing. This fact was true regardless of pupil ethnic group. Nevertheless, Negro and Puerto Rican pupils in general attained lower scores on the initial tests; as a group they showed less improvement over the experimental period than did other pupils. This finding was demonstrated both when scores of ethnic groups were compared and when individual pupil scores were analyzed.

A separate analysis was made of the factor of pupil travel, i.e., the reading achievement of pupils attending the original home school as contrasted with the achievement of pupils traveling longer distances to the new school. With respect to the Negro groups the findings were inconclusive; however, for the Other pupils, the Home Groups showed greater gains in reading than the Travel groups, at all grade levels.

The main finding concerning achievement is that pupils in all schools demonstrated an improved standing in relation to national norms at the end of the experimental period. Very frequently the improvement attained exceeded the expected gains based upon national norms.

Study of Gifted Students

In another study, three groups of approximately 60 gifted fifth grade subjects were tested for academic skills, social and emotional security, needs and problems, interests, and classroom reputation, by Nellie D. Hampton. The experimental group was transported daily to a central location for an eight-week summer session which had a curriculum adapted to the special abilities of the children. The other two groups, differing on awareness of inclusion in the study, were set up as control groups. The null hypothesis that there would be no significant differences among the three groups on any of the variables was accepted on all points except the academic areas. In these areas, the experimental group made significantly higher gains.[2]

Achievement and Socio-Economic Level

All studies related to achievement of children transported from home or neighborhood schools do not show

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[2]Nellie D. Hampton, "Effects of Special Training on the Achievement and Adjustment of Gifted Children," SRA Junior Inventory, Report No. CRP-923, State College of Iowa, Cedar Falls.

academic gains. Hammond, Sawhill, and Williams studied 224 minority children who were in a busing program in Seattle, Washington. The students were drawn from ten schools and were bused to 32 schools. Their school records, as measured by grades, suffered; 43 percent did more poorly than they had the previous year, 41 percent did the same as they had the previous year, and 6 percent did better than they had the previous year. Because no achievement test scores were reported, it was impossible to know whether the absolute achievement of bused children rose or fell.[3]

In his discussion of the relation of achievement to school characteristics, Coleman pointed out that socio-economic factors "bear a strong relation to academic achievement."[4] He inferred from his research that majority students are less affected by the school they attend than are minority students. In other words, based upon his compilation of studies, Coleman deduced that a change of school would be more likely to improve the achievement of minority students than to affect or decrease the achievement of majority students.

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[3]Alpha J. Hammond, Lucy M. Sawhill, and Rover B. Williams, A survey of the Adjustment of the Negro Students Who Transferred to Schools Outside Their Neighborhoods During 1963-1964 Under the New Seattle School Board Ruling (unpublished Master of Social Work Project, University of Washington, 1964).

[4]James S. Coleman, Equality of Educational Opportunity, U.S. Department of Health, Education and Welfare (Washington, D.C.: University of Washington, 1964).

Bindman, however, found in his study at the University of Illinois that student performance seemed unrelated to socio-economic background.[5] He studied a group of 154 males of the 326 Negro students on the main campus. Students from "more advantaged" homes were not found to be better prepared than those from "less advantaged" homes.

Four Communities

Thomas Mahan analyzed the results of busing in the four urban communities: Boston, Massachusetts; Hartford, Connecticut; Rochester, New York; and White Plains, New York.[6] In pilot studies, these communities began busing minority students from ghetto areas to urban communities. Of the four communities, Hartford was the only one initially who had a research design which included a comparison group. However, in spite of some differences, the four operations were similar. In every case students, who were different elementary age levels, were bused to schools in suburbs where an effort was made to re-create the advantages of the neighborhood school, including after-school activities, parent involvement, and school-community programs such as scouting.

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[5]Aaron M. Bindman, Participation of Negro Students in an Integrated University (unpublished Ph.D. dissertation in Sociology, University of Illinois, 1965), University Microfilm No. 65-7076.

[6]Thomas W. Mahan, "The Busing of Students for Equal Opportunities," The Journal of Negro Education, XXXVII, No. 3 (Summer, 1968), 291-300.

Boston. Teele reported in detail on the voluntary school integration project using the open enrollment plan of the Boston, Massachusetts School Department in transporting Negro children from predominantly Negro schools in the black district to more racially balanced schools in other parts of Boston.[7] The project, Project Exodus, involved private financing, intra-city busing, and the initiative and participation of working class ghetto residents. Both attitudinal and achievement tests on the children participating in Project Exodus in grades three through eight were obtained in the fall of 1967 and the spring of 1968. Similar data were collected on a comparison group of children not enrolled in Exodus and attending predominantly black schools in their neighborhood. Collection of change data was completed for 151 children. It was found that the children in Exodus showed greater improvement in achievement test scores than the non-participants. Teele and his associates are doing further data analysis and research to try to more clearly locate factors related to improvement in both affective and cognitive areas for Exodus and non-Exodus children.

Hartford. Project Concern in Hartford, Connecticut, involved busing approximately 260 inner-city children to

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[7]James E. Teele, The Study of Project Exodus: A School Racial Integration Project in Boston, Massachusetts, Final Report, Office of Education (Department of Health, Education and Welfare), Washington, D.C.

suburban elementary schools.[8] The project was designed to experimentally evaluate the effects of (1) placement in a suburban school with or without remedial-supportive assistance, and (2) placement in an inner-city school with or without compensatory services. Criterion variables used to evaluate the treatment were mental ability, academic achievement, personal-social development, and creativity. An evaluation of the findings in 1968 suggested that the bused experimental children in suburban classes in grades one through three had a significantly greater tendency to show growth in mental ability than the control children remaining in inner-city classrooms. In grades four and five, however, the controls showed higher achievement than the experimentals.

Rochester. In an effort to correct racial imbalance in two districts, in 1965 free transportation was provided for 25 first grade children who were sent voluntarily from a Rochester, New York public school to six schools in the West Irondequoit District.[9] This longitudinal metropolitan approach was continued the following year with another 25 first grade pupils and included more children and grade levels in ensuing years.

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[8]Thomas W. Mahan, Project Concern: An Interim Report on an Educational Exploration Preliminary Report, City School District, New York, March, 1969.

[9]A Cooperative Program Between a City School District and a Suburban School District, Interim Report, Rochester City School District, New York, March, 1969.

Students transferred to the suburban classes (the experimental group) were compared with a control group which remained in the city. Data were collected on academic achievement, attendance records, promotion rates, social growth, and work habits. Test data showed that the achievement of the transferred pupils was at least equal to, if not higher than the control group which remained in the city school.

White Plains. According to the report on the integration of schools in White Plains, New York, the racial balance which was achieved by busing inner-city Negro children to formerly all-white schools, has not had an adverse effect on the academic achievement of white students.[10] Furthermore, it has not led to a white middle class exodus.

The White Plains school racial balance plan involving 8,700 pupils, 17 percent of which were Negro, was implemented in 1964. Standardized test scores from white fifth-grade students who were in the third grade of the integrated receiving schools in 1964 (neighborhood group) were compared with scores from white children who were in the third grade in 1960 before their schools were integrated (control group). The neighborhood group in many respects scored at a higher achievement level than the control group.

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[10] The White Plains Racial Balance Plan. White Plains Public Schools, New York. ED 011 593.

Another test score comparison revealed that inner-city Negro children who were in the first grade in 1964 were achieving slightly better in the third grade after three years of integration than were Negro pupils who spent the first and second grades in segregated schools.

Further Studies

Syracuse, New York. D. H. Jaquith reported that in Syracuse, New York, 30 racial minority pupils were bused from their home school to predominantly white elementary schools.[11] The 30 pupils showed significant academic progress. Then two of the three predominantly Negro schools were closed, and the pupils were bused to integrated schools. The bused pupils doubled their advances in reading achievement, compared with those students in the remaining Negro school.

New Rochelle, New York. T. G. Wolman gave a more detailed report than that of Jaquith when he reported some of the academic effects of the optional transfer plan in New Rochelle, New York, where students from a Negro elementary school were bused to other schools.[12] Metropolitan Achievement test scores of transfer students in

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[11] D. H. Jaquith, School Integration in Syracuse, New York, U.S. Commission on Civil Rights, Washington, D.C., November, 1967, 16-18.

[12] T. G. Wolman, "Learning Effects of Integration in New Rochelle," Integrated Education, II, No. 6 (December 1964-January 1965), 30-31.

grades one through five showed that the mean grade equivalents were consistent with growth scores for non-transfer students from comparable socio-economic and ethnic groups. However, at the fourth-grade level, both Negro and white lower-class children had lower scores than upper-income white students, 80 percent of whom were achieving more than two years above grade level in reading. The most positive effects of integrated schooling in the Wolman study were observed at the kindergarten level.[13] The scores of kindergarten transfer students were significantly higher than those of comparable non-transfers.

Buffalo, New York. Three hundred and fifty Buffalo, New York, mostly Negro minority students, were transferred in the spring of 1966 from an inner-city school to schools which were 90 percent or more white.[14] Two hundred and ten second graders, mostly Negro, were transferred from an adjacent inner-city school to five other peripheral schools. A comparison was made of the students' pre-transfer and post-transfer scores on the paragraph meaning and word meaning section of the Stanford Achievement Test obtained from a sample of 54 transfer students and 60 students who were not transferred but were still in an

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[13] Ibid.

[14] Study of Achievement in Reading of Pupils Transferred from Schools 15 to 35 to Peripheral Schools to Overcrowding, to Abandon an Obsolete School, and to Achieve a more desirable Racial Balance in City Schools, Buffalo Public Schools, New York.

inner-city school. Pupils who were transferred from the inner-city school to peripheral schools showed significantly greater gains when they were compared with pupils who remained in inner-city schools. Further, teacher evaluation of achievement and adjustment to school and classroom procedures on the part of all pupils (grades one through six) who were bused from the inner-city, showed significant positive change.

Western Tennessee. Robert L. Williams and Fred Venditti gave pretests and posttests to randomly selected students in urban schools in Western Tennessee; the students were in three groups: a) those attending newly desegregated schools; b) those attending segregated schools; c) those attending schools which had been desegregated for one year or more.[15] The tests were opinionnaires, the questions of which had five-point answers. Using an Analysis of Variance, mixed design, with educational groups and the pretest-posttest dimension as the two independent variables, the researchers found that all groups decreased in their expressed satisfaction with school; however, not significantly. On the question which was related to students' appraisals of what they had learned, students in the newly integrated schools gave more positive responses than those

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[15]Robert L. Williams and Fred Venditti, "Effect of Academic Desegregation on Southern White Students' Expressed Satisfaction with School," The Journal of Negro Education, XXXVIII, No. 4 (Fall, 1969), 338-341.

in segregated schools.

Wisconsin Districts. In Wisconsin, a comparison was made on the educational results of re-districting males and females in communities.[16] Five re-districted communities were matched with five traditionally organized school districts. Starting with grade one, students were compared for twelve years. Matching criteria included district enrollment, physical facilities, size of community tax base, bus transportation, and common interests. Students were tested in grades one, six, nine, and twelve. B. W. Kreitlow reported that findings from the Wisconsin study indicated that both males and females from re-districted schools performed better in academic achievement than did those in the traditionally organized school districts.[17]

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[16]Barton W. Kreitlow, Long-term Study of Educational Effectiveness of Newly Formed Centralized School Districts in Rural Areas, Wisconsin University, Madison, 1966.

[17]Ibid.

CHAPTER III

PROCEDURES

Permission was obtained from the Oklahoma City Board of Education in August, 1970 to conduct this study in the Oklahoma City Public Schools, the school year 1970-1971. (Approval Form-Appendix B.) The School Board requested that the testing be confined to one mathematics center in each cluster and the two science centers, Douglass High School in Cluster A and Northeast High School in Cluster B. U.S. Grant High School in Cluster A and Northwest Classen High School in Cluster B were chosen as the mathematics centers; the initial enrollment for clustered classes was higher in these two schools than in the other four mathematics centers, thereby affording a larger population for random sampling. The Oklahoma City Board of Education further requested that the sampling be limited to fifty mathematics students and fifty science students in each cluster.

Participation in the testing by both teachers and students was entirely voluntary; i.e., principals in all four of the participating cluster schools left the decision to participate with the teachers; similarly, the teachers left the decision to participate with the students. There

were, however, no refusals from teachers or students. This was the case in both clusters and in the non-cluster school.

Students from as many different teachers as possible were included in the testing in both the mathematics and science centers. The fifty students in each cluster to which the Oklahoma City School Board limited the analyses, were chosen randomly, using a table of random numbers. However, in the non-cluster school, the same mathematics teacher instructed all advanced mathematics classes, and the same science teacher instructed all advanced science classes. Therefore, all the advanced mathematics students and all the advanced science students of the control group were tested in the non-cluster school. Fifty mathematics students and fifty science students were subsequently randomly chosen to be used in the study.

Personal Information Opinionnaire

A personal information opinionnaire was given to all participating cluster students. The purpose of the opinionnaire was to determine student attitudes toward the cluster plan and toward riding a school bus. The data from the opinionnaires indicated that student attitudes toward the cluster plan appeared to be positive rather than negative. Students responding favorably toward the cluster plan indicated that the educational opportunity was greater than before clustering. They further indicated

that they could meet more people in the cluster plan than they could before clustering. The responses to the ten questions on the opinionnaires are listed in Appendix C.

Controlling for Socio-Economic Status

Research has shown that socio-economic status, or variables, show a strong relationship to academic achievement.[1] For this reason it was necessary to control the socio-economic status of the different groups in order to protect the test results from contamination by extraneous variables. The particular socio-economic status classification paradigm chosen for the study was one developed by Alba M. Edwards.[2] In this classification system occupational respondents are classified in one of nine categories.

The parents or guardians of the 210 students chosen for the final analysis were used to establish the socio-economic status of each. The number and percentage of each category and the resulting chi square (X^2) statistics are shown in Tables 1, 2, 3, and 4.

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[1]James S. Coleman, Equality of Educational Opportunity, U.S. Department of Health, Education and Welfare (Washington, D.C.: U.S. Governmental Printing Office, 1966).

[2]Alba M. Edwards, Population Comparative Occupational Statistics for the United States, 1870-1940 (Washington, D.C.: U.S. Government Printing Office, 1943).

TABLE 1

NUMBER AND PERCENTAGE OF SOCIO-ECONOMIC CATEGORIES

	Cluster A		Cluster B		Non-Cluster		Totals	
	No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage
Professional	15	21.5	31	44.3	28	40.0	74	105.8
Proprietors, Managers and Officials	13	18.6	12	17.0	8	11.5	33	47.1
Clerks and Kindred Workers	26	37.1	10	14.3	17	24.3	53	75.7
Skilled Workers and Foremen	9	12.9	11	15.7	14	20.0	34	48.6
Semi-skilled	5	7.1	2	2.9	1	1.4	8	11.4
Unskilled	1	1.4	2	2.9	0	0.0	3	4.3
Unemployed	0	0.0	0	0.0	0	0.0	0	0.0
Assistance	0	0.0	0	0.0	1	1.4	1	1.4
Not determined	1	1.4	2	2.9	1	1.4	4	5.7
TOTALS	70	100	70	100	70	100	210	300

A chi square statistical test was performed on each category of the socio-economic status classification system. The results of these chi square tests are shown in Table 2.

TABLE 2

RESULTS OF SOCIO-ECONOMIC GROUP COMPARISONS

	Chi Square Tests Among Groups		
Type of Profession	Computed Chi Square	Tabled Value	Significance Level
Professional	8.569	5.991	$< .05^a$
Proprietors, Managers and Officials	1.270	5.991	.05
Clerks and Kindred Workers	10.518	5.991	$< .01^b$
Skilled Workers and Foremen	1.563	5.991	.05
Semi-skilled	4.595	5.991	.05
Unskilled	1.502	5.992	.05
Unemployed		5.991	.05
Assistance	.194	5.991	.05
Not Determined	1.026	5.991	.05

[a]Significant; $p < .05$

[b]Significant; $p < .01$

The results of the chi square tests by categories show that only two of the results were significant. There was a significant difference in the distribution of professional people for the Cluster A, Cluster B and non-cluster groups (chi square = 8.569; $p < .05$). The highest number of professionals was reported in Cluster B (31), and the lowest number was in Cluster A (15), while the non-cluster group reported 28.

There was also a significant difference in the distribution of the number of clerks and kindred workers of the three groups (chi square = 10.518; $p < .01$). The highest number of clerks and kindred workers was noted in the Cluster A group (26) and the lowest number was noted in the Cluster B group (10), while the non-cluster group listed 17 in that category.

All other chi square values were not significant at the .05 level, although the semi-skilled category was marginal (chi square = 4.595; $p > .05$). Of particular interest is the fact that none of the 210 subjects were unemployed and only one reported assistance as their main source of income.

An over-all or omnibus chi square test was made on all categories for all three groups. The results of this test showed no significant differences among the categories of the three groups of subjects (chi square = 14.836; $p > .05$). Table 3 gives a detailed comparison of the

TABLE 3

OMNIBUS CHI SQUARE TEST FOR ALL THREE GROUPS

	Cluster A		Cluster B		Non-Cluster			
	Observed	Expected	Observed	Expected	Observed	Expected		
Professional	15	25	31	25	28	25		
Proprietors, Managers and Officials	13	11	12	11	8	11		
Clerks and Kindred Workers	26	18	10	18	17	18		
Skilled Workers and Foremen	9	11	11	11	14	11		
Semi-skilled	5	3	2	3	1	3		
Unskilled	1	1	2	1	0	1		
Unemployed	0	0	0	0	0	0		
Assistance	0	.33	0	.33	1	.33		
Not Determined	1	1.33	2	1.33	1	1.33		
TOTALS	70	70	70	70	70	70	210	210

chi square = 14.8313; df = 16; $p > .05$

TABLE 4

PERCENTAGES FOR ALL THREE GROUPS

Groups	Percentages			X^2		
	Cluster A	Cluster B	Non-Cluster			
Professionals	21.5	44.3	40.0	X^2	8.569	$<$ .05
Proprietors, Managers and Officials	18.6	17.0	11.5	X^2	1.27	N.S.
Clerks and Kindred Workers	37.1	14.3	24.3	X^2	10.5157	$<$ .01
Skilled Workers and Foremen	12.9	15.7	20.0	X^2	1.5636	N.S.
Semi-skilled	7.1	2.9	1.4	X^2	4.5945	N.S.
Unskilled	1.4	2.9	0.0	X^2	1.5015	N.S.
Unemployed	0.0	0.0	0.0	X^2	0.0	N.S.
Assistance	0.0	0.0	1.4	X^2	0.1939	N.S.
Not Given	1.4	2.9	1.4	X^2	1.0261	N.S.
	100	100	100			

observed and expected frequencies used in the computations.

Since the tests conducted on the socio-economic status of the three groups showed them to be statistically equal, the experimenter concluded that no significant difference in achievement would be caused by differences in the socio-economic status levels. It was further concluded that any observed differences in gain scores would necessarily be caused by some factor other than socio-economic status.

Test Administration

In both cluster and non-cluster schools, classroom teachers administered the achievement tests to their students who were involved. This was to reduce the Halo effect as much as possible. The pretests were administered toward the end of the first quarter, and the posttests were administered toward the end of the fourth quarter, 1970-1971. Earlier administration of the pretest would have been desirable, but was not possible due to numerous schedule adjustments. It is thought that earlier test results would not have differed statistically from those that were taken. The actual administration dates of the tests are given in Figure 6.

Test Description and Scoring

Many standardized tests were examined in search of one which emphasized general concepts and applications of

Figure 6

Test Administration Dates

	School	Pretest	Posttest
Mathematics	Cluster A	November 16	May 6
	Cluster B	November 17	May 4
	Non-Cluster	November 16	May 3
Science	Cluster A	November 18	May 6
	Cluster B	November 18	May 4
	Non-Cluster	November 17	May 3

both mathematics and science. Advice was sought from the Testing and Evaluation Center at the Oklahoma City Board of Education. The compilation of recommendations led to the selection of the Metropolitan High School Mathematics Test, Advanced Forms, Am and Bm, and the Metropolitan High School Science Test, Advanced Forms, Am and Bm. These tests report a range in validity from .664 to .725 and a range of .83 to .91 in reliability for the mathematics test and a range in validity from .667 to .747 and a range of .81 to .90 in reliability for the science test.

All tests were manufally scored with a key provided by the test publisher. Raw scores and standardized scores were tabulated on all subjects. The data were then used in completing the analyses.

The further analyses of the data are given in Chapter IV which contains a detailed explanation of the actual computations made in testing the hypotheses. The final part of the chapter contains the results of the computations.

CHAPTER IV

ANALYSES OF DATA

Three hundred thirty high school students from the Oklahoma City Public School system were used in determining the amount of mathematics and science achievement gain experienced by clustered and non-clustered students. Students were given a pretest-posttest administration of an achievement test, the Metropolitan High School Mathematics Test or the Metropolitan High School Science Test. These two instruments yield a score that is composed of two sub-scores--concepts and applications. Posttest scores were subtracted from pretest scores in order to determine the amount of gain experienced. The mathematics and science groups were composed of students from one mathematics center and one science center from Cluster A, one mathematics center and one science center from Cluster B, and a non-clustered school in the Oklahoma City Public School system.

The data were punched and verified at the Merrick Computer Center on the campus of the University of Oklahoma at Norman, Oklahoma. The card format used in entering the data is shown in Figure 7. The Merrick Center is equipped with an IBM 360-50 computer and accompanying configuration. Part of this configuration is composed of statistical

Figure 7

Card Format of Data Collected

Information	Column(s)	Range of Possible Values
Student Number	1-3	(001-084)
School Number	4	1-5
Discipline Number	5	1-2
Mathematics		
Concepts		
Pretest Raw Score	6-7	2-36
Pretest Standard Score	8-9	1-86
Application		
Pretest Raw Score	10-11	1-30
Pretest Standard Score	12-13	0-99
Concepts		
Posttest Raw Score	14-15	13-34
Posttest Standard Score	16-17	38-85
Application		
Posttest Raw Score	18-19	0-30
Posttest Standard Score	20-21	0-99
Science		
Concepts		
Pretest Raw Score	6-7	12-61
Pretest Standard Score	8-9	16-98
Application		
Pretest Raw Score	10-11	2-53
Pretest Standard Score	12-13	0-85
Concepts		
Posttest Raw Score	14-15	13-58
Posttest Standard Score	16-17	18-99
Application		
Posttest Raw Score	18-19	10-51
Posttest Standard Score	20-21	19-96

packages of pre-written computer programs. Several of these programs were employed to make the necessary computations in testing the hypotheses.

The original plan was to use 50 subjects from each school for the analyses. However, because of subject mortality, one of the groups contained only 35 members and another 36 at the time the posttest was administered. This posed a problem to further computations since it is a basic assumption of Analysis of Variance (ANOVA) that the variances of the groups be equal or the number of subjects within the groups the same.[1]

A preliminary test for homogeneity of group variances showed the groups to be homogeneous, but the results were approaching marginality ($F = 2.05$; $p > .05$). As an attempt to avoid the violation of one of the Analysis of Variance assumptions, the groups were reduced to equal numbers of 35 subjects each. A table of random numbers was used in selecting the 35 participants of each group. The differences in the means and standard deviations of the groups before and after the sample adjustment are given in Table 5.

Table 5 shows that the ratio of the lowest variance of the pretest mathematics scores (156.25) to the highest pretest mathematics variance (477.86) was reduced from

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[1]W. F. Hays, Statistics (New York: Harper & Row, 1963).

TABLE 5

MEANS AND STANDARD DEVIATIONS OF GROUPS BEFORE AND AFTER EQUAL NUMBERS*

	Before Adjustment of Sample Size			After Adjustment of Sample Size		
Group	N	Mean	sd	N	Mean	sd
Cluster A/Mathematics	84	64.92	16.31	35	65.31	14.77
Cluster B/Mathematics	35	70.49	12.50	35	70.49	12.50
Non-Cluster/Mathematics	71	56.29	21.86	35	55.60	19.13
Cluster A/Science	55	68.23	14.29	35	71.17	11.81
Cluster B/Science	36	66.11	16.85	35	66.11	16.12
Non-Cluster/Science	51	61.22	20.30	35	58.09	16.28
Total N	312			210		

*Although 330 students were originally tested, only 312 had both pretest and posttest scores.

1: 3.058 to 1: 2.342, thus making the variance more commensurate with the others and more in accordance with the assumptions underlying the Analysis of Variance statistic. Since the assumptions were met the researcher continued with the testing of the stated hypotheses.

Results of Testing Hypothesis One

Hypothesis One stated that there was no significant difference among the pretest mathematics scores of the two

cluster groups and the non-cluster group. The results of testing this hypothesis are given in Table 6.

TABLE 6

ANALYSIS OF MATHEMATICS ACHIEVEMENT SCORES
(Pretest)

Source	Sum of Squares	Degrees of Freedom	Mean Square	F	p.
$SS_{between}$	1,629	2	814.5	3.58	$> .05$
SS_{within}	23,146	102	226.92		
SS_{total}	24,775	104			

Table 6 shows that there was no statistically significant difference among the means of the three groups ($F = 3.58$; $p. > .05$). Therefore, the null hypothesis of proposition number one (Ho_1) was accepted.

Results of Testing Hypothesis Two

Hypothesis Two stated that there was no significant difference among the pretest science scores of the two cluster groups and the non-cluster group. The results of testing this hypothesis are given in Table 7.

Table 7 shows that there was no significant difference among the means of the three groups of science students ($F = 2.25$; $p. > .05$). Therefore, the null hypothesis of proposition number two (Ho_2) was accepted.

TABLE 7

ANALYSIS OF SCIENCE ACHIEVEMENT SCORES
(Pretest)

Source	Sum of Squares	Degrees of Freedom	Mean Square	F	p.
$SS_{between}$	1,574	2	787	2.25	$> .05$
SS_{within}	35,598	102	349		
SS_{total}	38,746	104			

Results of Testing Hypothesis Three

Hypothesis Three stated that there was no significant difference among the mathematics achievement gain scores of the two cluster groups and the non-cluster group. The results of testing this hypothesis are given in Table 8.

TABLE 8

ANALYSIS OF MATHEMATICS ACHIEVEMENT GAIN SCORES

Source	Sum of Squares	Degrees of Freedom	Mean Square	F	p.
$SS_{between}$	3,998	2	1999	7.86	$< .001$
SS_{within}	25,927	102	254.18		
SS_{total}	29,925	104			

Table 8 shows a significant difference among the means of the three groups of subjects ($F = 7.86$; $p < .001$). In order to locate the specific differences, a Post-Hoc comparisons test was performed on the ranges of the mean values. The test used in this case was developed by Scheffe.[2] The results of these individual comparisons are given in Table 9.

TABLE 9

POST-HOC COMPARISONS OF MATHEMATICS ACHIEVEMENT GROUPS

	Non-Cluster 55.60	Cluster B 65.31	Cluster A 70.49
Non-Cluster 55.60		9.71[a]	14.89[b]
Cluster B 65.31		0	5.18
Cluster A 70.49			0

[a]Significant; $p < .05$

[b]Significant; $p < .01$

The results shown in Table 9 indicate that a significant difference occurred in the achievement gain scores of the three groups. In particular, Cluster A and Cluster B showed significantly higher gains in mathematics achievement than the non-cluster school. Therefore, the null hypothesis of proposition number three (Ho_3) was rejected.

[2]Ibid.

Results of Testing Hypothesis Four

Hypothesis Four stated that there was no significant difference among the science achievement gain scores of the two cluster groups and the non-cluster group. The results of testing Hypothesis Four are given in Table 10.

TABLE 10

ANALYSIS OF SCIENCE ACHIEVEMENT GAIN SCORES

Source	Sum of Squares	Degrees of Freedom	Mean Square	F	p
$SS_{between}$	3,047	2	1,523.5	6.67	$< .01$
SS_{within}	23,237	102	228.16		
SS_{total}	26,320	104			

Table 10 shows a significant difference among the means of the three groups of subjects ($F = 6.67$; $p < .01$). In order to locate the specific mean differences among the three groups, Scheffe's Post-Hoc Comparison technique was again used to test the significance of the mean ranges. The results of this test are given in Table 11.

The results shown in Tables 10 and 11 show that a significant difference was recorded among the science achievement gain scores of cluster and non-cluster high school students. Specifically, Clusters A and B both

TABLE 11

POST-HOC COMPARISONS OF SCIENCE ACHIEVEMENT GROUPS

	Non-Cluster 58.09	Cluster A 66.11	Cluster B 71.17
Non-Cluster 58.09	0	8.02[a]	13.08[b]
Cluster A 66.11		0	5.06
Cluster B 71.17			0

[a]Significant; $p. < .05$

[b]Significant; $p. < .01$

showed significantly higher science achievement gains than students from the non-cluster high school. Therefore, the null hypothesis of proposition number four (Ho_4) was rejected.

Graphic Analysis of Mathematics Subscores

In order to show more specific differences among the different groups, the pretest and posttest scores of the individual groups were superimposed on each other. The composite mathematics and science scores were further reduced to the subscores of concepts and applications. (Figures 8, 9, 10, and 11)

Figure 8

Graphic Display of Standardized Mathematics Concepts Scores of Cluster A, Cluster B, and the Non-Cluster School

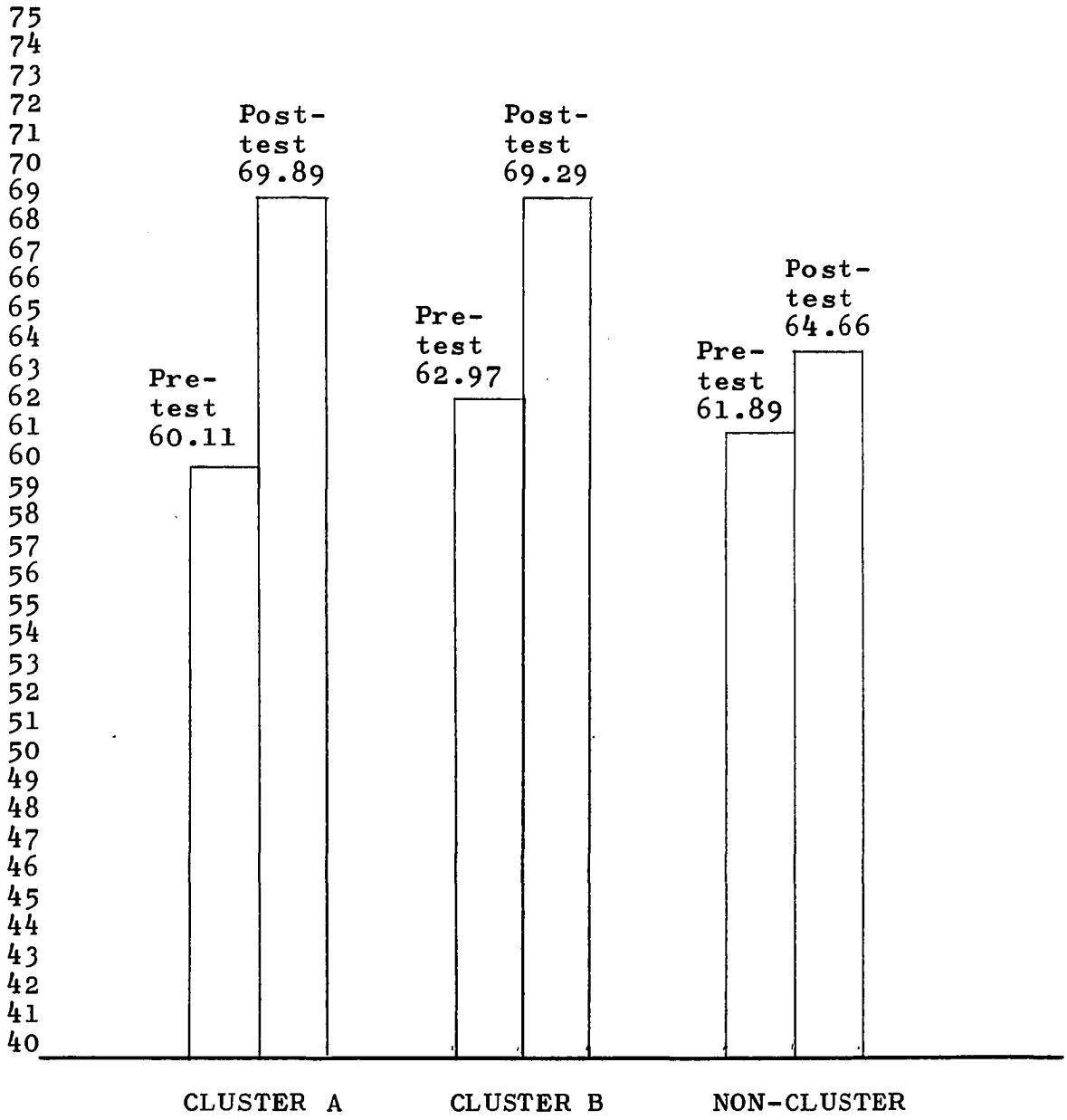


Figure 9

Graphic Display of Standardized Mathematics Computation Scores of Cluster A, Cluster B, and the Non-Cluster School

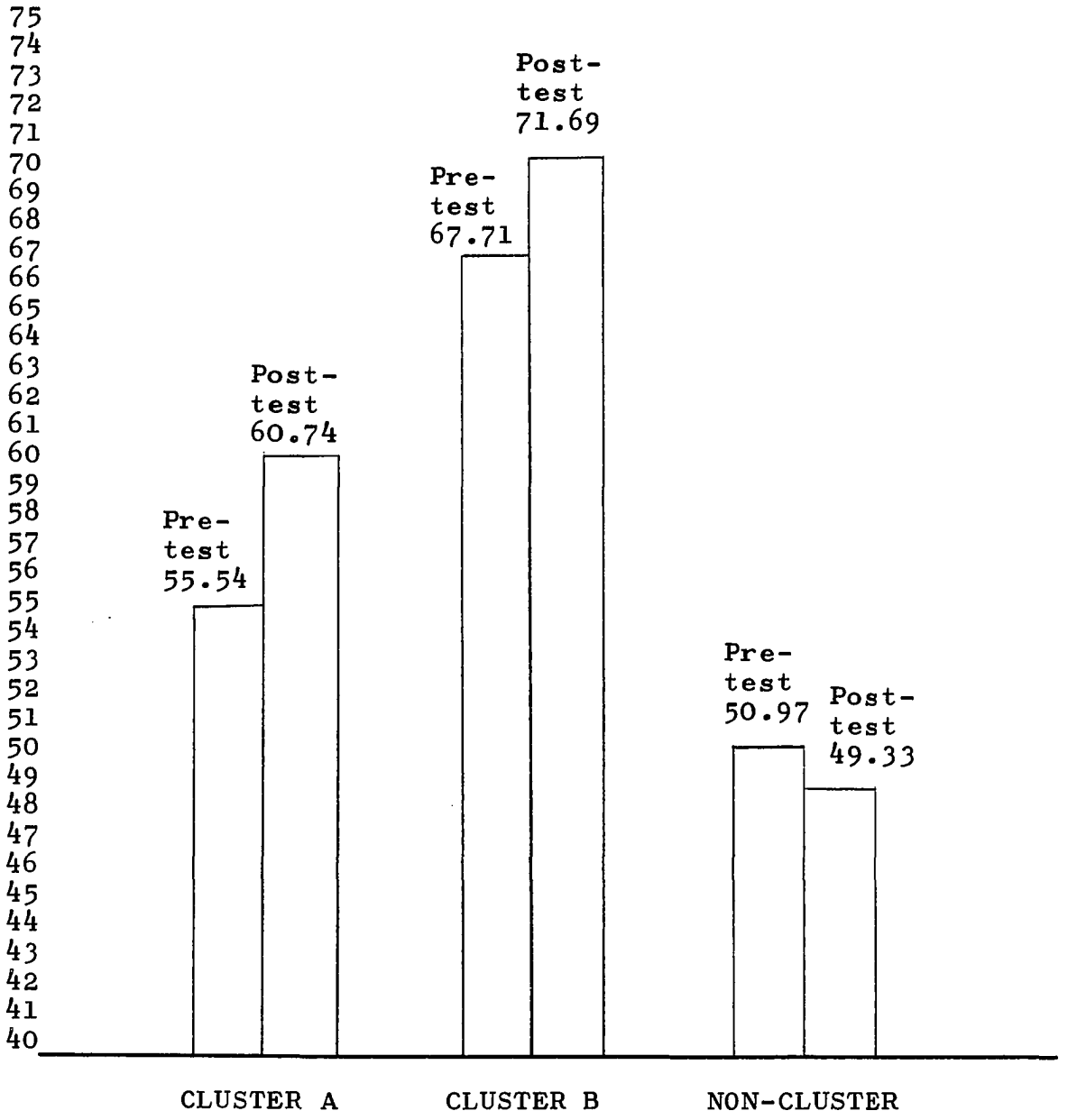


Figure 10

Graphic Display of Standardized Science Concepts Scores of Cluster A, Cluster B, and the Non-Cluster School

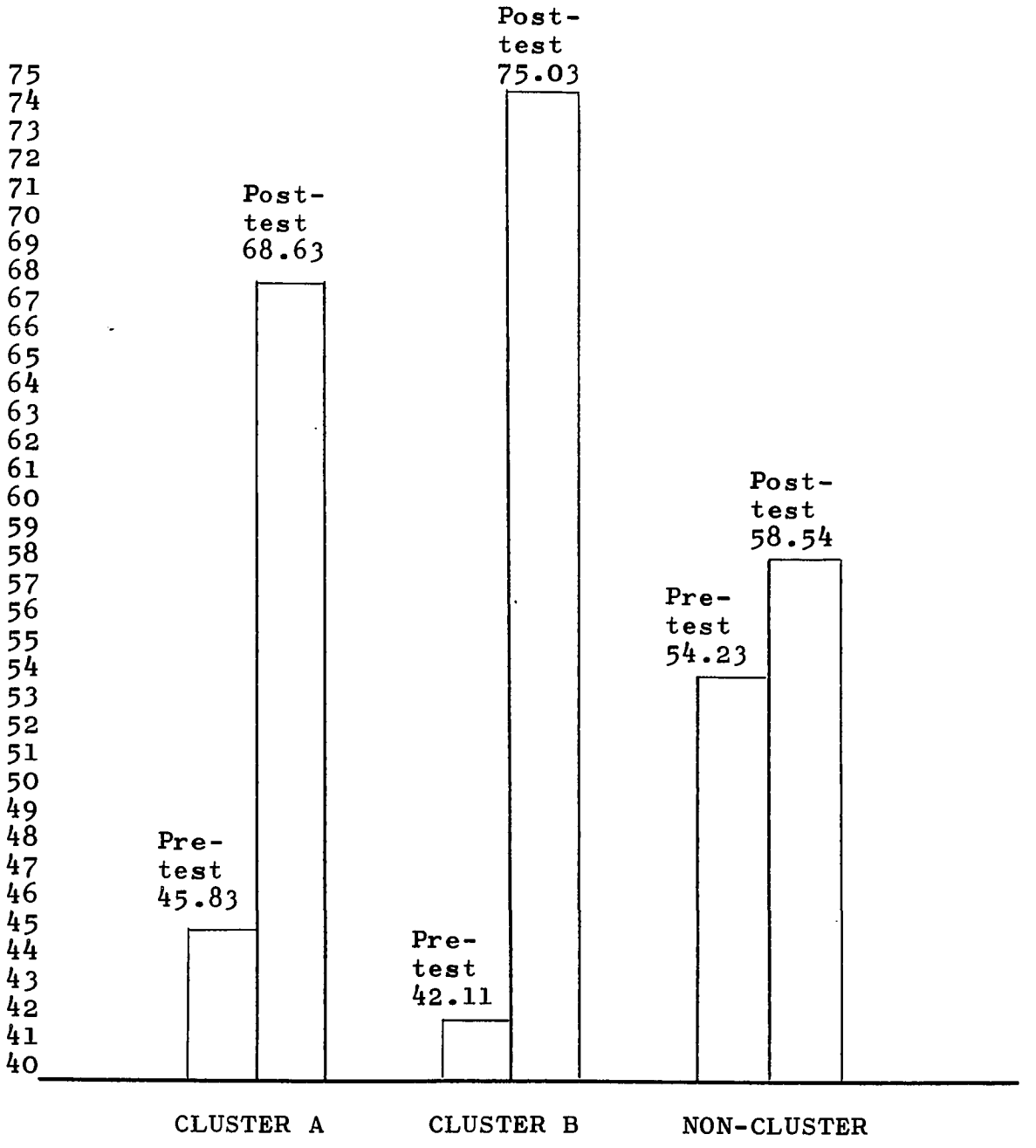
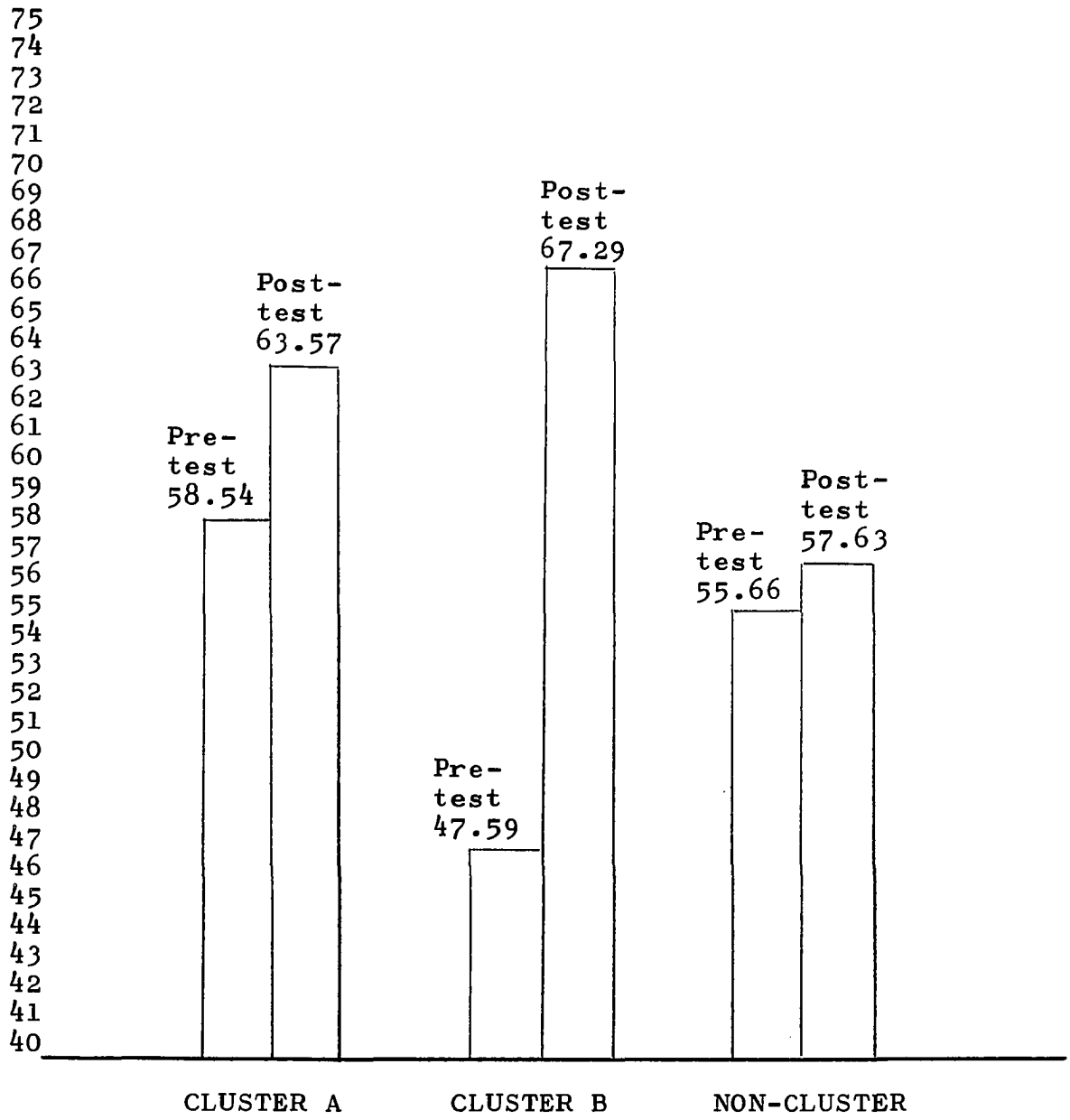


Figure 11

Graphic Display of Standardized Science Application Scores for Cluster A, Cluster B, and the Non-Cluster School



The dramatic gains made by Cluster A and Cluster B on the Concepts sections of the science test can be seen in Figure 10. While some gains are shown in their applications scores, they were not as significant as those shown in concept scores. (See Figures 10, and 11.)

Summary of Results

The results of testing the four (4) hypotheses stated in Chapter I showed no significant differences among the pretest scores of the mathematics and science students of the Cluster A, Cluster B, and non-cluster group. This allowed the researcher to accept the first two null hypotheses stated. The results of testing the third null hypothesis showed a significant gain in mathematics achievement for the Cluster A, and Cluster B groups, and no significant gain in mathematics achievement for the non-cluster group. The results of testing the fourth null hypothesis showed a significant gain in the science achievement scores of students from Cluster A and Cluster B, but an insignificant gain in science achievement scores of non-cluster students. Therefore, the researcher rejected the third and fourth null hypotheses stated.

The results of hypotheses three and four were further examined to determine specific differences among the three groups being analyzed. The results of these analyses showed that the cluster students made significantly higher gains than the non-cluster students.

CHAPTER V

SUMMARY, FINDINGS, CONCLUSION, DISCUSSION AND RECOMMENDATIONS

Summary

Three-hundred thirty high school students from the Oklahoma City Public School system were used in determining the amount of mathematics and science achievement gain experienced as a result of the cluster plan adopted as a means of achieving desegregation. Comparisons were made among two clusters, "A" and "B" and a non-cluster school. Standardized mathematics and science tests were administered in a pretest-posttest manner. The difference between these two measures was treated as a gain score for the academic period studied. An Analysis of Variance Statistic was used to test four hypotheses concerning the differences among the groups before and after the study. The investigator was hypothesizing that the cluster and non-cluster groups would have comparable mathematics and science scores at the beginning of the study (prior to clustering) and that the cluster students would experience comparable gains in their achievement scores to the non-cluster students' achievement scores. Mathematics and science were the only two areas studied. Respondents were categorized on the basis of a nine-point

scale to determine socio-economic status of the participants. A Chi Square statistic was used to determine differences among the three groups. In addition, an opinionnaire was given to students in the two clusters to determine attitudes toward the cluster plan. However, the validity and the reliability of the measure were not determined; therefore, no statistical analyses of the opinionnaire were made.

Findings

The results of testing the four (4) hypotheses stated in Chapter I showed no significant differences among the pretest scores of the mathematics and science students in Cluster A, Cluster B, and non-cluster groups. This allowed the researcher to accept the first two null hypotheses stated. The results of testing the third null hypothesis showed a significant gain in mathematics achievement for the Cluster A and Cluster B groups and no significant gain in mathematics achievement for the non-cluster group. The results of testing the fourth null hypothesis showed a significant gain in science achievement scores of students from Cluster A and Cluster B, but as insignificant gain in science achievement scores of non-cluster students. The results of hypotheses three and four were further examined to determine specific differences among the three groups being analyzed. The results of these analyses showed that the cluster students made significantly higher gains than

the non-cluster students. An omnibus Chi Square test on the nine-point socio-economic scale indicated no significant over-all difference in the socio-economic level of the three groups of students. Student responses to the opinionnaires indicated that the attitude of students toward the cluster plan appeared to be positive rather than negative.

Conclusion

Based upon the evidence the researcher obtained in this study, it can be concluded that the cluster plan contributed to the improvement of student achievement in advanced mathematics and science classes in Oklahoma City Public Secondary Schools 1970-1971. Generalizations beyond the population used in this study would be indefensible. However, other cities with populations similar to that of Oklahoma City might examine the cluster plan as a means of accomplishing desegregation mandates in their areas.

Discussion

Both the Cluster A and Cluster B students as well as the non-cluster students were select groups in that they were advanced students in mathematics and science. However, the two cluster groups might have had a stronger affinity for advanced mathematics and science subjects than the non-cluster group. In other words, perhaps only students extremely interested in advanced science enrolled in the

clustered classes. Perhaps some students who were only slightly interested in their subject matter enrolled in the non-cluster advanced mathematics and science classes. A stronger affinity for their subject matter could have influenced the significantly higher gains made by the cluster groups than the non-cluster group. The attitudes of the clustered students toward the cluster plan appeared to be positive rather than negative; some students who responded positively toward the cluster plan indicated that the plan provided for wider educational opportunity. In other words, many students expected to gain more in the cluster plan than if they had stayed in a traditional school. This expectation could have also influenced the higher gains made by the clustered groups. The results of this study indicate to the researcher that further studies are warranted regarding the influence of expectation and attitude on learning. Also, the significantly higher gains made by the clustered groups lead the researcher to deduce that the cluster plan should be further examined empirically as an organizational plan.

Recommendations

Based on the results of this study, the researcher recommends that the Oklahoma City Board of Education consider the following recommendations:

1. That the cluster plan be expanded to include more elementary mathematics and science classes rather than

be confined to only advanced classes.

2. That the cluster plan be expanded to include other subjects which involve the use of laboratory equipment.

3. That the cluster plan be extended to lower grades for subjects which require expensive equipment in instruction.

4. That the Board of Education encourage research similar to the present study at each stage of modification as a means of supporting educational change with empirical data.

5. That further studies concerning the cluster plan include matching subjects on I.Q., socio-economic status, and any other variables known to be related to achievement.

6. That in the future, pretest and posttest scores on a standardized achievement test be established as part of the requirements of the courses in the cluster plan.

7. That pretesting be conducted during the first two weeks of school.

8. That a control group be constantly maintained in each phase of modification of the cluster plan to be used as a comparison group in evaluating each phase.

9. That teachers involved in the cluster plan be given in-service training regarding evaluation of the cluster plan.

10. That an evaluation instrument be developed capable of recording a valid and reliable measure for cluster plan participants.

11. That an attempt be made to posttest participants who fail to complete a course. These students could be used as an optional control group.

12. That a standardized attitude measure be administered to future cluster plan participants. These data in turn could be used to determine the effect of attitude on achievement.

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APPENDIX A

EDUCATIONAL PARKS

EDUCATIONAL PARKS

As an answer to de facto segregation and educational improvement, many cities are trying educational parks, with some schools accommodating up to 30,000 pupils. The educational park has been defined by Alfred P. Fernandez as 1) a large school drawing attendance from the community at large (in small cities) or from a relatively large portion of the community in medium-sized to large cities; 2) a school which accommodates students at all grade levels on one site with the idea of improving articulation among all grade levels; 3) a school that endeavors to eliminate or reduce social and racial segregation; 4) a school which attempts to create a richer learning environment in an aesthetic setting; and 5) a more economical school system which has greater utilization of the school plant and facilities.[1]

Some cities which have developed or are developing educational parks are East Orange, New Jersey; New York City, New York; Syracuse, New York; Pittsburgh, Pennsylvania; Fort Lauderdale, Florida, and East San Jose, California.[2]

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[1] Alfred P. Fernandez, "The Educational Park: A Second Look," Journal of Secondary Education, XLV, No. 5 (May, 1970), 233.

[2] Ibid., 224-227.

East Orange educational parks (currently under development) will accommodate grades K through 14 at a common location. Clusters of schools (elementary through junior college) will be situated on different parts of the campus. However, all age groups will share some common facilities such as the auditorium, cafeteria, and audio visual centers. In addition, it will be utilized by the community as a whole.

New York City proposes two educational parks which will have clusters as in the East Orange plan. Each large center's high school will accommodate about four thousand, the intermediate school will contain from two thousand to three thousand students, and the elementary schools will enroll nearly three thousand students.

The Syracuse Public School System proposes to phase out more than one hundred elementary schools within the next fifteen years, and replace them with four large educational parks. The districts will be pie-shaped in order to ensure that students from suburbia and inner-city will be represented proportionately.

Pittsburgh proposes to combine neighborhood school with the educational park. The city will be divided into five large high school parks, each with feeder intermediate schools. Each intermediate school will have feeder elementary schools. Around the elementary schools will be pre-primary, day-care feeder centers.

Fort Lauderdale has one high school educational park which provides facilities for voluntary students from the entire city. The students progress at their own pace through the ungraded curriculum.

East San Jose will open an educational park for five thousand students in 1971. The school which will be built on a one hundred-acre site, will be composed of centers for four hundred to seven hundred students from all grades.

Philadelphia's Parkway Program has no site or buildings. City institutions and businesses are its classrooms and campus. The Parkway project accepts an equal number of students from the city's eight districts. This equality is established by lottery. Fifteen students from each district and ten from parochial-private schools are chosen.[3]

Parkway, which offers a four-year, full-time program, awards a standard high school diploma. To satisfy state graduation requirements, students schedule classes from about one hundred course offerings. Only English and mathematics are required, and these may be fulfilled in a variety of ways.

In the ungraded Parkway project, each unit has one hundred and thirty students, who are supervised by eight

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[3]"The Anywhere School--One City District's Break with the Past," School Management, XIII, No. 12 (December, 1969), 60.

teachers and a varying number of university interns. One of the eight teachers is the unit head. The faculty is comprised of instructors, university interns, volunteer instructors, and various professionals. The teacher-student ratio is approximately five to one.

APPENDIX B

APPROVAL NOTICE

Oklahoma City Public Schools
900 North Klein
Oklahoma City, Oklahoma 73106

August 10, 1970

Mrs. Ruth Kraemer
921 S.W. 55th Street
Oklahoma City, Oklahoma 73109

Dear Ruth:

I am happy to inform you that the Research Committee has approved your proposal to conduct a study in the Oklahoma City Public Schools. We believe that information concerning the new cluster plan would be most beneficial to us, and we are looking forward to seeing the results of your study.

Please contact me in order to make further arrangements.

Sincerely,

/signed/

Dr. Ron Schnee
Research Coordinator

RS/jr

APPENDIX C

PERSONAL INFORMATION

OPINIONNAIRE

1. Do you ride a bus to your cluster school?

2. How long does it take you to get from your home school to your cluster school?

3. How many different schools do you have classes in?

4. Do you like the cluster plan?

5. If yes, why? If no, why not?

6. What is your favorite subject in school?

7. Have you had any particular problems in adjusting to the cluster plan?

8. If yes, what are they?

9. Are you planning to go to college?

10. What do you plan to be when you complete your formal education?

1. Do you ride a bus to your cluster school?

MATHEMATICS						SCIENCE					
CLUSTER A			CLUSTER B			CLUSTER A			CLUSTER B		
Yes	No	Sometimes	Yes	No	Sometimes	Yes	No	Sometimes	Yes	No	Sometimes
13	22	0	6	27	2	30	5	0	19	7	9

2. How long does it take you to get from your home school to your cluster school?

MATHEMATICS						SCIENCE					
CLUSTER A			CLUSTER B			CLUSTER A			CLUSTER B		
5-10 Min.	15-20 Min.	25-30 Min.	5-10 Min.	15-20 Min.	25-30 Min.	5-10 Min.	15-20 Min.	25-30 Min.	5-10 Min.	15-20 Min.	25-30 Min.
16	8	10	7	5	4	3	17	15	0	31	4

3. How many different schools do you have classes in?

MATHEMATICS						SCIENCE					
CLUSTER A			CLUSTER B			CLUSTER A			CLUSTER B		
1	2	3	1	2	3	1	2	3	1	2	3
18	16	1	27	8	0	4	29	2	3	30	2

4. Do you like the cluster plan?

MATHEMATICS						SCIENCE					
CLUSTER A			CLUSTER B			CLUSTER A			CLUSTER B		
Yes	No	Neutral	Yes	No	Neutral	Yes	No	Neutral	Yes	No	Neutral
17	13	5	23	10	2	16	13	6	16	12	7

5. If yes, why? If no, why not?

	MATHEMATICS		SCIENCE	
YES	CLUSTER A	CLUSTER B	CLUSTER A	CLUSTER B
Educational opportunity greater	6	18	11	8
Less monotonous	3		2	4
Longer Timeblocks	7		7	7
Meet more people	6	5	4	3
NO				
Waste of time	7	4	2	10
Classes too long	2	1	1	1
Difficult to see teacher	2	1		1
Dislike buses		2		
Interference with lunch	4		1	

Question 5--Continued

	MATHEMATICS		SCIENCE	
	CLUSTER A	CLUSTER B	CLUSTER A	CLUSTER B
Prohibits home-school activities	2		1	1
Too much confusion		1	1	
Buses in poor condition	2		3	2
No purpose to cluster			5	10

6. What is your favorite subject in school?

	MATHEMATICS		SCIENCE	
	CLUSTER A	CLUSTER B	CLUSTER A	CLUSTER B
Psychology/Sociology	5	1	4	1
Band	5			1
Political Science	1			
Chemistry	1	2		
Bookkeeping	4			
Math	9	13		
Drama	1		1	1
Drafting and Design		1		2
Science	5	5	17	8
Journalism		1		

Question 6--Continued

	MATHEMATICS		SCIENCE	
	CLUSTER A	CLUSTER B	CLUSTER A	CLUSTER B
Geology	2			
English		6	5	6
Modern Dance		1		
Music		1		
Humanities		1		
History		1	5	2
Art		1		
Foreign Language		1		
Speech			2	
Electronics		1	1	1
Physical Education			1	
None				5

7. Have you had any particular problem in adjusting to the cluster plan?

MATHEMATICS				SCIENCE			
CLUSTER A		CLUSTER B		CLUSTER A		CLUSTER B	
Yes	No	Yes	No	Yes	No	Yes	No
13	21	10	25	10	25	6	29

8. If yes, what are they?

	MATHEMATICS		SCIENCE	
	CLUSTER A	CLUSTER B	CLUSTER A	CLUSTER B
Miss home school activities	0	0	1	0
Catching bus	3	1	1	2
Interference with lunch	2	0	1	2
Classes too long	4	0	1	0
Learning schedule	1	6	0	1
Buses in poor condition	3	0	0	0
Can't see teachers	2	0	1	0
Traveling too long	2	0	0	0
Crowded buses	0	1	0	0
Make-up difficult	0	1	0	3
Study difficult	0	1	0	0

9. Are you planning to go to college?

MATHEMATICS						SCIENCE					
CLUSTER A			CLUSTER B			CLUSTER A			CLUSTER B		
Yes	No	Undecided	Yes	No	Undecided	Yes	No	Undecided	Yes	No	Undecided
34	1	0	33	1	1	31	1	3	34	0	1

10. What do you plan to be when you complete your formal education?

	MATHEMATICS		SCIENCE	
	CLUSTER A	CLUSTER B	CLUSTER A	CLUSTER B
Undecided	10	14	10	7
Band Director	1			
Social Worker	1			
Engineer	6	4		8
Armed Services	3			1
Actor	1			
Teacher	5	4		
Journalist	1			
Dancer		1		
Law		1	1	1

Question 10--Continued

	MATHEMATICS		SCIENCE	
	CLUSTER A	CLUSTER B	CLUSTER A	CLUSTER B
Pilot		1	1	
Scientist		1	2	5
Photographer		1		
Doctor or Medicine		1	11	3
Computer Programmer		1		1
Missionary		1		2
Mathematician			2	
Stewardess			1	
Advertising			1	
Marriage				3
Government Service				1