# A COMPARISON OF STUDENTS' AND TEACHERS' PERFORMANCES IN AN OPEN AREA FACILITY AND IN SELF-CONTAINED CLASSROOMS

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A Dissertation

Presented to

the Faculty of the Graduate School

University of Houston

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In Partial Fulfillment

of the Requirements for the Degree

Doctor of Educational Administration

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by

Jack Bruce Warner

August, 1970

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# A COMPARISON OF STUDENTS' AND TEACHERS' PERFORMANCES IN AN OPEN AREA FACILITY AND IN SELF-CONTAINED CLASSROOMS

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ABSTRACT

Warner, Jack Bruce. "A Comparison of Students' and Teachers' Performances in an Open Area Facility and in Self-Contained Classrooms." Unpublished Doctoral dissertation, University of Houston, 1970.

Committee Chairman: Dr. Stanley Sanders

Purpose

The purpose of this study was to determine the effect of an open area facility, as compared with self-contained classrooms, upon the performance of students and teachers in an elementary school.

Design of Study

The study was designed from a systems model that was used to identify the components and processes within the study. The design consisted of five phases: Input, process, output, objectives, and evaluation.

Input

Controlled variables. The study was designed to achieve equality between experimental and control groups with regard to all input factors except that of facility, so far as possible.

In order to obtain equivalent samples in grades two, three, and four, students in each grade were separated into male and female groups, classified as younger or older, and randomly assigned to sections in the open area facility or to self-contained classrooms.

It was impossible to achieve complete equality of teachers, but three factors, (1) interest and motivation, (2) experience, and (3) quality rating, were all taken into consideration.

The remaining dependent factors of materials, regulations, curriculum, expectations and demands, teachers' aides, and special teachers were equally controlled with both groups receiving identical treatment.

Variable factor - facility. The experimental study was conducted at the Westwood Elementary School in Friendswood, Texas. A new open area facility was added to the existing plant. The original facility had been constructed with self-contained classrooms and had been in use for only one and a half school years. Both areas were completely carpeted, air conditioned and equipped with modern new furniture and instructional materials. The facilities were different in style but both were basically equal in quality and comfort. This one factor, the difference between the two facilities, was considered as being the influencing factor that could account for the occurring changes in the performances of the teachers and students.

Process and Output

Both the experimental (open area) and control (self-contained classrooms) groups operated within the same philosophy and regulations regarding instruction and classroom management. The organizational arrangement provided a single administration that supervised both groups. The effects of the facility upon the performance of teachers and students were determined in the process stage and evaluated as output.

Objectives and Evaluation Procedures

The following five objectives were established and for each objective that was identified, instruments were designed or selected for the purpose of evaluation.

1. Objective number one was to maximize student achievement in traditional basic skills and content. Standardized achievement tests were used for comparing the two groups.

2. Objective number two was to improve the teaching-learning procedures by involving the students in the learning activities. Flanders Verbal Interaction Analysis System was used for comparing the teaching apprcaches of the two groups.

3. Objective number three was tc improve the teaching-learning procedures by varying the sizes of instructional groups in order to adapt the content and methods to fit the needs of students. A record was kept of the amounts of time students spent in small, medium, or large size instructional groups and the percentages of time were used for comparing the control and experimental groups.

4. Objective number four was to improve the teaching-learning procedures by spending more time in the use of supplementary instructional materials and comparisons were made of the student time between the two groups.

5. Objective number five was to improve the teaching-learning procedures by having an organizational climate that was perceived by the teachers as being open. Halpin's Organizational Climate Description

Questionnaire was used to compare the perceptions of the climate of the two groups of teachers.

## Hypotheses

The following hypotheses were posed and tested:

1. There will be a significant difference between the standardized achievement test scores of the children in the open area when compared with the standardized achievement test scores of children in self-contained classrooms.

2. There will be a significant difference in the nature of teacher-student interaction in the open area and that in self-contained classrooms when the proportions of direct and indirect interaction for the two groups are compared.

3. There will be a significant difference in the amounts of time students spend in varying sizes of instructional groups when the open area grouping arrangements are compared with the grouping arrangements in self-contained classrooms.

4. There will be a significant difference in the extent of use of various supplemental materials with students in the open area as compared with students in self-contained classrooms.

5. There will be a significant difference in the organizational climate as perceived by teachers in the open area and the organizational climate as perceived by the teachers in the self-contained classrooms.

## Findings

Two of the five hypotheses were accepted and three were rejected.

When the achievement scores for the students in the open area and the students in self-contained classrooms were compared, differences were not statistically significant. When the teacher-student verbal interaction in the open area was compared with that in self-contained classrooms, there were no significant differences. The organizational climate perceived by teachers in the open area did not differ from that perceived by teachers in self-contained classrooms.

When the grouping arrangements of students in the open area were compared with the grouping arrangements of students in self-contained classrooms, there were significant differences. Similarly, when the amount of time supplementary materials were used with students in the open area was compared with the amount of time supplementary materials were used in self-contained classrooms, there were significant differences.

While there were no significant differences in standardized achievement test scores, teacher-pupil verbal interaction, and perceptions of the organizational climate, the open area teachers did tend to use more supplementary instructional materials and also varied the sizes of the instructional groups more than did the teachers in self-contained classrooms.

Conclusions and Recommendations

It was concluded that one type of facility was not superior to the other. Teacher and pupil performance were equal and similar when academic achievement, teacher-pupil verbal interaction, and the teachers'

perceptions of the organizational climate were compared. It was evident that the open area facility can accommodate the same type of program as successfully as can the self-contained classroom facility.

One very apparent advantage of the open area was the flexibility of the facility. Teachers took advantage of the space and spent significantly greater periods of time with small and large instructional groups, while the teachers in self-contained classrooms tended to spend a greater proportion of their time with medium size instructional groups.

The teachers in the open area also tended to use more supplementary instructional materials than did the teachers in self-contained classrooms. This may have been due to the various grouping arrangements that were taking place in the open area. It may be that materials were selected for the purpose of meeting the needs within the various size groups.

It was recommended to the officials of the Friendswood Independent School District that the next school building be an open area facility.

However, it was felt that certain separate special areas needed to be included in the plans. Special rooms are needed for sound movies or tape recordings. Also, a large enclosed area for art or special activities would be desireable. There is also a need to consider several exits, so that students who need to leave the area can do so without much distraction to others.

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# CHAPTER I

## INTRODUCTION

In the past thirty years, programs of instruction have experienced many changes. New programs began to require more flexible facilities, and students began to move in and out of the formerly isolated classrooms. Only recently, schools have been built with large open areas for the purpose of accommodating flexible programs. More schools are now being built with large open areas, but research has not yet proven whether schools without walls provide advantages that cannot be provided in buildings with self-contained classrooms.

### I. STATEMENT OF PROBLEM

The purpose of this study was to determine the effect of an open area facility, as compared with self-contained classrooms, upon the performance of students and teachers in an elementary school.

### II. BACKGROUND

Schools have had self-contained classrooms ever since the Quincy School was built in Boston in 1847. The self-contained classrooms continued to be accepted even though they would not allow the flexibility that new educational programs demanded. In very recent years, however, some schools have been built with large open spaces, in order to meet these demands. Although the open area concept has been recommended for providing greater flexibility, there is little proof

of its superiority over self-contained classrooms. In fact, there is a dearth of valid, objective evaluation and a lack of experimental research.

Due to the favorable reports of schools having open area facilities, the Board of Trustees and the School Superintendent of the Friendswood Independent School District had considered building an open area school in 1967. However, the final decision was that the faculty and the district were not ready for this kind of school, and it was not built as an open area facility. It was built with non-load-bearing walls so that it would be possible to remove the interior walls if this should become the desire of the faculty and administration in later years.

The new elementary school was used for one and a half years after completion in January, 1968. Due to increasing enrollments, it became necessary to provide additional classrooms for the opening of school in September, 1969. A new facility, equivalent to 12 elementary classrooms was added to the existing building. This new addition was constructed with no interior walls, and is one large open area of 11,760 square feet.

This new open area was constructed as a result of the teachers and administrators wanting to conduct actual field research at the Westwood Elementary School, Friendswood, Texas, for the purpose of comparing this open area facility with the already existing self-contained classrooms. Since it was clear that another new elementary school would need to be built in the Friendswood District in the following two or three years, the

research at the Westwood School was to be the major determinent of the design of the proposed new facility.

By having an open area and self-contained classrooms at one school, it was possible to compare two programs in equivalent settings. Having both arrangements in one school and under similar conditions, provided a rare opportunity for comparing the effects of the facility.

## III. ENVIRONMENTAL CHARACTERISTICS

The completion of the self-contained portion of the facility in 1968 and the open area portion of the facility in 1969 provided opportunity for experimental research.

Both areas were completely carpeted and air conditioned and each contained more than an adequate amount of storage space. Chalkboard and tackboard surfaces were also comparable in the self-contained classrooms and the open area being sufficiently extensive in both. Both areas had ample space for the number of students being accommodated and therefore were not over-crowded with students.

A central library, that had approximately ten books per student, was available to both groups. All audio-visual equipment and materials were catalogued and checked out from the central library.

There were two work areas for teachers, one in the new open area and the other in the area with self-contained classrooms. Both groups used the same teachers' lounge, located next to the office area in the older part of the building.

The open area had two outstanding differences when compared to the self-contained classrooms, the absence of interior walls and the type of furniture used.

Most open area schools have some type of partitioning or room dividers that allow the teachers to semi-enclose students and separate them from other groups. The open area of the Westwood School did not have any type of barrier that could be used for the purpose of screening one group from another. All objects which might serve as dividers were limited to table height. The self-contained classrooms were also less isolated than in a typical situation where the teacher could close her door and have complete seclusion from outsiders. All of the self-contained rooms had corridor walls that extended only halfway up to the ceiling, while the top half of the walls were glass. This allowed all rooms to be in full view from the hallway. The walls between all of the classrooms were extended fully to the ceiling so that all rooms were accoustically and visibly separated from each other.

The type of furniture used was another difference between the open area and the self-contained classrooms. Regular student desks were used by the groups in the self-contained classrooms. Grades two and three in these rooms used chairs and desks that were separate pieces, while the fourth grade used the combination one-piece chair desks. However, all desks were movable and could be moved anywhere within or out of the individual classrooms. In the open area, rectangular, trapazoidal, and circular

tables were the types of furniture used. Attached to each table were glides that held the tote trays provided to each student for the storage of miscellaneous materials. Students' books were stored in portable cabinets that were provided for each classroom. Students sat on light chairs. All of the furniture in the open area was movable including the lightweight teachers' desks that were equipped with casters.

## IV. DESIGN OF THE STUDY

Grades two, three, and four were chosen for the study. From a population of 461, students were randomly assigned to either a control or experimental group after being separated into groups according to age and sex. In each grade, approximately three-sevenths of the students were assigned to three traditional classrooms and constituted the control group, and three-sevenths of the students were assigned to teachers in the open area and constituted the experimental group.[1] The remaining one-seventh of the students were assigned to self-contained classrooms. In order to facilitate statistical design, it was desirable to keep the control and experimental groups equal in number. Therefore, this last one-seventh of the population was not treated as part of either group.

Both the experimental and control groups operated within the same philosophy and regulations regarding instruction and classroom management. The organizational arrangement provided a single administration

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[1] Infra., p. 38.

that supervised both groups.

Some departmentalization was used in both the control and experimental groups. Each of the four teachers of a given grade in the self-contained rooms taught reading, but each specialized by teaching only language, science, mathematics, or social studies. The three teachers of a given grade in the experimental group taught either mathematics, science or social studies. All of the grades divided their reading classes into groups of high, average, and low abilities and designated teachers to work with students on a particular level. A student could therefore have a different teacher for reading other than the homeroom teacher.

Music, physical education, and remedial reading were taught by special teachers. Students were taken out of the regular classrooms and moved to special facilities for these subjects.

A full-time teachers' aide was assigned to the experimental group and another full-time aide to the control group. Each aide helped teachers work with small and large groups of students in addition to grading papers, gathering materials and duplicating worksheets. The teachers' aide was not used as a regular teacher, but only worked with students as directed by a certified teacher.

It was impossible to achieve complete equality of teachers, but three factors, (1) interest and motivation, (2) experience, and (3) quality rating, were all taken into consideration.

Interest and motivation were recognized as variables that were difficult

to equate. To account for these factors, teachers were asked to select either the open area or self-contained classrooms. In a few cases, teachers could not be assigned to the area of their first choice, but if any teacher objected to teaching in either the open area or a self-contained classroom, that teacher was assigned to the area of her preference. The total teaching experience of both groups was considered when teachers were assigned to either the open area or self-contained classrooms. Assignments were made so that each group had some teachers with little or no previous teaching experience, and each group had some teachers with extensive experience. The quality rating of the two groups was taken into consideration by comparing the past evaluations of teachers who had taught previously in the district. A review of the evaluations did not reflect any noticeable difference between the quality of teachers in the control and experimental groups. Because of these considerations it was felt that the two groups of teachers did not differ substantially in characteristics that might influence the outcome of the evaluation.[2]

## V. DEPENDENT VARIABLES

Schools have certain objectives regardless of whether the facility is a building with self-contained classrooms or an open area school. Five such common objectives were accepted as being appropriate for all

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[2]Infra., p. 40.

classes in this study. These then became objectives for the study, as follows:

1. Achievement - One objective of this study was to determine if there were any significant differences between the control and experimental groups when the students' standardized achievement test scores were compared.

2. Interaction - A second objective of this study was to compare the nature and degree of teacher-pupil verbal interaction and the approaches teachers take in the control or experimental classes, whether they be indirect or direct, as measured by the Flanders Verbal Interaction Analysis System.[3]

3. Grouping - Objective number three was to compare the grouping arrangements of students in the open area with the grouping arrangements of students in the self-contained classrooms by comparing the percentage of time students were in small, medium, or large instructional groups.

4. Supplementary Materials - The fourth objective of this study was to compare the amount of time supplementary materials were used with students in the open area with the amount of time that these materials were used by students in the self-contained classrooms.

5. Organizational Climate - Objective number five was to compare the organizational climate as perceived by teachers in the open area and the

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[3]Ned A. Flanders and Edmond J. Amidon, The Role of the Teacher in the Classroom: A Manual for Understanding and Improving Teachers' Classroom Behavior, (Minneapolis: Paul S. Amidon & Associates, Inc., 1963).

organizational climate as perceived by teachers in the self-contained classrooms.

In summary, this study was designed to answer the following five questions:

1. Was there a significant difference between the control and experimental groups when the students' standardized achievement test scores were compared?

2. Was there a significant difference in the nature of teacher-student verbal interaction in the open area and that in the self-contained classrooms when the proportions of direct and indirect interaction for the two groups were compared?

3. Did the grouping arrangement of students in the open area differ significantly from the grouping arrangements of students in the self-contained classrooms when the percentages of time students spent in small, medium, and large groups were compared?

4. Was there a significant difference in the amount of time supplementary materials were used with students in the open area and the amount of time supplementary materials were used with students in self-contained classrooms?

5. Was there a significant difference in the organizational climate as perceived by teachers in the open area and the organizational climate as perceived by teachers in self-contained classrooms?

## VI. HYPOTHESES

The following hypotheses were formulated in accordance with the previously stated questions:

1. There will be significant differences between the standardized achievement test scores of the students in the open area when compared with the standardized achievement test scores of students in self-contained classrooms.

2. There will be significant differences in the nature of teacher-student verbal interaction in the open area and

that in self-contained classrooms when the proportions of direct and indirect interaction for the two groups are compared.

3. There will be significant differences in the amounts of time students spend in varying sizes of instructional groups, when the open area grouping arrangements are compared with the grouping arrangements in self-contained classrooms.

4. There will be a significant difference in the extent of use of various supplemental instructional materials of students in the open area as compared with students in the self-contained classrooms.

5. There will be a significant difference in the organizational climate of the school as perceived by teachers in the open area and the organizational climate of the school as perceived by teachers in self-contained classrooms.

## VII. THE INVESTIGATION MODEL

Figure 1, which follows, contains the design of the model that was established for the purpose of identifying the components and processes within the study.

The objectives of the design were established,[4] and for each objective that was identified, instruments were designed or selected for the purpose of evaluation.[5]

The factors that were to be considered in the study were identified for the purpose of establishing as many controls as were feasible. All factors were equalized as nearly as possible except for the facility

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[4] Supra., p. 7.

[5] Infra., p. 43.

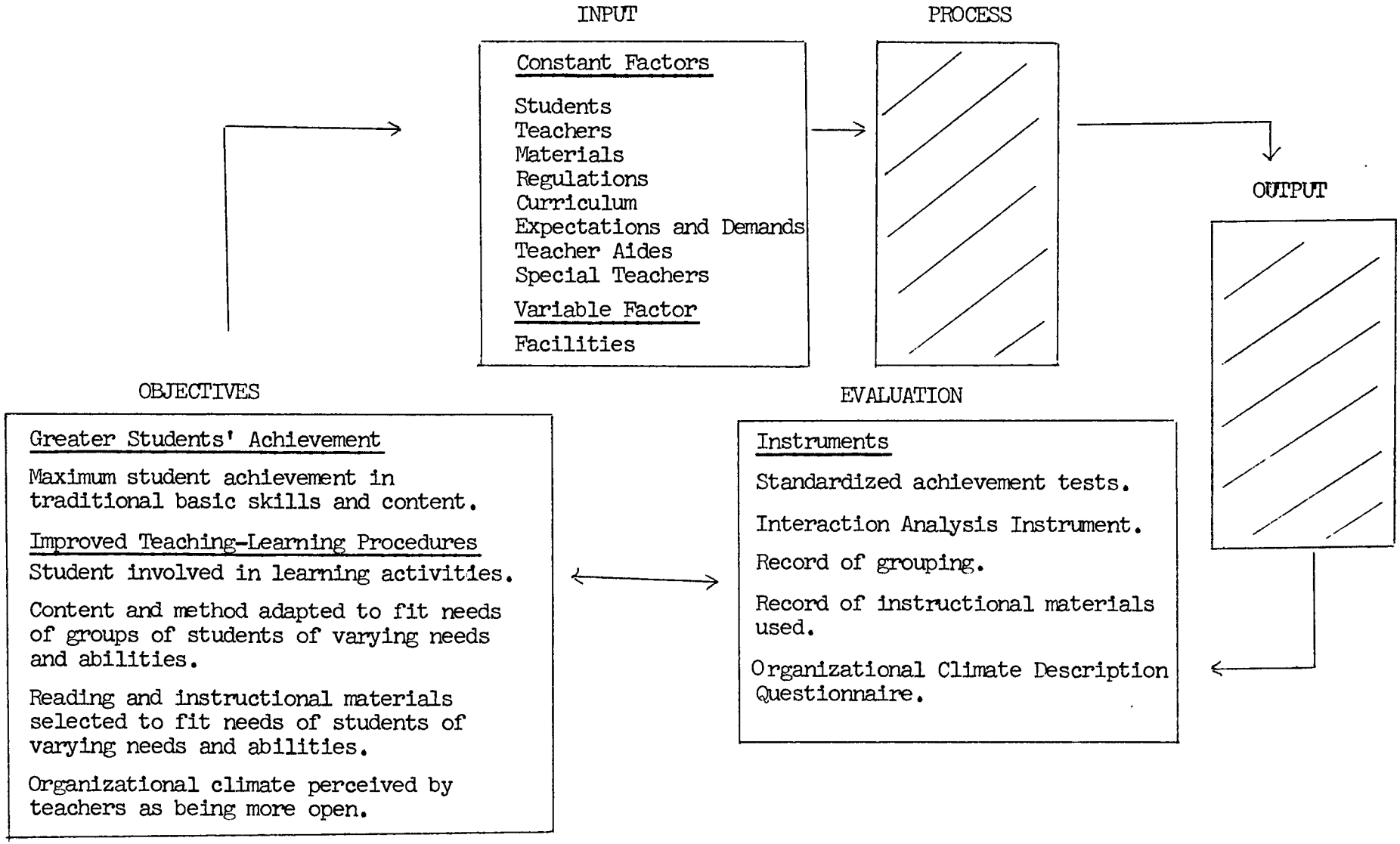


Figure 1

Design Model

which is the variable factor in the design. The facility was considered to be the independent factor that would (1) have an effect on the other input factors, (2) cause the process to vary in the control and experimental programs, respectively, and (3) account for differences in the measures of output.

## VIII. ORGANIZATION OF THE STUDY

Chapter I has presented a broad overview and a general description of the study. The chapter was divided into seven sections as follows: (1) Introduction, (2) Background, (3) Environmental Characteristics, (4) Dependent Variables, (5) Objectives, (6) Hypotheses, and (7) The Investigation Model.

Chapter II will be a review of the literature that is relevant to this study. The subtopics that will be covered are: (1) Trends in Buildings, (2) Increasing Prevalence of Open Area Schools, (3) Pertinent Opinions, (4) Comparability Studies, and (5) Need For More Research.

Chapter III will describe the design of the study. Each of the five objectives will be described along with the procedures and instruments used for the purpose of evaluation.

Chapter IV will report the findings of the study. Findings also will be reported for each of the five objectives of the study.

Chapter V will include a summary and the conclusions of the study.

# CHAPTER II

## REVIEW OF LITERATURE

Over the years there has been an abundance of literature referring to buildings and their relationship to programs. However, true research relating to the effects of a facility upon an educational program are rare. Furthermore, research related directly to the problem of this study, the effect of an open area facility upon the program, is nonexistent.

In order to develop meaningful background, this review includes summaries of literature relating to five topics: (1) Trends in Buildings, (2) Prevalence of Open Space Schools, (3) Pertinent Opinions, (4) Comparability Studies, and (5) Need For More Research.

### I. TRENDS IN BUILDINGS

For a long period of time, early American schools were constructed with the idea of providing shelter in which the teachers and students might come together.[1] These were simple one room schools that usually consisted of a few benches for the students and a built up podium for the teacher. The room usually had a fireplace on one side and windows at the other. This structure was so simple that it failed to attract the attention of architects and was repeatedly built in the same manner. School buildings, therefore, remained basically the same in design for

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[1]Basil Castaldi, Creative Planning of Educational Facilities, (Chicago: Rand McNally and Company, 1969), p. 7.

many years and continued to be built with the idea of providing a sheltered environment where the teacher could instruct pupils.

As the population in America increased and as more pupils began to attend school, it became necessary to construct larger buildings. The solution to this problem was to construct a larger building and put the rooms adjacent to each other. Still later, in the latter part of the nineteenth century, it became necessary to construct schools that were large in comparison to the schools of the past. These larger schools were more complex to plan and build, therefore, architects began to become involved. Their designs emphasized shape, form, and style, not the functional aspect of school plants.[2] Multi-story buildings began to evolve but few changes, if any, were made inside the classrooms. Classrooms were built side by side, and on top of each other. Schools continued to be built with little collaboration between the architect and the educator, and the classrooms were planned to meet housing needs rather than instructional needs.[3] According to McClurkin, "The low ebb in school plant planning in this century probably was reached in the later years of the Great Depression, when Works Progress Administration worked directly in local school districts to construct buildings with work-relief crews, on 'plans' worked up by WPA Offices,

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[2]Ibid., p. 11.

[3]Ibid., p. 13.

with no consultation with state or local specialists, and with a minimum local financial support."[4]

The year, 1950, was considered to be the time when educational architecture began to be based on the needs of the pupil.[5] This was the first time a large majority of architects got together with educators throughout the nation to discuss common problems concerning the building of schools. As a result of these meetings, schools began to be planned based on the needs of the pupil.[6]

As educators and architects have worked together over the past twenty years, many noticeable changes have taken place in school design. Schools have become more attractive in appearance. More attention has been given to the interior learning environment within the school. The buildings are no longer being built strictly for shelter, but instead are being planned and constructed to provide a type of atmosphere that will be stimulating to the learning process.

As educational programs have expanded to meet the demands of new knowledge and information, educators have become more concerned about the learning process, and there have been more demands for changes in the architectural design of school buildings. Educational programs have

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[4]W.D. McClurkin, School Building Planning, (New York: The Macmillan Co., 1964), p. 17.

[5]William B. Caudill, Toward Better School Design, (New York: F.W. Dodge Corporation, 1954), p. 16.

[6]Ibid., p. 17.

demanded that buildings be constructed to allow for a maximum amount of flexibility. Instead of having classrooms all of the same size which are planned to accommodate the same numbers of students, educators are asking for rooms of various sizes. In addition to rooms of various sizes, demands are being made for versatility of space. Instead of having a certain space designed for one subject, educators want to use the space for different things and be able to rearrange the space if necessary. As a result of these demands, more schools are being built with movable partitions that will accommodate varying sizes of student groups.[7]

In order to provide even greater flexibility, some schools have been built without any interior walls. Some educators feel that a one room school can provide the type of flexibility that will be necessary to meet the demands of existing and future educational programs.

## II. PREVALENCE OF OPEN SPACE SCHOOLS

"Open area" schools, as defined by present educators, have only been constructed within the past decade. These open space schools have varied considerably in size and shape, but their common element is of large areas of unbroken space. These schools, without interior walls, have generally been planned to facilitate either team teaching or some type of continuous progress plan for pupils.[8]

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[7]"How the School Construction Dollar Is Spent," School Management, 11:67, July, 1967.

[8]"Schools Without Walls," (New York: Educational Facilities Laboratories, April, 1968), p. 3.

The first school house to draw national attention by rejecting interior walls was an elementary school in Carson City, Michigan.[9] In 1957, an area equivalent to the size of four classrooms, was constructed for the purpose of accommodating groups of varying sizes. The instructional program utilized a team teaching approach and the open area made it possible to vary the size of the groups without moving to other facilities.

The advantages of large spaces became known in the next few years, and other schools began to find ways of removing walls or of providing large lecture areas. Most of these schools, however, did not go beyond the point of combining spaces that were equivalent to the size of two classrooms.

Another school which received early attention as an open space facility was the Lewis Sands School in Chagrin Falls, Ohio.[10] This open space area was also equivalent to the size of four classroooms. The lack of carpeting in the Lewis Sands School was considered to be one of its shortcomings.

The Dilworth School in San Jose, California, was an award winning school which was said to have influenced a new generation of open space schools.[11] The open space school was considered to be the best way of accommodating this school's team teaching program. This school was one

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[9]"SPL Reports," School Planning Laboratory (California: Stanford University, May, 1968), p. 6.

[10]"Schools Without Walls," op. cit., p. 16.

[11]Ibid.

of the first to demonstrate the advantage of an instructional materials center that was easily accessible to teachers and students.

Since the Dilworth School, there have been many schools constructed with large open spaces. Most of these schools were planned with features designed to accommodate multi-class groups more efficiently. However, it is interesting to note that most of these schools have "hedged" by including structural features which would allow partitions to be added and allow separate rooms to be formed, if future educational programs should show this to be desirable.[12]

In the 1960's many new school buildings included movable or operable walls, which made possible the conversion of space to either individual classrooms or larger open areas. An article in the July, 1967, issue of School Management, contained a nationwide survey of the percentages of new schools, built in 1966 and 1967 and those planned for 1968, which included movable walls.

The data was collected and calculated on a regional basis with the United States divided into nine different regions. Eight of the nine regions had a yearly increase of buildings that were constructed with operable walls. The national percentage of schools with operable walls had tripled over the three year survey period. As can be seen in Table I, nearly half of the new schools, planned for construction in 1968, were designed with operable walls.

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[12]"How Award Winning Schools Compare," Nations Schools, 80:54, January, 1968.

TABLE I

NATIONAL PERCENTAGE OF SCHOOL BUILDINGS WITH OPERABLE WALLS

| | 1966 | 1967 | 1968 |
|---|---|---|---|
| Elementary New | 13.9 | 30.6 | 43.9 |
| Elementary Additions | 8.0 | 19.4 | 21.2 |
| Secondary New | 16.8 | 28.5 | 49.1 |
| Secondary Additions | 8.4 | 15.7 | 27.0 |

Source: "How the School Construction Dollar Is Spent," School Management, 11:67, July, 1967.

The educational magazine, Nations Schools, regularly publishes descriptions of schools that were selected by a committee representing the Council of Educational Facilities Planners as "Schools-of-the-Month". A survey of these schools has revealed a common element that prevailed in most of the buildings that were chosen for the award. Beginning in 1965, ten of the eleven schools selected were built with instructional areas that accommodate large and small groups of students. In 1966, nine of the eleven schools were designed with special areas for groups of varying sizes. The open space concept was the outstanding design feature in eight of the eleven schools chosen as 1967 winners and, as noted by the editor, "Sprawling, open instructional spaces - more than any other feature - is the design characteristic that forms a common

bond for the majority of the award schools."[13] Again in 1968, the large instructional areas were considered to be an outstanding feature in the design of all ten schools that received the award. The schools were described by the editor who expressed the viewpoint, "Although each of the ten School-of-the-Month selections is individualistic....all are planned with the utmost classroom flexibility, often with provisions for team teaching situations."[14] From 1965 through 1968, thirty-seven (or eighty-six percent) of the forty-three schools chosen for the "School-of-the-Month" award, were built with the type of spaces that could accommodate large and small groups of students. It was felt that this was an indication that large instructional areas had been accepted as a desirable characteristic for outstanding, modern buildings.

The number of schools winning the "School-of-the-Month" award and having flexible facilities can be extracted from Table II.

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[13]"How 1967 Schools of the Month Shaped Up," Nations Schools, 80:55, December, 1967.

[14]"School of the Month: Roundup of 1968 Winners," Nations Schools, 82:54, December, 1968.

TABLE II

NATIONS SCHOOLS - "SCHOOL-OF-THE-MONTH"

| | 1964 | | 1965 | | 1966 | | 1967 | | 1968 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *A | *B | A | B | A | B | A | B | A | B |
| Elementary | 1 | 4 | 4 | 4 | 0 | 0 | 6 | 7 | 6 | 6 |
| Secondary | 2 | 5 | 5 | 6 | 9 | 11 | 2 | 4 | 4 | 4 |

*A - "School of the Month" with large instructional areas
*B - Total Number selected for "School-of-the-Month"

In addition to the "School-of-the-Month" awards, Nations Schools also publishes an annual description of "Award-Winning-Schools" that are selected from school designs that were considered for exhibit at the annual meeting of the American Association of School Administrators. The exclusiveness of being chosen as an "Award-Winning-School" is characterized by the statement in the January, 1969, issue of Nations Schools by the comment, "The schools themselves were initially chosen from hundreds of entrees submitted for exhibition consideration at the 1968 AASA annual meeting, and were among those chosen to receive citations of design excellence from a special AASA jury."[15]

Since the first "Award-Winning-Schools" were chosen in 1964, 83 of 120, or nearly 70 percent, of the schools were designed with spaces

[15]"Why New Design Dimensions: Reader's Guide to '68 Award-Winning Schools," Nations Schools, 83:42, January, 1969.

for large group instruction. The yearly figures are shown in Table III, below.

TABLE III

NATIONS SCHOOLS - "AWARD WINNING SCHOOLS"

| | 1964 | | 1965 | | 1966 | | 1967 | | 1968 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *A | *B | A | B | A | B | A | B | A | B |
| Elementary Schools | 5 | 12 | 6 | 12 | 10 | 10 | 11 | 12 | 3 | 5 |
| Secondary Schools | 15 | 19 | 9 | 14 | 8 | 8 | 5 | 12 | 11 | 16 |

*A - "Award Winning Schools" with flexible open spaces
*B - Total Number of "Award Winning Schools"

Every year the American Association of School Administrators publishes filmstrips and catalogues with descriptions of school designs that were selected as architectural exhibits at the annual AASA meeting. A review of the filmstrips, for the years 1960 through 1969, revealed that the open design first appeared in the Needham Junior High School, Needham, Massachusetts, in 1961.[16] The open space design has been consistently chosen for the exhibits, but as illustrated in Table IV, there were more schools designed with large open areas, in 1968 and 1969, than in any of the previous years.

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[16]American Association of School Administrators, School Buildings, 1961, (A filmstrip of Architectural Exhibits at the 1961 annual meeting of the association.)

TABLE IV

A.A.S.A. ARCHITECTURAL FILMSTRIP EXHIBITS

1960 - 1969 NUMBERS OF SCHOOLS HAVING FLEXIBLE OPEN SPACES, BY YEAR

| | Elementary Schools | Junior and Senior High Schools | Colleges |
|---|---|---|---|
| 1960 | 0 | 0 | 0 |
| 1961 | 0 | 1 | 0 |
| 1962 | 4 | 4 | 0 |
| 1963 | 2 | 3 | 0 |
| 1964 | 2 | 3 | 0 |
| 1965 | 3 | 1 | 1 |
| 1966 | 2 | 1 | 1 |
| 1967 | 3 | 5 | 0 |
| 1968 | 6 | 6 | 0 |
| 1969 | 11 | 3 | 0 |

Source: American Association of School Administrators, School Buildings, (Washington: The Association, 1960-1969).

It is clearly evident that educators and architects have come a long way in planning buildings that provide greater flexibility. School buildings are being designed with many different features but it is apparent that the trend is to build a facility that will accommodate various size groups, and will have the flexibility to change the sizes of areas to fit the demands of the times.

## III. PERTINENT OPINIONS

The complexity of planning and building schools has forced educators and architects to learn to communicate with each other. As was expressed

by MacConnell, "The time is past when the concerted efforts of a school board and local builders could bring about the completion of an adequate school plant within a short time."[17] Educators are just beginning to learn to describe buildings in terms of educational specifications and now they are being confronted with a task that is even more difficult. This problem was clearly pointed out by Gibson who expressed the idea, "If the changes we are looking for in education are ever to be more than slogans, they must be valued against a scale based on cultural needs of the past, present, and future . . . ."[18]

The open space school was planned to meet the present educational demands, and hopefully by accommodating the team teaching concept, meet the demands of the future. According to Heathers, "Team teaching, in five short years, has won a prominent place within the reform movement . . . . There are good reasons to expect that team teaching can make important contributions to improving the quality of instruction."[19] If Heathers is correct in his assumption, team teaching will be a common approach used in schools in the future.

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[17]James C. MacConnell, Planning for School Buildings, (New Jersey: Prentice Hall, Inc., 1957), p. 1.

[18]Charles Gibson, "Shaping Schools to Change," (School Planning Laboratory, California: Stanford University, 1966), p. 9.

[19]Glen Heathers, "Team Teaching and the Educational Reform Movement," Team Teaching (Judson T. Shaplin and Henry F. Olds, (ed.), New York: Harper and Row, Inc., 1964), p. 346-347.

The school plant can be an asset or a hindrance to the educational program, therefore, comments of authorities who have been involved with team teaching were reviewed for the purpose of finding out if the open plan meets the demands of the team teaching concept.

Trump has expressed the opinion that schools of the future will have more flexibility in their programs, as a result of changes in their facilities. According to Trump, "Building design makes a major contribution to a school program aimed at quality education by providing greater flexibility."[20]

Researchers from the Educational Facilities Laboratory, in making an assessment of the physical plant in relation to team teaching, found that most of the methods in experimental team teaching programs are severely handicapped when forced to function in the typical school building designed with two rows of classrooms of equal size separated by a long narrow corridor. According to Clinchy, "Team teaching programs all appear to require school space . . . . The space must allow the rapid shifting of group size and the rapid changing of the participants of any group."[21]

School Management expressed a similar viewpoint by stating, "Team teaching within limitations can operate in almost any school building, but it can't live up to its full potential unless the building has the

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[20]J. Lloyd Trump and Banham Dorsey, Focus on Change: Guide to Better Schools, (Chicago: Rand McNally and Company, 1961), p. 96.

[21]Evans Clinchy, Profiles of Significant Schools: Schools for Team Teaching, (New York: Educational Facilities Laboratories, Inc., 1961), p. 12.

proper spaces and facilities."[22] The space must be able to accommodate groups of various sizes, anywhere from 100 students down to one or two children studying by themselves.[23]

Kane, in his doctoral dissertation, "Evaluation of the Dundee Elementary School Plant As A Team Teaching Facility," expressed the opinion that schools planning facilities for team teaching need to design large group areas with adequate provisions for handling large numbers of students.[24]

Sargent was more emphatic about the open plan being suited for team teaching as he expressed the opinion, "If one of the conditions of team teaching schools--especially when combined with the nongraded pattern of organization--is that there be as few barriers as possible to interfere with the free movement of students and teachers, than the open plan meets this criterion most successfully."[25]

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[22]"How To Introduce Team Teaching In Your Elementary Schools," School Management, 5:121, November, 1961.

[23]Ibid.

[24]Joseph D. Kane, "An Evaluation of the Dundee Elementary School Plant As A Team Teaching Facility," (unpublished Doctoral dissertation, Columbia University, New York, 1965), p. 138.

[25]Cyril G. Sargent, "The Organization of Space," Team Teaching, (Judson T. Shaplin and Henry F. Olds, Jr., (eds.), New York: Harper and Row, Inc., 1964), p. 223.

Not all team teaching patterns are organized in the same manner and, in fact, it is practically impossible to find two teams working in the same way.[26] A school, even though planned as a team teaching facility, will need to be designed around the educational program that will be carried on in that particular school. Beggs, in referring to a team teaching facility, expressed the opinion, "The size of the learning group should be determined by the nature of the activity."[27] Olds, looking at the team teaching concept in existing buildings, pointed out the problem with the statement, "Of course, decisions about group sizes will have to be guided by the size and number of spaces that are available to the team. If the largest space....is a classroom....the team will be extremely limited in the variety of sizes that can be obtained."[28] Since team teaching requires various sizes of teaching spaces, it is evident that the school must have as few barriers as possible. Since it is much easier to put up barriers than to remove walls, the open space school would appear to be the type of facility that would best accommodate team teaching.

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[26]Stuart E. Dean, "Team Teaching: A Review," Change and Innovation in Elementary School Organization, (Maurie Hillson,(ed), New York: Holt, Rinehart and Winston, 1965), p. 211.

[27]David W. Beggs III, "Fundamental Considerations For Team Teaching," Team Teaching, (Indiana: Indiana University Press, 1968), p. 36.

[28]Henry F. Olds, Jr., "A Taxonomy For Team Teaching," Team Teaching, (Judson T. Shaplin and Henry F. Olds,(ed), New York: Harper and Row, Inc., 1964), p. 114.

It must be recognized that the open space facility should not "stand" or "fall" on the design factor alone. This was explicitly expressed by Superintendent Charles Knight of the Cupertino Union School District who remarked, "Without an enthusiastic, well prepared teaching staff.... its promise of new opportunities for better education will remain just that: a promise."[29]

The open space concept is a relatively new area that will probably be the subject of many investigations. At this time, however, there is a limited amount of literature concerning the open concept with most of the evaluations being subjective in nature. These evaluations, however, have led to the construction or planning of additional buildings with open spaces.

An example of this occurred in the Oak Grove Elementary School District near San Jose, California. Its personnel evaluated their open space school and expressed the opinion, "Even with the lack of any formal procedures or evaluations, the District believes that the open space elementary school has more advantages than disadvantages."[30] There are now four open space schools within the Oak Grove District.[31]

In another case, the Clark County Nevada School District evaluated their educational objectives and decided that a one room school would be

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[29]"Schools Without Walls," op. cit., p. 55.

[30]"SPL Reports," School Planning Laboratory (California: Stanford University, May, 1968), p. 8.

[31]Ibid.

appropriate for their instructional program. The editor of School Planning Laboratory reported that, "The staff of this new Ruby S. Thomas School is convinced that solving the big problems that go with the big room will result in significantly larger educational rewards."[32] The Clark County District is planning on building five more elementary schools with the Ruby S. Thomas School being designated as the prototype school.[33]

Probably the most significant opinion about the open space concept can be found in a report submitted by Robert Ramsey to the United States Department of Health, Education and Welfare. Robert Ramsey, Donald Knox and John Gilliland visited four schools with open spaces for the purpose of seeing actual programs of instruction being conducted in open settings and to determine if such facilities really work.[34]

The Beaumont Junior High School and the Garden Springs Elementary School were two schools visited in Lexington, Kentucky. As a result of this visit, Ramsey reported that, "All teachers and administrators with whom we visited are 'sold' on 'schools without walls' and are enthusiastic. They particularly emphasize the advantages of flexible grouping, team

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[32]"The Ruby S. Thomas Elementary School," School Planning Laboratory (California: Stanford University, 1965), p. 4.

[33]Ibid., p. 1.

[34]Robert Ramsey, Resume and Report of Visitations to Schools Employing the Open Space Concept of School Construction ("Schools Without Walls"), (ERIC: Document Resume EF001947, 1969), p. 1.

teaching and working closely with other adult professionals."[35] The teachers at the Garden Springs Elementary School indicated that they felt that open space facilities have enabled them to do a much better job of individualizing instruction.[36]

The Valley Winds Elementary School and the Lewis and Clark Elementary School were two schools visited in St. Louis, Missouri. The open space concept was apparently satisfying to the teachers of Valley Winds School as Ramsey reported, "Here again, all teachers were convinced of the advantages of the 'open space' concept and would not want to work in a conventional facility."[37]

The success of open space facilities must have been apparent to Ramsey for his conclusions to the visits were, "The open space will work.... The greatest advantages of the 'open space' concept lie in the potential for flexible grouping (large group-small group-individual work), team teaching, and individualized instruction."[38]

## IV. COMPARABILITY STUDIES

Facilities are normally evaluated in terms of their adequacy to accommodate the desired instructional program. However, most of the

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[35] Ibid., p. 3.

[36] Ibid., p. 4.

[37] Ibid., p. 5.

[38] Ibid., p. 7.

available research deals with programs rather than facilities. To the best of the investigator's knowledge, the first open space school was built approximately twelve years ago and there is still a dearth of information about the effects of the facility on student achievement. Robert Anderson, in answer to the authors' request for information pertaining to open space facilities, replied, "I have some doubts that you will be able to find any useful studies, especially if you are looking for reliable information about the effects on student achievement."[39]

Since team teaching is the instructional organization used in most of the schools with open spaces, this section will report on several studies related to team teaching.

Two studies, by Knox[40] and Kane,[41] were conducted in facilities with large open areas for the purpose of evaluating the effects of the facility upon the educational program. At the Lewis Sands School in Chagrin Falls, Ohio, Knox compared a team teaching program, taught in a large open area, with the programs taught in self contained classrooms where one teacher

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[39]Personal Correspondence of the Author, Letter from Robert H. Anderson, September 3, 1969.

[40]Donald Moser Knox, "An Experimental Study of the Effect of A Team Teaching Program Upon Certain Selected Variables (Achievement-Anxiety-Social Relations)," (unpublished Ed.D. dissertation, Western Reserve University, 1965).

[41]Joseph D. Kane, "An Evaluation of the Dundee Elementary School Plant As A Team Teaching Facility," (unpublished Ed.D. dissertation, Columbia University, 1965).

taught all subjects. Fifty students were randomly selected for a control and experimental group for the purpose of comparing the achievement, anxiety, and social relations of the two respective groups. No significant differences were found to exist between the experimental and control groups with respect to the variables of reading, arithmetic, or language achievement, nor with respect to measure of anxiety, and social relations. Kane, in his dissertation, evaluated a facility with instructional spaces of varying sizes, built to accommodate a team teaching program. Teachers were interviewed for the purpose of determining if the facility was adequately designed and functional for the team teaching program at the Dundee Elementary School. The teachers were in agreement that areas of differing sizes were necessary for team teaching, and that the areas needed to be strategically placed within the building in order to accommodate team teaching.

One recent study, conducted by Crandell,[42] attempted to compare the results of one form of team teaching organization with the self-contained classroom organization in four elementary schools in the Birmingham School District, Birmingham, Michigan. Academic achievement tests in science, reading comprehension, reading vocabulary, and spelling were administered to measure differences in the achievement of the team teaching and self contained classroom groups. Only two sub-areas in

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[42]Edwin Whitney Crandell, "An Experimental Study: Team Teaching Compared With the Self Contained Classroom in Upper Elementary School Grades," (unpublished Ed.D. dissertation, Wayne State University, 1966), p. 175.

language arts were found to favor the team organization while four academic areas, including social studies and all three sub-areas in arithmetic, favored the self contained classroom groups. Among the categories in which no significant differences were found were the crucial academic areas of science, reading comprehension, reading vocabulary, and spelling.

The Franklin, Norwalk, and Pittsburgh projects are recognized throughout most of the literature on team teaching and probably have provided valuable information to many schools who are experimenting in the area of team teaching. They are among the most extensive studies, in terms of numbers of students involved.

The Franklin School Project is a major activity within the School and University Program for Research and Development (SUPRAD). The program involves the school systems of Lexington, Concord, and Newton, Massachusetts, and Harvard University, and received a ten year grant from the Ford Foundation.[43] Even though the project began in 1957, there has not been any published data concerning the effects of team teaching on student achievement. Dean, in reviewing the evaluation at Franklin stated, "Dr. Anderson's subjective summary indicates that team teaching is not 'disadvantageous' to children, that its results warrant further experimentation and refinement of proceedings. As far as its

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[43]Robert H. Anderson, Ellis A. Hagstrom, and Wade M. Robinson, "Team Teaching In An Elementary School," School Review, 68:71-84, Spring, 1960.

effects on pupils go - in growth of personality, in adjustment and achievement - he thinks them 'no less satisfactory' than the effects in more traditional setting."[44]

The Norwalk Plan, as described by Heathers, "provides representative findings on the outcomes of team teaching in the elementary school."[45] This was a two year study of the relationship between team teaching and student achievement. The plan involved seven three-teacher teams in grades two through six. Each team had a group of 75 to 90 students in a single grade. After comparing the different subtests and different groups, it was reported that 90 favored team teaching while 114 favored the self-contained classroom. Team teaching showed advantages in the areas of reading and spelling. The self-contained classroom held the advantage in language and in arithmetic skills and problem solving. Heather's reported that the divergent results suggest that the effectiveness of the implementation of team teaching was uneven from subject to subject and from grade to grade.[46]

The Pittsburgh Project, like the Franklin Project, also was funded through a grant from the Ford Foundation. The program began in a cluster of five elementary schools in 1960 and increased to ten schools by 1962.

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[44]Stuart E. Dean, "Team Teaching: A Review," School Life, 44:7, September, 1961.

[45]Glen Heathers, "Research On Team Teaching," Team Teaching, (Judson T. Shaplin and Henry F. Olds, Jr.,(eds), New York: Harper and Row, 1964), p. 327.

[46]Ibid., pp. 306-344.

There were 7,500 students in the program and, according to Hillson, "The largest number of pupils in team teaching anywhere in the United States."[47] The groups of students varied in sizes from 5 to 120 and classes were held for various lengths of time. Teams in the primary department were organized on a grade level basis while teams at the intermediate level were organized in the academic subjects. The experiment is still considered too new to point definitely to specific results achieved which can be measured and evaluated.[48]

There are a number of studies that have been conducted on the secondary school level under the auspices of the Commission on the Experimental Study of the Utilization of the Staff in the Secondary School. This commission invited high schools all over the country to engage in experimental projects that focused on a search for more productive ways of using the time and talents of professional teachers. As a result of this invitation, and the provision of funds to implement and evaluate the project, there are numerous reports on team teaching and instructional groups of varying sizes. The various projects were carried out by the schools themselves and are reported in the January 1958, 1959, 1960, and 1961 issues of the National Association of Secondary School Principals' publication, The Bulletin. The names of all the participating schools, along with the project titles, can be found in Trump's

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[47]Maurie Hillson, "Pupils, Patterns, and Possibilities," Change and Innovation in Elementary School Organization, (New York: Holt, Rinehart and Winston, 1965), p. 192.

[48]Ibid., p. 198.

report.[49] Trump has summarized the findings of these projects as follows:

> Students had improved learning opportunities because they came in contact with more teachers, and with the best competencies of those teachers, either as they met them in person or were aided by technological instructional devices.
>
> Teachers found increased satisfaction in teaching and their morale was raised as their special abilities were tapped to a greater degree.
>
> Principals of the schools worked more closely and effectively with teachers and students in programs of instructional leadership.
>
> Something intangible, yet real, produces a general stimulation in the school and community where experimentation occurs.[50]

## V. NEED FOR MORE RESEARCH

There are definite indications that many schools throughout the country have accepted the team teaching organization.

Dean[51] in commenting about the acceptance of team teaching projects stated, "It seems fairly reasonable to say that they are to be found now in at least 100 communities, in both elementary and secondary schools." There are also good indications that many schools are being built with large open areas, or instructional spaces that are flexible in nature, to accommodate team teaching programs.

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[49] Trump, op. cit., p. 131-135.

[50] Ibid., p. 103.

[51] Dean, op. cit., p. 6.

Team teaching and the first open space school are relatively equal in age in that both began to appear around 1957. Most of the literature consists of reports on team teaching while very little has been written about open space facilities. With most of the emphasis on the team teaching topic, it is interesting that there is still an apparent need for more evaluation. This need can be substantiated by those who have made a thorough review of many of the team teaching projects. Dean stated that, "The team teaching idea has been in practice for so little time in so few communities that conclusive evidence of its effectiveness has not had time to accumulate."[52] Drummond, in looking at team teaching said practically the same thing when he remarked, "The worth of attempts at team teaching is not proven to date."[53]

Johnson and Hunt are a little more definite in their statement regarding team teaching as they expressed the opinion that, "One must conclude from the studies made that at present there is no clear evidence supporting or refuting the superiority of team teaching....There is, as yet, no clear evidence that team teaching raises the level of achievement of the students being taught."[54] Olivero, almost expressed the same opinion by stating, "In professional literature there is little

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[52] Ibid., p. 7.

[53] Harold D. Drummond, "Team Teaching: An Assessment," Change and Innovation in Elementary School Organization, (Chicago: Holt, Rinehart, and Winston, 1965), p. 224.

[54] Robert H. Johnson, and John J. Hunt, Px For Team Teaching, (Minneapolis, Minnesota: Burgess Publishing Co., 1968), pp. 53-55.

evidence on the subject, either pro or con, that can be substantiated by carefully controlled research results."[55] Carlin has also reinforced what the others have expressed by stating that, "Experimentally team teaching has gone under the glass in a number of studies, most of which have adopted testing criteria based on pupil achievements and most of which have found no statistically significant differences in this area. More is being done, and it is too early to say definitely that there can be no improvement in pupil achievements."[56]

The need for research concerning the effects of an open area is substantiated by the fact that it is almost nonexistent in the literature. The fact that there are still uncertainties about the effects of team teaching on pupil achievement further illustrates the need for more studies. Open space schools, like team teaching, are found in many areas. Therefore, it is necessary that more studies be made concerning the effects of open area schools.

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[55]James L. Olivero, "Evaluation Considerations for Team Teaching," Team Teaching: Bold New Venture, (Indianapolis, Indiana: Unified College Press, 1964), p. 105.

[56]Philip M. Carlin, "A Current Appraisal of Team Teaching," School Organization: Theory and Practice, (Marian Pope Franklin,(ed.), Chicago: Rand McNally and Company, 1967), p. 282.

# CHAPTER III

## DESCRIPTION OF THE EXPERIMENTAL STUDY

As described in the introductory chapter, a model was designed for the purpose of identifying the components and processes within the study. As shown in Figure 2, the design consisted of five phases which included: input, processes, output, objectives, and evaluation. The selected factors within the input phase of the design were exposed to a year of experimentation and evaluated according to the objectives within the design.

Chapter III was divided into five sections which included the sampling procedures, teacher equivalency, other input factors, the data collection procedures, and the statistical design.

## I. SAMPLING PROCEDURES

The input phase of the design took into consideration eight constant factors as well as the major variable factor of facility. Each of the eight constant factors were subject to controls in order to maintain equality between the experimental and control groups.

Several procedures were carried out for the purpose of attempting to achieve maximum equivalency between the two groups. Students on the individual grade levels were grouped according to sex. The groups were then arranged chronologically from oldest to youngest. The median age

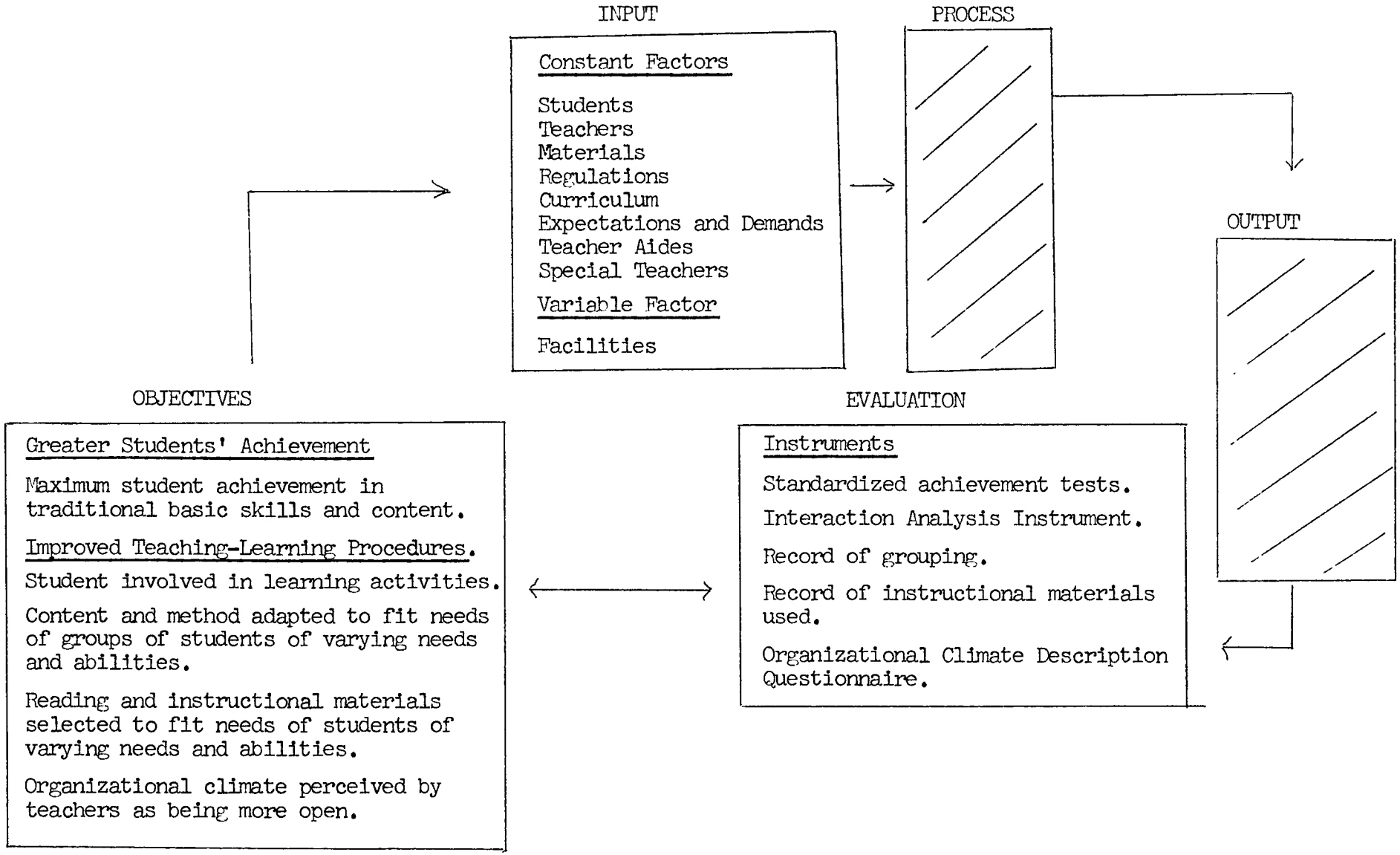


Figure 2

DESIGN MODEL

was the dividing point for separating the two groups into younger and older sections. Each grade level, therefore, had four sections that consisted of a group of younger males, a group of older males, a group of younger females and a group of older females. Students within the four sections for each grade level were numbered separately, and in consecutive order. A table of random numbers was used to place students from each of the four age-sex subgroups into one of the seven sections of each grade level. In order to maintain a class size ranging from twenty-five to thirty students, it was necessary to have seven sections at each of the three grade levels. Thus, all of the seven class sections contained the same proportions of older males and younger males and the same proportions of older females and younger females. The table of random numbers was again used to determine which sections were to be designated as the experimental group and which would constitute the control group. The first three numbers to appear on the table were used to determine the experimental group while the next three were used to select the control group. The seventh number on the table designated a section which was not treated as part of either the experimental or the control group. The open area could satisfactorily accommodate nine sections within this student range. Therefore, each of grades two, three, and four had three sections of students in the open area and four sections of students, including the three in the control and the one non-participating section, in self-contained classrooms.

## II. TEACHER EQUIVALENCY

Another factor within the input phase of the design was the assignment of teachers to either the open area or self-contained classrooms.

The problem of teacher equivalency was recognized early in the design stage of the study. As discussed above, teachers' preferences were taken into consideration in determining assignments to open area (experimental) sections or to contained classrooms (control) sections.[1] It seemed impossible to achieve complete equality of teachers, but it was possible to achieve "equivalency" in experience and training for teachers in the control and experimental groups.

The total amount of teaching experience, along with the total amount of teaching experience within the district, was compared between teachers of the control and experimental groups. Both groups had five teachers who taught five years or less. Also, both groups had four teachers who had six or more years of teaching experience. Eight of the nine teachers in the control group had less than six years of experience within the district, while one teacher had more than six years of experience within the district. Table V is used to illustrate the comparability of teaching experience between teachers in the control and experimental groups.

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[1] Supra., p. 6.

TABLE V

TOTAL TEACHING EXPERIENCE AND IN-DISTRICT EXPERIENCE

| | Numbers of Teachers: | |
|---|---|---|
| Total Teaching Experience | Control Group | Experimental Group |
| 0 - 1 year | 3 | 3 |
| 2 - 5 years | 2 | 2 |
| 6 + years | 4 | 4 |
| | Numbers of Teachers: | |
| In-District Experience | Control Group | Experimental Group |
| 0 - 1 year | 7 | 4 |
| 2 - 5 years | 1 | 5 |
| 6 + years | 1 | 0 |

Another method of comparing the experience factor of the two teaching groups was to determine the means of the total teaching experience and of the in-district experience. The average in-district experiences for the control group was 2.11 years as compared to 1.67 years for the experimental group. The average for the total teaching experience also favored the control group who had 8.0 years as compared to the experimental group who had 5.7 years. T-tests were used to measure the significance of the differences between the teaching experiences of the two groups. As indicated in Table VI, the difference between the means was not significantly different.

TABLE VI

STATISTICAL COMPARISON OF EXPERIENCE (TEACHING) MEANS

| | df | t | p |
|---|---|---|---|
| In-District | 16 | .158 | > .05 |
| Total | 16 | .59 | > .05 |

Table VII illustrates the comparison between the means of the teaching experience for both groups.

TABLE VII

MEAN TEACHING EXPERIENCE FOR CONTROL AND EXPERIMENTAL GROUPS

| | N | In-District Experience | Total Teaching Experience |
|---|---|---|---|
| Control | 9 | 2.11 years | 8.0 years |
| Experimental | 9 | 1.67 years | 5.7 years |

## III. OTHER INPUT FACTORS

In addition to the aforementioned factors of students and teachers, the other six constant factors were: materials, regulations, curriculum, expectations and demands, teacher aides, and special teachers. All six of these factors were controlled under the design of the study so as to achieve equality between the two groups.[2] All possible measures were taken to ensure the fact that all teachers had equal opportunities to

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[2] Supra., p. 3.

carry out the educational objectives of the school. Teachers from both groups were jointly involved in meetings held primarily for the purpose of establishing controls relevant to these six factors.

## IV. DATA COLLECTING PROCEDURES

Within the design were five different objectives and five methods for evaluating the respective objectives.

The first objective was to determine if there were any significant differences between the control and experimental groups when the students' standardized achievement test scores were compared. The philosophy of the school has always been such that teachers have never had to fear the results of students' achievement test scores in relation to their performance. Teachers were well aware that the standardized achievement tests were not considered to be measures of all of the objectives of the school, and that teachers were not "rated" according to this single measure of performance. It was considered important to keep the testing program in the same perspective as it has always been in the past. Therefore, all teachers administered the achievement tests to their respective classrooms. Grade level meetings were used as a method of coordinating the procedures that teachers were to use while administering the tests. All testing commenced in the latter part of March and was completed within a period of one week. Raw scores were collected and used to compare the composite scores and subtest scores

for those students who were in attendance for the entire 1969-70 school year. For the purpose of having equal n's in the statistical evaluation some students were randomly eliminated.

Grade two was given the Science Research Associate Achievement Series, Form C.[3] The subject areas included in this test were reading, language, and arithmetic. Grades three and four were given the Iowa Test of Basic Skills, Forms 3 and 4.[4] The subject areas included in this test were reading, language skills, and arithmetic skills.

The second objective of this study was to compare the nature and degree of teacher-pupil verbal interaction and the communicative methods which teachers employed in the control and experimental classes, whether they be indirect or direct. The Flanders Verbal Interaction Analysis System[5] was used for making the comparison between the two groups.

The Flanders instrument is used as a measure of verbal behavior. All verbal communication is classified or coded as falling into one of

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[3]Louis P. Thorpe, D. Welty Lefever, and Robert A. Naslund, Science Research Associates Achievement Series, (Science Research Associates, Chicago, 1964).

[4]E.F. Lindquist and A.N. Hieronymus, Iowa Test of Basic Skills, (Houghton Mifflin Company, Boston, 1964).

[5]Ned A. Flanders and Edmond J. Amidon, The Role of the Teacher In The Classroom: A Manual for Understanding and Improving Teachers' Classroom Behavior, (Minneapolis: Paul S. Amidon and Associates, Inc., 1963).

the ten areas described in the following:

1. ACCEPTS FEELING: accepts and clarifies the feeling tone of the students in a nonthreatening manner. Feelings may be positive or negative. Predicting or recalling feelings is included.

2. PRAISES OR ENCOURAGES: praises or encourages student action or behavior. Jokes that release tension, but not at the expense of another individual; nodding head, or saying "um hm?" or "go on" are included.

3. ACCEPTS OR USES IDEAS OF STUDENTS: clarifying, building, or developing ideas suggested by a student. As teacher brings more of his own ideas into play, shift to Category 5.

4. ASKS QUESTIONS: asking a question about content or procedure with the intent that a student answer.

5. LECTURING: giving facts or opinions about content or procedures; expressing his own ideas, asking rhetorical questions.

6. GIVING DIRECTIONS: directions, commands, or orders with which a student is expected to comply.

7. CRITICIZING OR JUSTIFYING AUTHORITY: statements intended to change student behavior from nonacceptable to acceptable pattern; bawling someone out; stating why the teacher is doing what he is doing; extreme self-reference.

8. STUDENT TALK - RESPONSE: talk by students in response to teacher. Teacher initiates the contact or solicits student statement.

9. STUDENT TALK - INITIATION: talk by students, which they initiate. If "calling on" student is only to indicate who may talk next, observer must decide whether student wanted to talk. If he did, use this category.

10. SILENCE OR CONFUSION: pauses, short periods of silence, and periods of confusion in which communication cannot be understood by the observer.[6]

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[6]Edmund J. Amidon, and Ned A. Flanders, "A Manual for Understanding and Improving Teacher Classroom Behavior," (Association for Productive Teaching, Inc., Minneapolis, Minneasota, 1967), p. 14.

For each teacher in the study, three different lessons were tape recorded as the teacher was in the process of teaching a class of students. All recordings were taped for a period of fifteen minutes and were made when the class size was between 15 and 35 students. The three different recordings were done during the months of November, January, and March. One day was used to record each particular grade level and all three grades were recorded within the same week. The teachers were told early in the school day that they were to be recorded on that particular day. This was done to avoid situations such as testing, watching films or exercises that only required the students to be writing. Recordings were made of sessions where the students had the opportunity to react verbally within the class situation. All of the recordings were taped and initially coded into one of the ten areas by the investigator. After each tape session was coded and recorded in the form of a matrix, the tabulations within the matrix were computed for the purpose of identifying the percentage of teacher talk and the percentage of student talk. I/D ratios were also computed from the tabulations with the matrix. The I/D ratio is a computed percentage that represents the ratio of indirect and direct teacher statements. The percentage of teacher talk and student talk was computed for all of the sections in the open area and the percentage of teacher talk and student talk was computed for all of the sections in self-contained classrooms. The percentage of teacher talk and student talk was computed separately for each of the three grades

in the open area and also for each of the same three grades in self-contained classrooms and finally for each individual teacher. I/D ratios were also computed in the same manner as the percentages of teacher and student talk. The percentages of time of teacher and student talk, and the computed I/D ratios, were used for comparing the teaching approaches between the two groups of teachers.

The third and fourth objectives of the study involved personal interviews with individual teachers; therefore, the data for these two objectives were gathered concurrently. The third objective was to compare the percentages of time students were in small, medium, or large instructional groups in the experimental and control groups, respectively. Two recording sheets were devised by the investigator for the purpose of gathering the data necessary for making these comparisons. (See Appendix A) The fourth objective of the study was to compare students in the open area with students in the self-contained classrooms with regard to the proportion of time spent in the use of various supplementary materials.

An arbitrary decision was made to use the middle eighteen weeks of the school year for recording information. Each teacher was individually interviewed by the investigator eight times during the eighteen week period. Teachers were interviewed and asked to discuss only the activities that were taught on the preceding day; therefore, an interview on Tuesday would only involve the teaching done on Monday.

Teachers on one grade level, including teachers in both the control and experimental groups, were all interviewed on the same day.

Each teacher described the events that took place on the entire preceding day. The teachers were asked to begin with the first subject that was taught and to describe the materials used for the class and the sizes of all instructional groups which were organized.

Supplementary materials were considered to be only those materials used other than basal textbooks and accompanying materials commercially supplied to go along with the state adopted books. The teacher described all materials that were used by individual students or by groups and the amount of time these materials were used. On the data gathering instrument, the information obtained from the teachers was listed under one of four categories (1) visual and audio-visual, (2) audio, (3) supplemental printed materials, and (4) others. Student time was computed for each of the four areas and used as the basis for comparing the amount of time supplemental materials were used by students in the open area with the amount of time supplemental materials were used in the self-contained classrooms. The same four measures of student time spent in use of special materials were also compared for experimental and control groups in each of the respective grades.

In examining data regarding instructional groupings, students were considered to be in an instructional group only when the teacher was

present or involved in the instructional process within the group. Students who were not working under the direct supervision of the teacher at any particular time were not counted in an instructional group. Teachers were asked to discuss their methods of instruction and the number of students who were involved in the various activities during an entire school day. The teachers were asked to account for the physical presence of every student during each subject that was taught. The recording sheet used for gathering the data relevant to the grouping procedures contained the following three categories: (1) small group instruction (less than 15 students), (2) medium size group instruction (15-35 students), and (3) large group instruction (35 or more students). Data regarding students who were away from their regular classroom and in attendance with a special teacher were not used in comparing the grouping practices. The only information recorded on the grouping information sheet was the actual time that the classroom teacher worked with students. The teaching time for each of the three different size instructional groups was computed for the entire experimental group in the open area and for the entire control group in self-contained classrooms.

The fifth objective of this study was to compare the organizational climate as perceived by teachers in the open area and the organizational climate as perceived by teachers in self-contained classrooms. Both groups of teachers worked within the same single school and were treated as one

faculty. Teachers in both groups were expected to adhere to the same policies and practices that existed for the entire faculty. The same duties and responsibilities were required of teachers in both the control and experimental groups. Every teacher was expected to attend faculty meetings that were held for the entire staff at one time. The Organizational Climate Description Questionnaire (OCDQ)[7] was used to measure the effect of the climate as it was perceived by teachers in both the control and experimental groups.

The OCDQ identifies eight dimensions of organizational behavior and six types of organizational climate. The respondents are asked to select from one of four categories: (1) rarely occurs, (2) sometimes occurs, (3) often occurs, and (4) very frequently occurs. Answer sheets were identified according to a grade level and whether it was from a respondent in the open area or in a self contained classroom. Each item was assigned to one of the eight dimensions that are described in the following:

Teachers' Behavior:

1. Disengagement refers to the teachers' tendency to be "not with it." This dimension describes a group which is "going through the motions," a group that is "not in gear" with respect to the task at hand. It corresponds to the more general concept of 'anomie' as first described by Durkheim. In short, this subtest focuses upon the teachers' behavior in a task-oriented situation.

2. Hindrance refers to the teachers' feeling that the principal burdens them with routine duties, committee demands, and other requirements which the teachers construe as unnecessary "busy-work." The teachers perceive that the principal is hindering rather than facilitating their work.

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[7]Andrew.W. Halpin, Theory and Research In Administration, (New York: The MacMillan Company, 1966), p. 131-249.

3. Esprit refers to morale. The teachers feel that their social needs are being satisfied, and that they are, at the same time, enjoying a sense of accomplishment in their job.

4. Intimacy refers to the teachers' enjoyment of friendly social relations with each other. This dimension describes a social-needs satisfaction which is not necessarily associated with task-accomplishment.

Principal's Behavior:

5. Aloofness refers to behavior by the principal which is characterized as formal and impersonal. He "goes by the book" and prefers to be guided by rules and policies rather than to deal with the teachers in an informal face-to-face situation. His behavior, in brief, is universalistic rather particularistic; nomothetic rather than idiosyncratic. To maintain this style, he keeps himself - at least, "emotionally" - at a distance from his staff.

6. Production Emphasis refers to behavior by the principal which is characterized by close supervision of the staff. He is highly directive and plays the role of a "straw boss." His communication tends to go in only one direction, and he is not sensitive to feedback from the staff.

7. Thrust refers to behavior by the principal which is characterized by his evident effort in trying to "move the organization." Thrust behavior is marked not by close supervision, but by the principal's attempt to motivate the teachers through the example which he personally sets. Apparently, because he does not ask the teachers to give of themselves anymore than he willingly gives of himself, his behavior, though starkly task-oriented, is nonetheless viewed favorably by the teachers.

8. Consideration refers to behavior by the principal which is characterized by an inclination to treat the teachers "humanly," to try to do a little something extra for them in human terms.[8]

The raw scores for the eight dimensions were factor analyzed and the composite scores for the entire sample of teachers provided the basis

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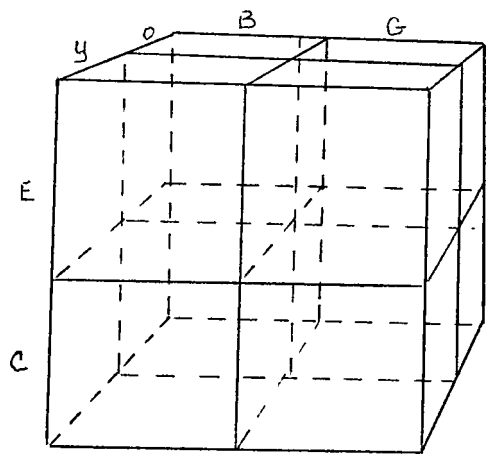
[8]Ibid., pp. 150-151.

for classifying the school's organization climate into one of the following six organizational climates: (1) open, (2) autonomous, (3) controlled, (4) familiar, (5) paternal, and (6) closed. These six climates or categories were used as a basis for comparing the climate of this single school, as it was perceived by teachers in the open area (experimental) and as it was perceived by teachers in self-contained classrooms. This comparison between the perceptions of teachers in the control and experimental groups was also made for each of the respective grades. If the same organizational climate within one school was perceived as being different by the two groups of teachers, it was evident that something influenced the teachers' perceptions.

## V. STATISTICAL DESIGN

The experimental study was designed to evaluate the effects of three variables within a three factor design. These three variables were the group (self-contained or open area), sex, and age. Analysis of variance was used to evaluate the composite and subtest scores on standardized achievement tests as they relate to the variables within the three factor design, as shown in the diagram below:




E - Experimental

C - Control

Y - Younger

O - Older

B - Boy

G - Girl

The analysis included the main effects, first order interaction, and second order of interaction terms for the three variables.

The Flanders Verbal Interaction Analysis System[9] was used to compare the nature and degree of teacher-pupil verbal interaction and the approaches teachers take in their classes, whether they be indirect or direct. The three tape recordings for each of the teachers in the open area were coded and tabulated within a single matrix and the tape recordings for each of the teachers in the self-contained classrooms were coded and tabulated within a single matrix. The same coded recordings for teachers in the open area were tabulated into matrices for each of the three grades and the same coded recordings for teachers in the self-contained classrooms were tabulated into matrices for each of the three grades. Finally, each of the teachers' recordings were tabulated within a single matrix for each individual teacher. By using the Flanders System, each of the matrices provided the tabulations that were used to determine the following three measures: (1) I/D ratio, (ratio of indirect to direct statements), (2) teacher talk, and (3) student talk. These three measures were used as a basis for comparing the approaches teachers take in both the control and experimental groups. Analysis of variance was used to determine the statistical significance of differences in the three measures.

The amount of time supplementary materials were used with students in the open area was compared with the amount of time that supplementary materials were used with students in self-contained classrooms. Each

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[9]Flanders, op. cit.

teacher provided the data that was recorded in one of the following four areas; (1) audio and visual, (2) audio, (3) supplemental printed materials, and (4) others. For each of the four types, as well as for all supplemental materials, student time was computed through the process of multiplying the amount of time materials were used by the number of students who were involved with the materials. The arithmetic means for the student times in the open area group were compared with the arithmetic means of student times in self-contained classrooms. Thus, it was possible to compare control and experimental groups with regard to total use of supplemental materials and also with regard to types of materials used more frequently. Also, these same comparisons of experimental and control groups were made for each of the three respective grades. Analysis of variance was used to determine the statistical significance of the four areas of supplemental materials.

Data relevant to the grouping arrangements was also analyzed and compared. The arithmetic means were computed for the amounts of time that students spent in small, medium, and large groups, and used as the measures for comparing the grouping arrangements of the control and experimental groups, respectively. Also, these same comparisons of control and experimental groups were made for each of the three respective grades. Analysis of variance was used to determine the statistical significance of differences in the grouping arrangements.

The organizational climate as perceived by teachers in the open area was compared with the organizational climate as perceived by teachers in

the self-contained classrooms. The raw scores of the OCDQ were standardized for each teacher and used to plot a profile in standard scores. The scores indicate how often certain types of behavior reportedly "occur" according to the teachers and the principal.[10] The raw scores from the eight dimensions were used to form the basis for defining and classifying the school as falling within one particular organizational climate. The climate may be described as being one of six on a continuum which ranges from open to closed. The climate as perceived by the teachers in the open area was compared with the climate as it was perceived by the teachers in self-contained classrooms. Also, the climate as perceived by the teachers in each of the three grades in the open area were also compared with the climate as it was perceived by the teachers in self-contained classrooms who were of the same identical grades. No test of statistical significance was applied. Rather, the question was asked, "Do teachers in the two groups perceive the school as having the same organizational climate or do they perceive it differently?"

Thus was the model of the project applied.[11] Five different types of evaluative instruments were employed to measure the achievement of each of the predetermined objectives. The control and experimental groups were compared with regard to each of the measures. Two-tailed tests were used, and differences were considered statistically significant only if they existed at the .05 level.

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[10] Halpin, op. cit., p. 167.

[11] Supra., p. 39.

# CHAPTER IV

## THE ANALYSIS OF RESULTS

The findings are reported in five major sections. Each section contains the statistical information regarding each of the five objectives of the study (Achievement, Teacher-Pupil Interaction, Supplemental Material Usage, and Organizational Climate).

### I. ACHIEVEMENT TEST SCORES

It was hypothesized that there would be a significant difference between the control and experimental groups when the students' standardized test scores were compared.

Each individual grade in the open area was compared with each individual grade in self-contained classrooms. The open area students' raw scores for each of the respective subject areas were compared with the raw scores for the students in self-contained classrooms. The eight academic achievement scores for each of the three grades were statistically compared by a three factor analysis of variance. The results of the analyses are listed in Appendix B.

Only the scores for those students who were in attendance for the entire school year were included in the study. From the population of students in each of the three grades, a random numbers table was used to select an even number of students for each of the eight cells within the statistical design.

Second Grade. The SRA Achievement Series,[1] was administered to all second grade students during the month of March, 1970. The raw scores, from a sample population of 136 students, were used for comparing the eight different achievement areas of vocabulary, reading comprehension, language skills total, arithmetic concepts, arithmetic reasoning, arithmetic computation, arithmetic total, and total composite achievement.

When comparisons were made of achievement scores for the students, no significant differences were found to exist within the two factors, facility and age or their interactions.

In the scores for the areas of reading comprehension, language skills total, arithmetic reasoning, and total composite, the girls' scores were significantly higher than the scores for the boys. The similarity of the test results can be seen in Table VIII which lists the average scores in each of the eight achievement areas.

Third Grade. The Iowa Test of Basic Skills,[2] was administered to all third grade students during the month of March, 1970. The raw scores, from a sample population of 112 students, were used for comparing the eight different achievement areas of vocabulary, reading, spelling, language skills total, arithmetic concepts, arithmetic problems, arithmetic total, and total composite achievement.

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[1]Louis P. Thorpe, D. Welty Lefever, and Robert A. Naslund, Science Research Associates Achievement Series, (Science Research Associates, Chicago, 1964).

[2]E.F. Lindquist, and A.N. Hieronymus, Iowa Test of Basic Skills, (Houghton Mifflin Company, Boston, 1964).

TABLE VIII

MEAN SCORES FOR SECOND GRADE STUDENTS - SCIENCE RESEARCH ASSOCIATE SERIES*

| ACHIEVEMENT AREA | BOYS | | | | GIRLS | | | |
|---|---|---|---|---|---|---|---|---|
| | Experimental | | Control | | Experimental | | Control | |
| | Younger | Older | Younger | Older | Younger | Older | Younger | Older |
| Vocabulary | 20 | 18 | 19 | 18 | 18 | 20 | 21 | 18 |
| Reading | 29 | 28 | 27 | 26 | 29 | 31 | 34 | 30 |
| Language Total | 75 | 70 | 71 | 70 | 77 | 75 | 84 | 83 |
| Arithmetic Concepts | 25 | 22 | 24 | 23 | 22 | 23 | 23 | 22 |
| Arithmetic Reasoning | 16 | 13 | 13 | 11 | 14 | 16 | 16 | 14 |
| Arithmetic Computation | 21 | 19 | 19 | 18 | 19 | 21 | 19 | 20 |
| Arithmetic Total | 61 | 54 | 56 | 52 | 56 | 58 | 58 | 56 |
| Total Composite | 184 | 168 | 173 | 162 | 180 | 184 | 194 | 186 |

*Louis P. Thorpe, D. Welty LeFever, and Robert A. Naslund, Science Research Associates Series, (Science Research Associates, Chicago, 1964).

When comparisons were made of the achievement scores for the students, no significant differences were found to exist within the two factors, facility and age, or their interactions.

There was a significant difference, between sexes, in the scores for the areas of reading, spelling, language skills total, arithmetic problems, arithmetic total, and total composite achievement. In these six areas, the girls' scores were significantly higher than the scores for the boys. Also, in the area of vocabulary, the scores for the younger boys and girls were significantly higher than the scores for the older boys and girls. The similarity of the test results can be seen in Table IX, which lists the average scores in each of the eight achievement areas.

Fourth Grade. The Iowa Test of Basic Skills[3] was administered to all of the fourth grade students during the month of March, 1970. The raw scores, from a sample population of 120 students, were used for comparing the eight different achievement areas of vocabulary, reading, spelling, language skills total, arithmetic concepts, arithmetic problems, arithmetic total, and total composite achievement.

When the comparisons were made of the scores for the students, the differences for six of the eight achievement areas were not significant. However, for the achievement areas of arithmetic problems and arithmetic total, the scores for the students in the self-contained classrooms were

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[3]Ibid.

TABLE IX

MEAN SCORES FOR THIRD GRADE STUDENTS - IOWA TEST OF BASIC SKILLS*

| ACHIEVEMENT AREA | BOYS | | | | GIRLS | | | |
|---|---|---|---|---|---|---|---|---|
| | Experimental | | Control | | Experimental | | Control | |
| | Younger | Older | Younger | Older | Younger | Older | Younger | Older |
| Vocabulary | 23 | 19 | 24 | 20 | 24 | 24 | 22 | 21 |
| Reading | 30 | 26 | 36 | 29 | 38 | 36 | 32 | 33 |
| Spelling | 19 | 18 | 24 | 18 | 26 | 26 | 26 | 23 |
| Language | 81 | 71 | 88 | 77 | 107 | 105 | 101 | 90 |
| Arithmetic Concepts | 21 | 17 | 23 | 20 | 22 | 21 | 23 | 22 |
| Arithmetic Problems | 14 | 11 | 15 | 13 | 17 | 16 | 17 | 17 |
| Arithmetic Total | 35 | 28 | 38 | 34 | 39 | 36 | 40 | 38 |
| Total Composite | 219 | 186 | 238 | 209 | 267 | 255 | 250 | 238 |

*E.F. Lindquist, and A.N. Hieronymus, Iowa Test of Basic Skills, (Houghton Mifflin Company, Boston, 1964).

significantly higher than the scores for the students in the open area. The differences were significant at the .05 level of confidence.

For every achievement area except arithmetic problems, there was an interaction between sex and facility. As can be seen in Table X, the average scores for the girls in the self contained classrooms were higher than the scores for the girls in the open area, in all eight achievement areas. However, the average scores for the boys in the open area were higher than the average scores for the boys in the self-contained classrooms, in six of the eight achievement areas. Thus, there was an interactive effect between the sex of the student and the facility.

There were three achievement areas in which there were significant differences between the two sexes. The spelling, language, and total composite achievement scores for the girls were significantly higher than the scores for the boys.

Table XI summarizes the results of the analysis of variance that was used for comparing the students' scores in the eight different achievement areas, for the two factors of facility (open area versus contained classrooms) and sex (boys versus girls). There were no significant findings related to age of students or its interactions with the other two variables so these analyses are omitted from the table.

It was, therefore, concluded that the standardized achievement test scores for the open area students and the standardized achievement test scores for the students in self-contained classrooms did not reflect any

TABLE X

MEAN SCORES FOR FOURTH GRADE STUDENTS - IOWA TEST OF BASIC SKILLS*

| ACHIEVEMENT AREA | BOYS | | | | GIRLS | | | |
|---|---|---|---|---|---|---|---|---|
| | Experimental | | Control | | Experimental | | Control | |
| | Younger | Older | Younger | Older | Younger | Older | Younger | Older |
| Vocabulary | 28 | 24 | 23 | 25 | 24 | 25 | 28 | 28 |
| Reading | 46 | 38 | 35 | 39 | 39 | 44 | 45 | 45 |
| Spelling | 26 | 25 | 22 | 21 | 27 | 26 | 29 | 29 |
| Language | 100 | 94 | 88 | 98 | 105 | 100 | 113 | 119 |
| Arithmetic Concepts | 24 | 23 | 23 | 24 | 22 | 22 | 26 | 26 |
| Arithmetic Problems | 17 | 16 | 16 | 18 | 16 | 17 | 19 | 21 |
| Arithmetic Total | 41 | 39 | 39 | 41 | 38 | 40 | 45 | 47 |
| Total Composite | 284 | 255 | 243 | 265 | 271 | 272 | 303 | 311 |

*E.F. Lindquist, and A.N. Hieronymus, Iowa Test of Basic Skills, (Houghton Mifflin Company, Boston, 1964).

actual differences. When the eight achievement areas were compared for each of the three respective grades, a total of twenty-four comparisons, there were differences in only two cases. Grades two and three did not have any achievement areas that were significantly different, grade four showed significant differences in the achievement areas of arithmetic problems and arithmetic total where the scores for the students in self-contained classrooms were significantly greater than the scores for the students in the open area.

TABLE XI

RESULTS OF ANALYSIS OF VARIANCE FOR FOURTH GRADE

| Achievement Areas | VARIABLES AND INTERACTIONS | | | |
|---|---|---|---|---|
| | Age | Facility | Sex | Interactions* (Sex and Facility) |
| Vocabulary | N.S. | N.S. | N.S. | .05 |
| Reading | N.S. | N.S. | N.S. | .05 |
| Spelling | N.S. | N.S. | .01 | .05 |
| Language | N.S. | N.S. | .01 | .05 |
| Arithmetic Concepts | N.S. | N.S. | N.S. | .05 |
| Arithmetic Problems | N.S. | .05 | N.S. | N.S. |
| Arithmetic Total | N.S. | .05 | N.S. | .05 |
| Total Composite | N.S. | N.S. | .05 | .05 |

*There were no significant differences due to interactions within any of the other factors.

N.S. - Not statistically significant
.05 - Significant at .05 level
.01 - Significant at .01 level

## II. TEACHER-PUPIL VERBAL INTERACTION

It was hypothesized that there would be a significant difference in the nature of teacher-student verbal interaction in the open area and that in the self contained classrooms when the proportions of direct and indirect interaction for the two groups were compared.

For each teacher in the study, three different lessons were tape recorded as the teacher was in the process of teaching a class of students. All recordings were taped for a period of fifteen minutes and were made when the class size was between 15 and 35 students. Recordings were made of sessions where the students had the opportunity to react verbally within the class situation. That is, classroom activities such as testing, watching films or writing exercises, that did not require verbal interaction between the teacher and student were not taped.

The Flanders Verbal Interaction Analysis Sytem[4] was used to compare the nature and degree of teacher-pupil verbal interaction and the approaches teachers take in their classes, whether they be indirect or direct. The ratio of indirect and direct teacher statements (represented by an "I/D ratio"), the average percentage of teacher talk, and the average percentage of student talk, were used for comparing the teaching approaches between the open area teachers and the teachers in self-contained classrooms. Analysis of variance was used for making the comparisons between the two groups.

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[4]Ned A. Flanders, and Edmond J. Amidon, The Role of the Teacher in the Classroom: A Manual for Understanding and Improving Teachers' Classroom Behavior, (Minneapolis: Paul S. Amidon and Associates, Inc., 1963).

Percentages were computed in the three areas of (1) I/D ratio, (2) teacher talk, and (3) student talk. When each of the three percentages for the teachers in the open area were compared with the percentages for the teachers in self-contained classrooms, there were not any significant differences in any of the three areas.

Teachers in the open area were found to have made indirect statements 53 percent of the time while the teachers in self-contained classrooms made indirect statements 51 percent of the time. The percentages for both groups of teachers could be interpreted to mean that for each indirect teacher statement, there was a direct teacher statement. Thus, the teachers in both groups spent approximately half of their time in attempting to stimulate verbal participation by the students while the other half of their time concentrated on increasing student compliance with teacher opinion and direction. Differences between the two groups were not significant.

It was found that the verbal behavior for both groups of teachers varied from one month to another. The three average I/D ratios for the open area teachers were 59, 44, and 57 respectively, and 55, 49, and 48 respectively for the control group. The analysis of variance revealed that there were significant differences due to trials. However, these differences did not indicate any trend for teachers to increase or decrease the proportion of indirect statements.

Percentages were computed for the amounts of time the teacher talked in the experimental and control groups and comparisons were made. The teachers in the open area talked 61 percent of the time while the teachers

in self-contained classrooms talked 62 percent of the time. Percentages were also computed for the amounts of time that the students talked, and comparisons were made between the two groups. The students in the open area talked 31 percent of the time while the students in self-contained classrooms talked 27 percent of the time. The fact that the two combined percentages of teacher talk and student talk do not total 100 percent is explained by the fact that the remaining percent of the classroom time was coded as being in the category defined as "silence or confusion." The teaching approaches for both groups were very similar in that the percentages of teacher talk and student talk did not tend to vary. The teachers in both groups talked twice as much as did the student.

Thus, the research hypothesis was not upheld in that there were not any significant differences in the nature of teacher-student verbal interaction in the open area and that in self-contained classrooms, when the proportions of direct and indirect interaction for the two groups were compared.

The percentages of teacher-pupil verbal interaction and the I/D ratios were basically the same for the control and experimental groups. This was true for each of the respective grades as well as for the entire three grades in the experimental and control groups.

## III. GROUPING ARRANGEMENTS

It was hypothesized that there would be a significant difference in the amount of time students spent in varying sizes of instructional groups

when the open area grouping arrangements were compared with the grouping arrangements in self-contained classrooms. The instructional groups were classified as being either large, medium, or small. The amounts of time students spent in the groups of the three respective sizes were used as the bases for comparing the grouping arrangements in the open area with grouping arrangements in the self-contained classrooms.

The amounts of time students spent in small, medium, and large size instructional groupings were compared for grades two, three, and four, respectively. Eight sample days and eight different interviews for each teacher were used to obtain the amounts of time students spent in the three sizes of instructional groups. The amounts of time were compared by analysis of variance.

The results of the analysis upheld the research hypothesis that there would be a significant difference in the amounts of time students spend in varying sizes of instructional groups when the open area grouping arrangements are compared with the grouping arrangements in self-contained classrooms. The teachers in the open area tended to vary the grouping arrangements and spent considerably less time in medium size groups. The teachers in self-contained classrooms spent eighty-one percent of the time in medium size groups while the open area teachers spent only fifty-eight percent of the time in medium size groups. Figure 3 graphically illustrates the difference in the amounts of time respective grades spent in medium size groups. As illustrated, the second grade open area teachers spent only an average of 88 minutes per day in medium size groups, while the

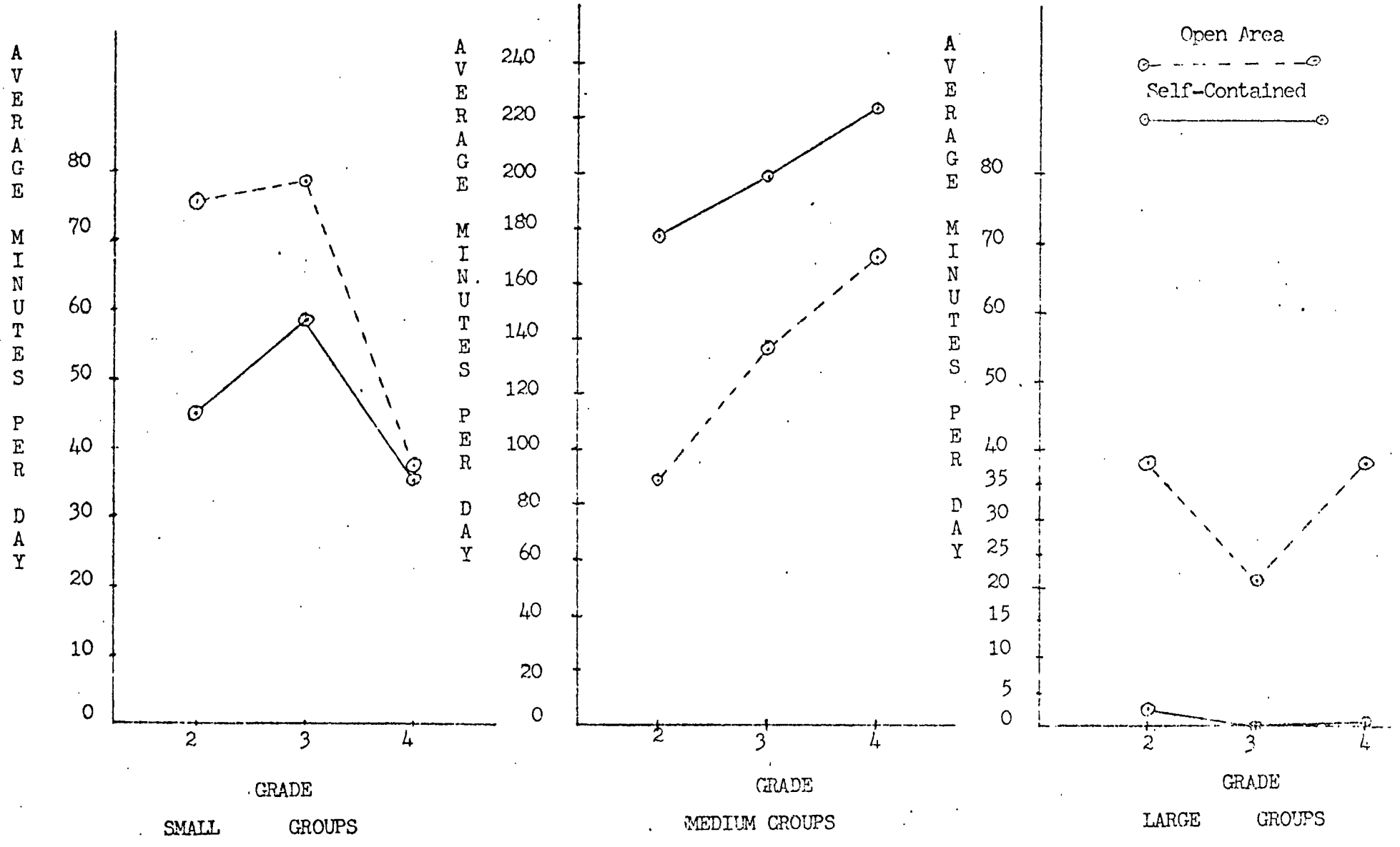


FIGURE 3

TIME SPENT IN VARIOUS SIZE GROUPS

second grade self-contained classroom teachers spent an average of 177 minutes in medium size groups. The third grade teachers in the open area had medium size groups an average of 136 minutes per day while the third grade self-contained classroom teachers spent 198 minutes in medium size groups. The fourth grade teachers in the open area spent an average of 170 minutes in medium size groups while the fourth grade self-contained classroom teachers spent 223 minutes in medium size groups. For the entire group of teachers in the open area, the average time per day spent in medium size groups was 131 minutes or slightly more than two hours. For the entire group of teachers in self-contained classrooms, the average time per day spent in medium size groups was 200 minutes or 3 hours and 20 minutes.

The data regarding the analysis of variance for medium size group instruction in Table XII shows more detail regarding the significance of these comparisons. From the analysis it can be concluded that:

1. The basic hypothesis was upheld. Teachers in the open area did regroup their students and depart from the typical classroom size grouping to a greater extent than did teachers in the self-contained classrooms.

2. Lower grades spent significantly less time in medium size groups than did the upper grades.

3. There was significant interaction of trials and grade.

4. There was significant interaction of all three factors - trial, grade, and facility.

TABLE XII

ANALYSIS OF VARIANCE FOR MEDIUM SIZE GROUPING

| SOURCE | SS | DF | MS | F | P |
|---|---|---|---|---|---|
| TOTAL | 517038.64 | 143.0 | | | |
| BETWEEN SUBJECTS | 337588.14 | 17.0 | | | |
| GRADE | 98272.60 | 2.0 | 49136.30 | 9.16 | <.005 |
| FACILITY | 166600.03 | 1.0 | 166600.03 | 31.04 | <.001 |
| GRADE X FACILITY | 8313.43 | 2.0 | 4156.72 | 0.77 | |
| ERROR | 64402.08 | 12.0 | 5366.84 | | |
| WITHIN SUBJECTS | 179450.50 | 126.0 | | | |
| TRIALS | 11931.75 | 7.0 | 1704.54 | 1.73 | |
| TRIALS X GRADE | 39095.96 | 14.0 | 2792.57 | 2.84 | <.005 |
| TRIALS X FACILITY | 11170.64 | 7.0 | 1595.81 | 1.62 | |
| TRIALS X GRADE X FACILITY | 34589.57 | 14.0 | 2470.68 | 2.51 | <.01 |
| ERROR | 82662.58 | 84.0 | 984.08 | | |

Since the times spent in medium size grouping arrangements were significantly different between the open area and the self-contained classrooms, it was quite apparent that the differences in time should also be reflected in the small and large group arrangements.

As Figure 3 illustrated, it was clearly evident that the teachers in the open area spent significantly more time in large group instruction than did teachers in the self-contained classrooms. The eight interviews revealed that the nine open area teachers had a combined total of 2,320 minutes in large group instruction, while the nine self-contained classroom teachers had a combined total of only 95 minutes. The nine open area teachers spent an average of 32 minutes per day in large group instruction while the nine

teachers in self-contained classrooms averaged slightly over 1 minute per day in large group instruction. The difference was so obvious that no statistical test of significance was required.

While Figure 3 shows the second and third grade open area groups spent more time in small groups than did the self-contained classroom groups, the analysis of variance in Table XIII clearly shows that the existing difference was not statistically significant. The only significant finding was that the amount of time spent in small groups was greater in lower grades than in upper grades, without differentiation between the experimental and control groups.

TABLE XIII

ANALYSIS OF VARIANCE FOR SMALL GROUP INSTRUCTION

| SOURCE | SS | DF | MS | F | P |
|---|---|---|---|---|---|
| TOTAL | 181582.16 | 143.0 | | | |
| BETWEEN SUBJECTS | 83503.28 | 17.0 | | | |
| GRADE | 26172.60 | 2.0 | 13086.30 | 3.89 | <.05 |
| FACILITY | 10319.17 | 1.0 | 10319.17 | 3.07 | |
| GRADE X FACILITY | 6664.68 | 2.0 | 3332.34 | 0.99 | |
| ERROR | 40346.83 | 12.0 | 3362.24 | | |
| WITHIN SUBJECTS | 98078.87 | 126.0 | | | |
| TRIALS | 4012.66 | 7.0 | 573.24 | 0.81 | |
| TRIALS X GRADE | 14532.74 | 14.0 | 1038.05 | 1.47 | |
| TRIALS X FACILITY | 7929.88 | 7.0 | 1132.84 | 1.60 | |
| TRIALS X GRADE X FACILITY | 12268.43 | 14.0 | 876.32 | 1.24 | |
| ERROR | 59335.17 | 84.0 | 706.37 | | |

## IV. SUPPLEMENTARY MATERIALS

It was hypothesized that there would be a significant difference in the extent of use of various supplemental instructional materials by students in the open area as compared with students in the self-contained classrooms.

The use of supplementary materials was compared in terms of student time which was computed by multiplying the number of minutes the materials were used by the number of students who were involved with the materials. The differences of these student times were statistically compared by a three-way factor analysis of variance. The three factors were grade, facility, and trials.

The average amount of student time for supplementary material usage in the open area was 1,526 minutes per teacher while the average amount of student time for using supplementary materials in self contained classrooms was 1,043 minutes per teacher. The open area groups, therefore, averaged 438 student minutes more per day than did the self-contained group.

As can be seen in Table XIV, the amount of student time spent in the use of supplementary materials was greater for each of the respective grades in the open area when compared with each of the same three grades in self-contained classrooms. The eight different interviews revealed that the fourth grade open area teachers averaged 856 student minutes more per day than the fourth grade self contained classroom teachers.

The third grade open area teachers averaged 280 student minutes more per day than did the third grade self contained classroom teachers. Also, the second grade open area teachers averaged 316 student minutes more per day than did the teachers in the second grade self-contained classrooms.

The teachers in the open area spent approximately three times as many student minutes with the use of audio and visual materials and twice as much time with supplementary printed materials, than did the self-contained classroom teachers. There was only a slight difference in student minutes for audio materials and the area classified as other materials.

TABLE XIV

USE OF SUPPLEMENTARY MATERIALS - TOTAL STUDENT MINUTES

| | OPEN AREA | CONTAINED CLASSROOMS |
|---|---|---|
| Grade Two | 25,385 | 17,885 |
| Grade Three | 37,614 | 30,892 |
| Grade Four | 46,891 | 26,345 |
| TOTAL | 109,890 | 75,122 |

Thus, the hypothesis was accepted. There was a significant difference in the extent of use of various supplementary materials. The statistical difference is substantiated by the analysis of variance as

recorded in Table XV. It can be concluded that teachers in the open area were encouraged to depart from the basic textbook materials more frequently than teachers in self-contained classrooms.

TABLE XV

ANALYSIS OF VARIANCE FOR SUPPLEMENTARY MATERIAL USAGE

| SOURCE | SS | DF | MS | F | P |
|---|---|---|---|---|---|
| TOTAL | 176067532.55 | 143.0 | | | |
| BETWEEN SUBJECTS | 38877727.55 | 17.0 | | | |
| GRADE | 10813817.72 | 2.0 | 5406908.86 | 3.78 | |
| FACILITY | 8394540.45 | 1.0 | 8394540.45 | 5.87 | <.05 |
| GRADE X FACILITY | 2513238.72 | 2.0 | 1256619.36 | 0.88 | |
| ERROR | 17156130.67 | 12.0 | 1429677.56 | | |
| WITHIN SUBJECTS | 137189805.00 | 126.0 | | | |
| TRIALS | 10816095.56 | 7.0 | 1545156.51 | 1.42 | |
| TRIALS X GRADE | 17181059.95 | 14.0 | 1227218.57 | 1.13 | |
| TRIALS X FACILITY | 1294564.32 | 7.0 | 184937.76 | 0.17 | |
| TRIALS X GRADE X FACILITY | 16390088.48 | 14.0 | 1170720.61 | 1.07 | |
| ERROR | 91507996.69 | 84.0 | 1089380.91 | | |

## V. ORGANIZATIONAL CLIMATE

It was hypothesized that there would be a significant difference between the organizational climate of the school as perceived by teachers in the open area and the organizational climate of the school as perceived by the teachers in self-contained classrooms.

The raw scores from the Organizational Climate Description Questionnaire identified eight dimensions of organizational behavior for the teachers in the open area and eight dimensions for the teachers in self-

contained classrooms. The raw scores for each of the eight different dimensions were converted into standardized scores, and profiles comprised by these standardized scores were drawn. These profiles were compared with one another, and with the profiles of schools which Halpin had characterized as being "prototypic" of the six climates: (1) open, (2) autonomous, (3) controlled, (4) familiar, (5) paternal, and (6) closed.[5] It was found that the climates which were perceived by the two groups of teachers were quite similar. T-tests were used to compare the differences of the results for each of the eight different dimensions. For seven of the eight subtests (Disenchantment, Hindrance, Esprit, Intimacy, Aloofness, Production Emphasis, Thrust, and Consideration), the differences in mean raw scores between the two groups were not significant. Only in the dimension of "hindrance" did the t-test show a significant difference between the scores for the two groups of teachers. When compared with profiles of the so-called "prototypic" schools it was found that the profiles for these two groups of teachers did not closely resemble the profiles of any of the recognized climates. The profile representing the open area teachers resembled that for schools with closed climates more closely than any of the other typical climates, and the profile representing the self-contained classroom teachers resembled that of autonomous schools most closely. However, both differed substantially from each and

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[5]Andrew W. Halpin, Theory and Research in Administration, (The MacMillan Company, New York, 1966), pp. 155-156.

every "typical" climate school. The two were clearly more similar to one another than to any of the "typical" climates. Thus, the research hypothesis was rejected. The difference in the climate as perceived by the two groups of teachers, experimental and control, could not be deemed to be significant.

## VI. INCIDENTAL FINDINGS

Although teacher satisfaction and student discipline were not within the design of the study, the investigator felt it important to mention these two areas. Eight of the nine teachers expressed satisfaction with teaching in the open area facility and wanted to continue teaching in an open area in the future. Only one teacher expressed a desire to return to a self-contained classroom.

Early in the experiment, fears were expressed by parents concerning the effect of increased distraction and problems of maintaining student discipline in the open area. In the end, however, there was a general agreement among the teachers that they had fewer discipline problems than in previous years, and that the problems were less serious in nature. It was also related by the teachers that the openness of the facility was not a distractive factor except when large groups of students were moving all at one time.

# CHAPTER V

## REVIEW AND CONCLUSIONS

The purpose of this study was to determine the effect of an open area facility as compared with self-contained classrooms, upon the performance of students and teachers in an elementary school.

### I. DESIGN OF STUDY

The study was designed from a systems model that was used to identify the components and processes within the study. The design consisted of five phases which included: input, process, output, objectives, and evaluation.

The dependent factors of the input phase were controlled as much as possible. In order to obtain equivalent samples, students in each grade were separated into male and female groups, classified as younger or older, and randomly assigned to one of three sections in the open area or to a self contained classroom. It was impossible to achieve complete equality of teachers, but three factors, (1) interest and motivation, (2) experience, and (3) quality rating, were all taken into consideration. The remaining dependent factors of materials, regulations, curriculum, expectations and demands, teachers' aides, and special teachers were equally controlled with both groups receiving identical treatment. Both groups were located within the same building and treated as one single faculty. They were both under the direction of the same school

principal and worked within the organizational philosophy accepted by the entire school. The same educational goals prevailed and similar educational programs were conducted in the open area facility and in self-contained classrooms.

The facility was the one variable factor of the input phase. The difference between the two facilities was considered as being the influencing factor that could account for the occurring changes in the performances of the teachers and students.

Process and output were two unknown phases of the design. The effects of the facility upon the performance of teachers and students were determined in the process stage and subsequently evaluated as output.

Five objectives were identified and for each objective an instrument or method was selected for the purpose of evaluation. Aspects of process and of output were sampled and evaluated by these instruments.

Objective number one was to compare student achievement in traditional basic skills and content between the control and experimental groups. The SRA Achievement Series[1] was administered to the second grade students, and the Iowa Test of Basic Skills[2] was given to the third and fourth grade students. A three factor analysis of variance was used for comparing the raw scores for students in the same grades in self-contained classrooms in order to determine if there were any significant differences in the achievement of the two groups.

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[1]Louis P. Thorpe, D. Welty Lefever, and Robert A. Naslund, Science Research Associates Series, (Science Research Associates, Chicago, 1964).

[2]E.F. Lindquist and A.N. Hieronymus, Iowa Test of Basic Skills, (Houghton Mifflin Company, Boston, 1964).

Objective number two was to compare the extent to which students were directly involved in the learning activities, in the open area and in the self-contained classrooms. Student participation, teacher-pupil verbal interaction, and indirect teaching were considered to be evidence of desirable teaching-learning procedures. The Flanders Verbal Interaction Analysis System[3] was used for comparing the teaching behavior as to whether it was more indirect or direct, and also, the proportions of time that were devoted to teacher and student talk. Analysis of variance was used for making the comparisons

Objective number three was to compare the grouping arrangements of students in self-contained rooms with the grouping arrangements of students in the open area. The varying of the sizes of instructional groups was considered to be evidence that content and method had been adapted to meet the needs of the students. A record was kept of the amounts of time students were in small, medium, or large size instructional groups within the control and experimental groups respectively. The percentages of time spent in the three various size groups were compared by analysis of variance.

Objective number four was to compare the amount of time supplementary materials were used with students in the open area and the amount of time supplementary materials were used with students in self-contained classrooms. It was assumed that use of supplementary materials indicated effort to meet the varying needs and abilities of students.

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[3]Ned A. Flanders and Edward J. Amidon, The Role of the Teacher in the Classroom: A Manual For Understanding and Improving Teachers' Classroom Behavior, (Minneapolis: Paul S. Amidon and Associates, Inc., 1963).

A record was kept of the amounts of time students spent with supplementary instructional materials and recorded as student time. The student time for the two groups was compared by analysis of variance.

Objective number five was to compare the organizational climate as perceived by teachers in the open area and the organizational climate as perceived by teachers in self-contained classrooms. Halpins' Organizational Climate Description Questionnaire[4] was used to measure the effects of the climate as it was perceived by the two groups of teachers, and the findings were compared.

Based on the above objectives and evaluation procedures, the following hypotheses were tested.

1. There will be a significant difference between the standardized achievement test scores of the children in the open area when compared with the standardized achievement test scores of children in self-contained classrooms.

2. There will be a significant difference in the nature of teacher-student verbal interaction in the open area and that in self-contained classrooms when the proportions of direct and indirect interaction for the two groups are compared.

3. There will be a significant difference in the amounts of time students spend in varying sizes of instructional groups when the open area grouping arrangements are compared with the grouping arrangements in self-contained classrooms.

4. There will be significant differences in the extent of use of various supplemental materials with students in the open area as compared with students in self-contained classrooms. It was assumed that improved teaching-learning procedures would be evidenced by teachers perceiving the climate as being open.

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[4]Andrew W. Halpin, Theory and Research In Administration, (New York: The MacMillan Company, 1966), pp. 131-249.

5. There will be a significant difference in the organizational climate as perceived by teachers in the open area and the organizational climate as perceived by the teachers in the self-contained classrooms.

## II. SUMMARY OF FINDINGS

When the achievement scores for the students in the open area and the students in self-contained classrooms were compared, differences were not significant. Students in the open area did as well on standardized achievement tests as did the students in the self-contained classrooms. When the eight achievement areas were compared for each of the three respective grades, a total of twenty-four comparisons, there were differences in only two cases. The type of facility apparently did not effect student learning.

When the achievement scores between the sexes were compared, there did appear to be some differences. The girls in grades two, three, and four tended to score higher on achievement tests than did the boys. The girls scored significantly higher than the boys in thirteen of the twenty-four different test areas. There were not any significant differences in the other eleven areas. In the fourth grade only, there was significant interaction between the two factors, sex and facility, in seven of the eight achievement areas. The girls in the self-contained classrooms tended to score higher than the girls in the open area while the boys in the open area tended to score higher than the boys in self-contained classrooms.

The principal finding was that there were not significant differences between the standardized achievement test scores of the children in the open area when compared with the standardized achievement test scores of children in self-contained classrooms, therefore, the first hypothesis was rejected.

When the teacher-student verbal interaction in the open area was compared with that in the self-contained classrooms, the computed percentages for the I/D ratio, teacher talk, and student talk were not significantly different. The teachers in both facilities spent approximately half of their time in attempting to stimulate verbal participation by the students while the other half of their time was concentrated on increasing student compliance with teacher opinion and direction. Also, approximately two-thirds of the class time was spent with the teachers talking while less than one third of the time was spent with student talk. This was true of both the experimental and control groups. There were not any significant differences in the nature of teacher-student verbal interaction in the open area and that in self-contained classrooms when the proportions of direct and indirect interaction for the two groups were compared, thus the hypothesis was rejected.

When the small, medium, and large grouping arrangements were compared, there were significant differences. Students in the open area spent considerably more time in small and large instructional groups, while the students in self-contained spent a greater proportion of their

time in medium size groups. Teachers in the open area did regroup their students and departed from the typical classroom size grouping to a greater extent than did the teachers in self-contained classrooms. There were significant differences in the amounts of time students spent in varying sizes of instructional groups when the open area grouping arrangements were compared with the grouping arrangements in self-contained classrooms. Thus, the hypothesis was accepted.

When the use of supplementary instructional materials was compared, there was a significant difference in the amount of time supplemental materials were used. Teachers in the open area departed more from the basic textbook materials and used supplementary instructional materials more frequently than did the teachers in self-contained classrooms. The third and fourth grade open area teachers used supplementary materials to a greater extent than did any of the teachers in the other grades. There were significant differences in the amounts of time the open area students spent in the use of supplemental instructional materials when compared with the amounts of time the students in self-contained classrooms spent in the use of supplementary instructional materials. Thus, the research hypothesis was accepted.

When the perceptions of the organizational climate were compared, the open area teachers' perceptions were very similar to the perceptions of the self-contained classroom teachers. There were not any significant differences in the organizational climate as perceived by teachers in the open area and the organizational climate as perceived by the teachers in the self-contained classrooms, therefore, the hypothesis was rejected.

Incidental to the hypotheses, teachers' satisfaction, effect upon student discipline, and student distractions were considered. Eight of the nine teachers verbally expressed their satisfactions by wanting to continue teaching in the open area. Student discipline problems were considered to be fewer than in self-contained classrooms. There was not a problem of distraction except in a few cases where audio-visual materials were used and when large groups of students moved physically from one place to another within the open area.

## III. CONCLUSIONS

It was concluded that one type of facility was not superior to the other when considering academic achievement, teacher-pupil interaction, and the teachers' perceptions of the organizational climate. It was evident that the open area facility can handle the same type of program as successfully as can the self-contained classroom facility. It was also evident that the open area facility lends itself to different grouping arrangements of students and the use of supplementary instructional materials.

The fact that only two of twenty-four achievement comparisons had significant differences can probably be attributed to several factors. The first reason might be that time was not a variable. Academic achievement may be effected after students have been in an open area facility a longer period of time. It may be possible that there could be a

relationship between the students' academic achievement and the amount of time spent in contrasting types of facilities. The second reason may be that the types of facilities did not differ enough to have effected academic achievement. Also, the open area facility was designed primarily for allowing instructional flexibility. The purpose of the building may not be to make students learn faster, but instead, to provide educational opportunities for broadening the students' learning activities.

When the achievement test scores were compared between the sexes, the girls in each of the three respective grades tended to score higher than the boys. This apparently was not unusual in that Stroud[5] has found that the achievement test scores for girls are consistently higher than the scores for boys in the elementary school. The interaction between the factors, sex and facility, might suggest the desirability of further study to investigate the possibility that there are advantages of an open area that are favorable for boys.

When the teacher-student verbal interactions were examined for the control and experimental groups, the differences were not found to be significant. The investigator felt that the teachers reacted in a way that allowed them a feeling of security in what they were doing. When the investigator visited teachers' classes with a tape recorder, they

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[5]James B. Stroud, Psychology in Education, (New York: Longmans, Green and Company, 1956), pp. 390-392.

seemed to perform in a manner that they felt would be considered acceptable. The taped teaching sessions most likely could not be considered as typical class situations. The investigator had observed many classroom activities where the teachers encouraged the students to engage in a variety of activities that permitted verbal exchanges between the teacher and student. However, when the taping sessions began, both the teacher and student seemed to feel more comfortable when the teachers did most of the talking. It appeared that whenever teaching sessions were to be taped, the teachers tended to ask questions which required only direct answers. If the classroom activities could have been monitored in some other way so that the investigator would not be seen, the findings might have differed.

When the teachers' perceptions of the organizational climate were compared for the two groups, the findings were not found to be significant. The investigator feels that the organizational climate did not differ since both groups were located in the same building and under the supervision of the same principal. Also, both groups had planning periods together and were treated as one single faculty.

When the instructional grouping arrangements were compared, there were significant differences. One very apparent advantage of the open area was the flexibility of the facility. Teachers in the open area immediately began to take advantage of the space by having instructional groups of various sizes. The sizes of the groups were more suited to the

instructional needs, as was evidenced by the amounts of time spent in small and large group instruction. The investigator feels that the absence of walls was the main incentive for the teachers in the open area to vary the sizes of instructional groups. The students could move quite easily and also with hardly any loss of time. The self-contained classroom evidently was a confining factor, since most of the teaching was done with regular size instructional groups. The confining space of a self-contained classroom appears to accentuate the noise and movement of students and therefore, the teachers tended to keep the students in one group and discouraged movement.

When the use of supplementary instructional materials for the two groups was compared, there were significant differences. The open area teachers tended to use more supplementary instructional materials than did the teachers in self-contained classrooms. This may have been due to the various grouping arrangements that were taking place in the open area. That is, materials were selected for the purpose of meeting the needs within the various size groups. It is also possible that teachers learned from each other by working closely together and thus were encouraged to share materials and ideas. The open area facility had various instructional materials openly displayed and easily accessible to all teachers. This may have made it easier to obtain materials and thereby encouraged the use of supplementary instructional materials.

It was, therefore, concluded that the open area facility encouraged the development and utilization of varied instructional materials. This

utilization of varied materials seemed especially pertinent at the upper grade levels. Usually, the upper grades have more of a tendency to follow the basic textbook and use it as the main source of instruction. Since the fourth grade open area teachers used supplementary materials to a greater extent than did the teachers in self-contained classrooms, it was recommended that grades four and five utilize the open area in the next coming school year.

This study was conducted mainly for the purpose of helping officials of the Friendswood Independent School District decide on the type of structure that will be planned for the next new elementary school. It was the recommendation of this investigator that the next school building be an open area facility, but that certain separate special areas need to be included in the plans. Special rooms are needed for sound movies or tape recordings. Also, a large enclosed area for art or special activities would be desirable. There is a need for several exits so that students who want to leave the area can do so without much distraction.

This was only a one year study and only a beginning look at the open area concept. It is hoped that more studies will be forthcoming and that more knowledge can be gained.

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# APPENDIX A

## RECORDING SHEETS USED FOR COLLECTING DATA RELEVANT TO GROUPING PRACTICES AND SUPPLEMENTARY MATERIAL USAGE

Instrument A

Teacher _____ Group (E or C) Grade _____ Date _____

TIME SPENT IN GROUPS:

| Large Group Instruction (More than 35 in group) | Medium-sized Group Instruction (15-35 in group) | Small Group Instruction (Less than 15 in group) |
|---|---|---|
| Time & Activity: | Time & Activity: | Time & Activity |
| | | |
| Total Minutes of School Day _____ | _____ | _____ |
| Percent of School Day _____ | _____ | _____ |

Instrument B

Teacher _____ Group (E or C) Grade _____ Date _____

| *CATEGORY | *OPERATOR | **ROLE OF TEACHER | ACTIVITY | TITLE OF MATERIAL | AMOUNT OF TIME USED | NUMBER IN GROUP | STUDENT MINUTES |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

*CATEGORY

I. Visual & AV Materials

a. 16mm
b. Overhead
c. Filmstrip Projector
d. Television
e. Opaque Projector

Total Student Min._____

II. Audio Materials

a. Tape Recorder
b. Record Player

Total Student Min._____

III. Supplemental Printed Materials

a. Books
b. Cyclo Teacher
c. Mimeo Materials (Not accompanying basal text)

Total Student Min._____

IV. Other

Total Student Min._____

*OPERATOR

S - Student

T - Teacher

TA - Teacher Aide

**Role of Teacher

P - Participant

NP - Nonparticipant working with other group(s)

A - Absent planning or other work outside of classroom

Total amount of time using special materials _____

Total time with teacher as participant _____

Total time of students without teacher _____

Total student minutes involved _____

# APPENDIX B

## ANALYSIS OF VARIANCE FOR SECOND, THIRD, AND FOURTH GRADE ACHIEVEMENT TESTS

## ANALYSIS OF VARIANCE FOR SECOND GRADE ACHIEVEMENT TESTS

VOCABULARY:

| SOURCE | SS | DF | MS | F | P |
|---|---|---|---|---|---|
| TOTAL | 5043.76 | 135.0 | | | |
| FACILITY | 0.60 | 1.0 | 0.60 | 0.02 | |
| SEX | 6.18 | 1.0 | 6.18 | 0.16 | |
| AGE | 27.36 | 1.0 | 27.36 | 0.72 | |
| SEX X FACILITY | 11.18 | 1.0 | 11.18 | 0.29 | |
| AGE X FACILITY | 60.89 | 1.0 | 60.89 | 1.60 | |
| SEX X AGE | 8.01 | 1.0 | 8.01 | 0.21 | |
| AGE X SEX X FACILITY | 58.24 | 1.0 | 58.24 | 1.53 | |
| ERROR | 4871.29 | 128.0 | 38.06 | | |

READING COMPREHENSION:

| SOURCE | SS | DF | MS | F | P |
|---|---|---|---|---|---|
| TOTAL | 4377.35 | 135.0 | | | |
| FACILITY | 13.60 | 1.0 | 13.60 | 0.45 | |
| SEX | 346.24 | 1.0 | 346.24 | 11.37 | <.005 |
| AGE | 14.89 | 1.0 | 14.89 | 0.49 | |
| SEX X FACILITY | 48.24 | 1.0 | 48.24 | 1.58 | |
| AGE X FACILITY | 20.65 | 1.0 | 20.65 | 0.68 | |
| SEX X AGE | 19.13 | 1.0 | 19.13 | 0.63 | |
| AGE X SEX X FACILITY | 17.65 | 1.0 | 17.65 | 0.58 | |
| ERROR | 3896.94 | 128.0 | 30.44 | | |

LANGUAGE TOTAL:

| SOURCE | SS | DF | MS | F | P |
|---|---|---|---|---|---|
| TOTAL | 29847.93 | 135.0 | | | |
| FACILITY | 225.18 | 1.0 | 225.18 | 1.11 | |
| SEX | 2585.65 | 1.0 | 2585.65 | 12.70 | <.001 |
| AGE | 190.60 | 1.0 | 190.60 | 0.94 | |
| SEX X FACILITY | .693.01 | 1.0 | 693.01 | 3.40 | |
| AGE X FACILITY | 63.60 | 1.0 | 63.60 | 0.31 | |
| SEX X AGE | 11.18 | 1.0 | 11.18 | 0.05 | |
| AGE X SEX X FACILITY | 22.24 | 1.0 | 22.24 | 0.11 | |
| ERROR | 26056.47 | 128.0 | 203.57 | | |

(Analysis of Variance for Second Grade Continued)

ARITHMETIC CONCEPTS:

| SOURCE | SS | DF | MS | F | P |
|---|---|---|---|---|---|
| TOTAL | 4532.64 | 135.0 | | | |
| FACILITY | 0.07 | 1.0 | 0.07 | 0.00 | |
| SEX | 55.65 | 1.0 | 55.65 | 1.61 | |
| AGE | 20.65 | 1.0 | 20.65 | 0.60 | |
| SEX X FACILITY | 0.18 | 1.0 | 0.18 | 0.01 | |
| AGE X FACILITY | 0.89 | 1.0 | 0.89 | 0.03 | |
| SEX X AGE | 13.60 | 1.0 | 13.60 | 0.39 | |
| AGE X SEX X FACILITY | 27.36 | 1.0 | 27.36 | 0.79 | |
| ERROR | 4414.24 | 128.0 | 34.49 | | |

ARITHMETIC REASONING:

| SOURCE | SS | DF | MS | F | P |
|---|---|---|---|---|---|
| TOTAL | 3499.03 | 135.0 | | | |
| FACILITY | 24.74 | 1.0 | 24.74 | 1.01 | |
| SEX | 120.47 | 1.0 | 120.47 | 4.91 | $<.05$ |
| AGE | 51.88 | 1.0 | 51.88 | 2.11 | |
| SEX X FACILITY | 73.53 | 1.0 | 73.53 | 3.00 | |
| AGE X FACILITY | 26.47 | 1.0 | 26.47 | 1.08 | |
| SEX X AGE | 32.03 | 1.0 | 32.03 | 1.30 | |
| AGE X SEX X FACILITY | 28.26 | 1.0 | 28.26 | 1.15 | |
| ERROR | 3141.65 | 128.0 | 24.54 | | |

ARITHMETIC COMPUTATION:

| SOURCE | SS | DF | MS | F | P |
|---|---|---|---|---|---|
| TOTAL | 3353.74 | 135.0 | | | |
| FACILITY | 11.76 | 1.0 | 11.76 | 0.47 | |
| SEX | 9.53 | 1.0 | 9.53 | 0.38 | |
| AGE | 0.47 | 1.0 | 0.47 | 0.02 | |
| SEX X FACILITY | 1.44 | 1.0 | 1.44 | 0.06 | |
| AGE X FACILITY | 2.38 | 1.0 | 2.38 | 0.09 | |
| SEX X AGE | 88.97 | 1.0 | 88.97 | 3.53 | |
| AGE X SEX X FACILITY | 14.24 | 1.0 | 14.24 | 0.57 | |
| ERROR | 3224.94 | 128.0 | 25.19 | | |

(Analysis of Variance for Second Grade Continued)

ARITHMETIC TOTAL:

| SOURCE | SS | DF | MS | F | P |
|---|---|---|---|---|---|
| TOTAL | 26107.88 | 135.0 | | | |
| FACILITY | 78.01 | 1.0 | 78.01 | 0.40 | |
| SEX | 45.89 | 1.0 | 45.89 | 0.23 | |
| AGE | 246.24 | 1.0 | 246.24 | 1.25 | |
| SEX X FACILITY | 97.24 | 1.0 | 97.24 | 0.49 | |
| AGE X FACILITY | 7.07 | 1.0 | 7.07 | 0.04 | |
| SEX X AGE | 246.24 | 1.0 | 246.24 | 1.25 | |
| AGE X SEX X FACILITY | 122.36 | 1.0 | 122.36 | 0.62 | |
| ERROR | 25264.82 | 128.0 | 197.38 | | |

TOTAL COMPOSITE ACHIEVEMENT:

| SOURCE | SS | DF | MS | F | P |
|---|---|---|---|---|---|
| TOTAL | 177812.40 | 135.0 | | | |
| FACILITY | 0.89 | 1.0 | 0.89 | 0.00 | |
| SEX | 7105.07 | 1.0 | 7105.07 | 5.53 | <.025 |
| AGE | 2057.65 | 1.0 | 2057.65 | 1.60 | |
| SEX X FACILITY | 2232.36 | 1.0 | 2232.36 | 1.74 | |
| AGE X FACILITY | 81.07 | 1.0 | 81.07 | 0.06 | |
| SEX X AGE | 1089.89 | 1.0 | 1089.89 | 0.85 | |
| AGE X SEX X FACILITY | 657.36 | 1.0 | 657.36 | 0.51 | |
| ERROR | 164588.12 | 128.0 | 1285.84 | | |

## ANALYSIS OF VARIANCE FOR THIRD GRADE ACHIEVEMENT TESTS

VOCABULARY:

| SOURCE | SS | DF | MS | F | P |
|---|---|---|---|---|---|
| TOTAL | 3849.68 | 111.0 | | | |
| FACILITY | 11.57 | 1.0 | 11.57 | 0.34 | |
| SEX | 41.29 | 1.0 | 41.29 | 1.22 | |
| AGE | 150.89 | 1.0 | 150.89 | 4.45 | <.05 |
| SEX X FACILITY | 72.32 | 1.0 | 72.32 | 2.13 | |
| AGE X FACILITY | 2.29 | 1.0 | 2.29 | 0.07 | |
| SEX X AGE | 46.29 | 1.0 | 46.29 | 1.37 | |
| AGE X SEX X FACILITY | 0.89 | 1.0 | 0.89 | 0.03 | |
| ERROR | 3524.14 | 104.0 | 33.89 | | |

READING:

| SOURCE | SS | DF | MS | F | P |
|---|---|---|---|---|---|
| TOTAL | 15172.86 | 111.0 | | | |
| FACILITY | 0.57 | 1.0 | 0.57 | 0.00 | |
| SEX | 585.14 | 1.0 | 585.14 | 4.48 | <.05 |
| AGE | 228.57 | 1.0 | 228.57 | 1.75 | |
| SEX X FACILITY | 531.57 | 1.0 | 531.57 | 4.07 | |
| AGE X FACILITY | 0.57 | 1.0 | 0.57 | 0.00 | |
| SEX X AGE | 185.14 | 1.0 | 185.14 | 1.42 | |
| AGE X SEX X FACILITY | 63.00 | 1.0 | 63.00 | 0.48 | |
| ERROR | 13578.29 | 104.0 | 130.56 | | |

SPELLING:

| SOURCE | SS | DF | MS | F | P |
|---|---|---|---|---|---|
| TOTAL | 5291.96 | 111.0 | | | |
| FACILITY | 0.89 | 1.0 | 0.89 | 0.02 | |
| SEX | 814.32 | 1.0 | 814.32 | 20.82 | <.001 |
| AGE | 146.29 | 1.0 | 146.29 | 3.74 | |
| SEX X FACILITY | 85.75 | 1.0 | 85.75 | 2.19 | |
| AGE X FACILITY | 112.00 | 1.0 | 112.00 | 2.86 | |
| SEX X AGE | 57.14 | 1.0 | 57.14 | 1.46 | |
| AGE X SEX X FACILITY | 7.00 | 1.0 | 7.00 | 0.18 | |
| ERROR | 4068.57 | 104.0 | 39.12 | | |

(Analysis of Variance for Third Grade Continued)

LANGUAGE SKILLS TOTAL:

| SOURCE | SS | DF | MS | F | P |
|---|---|---|---|---|---|
| TOTAL | 83983.43 | 111.0 | | | |
| FACILITY | 128.57 | 1.0 | 128.57 | 0.20 | |
| SEX | 13202.29 | 1.0 | 13202.29 | 20.72 | <.001 |
| AGE | 2161.29 | 1.0 | 2161.29 | 3.39 | |
| SEX X FACILITY | 1856.57 | 1.0 | 1856.57 | 2.91 | |
| AGE X FACILITY | 155.57 | 1.0 | 155.57 | 0.24 | |
| SEX X AGE | 120.14 | 1.0 | 120.14 | 0.19 | |
| AGE X SEX X FACILITY | 89.29 | 1.0 | 89.29 | 0.14 | |
| ERROR | 66269.71 | 104.0 | 637.21 | | |

ARITHMETIC CONCEPTS:

| SOURCE | SS | DF | MS | F | P |
|---|---|---|---|---|---|
| TOTAL | 4053.96 | 111.0 | | | |
| FACILITY | 82.29 | 1.0 | 82.29 | 2.28 | |
| SEX | 66.04 | 1.0 | 66.04 | 1.83 | |
| AGE | 116.04 | 1.0 | 116.04 | 3.22 | |
| SEX X FACILITY | 20.57 | 1.0 | 20.57 | 0.57 | |
| AGE X FACILITY | 3.57 | 1.0 | 3.57 | 0.10 | |
| SEX X AGE | 12.89 | 1.0 | 12.89 | 0.36 | |
| AGE X SEX X FACILITY | 0.57 | 1.0 | 0.57 | 0.02 | |
| ERROR | 3752.00 | 104.0 | 36.08 | | |

ARITHMETIC PROBLEMS:

| SOURCE | SS | DF | MS | F | P |
|---|---|---|---|---|---|
| TOTAL | 3522.56 | 111.0 | | | |
| FACILITY | 40.08 | 1.0 | 40.08 | 1.34 | |
| SEX | 279.72 | 1.0 | 279.72 | 9.37 | <.005 |
| AGE | 61.51 | 1.0 | 61.51 | 2.06 | |
| SEX X FACILITY | 5.58 | 1.0 | 5.58 | 0.19 | |
| AGE X FACILITY | 4.72 | 1.0 | 4.72 | 0.16 | |
| SEX X AGE | 25.08 | 1.0 | 25.08 | 0.84 | |
| AGE X SEX X FACILITY | 1.51 | 1.0 | 1.51 | 0.05 | |
| ERROR | 3104.36 | 104.0 | 29.85 | | |

(Analysis of Variance for Third Grade Continued)

ARITHMETIC TOTAL:

| SOURCE | SS | DF | MS | F | P |
|---|---|---|---|---|---|
| TOTAL | 13458.78 | 111.0 | | | |
| FACILITY | 237.22 | 1.0 | 237.22 | 2.04 | |
| SEX | 617.58 | 1.0 | 617.58 | 5.30 | <.025 |
| AGE | 346.51 | 1.0 | 346.51 | 2.97 | |
| SEX X FACILITY | 47.58 | 1.0 | 47.58 | 0.41 | |
| AGE X FACILITY | 16.51 | 1.0 | 16.51 | 0.14 | |
| SEX X AGE | 73.94 | 1.0 | 73.94 | 0.63 | |
| AGE X SEX X FACILITY | 3.94 | 1.0 | 3.94 | 0.03 | |
| ERROR | 12115.50 | 104.0 | 116.50 | | |

TOTAL COMPOSITE:

| SOURCE | SS | DF | MS | F | P |
|---|---|---|---|---|---|
| TOTAL | 478404.43 | 111.0 | | | |
| FACILITY | 141.75 | 1.0 | 141.75 | 0.04 | |
| SEX | 43687.00 | 1.0 | 43687.00 | 11.12 | <.001 |
| AGE | 13072.32 | 1.0 | 13072.32 | 3.33 | |
| SEX X FACILITY | 10375.75 | 1.0 | 10375.75 | 2.64 | |
| AGE X FACILITY | 11.57 | 1.0 | 11.57 | 0.00 | |
| SEX X AGE | 2508.04 | 1.0 | 2508.04 | 0.64 | |
| AGE X SEX X FACILITY | 41.29 | 1.0 | 41.29 | 0.01 | |
| ERROR | 408566.71 | 104.0 | 3928.53 | | |

## ANALYSIS OF VARIANCE FOR FOURTH GRADE ACHIEVEMENT TESTS

VOCABULARY:

| SOURCE | SS | DF | MS | F | P |
|---|---|---|---|---|---|
| TOTAL | 5277.99 | 119.0 | | | |
| FACILITY | 11.41 | 1.0 | 11.41 | 0.26 | |
| SEX | 37.41 | 1.0 | 37.41 | 0.86 | |
| AGE | 8.01 | 1.0 | 8.01 | 0.19 | |
| SEX X FACILITY | 261.08 | 1.0 | 261.08 | 6.03 | <.025 |
| AGE X FACILITY | 42.01 | 1.0 | 42.01 | 0.97 | |
| SEX X AGE | 16.88 | 1.0 | 16.88 | 0.39 | |
| AGE X SEX X FACILITY | 54.67 | 1.0 | 54.67 | 1.26 | |
| ERROR | 4846.53 | 112.0 | 43.27 | | |

READING:

| SOURCE | SS | DF | MS | F | P |
|---|---|---|---|---|---|
| TOTAL | 15737.97 | 119.0 | | | |
| FACILITY | 13.33 | 1.0 | 13.33 | 0.11 | |
| SEX | 396.03 | 1.0 | 396.03 | 3.16 | |
| AGE | 0.13 | 1.0 | 0.13 | 0.00 | |
| SEX X FACILITY | 563.33 | 1.0 | 563.33 | 4.50 | <.05 |
| AGE X FACILITY | 116.03 | 1.0 | 116.03 | 0.93 | |
| SEX X AGE | 163.33 | 1.0 | 163.33 | 1.30 | |
| AGE X SEX X FACILITY | 456.30 | 1.0 | 456.30 | 3.64 | |
| ERROR | 14029.47 | 112.0 | 125.26 | | |

SPELLING:

| SOURCE | SS | DF | MS | F | P |
|---|---|---|---|---|---|
| TOTAL | 5288.59 | 119.0 | | | |
| FACILITY | 11.41 | 1.0 | 11.41 | 0.29 | |
| SEX | 533.41 | 1.0 | 533.41 | 13.53 | <.001 |
| AGE | 18.41 | 1.0 | 18.41 | 0.47 | |
| SEX X FACILITY | 304.01 | 1.0 | 304.01 | 7.71 | <.01 |
| AGE X FACILITY | 3.01 | 1.0 | 3.01 | 0.08 | |
| SEX X AGE | 0.68 | 1.0 | 0.68 | 0.02 | |
| AGE X SEX X FACILITY | 3.01 | 1.0 | 3.01 | 0.08 | |
| ERROR | 4414.67 | 112.0 | 39.42 | | |

(Analysis of Variance for Fourth Grade Continued)

LANGUAGE SKILLS TOTAL:

| SOURCE | SS | DF | MS | F | P |
|---|---|---|---|---|---|
| TOTAL | 63006.37 | 119.0 | | | |
| FACILITY | 750.00 | 1.0 | 750.00 | 1.60 | |
| SEX | 6020.83 | 1.0 | 6020.83 | 12.82 | <.001 |
| AGE | 34.13 | 1.0 | 34.13 | 0.07 | |
| SEX X FACILITY | 2150.53 | 1.0 | 2150.53 | 4.58 | <.05 |
| AGE X FACILITY | 1346.70 | 1.0 | 1346.70 | 2.87 | |
| SEX X AGE | 38.53 | 1.0 | 38.53 | 0.08 | |
| AGE X SEX X FACILITY | 50.70 | 1.0 | 50.70 | 0.11 | |
| ERROR | 52614.93 | 112.0 | 469.78 | | |

ARITHMETIC CONCEPTS:

| SOURCE | SS | DF | MS | F | P |
|---|---|---|---|---|---|
| TOTAL | 4274.37 | 119.0 | | | |
| FACILITY | 90.13 | 1.0 | 90.13 | 2.52 | |
| SEX | 10.80 | 1.0 | 10.80 | 0.30 | |
| AGE | 0.03 | 1.0 | 0.03 | 0.00 | |
| SEX X FACILITY | 149.63 | 1.0 | 149.63 | 4.19 | <.05 |
| AGE X FACILITY | 6.53 | 1.0 | 6.53 | 0.18 | |
| SEX X AGE | 2.13 | 1.0 | 2.13 | 0.06 | |
| AGE X SEX X FACILITY | 12.03 | 1.0 | 12.03 | 0.34 | |
| ERROR | 4003.07 | 112.0 | 35.74 | | |

ARITHMETIC PROBLEMS:

| SOURCE | SS | DF | MS | F | P |
|---|---|---|---|---|---|
| TOTAL | 3324.37 | 119.0 | | | |
| FACILITY | 112.13 | 1.0 | 112.13 | 4.15 | <.05 |
| SEX | 70.53 | 1.0 | 70.53 | 2.61 | |
| AGE | 17.63 | 1.0 | 17.63 | 0.65 | |
| SEX X FACILITY | 67.50 | 1.0 | 67.50 | 2.50 | |
| AGE X FACILITY | 19.20 | 1.0 | 19.20 | 0.71 | |
| SEX X AGE | 10.80 | 1.0 | 10.80 | 0.40 | |
| AGE X SEX X FACILITY | 1.63 | 1.0 | 1.63 | 0.06 | |
| ERROR | 3024.93 | 112.0 | 27.01 | | |

(Analysis of Variance for Fourth Grade Continued)

ARITHMETIC TOTAL:

| SOURCE | SS | DF | MS | F | P |
|---|---|---|---|---|---|
| TOTAL | 12436.80 | 119.0 | | | |
| FACILITY | 403.33 | 1.0 | 403.33 | 3.97 | $<.05$ |
| SEX | 136.53 | 1.0 | 136.53 | 1.35 | |
| AGE | 19.20 | 1.0 | 19.20 | 0.19 | |
| SEX X FACILITY | 418.13 | 1.0 | 418.13 | 4.12 | $<.05$ |
| AGE X FACILITY | 48.13 | 1.0 | 48.13 | 0.47 | |
| SEX X AGE | 22.53 | 1.0 | 22.53 | 0.22 | |
| AGE X SEX X FACILITY | 22.53 | 1.0 | 22.53 | 0.22 | |
| ERROR | 11366.40 | 112.0 | 101.49 | | |

TOTAL COMPOSITE:

| SOURCE: | SS | DF | MS | F | P |
|---|---|---|---|---|---|
| TOTAL | 449371.59 | 119.0 | | | |
| FACILITY | 2990.01 | 1.0 | 2990.01 | 0.85 | |
| SEX | 22331.41 | 1.0 | 22331.41 | 6.36 | $<.025$ |
| AGE | 25.21 | 1.0 | 25.21 | 0.01 | |
| SEX X FACILITY | 19789.01 | 1.0 | 19789.01 | 5.63 | $<.025$ |
| AGE X FACILITY | 6615.68 | 1.0 | 6615.68 | 1.88 | |
| SEX X AGE | 500.21 | 1.0 | 500.21 | 0.14 | |
| AGE X SEX X FACILITY | 3619.01 | 1.0 | 3619.01 | 1.03 | |
| ERROR | 393501.07 | 112.0 | 3513.40 | | |